Let's Beat the Climate Change

A Guidebook with 25 Adaptation Methods

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Coming to terms with the challenge

The Bundelkhand Region has a population of nearly 21 million. Out of this, over 82 per cent lives in the rural areas. More than 80 per cent of the population depends on agriculture, livestock and forestry. Many make a living by migration during the non-cultivation seasons. Bundelkhand is one of the most backward regions on the map of India.

While the lack of sufficient energy, water, communication and a marked absence of industries are the contributing factors for Bundelkhand's socio-economic condition, the climate change is looming as the most serious threat to its agriculture, livestock and the existence of its people. Long spells of droughts, scares rainfall and hot extremes are gradually turning the region into a virtual wasteland. The ponds have gone dry. Water is disappearing from the wells. The farms are barren. Agriculture which has been the mainstay for people's livelihoods is in a dire strait.

It is apparent that the situation in Bundelkhand region is at a critical stage due to climatic change. Agriculture, water, energy and livelihood options are all interlinked. To create opportunities sustainable livelihood and prevent peoples' migration from Bundelkhand, Development Alternatives initiated a socio-economic campaign-'Shubh Kal'.

The campaign was aimed at providing localized solutions to the emerging problems faced by the vulnerable and marginalised communities of the region. The campaign had three target groups: farmers, artisans and women, who were worst affected by persistent drought. The project envisaged to help the communities through various support measures that would lead to improved income through enhanced natural resource management and by adopting livelihood techniques resilient to climate change.

'Shubh Kal' campaign was based on participatory model of communication. Under this participatory campaign, the communities had chosen a few adaptation methods such as changing to drought-resistant crop varieties, using new agro-technologies, rain water harvesting and tapping alternatives sources of livelihoods. The adaptation methods proved to be extremely effective and they brought about a behavioral change among the communities that lead to change the lives of the people.

The success story of Bundelkhand can be replicated in other regions of the country to meet the challenges of climate change.

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What is a Kitchen Garden?

A kitchen garden is one where you can grow vegetables, fruits, herbs and condiments for you and your family. It can be grown in the yard behind or in front of your house. It can also be started in pots placed on windows sills, along the doors or on the roof of your house.

Maintaining a kitchen garden will give you several advantages such as:

- Fresh and nutritious fruits and vegetables
- Savings as you will buy less from the market
- Improved health for you and your family
- Additional source of income once you succeed, you can also sell extra fruits, vegetables, herbs, condiments, medicinal plants and flowers from your garden
- Additional source of food close by incase of any food shortages due to failure of rains/drought

Things to remember before starting your own kitchen garden:

- Anyone can work and contribute towards a kitchen garden – an individual (you), your entire family or even several members of your community together
- It is better to start small and expand gradually
- Waste water from the kitchen and bathroom can be used to water the kitchen garden, provided they are free of soap and chemical detergent
- Crops which have high nutritional value and are suited to your local conditions need to be selected
- Ensure that no chemical pesticides or fertilizers are used because these harm the environment and degrade the soil quality

What do I need to set up a kitchen Garden?



- Time: 3-5 months

- Preparing the kitchen garden (clearing, land preparation) can take upto 2 days depending on the size and number of people available. Depending on what you plant, it can take from 3-5 months to a year to grow. For instance, beans, onions and peas take about 3 months while potatoes, tomatoes and squash can take about 5 months. You will also need at least 15-30 minutes each day to water, check the plants and harvest the ripe vegetables/fruits.
- Investment Required: Rs. 1500 to Rs. 3000
- Some money will be required to buy good quality compost and saplings for each season – this can cost between Rs. 1500 to

3000 depending on the size of the garden and number and type of seeds and saplings.

- Knowledge and Information:
- Basic knowledge of planting and harvesting and a keen eye to spot infections in plants.
- Knowledge of seeds and seasons, eg- what vegetables grow best in which season?

Steps

- 1. Site Selection: First, you need to choose whichever site is available and most convenient to you. Ensure that the site receives 6-8 hours of sunlight a day and is close to a steady supply of water. A good option could be the backyard of the house, so that your family can look after the vegetables during leisure and the wastewater from the bathrooms and kitchen can be diverted to the vegetable beds. Other options include the front yard or some waste land close to the community well.
- 2. Land Preparation: Clear the land and dig the garden area to a depth of about 8-10 inches to loosen the soil and remove any roots if any. Surround the garden with bricks, logs and rocks to make a raised bed. This area then needs to be filled with good quality soil and compost. Chemical fertilizers should be avoided. Fallen tree branches/ wood can be used to make square grids (approx. 40cm x 40 cm) in order to divide the garden into small plots. In case your land is at risk of being attacked by stray cattle, you need to surround it with a fence.

- 3. Sowing and Planting: Seeds need to be planted in each of the plots, however care needs to be taken with different types of seeds. Direct seeding plants such as bhindi and beans can be planted on one side and perennial plants such as drumstick, curry leaf 'kadhi patta', papaya etc. should be planted on another so they do not shade other crops or compete for nutrition. Certain seeds will require to be transplanted (eg. tomatoes, brinjal) and first planted in a pot or nursery bed and covered with top soil and, if possible, neem cakes to protect them from ants and then moved into the kitchen garden after a period of 30-45 days.
- 4. Watering: Crops need to be watered regularly, if you are using grey water from the kitchen or bathroom, ensure that it is free of chemical detergent or soap. Seeds and seedlings need to be watered gently, plants should never be drowned with water, if they require a lot of water it should be given in stages, ensure that the soil is watered and not the plants as water on the leaves can hurt the plants.
- 5. Harvesting: You should know if the crop must ripen on the plant or can also ripen off the plant before harvesting. Harvesting should ensure that the produce is fresh and undamaged. Use a knife or pruning shears rather than breaking or twisting the stems. Store a few seeds to sow again next season. Old plants can be left in the soil as compost.

Flow Diagram: Setting up a Kitchen Garden



How will a kitchen garden enable me to adapt to the effects of climate change?

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- Kitchen gardens increase the diversity of your food crops
- Contribute to food security and additional sources of income for your household
- It reduces dependence on agricultural crops that may be affected by changing climate
- · Since kitchen gardens are usually small and

Short Notes / Tips / Any other important points

A garden that can be managed by children can be made by cutting a car tyre in half. It can be filled with soil and manure and planted with vegetables. Heat from the sun warms the tyre and helps the plants grow and such a garden requires only 1 litre of water a day.

Govt. Scheme: Funds for your kitchen garden can be leveraged from The National Horticulture Mission which provides funds for vegetable planting.

manageable, it is easy to control pests and diseases through the removal of affected parts

 Improve the quality of the soil with the use of organic manure and without the use of chemical fertilizers or pesticides. Chemical pesticides and fertilizers pollute the environment and contribute to climate change





What is Vermi-Composting?

Vermi-composting is the process by which earthworms' species are used to convert organic wastes into vermi-compost, excellent organic manure.

Preparing vermi-compost has several advantages, these are:

- It provides nutrients to make soil rich and fertile, and keeps it moist and airy by opening up the soil, and trapping and draining water
- Vermi-composting helps ensure the reuse of organic waste as a resource
- It can also be looked at as an alternative to chemical fertilizers which not only cost money but causes water pollution and contributes to climate change
- It leads to the reduction of pathogenic microorganisms thus leading to better

Process

Resources Required

- Duration: Initially preparing the compost bins requires 2 days, however it takes a period of 50 – 80 days for the preparation of vermi-compost and between 10-20 minutes each day to segregate and collect organic waste for the compost bin.
- Investment Required: Rs. 1500

2-3 Containers/bins

The container can be made of brick, cement, plastic, wood or stone (Rs. 1000). A conveniently sized container would have the dimensions of $1m \times 1m \times 0.6m$. Another container is required for decomposition of organic waste, and a third can be used to store prepared vermi-compost.

hygiene and health in your area

Things to remember before preparing vermicompost are:

- Most organic waste can be used for vermicomposting including domestic wastes (kitchen), farm wastes (crop residues, domestic animal, leaf litter, etc.), and wastes from public places like markets, hotels etc.
- The following materials should not be used

 large pieces of wood, plastic, metal, glass,
 wire, coal ash, synthetic fabrics or very tough
 weeds
- The earthworm species preferred are Isinia Fiteda, Octofireno Cireta, Utreelus Ugeene and Uranix Exkeveta
- Protect the vermibed from animals and birds

Feed mixture

Dung is mixed with any organic wastes in the ratio of 1:8 and put in the container. If dung is not available, a little vermi-compost or soil can be added to the waste.

- Worms: Earth worms (Rs. 500 1kg). Alternatively, 500gms of jaggery (gud) and 500 gms of fresh cattle dung should be dissolved in two litres of water and sprinkled over an area of 1m x 1m surface soil. This should be covered with straw and an old gunny bag and left for 20-30 days during that time water should be sprinkled over it. Several native worms will collect at this spot which can be collected and used.
- **Pre condition/ support condition:** The processes should take place under an overhead cover to avoid direct sunlight and rain.

Steps

- Preparation of compost pit: Arrange two containers, one for decomposition of wastes and the other for vermi-composting with suitable protection and shelter. Allow the organic wastes to decompose partially for 15-20 days in one of the containers.
- 2. Preparation of 'vermibed': For ideal decomposition, a vermibed or bed for earthworms should be made by putting a good layer of moist loamy soil (5 6 inches) at the bottom of the pit. Earthworms can then be introduced into this bed. Some dung and the partially decomposed organic waste can now be introduced into the container including dry leaves, agriculture waste and chopped hay/straw. The bed should neither be dry nor soggy.
- 3. Maintaining the 'vermibed': The vermibed can be covered with an old jute 'gunny' bag to discourage birds; however plastic sheets should be avoided as they trap heat. Water should be sprinkled over the compost regularly to keep the pile moist. The worms

feed on the waste and assimilate 5-10% for their growth; the rest is excreted as small granular pellets at the surface.

- 4. Collecting the compost: The compost is ready when the material is moderately loose and crumbly and the colour of the compost is dark brown with an earthy smell. Either the earthworm castings may be collected twice a week once the process is complete, or the other way of collecting vermi-compost is at the end after 50-60 days. The material can be dumped on the ground and made into a heap and left for few hours in the sun. It forces the worms to move to the cool base of the heap. They can then be taken out and reintroduced into the next feed. The collected castings can be dried in the shade and sieved through a 3 mm sieve to separate cocoons and young ones.
- Repeat: During the first cycle, organic waste is decomposed in the second container and the cycle is repeated. The cocoons and young worms sieved from the vermicompost should also be reintroduced into the next feed.

How will vermi-composting enable me to adapt to the effects of climate change?

- Vemi-composting is an excellent alternative to harmful and expensive chemical fertilizers. The manufacture and use of chemical fertilizers emit harmful gases that cause climate change
- The burning and open disposal of organic wastes from the kitchen, gaushala and farmland also emit gases that lead to climate

change. You can effectively utilize these wastes to make vermi-compost to use in your garden or farmland

 Additional benefits of vermi-composting include an additional source of income if you sell the vermi-compost. This can be done at a household level or even through cooperative efforts of an SHG





What is Amrut-Mitti?

Amrut-Mitti is the process which is adopted through imitating the natural system where nature uses its own resources such as leaves, vegetation, animal dung, animal urine, water etc. for enrichment of top soil. Just like the forest does not need any fertilizers or pesticides and yet the soil remains fertile, the same way if rich organic matter is retained in the soil, plants / crops can develop better resistance against pests and diseases and yield a good crop.



Preparing vermi-compost has several advantages, these are:

- · Enrichment of top soil
- More water holding capacity
- · No need of specific shed for preparation
- Farmers friendly (no need of specific skill)
- Zero waste emission
- Better quality of manure
- · Strong, healthier and nutritional plant
- The inputs are made from natural materials
- Use of indigenous micro organisms

Things to remember before preparing Amrut-Mitti are:

- Don't keep the Amrut Mitti unmulched or exposed to sunlight; if microbes are exposed to the sun even for a short period, they die, resulting in a loss of all the efforts taken to build them up
- Don't use any chemicals along with this soil. This will result in poor soil quality
- Don't till the soil as this leads in a loss of moisture and microbes

Process

Resources Required

- Duration: 100 days
- Investment Required: Water tank Rs. 100 (Generally available in every house), Jaggery or excess ripe fruit - Around Rs. 50, Seeds - Rs. 50
- 10'x3'x1' space for preparing Amrut-mitti heap
- Agriculture residues/ kitchen waste/ tree leaves/ waste of cattle yard: Around 50-60 kg



- Soil: 6- 10 kg
- Seed: 300 gm different type of seed for greening

For preparation of 60-70 litre Amrit Jal

- Cow dung: 750 gm
- Cow urine: 750 lit
- Jaggery: 50 gm
- Water: 60-70 lit
- Pre condition/ support condition: Basic knowledge of farming

Steps

- 1. **Preparation of Amrit Jal:** Mix cow dung, cow urine and jaggery in one drum for 3 days and stir 2 to 3 times a day, both clock and anti clockwise. On the 4th day mix with 50 to 60 liters of water and you will have Amrit Jal ready for use.
- Preparation of compost heaps: For preparation of heap, put one layer (2"- 3") of chopped and soaked (in Amrit Jal for 24 hours) agri residues/ leaves/ waste. Then put one layer of soil and spray Amrit Jal for moisture. Keep this way in alternate till 1'-1.5' height or 10-15 layer and after that put last layer of 2" soil.

- 3. Greening of heap: Easily available seeds are to be used for greening. First of all collect the seed and soak in Amrit Jal for 24 hours. After that, broadcast seeds in top layer of heap and mulching of around 4" with dry leaves or grasses for fast germination and at last spray Amrit Jal for moisture. After germination of seed remove the mulch and spray Amrit Jal time to time to maintain moisture.
- a. After 20-21 days of interval: Seed would have grown to some height, cut off around 25% of the greens, without disturbing the roots. After cutting it off, cut around one inch of the stem and put it back on the heap.
- **b.** After second 20-21 days of interval: Cut the grown plant again (around 25 % of height), which will consist of matured leaves and put back (green cutting) in heap.
- c. After the third 20-21 days of interval: Third interval that is 60-65 days, remove all the plants by uprooting. Chop them in 2"-3" and spread them out on the heap of compost. Leave for 3-4 days till they become yellow and then mix them into the heap. Composted heap is to be kept for 30 more days. However, after every 7 days it should be tilled.





How will Amrut-Mitti enable me to adapt to the effects of climate change?

- Amrut-Mitti is an excellent alternative to harmful and expensive chemical fertilizers. The manufacture and use of chemical fertilizers emit harmful gases that cause climate change
- Amrut-Mitti increases the water holding capacity of soil, keeping the soil moist for longer and thus conserves water
- There is no need of tilling the soil when Amrut-Mitti is used and this conserves soil carbon which is important in fighting with climate change
- Emissions from livestock waste water are reduced
- It is not only safe for environment, but rejuvenates and rehabilitates the ecological balance of soil





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What is Agro Forestry?

Agro forestry is an integrated approach of using the interactive benefits from combining trees and shrubs with crops and/or livestock. It combines agricultural and forestry technologies to create more diverse, productive, profitable, healthy and sustainable land-use systems.

Agro forestry has several advantages, these are:

 Increased production of agro forestry products such as fruits, nuts and edible oils for home consumption and sale



- Restoring farm soil fertility
- Provision of fuel and fodder
- Odour, dust and noise reduction
- Green space and visual aesthetics

Things to remember before practicing agro forestry are:

- Agro forestry has two functions. Productive functions include the provision of food, fodder, fuel-wood, fruits etc. The protective functions are windbreaks, shelter beds, soil conservation and soil improvement
- Ensure you choose trees that will not compete with your crop for sunlight, nutrients and water

Process

Resources Required

- **Duration:** 2-3 days for plantation between 3 months 2 years for tree growth depending on tree/crops
- Investment Required: Rs 1500 for saplings/ seeds

Steps

There are a variety of options to practice agro forestry, the ones most relevant to semi-arid regions such as Bundelkhand are:

1. Agrisilvicultural Systems: In this system, agricultural crops are intercropped with tree crops in the interspaces between the trees. Under this system, agricultural crops can be grown upto two years under protective irrigated condition and under rainfed farming upto four years. The crops can be grown profitably up to the above said period, beyond which it is uneconomical to grow grain crops. However, fodder crops, shade loving crops and shallow rooted



crops can be grown economically for longer. Wider spacing is adopted without sacrificing tree population for easy cultural operation and to get more sunlight to the intercrop. Performance of the tree crops is better in this system as compared to monoculture

Examples: Multipurpose – Butea monosperma, Azdairachta indica, Madhuca latifolia, Albizia lebbeck, Acacia leucophloea; fruit trees such as Ber and Grasses such as Sorghum, Guar, Pigeonpea Cowpea.

2. Silvopastoral Systems: The production of woody plants combined with pasture is referred to Silvipasture system. The trees and shrubs may be used primarily to produce fodder for livestock or they may be grown for timber, fuel wood, fruit or to improve the soil

This system is classified into three categories:

a) **Protein bank:** In this Silvipastoral system, various multipurpose trees (protein rich trees) are planted in or around farmlands

and range lands for cut and carry fodder production to meet the feed requirement of livestock during the fodder deficit period in winter

Example: Acacia nilotica, Albizia lebbeck, Azadirachta indica, Leucaena leucocephala, Gliricidia sepium, Sesbania grandiflora

 b) Live-fence of fodder trees and hedges: In this system, various fodder trees and hedges are planted as live fence to protect the property from stray animals or other biotic influences

Example: Gliricidia sepium, Sesbania grandiflora, Erythrina sp, Acacia sp.

c) Trees and shrubs on pasture: In this system, various tree and shrub species are scattered irregularly or arranged according to some systemic pattern to supplement forage production

Example: Acacia nilotica, Acacia leucophloea, Tamarindus indica, Azadirachta indica.

How will agro forestry enable me to adapt to the effects of Climate Change?

- Agro forestry has the potential to help reduce climate change since trees take up and store carbon at a faster rate than crops
- Deforestation can be reduced
- Agro forestry has higher biodiversity than conventional agriculture systems. Biodiversity provides essential ecosystem services and builds resilience to climate

change by increasing the diversity of on farm tree crops and tree cover as a buffer against climate change

 Agro forestry can lead to increased productivity and economic benefits through the ecological goods and services such as water conservation, non-timber forest products etc.



Rainwater Harvesting

Solution for Water Scarcity



What is Rainwater harvesting?

Rainwater harvesting is the accumulating and storing of water for reuse. The water can be used to replenish groundwater as well as for drinking for livestock, and irrigation depending on the kind of structure, for example it can be stored in a rainwater tank or directed to recharge groundwater.

Rainwater harvesting has several advantages, these are:

- Rainwater is a relatively clean and free source of water
- It provides a source of water at a point where it is needed

- It promotes self sufficiency and conserves water resources
- It can be used to water a kitchen garden, increasing the diversity of food crops
- Low running costs

Things to remember before practicing rainwater harvesting are:

- There are different types of Rainwater harvesting structures that can be used for storage and reuse of water and for ground water recharge.
- The Rainwater Harvesting structure should be in place before the rainy season starts for effective utilization of rainwater

Process

Resources Required

- Investment Required:
- a. Recharge pit of 1.5m x 1.5m x 2m (Total Rs. 1000)
- Excavation: Rs 200
- Perforated Brick lining: Rs 700
- Stone, Sand and Pebbles for filling: Rs 100
- b. Cost of PVC Pipe: Rs. 40 per running meter (rm)

Steps

- Catchment of a water harvesting system is the surface which directly receives the rainfall and provides water to the system. The best catchment area would be the roof of your house which could be flat or sloping. The way you construct your structure will depend on your catchment. For a sloping roof follow all steps given here and for a flat roof proceed to step 4.
- 2. Gutters are channels all around the edge of a sloping roof to collect and transport water to the recharge structure. Your Gutters can be semi-circular or rectangular and can be made using locally available material such as PVC material or Bamboo or Betel trunks. You can prepare semi-circular gutters of PVC material by cutting those pipes into two equal semi-circular channels.
- 3. Attach gutters to the roof and ensure they are adequately supported, so they do not sag or fall off when loaded with water. The way in which gutters are fixed depends on the construction of the house; it is possible to fix iron or timber brackets into the walls, but for houses having wider eaves, some method of attachment to the rafters is necessary. The gutters around the roof need to be attached to the conduit.
- 4. Conduit is a pipeline or drain that can carry rainwater from the flat roof or gutter to the

recharge pit. A Conduit of any material such as polyvinyl chloride (PVC) or galvanized iron (GI) that transports water from the roof or the gutter needs to be constructed.

 Construction of recharge structure for groundwater recharge is the final step. A simple and effective structure is a recharge pit/ percolation pit. It can range from 1.5m - 3m wide and 2m - 3m deep. First this area needs to be excavated; next the excavated pit is lined with a brick/stone wall with openings (weep-holes) at regular intervals and filled with pebbles or brick jelly and river sand. The top area of the pit can be covered with a perforated cover such as concrete slabs, if necessary.

How will rainwater harvesting enable me to adapt to the effects of climate change?

- Rainwater harvesting provides cost efficient adaptation options for variable supplies in water as a consequence of climate change
- · Enables the replenishing of groundwater

that can lead to more water for agriculture and improved water and food security

 Provides an additional source of water and enables water conservation

Short Notes / Tips / Any other important points

Various recharge structures are possible - some of which promote the percolation of water through soil strata at shallower depth (e.g., recharge trenches, permeable pavements), whereas, others conduct water to greater depths from where it joins the groundwater (e.g. recharge wells). At many locations, existing structures like wells, pits and tanks can be modified as recharge structures.





What is Organic Farming?

Organic farming uses techniques to achieve good crop yields without harming the natural environment or any people who live and work in it. Some of the most important methods used in organic farming include use of compost, crop rotation, increasing the diversity of crops and careful use of water resources.



Organic farming will give you several advantages such as:

- Produce healthy and better tasting food, feed for animals and quality crops to sell at a good price
- Reduces dependence on chemical fertilizers and saves money in the long run on the increasing need for fertilizers
- Quality organic produce fetches higher prices in the market

Things to remember before practicing Organic farming are:

- A "National Project on Organic Farming" scheme was launched by the Government of India during the 10th Five year Plan to provide Financial and Technical support for setting up of organic input production unit such as fruits and vegetable market, waste compost, bio-fertilizers and bio-pesticides and vermiculture hatcheries, capacity building through service providers, human resource development through training and demonstration, awareness creation and market development and quality control of organic inputs
- Funding for organic farming is available under the National Horticulture Mission and the Rashtriya Krishi Vikas Yojna
- The National Centre for Organic Farming in Ghaziabad, set up under this scheme has 16 programmes for awareness, training and demonstration of organic farming standards and practices

Steps

1. **Soil and Water Conservation:** Soil and water conservation should be practiced through methods, such as bunding and hedging and improvement should be done



through plantation of legumes and mulching on the soil surface.

- Manure: Manure should include compost form animal manure, leaf litter and vermicompost. Chemical fertilizers should not be used.
- 3. **Pest, disease and weed control:** Crop rotation should be practiced, genetic diversity should be increased and monoculture should be avoided at all costs. Natural pesticides such as neem and useful predators that eat pests should be encouraged.
- 4. Choice of Crops and Variety: Crops need to be selected carefully, based on the amount and type of nutrients needed, water requirements as well as soil type, rainfall and temperature. Genetically engineered seeds should not be used.
- 5. **Crop Rotation:** Crop rotation is an effective way of controlling pests and diseases and improving soil fertility. Leguminous plants such as beans, peas, cowpea and others improve soil fertility by fixing nitrogen in the soil.

How will organic farming enable me to adapt to the effects of climate change?

- Organic farming improves soil quality because of the farming practices used
- Enables an increased diversity of crops, which increases resilience to climate change
- Contributes to food security and additional sources of income for your household
- It provides more opportunities for employment, as it requires more labour input. It also reduces periodical unemployment because of the diversification of crops and the different planting and harvesting schedules it involves
- The use of natural pest control techniques used in organic farming is effective in reducing pests and improving the quality of your soil without using chemical fertilizers that pollute the environment
- It ensures that your water sources stay clean and safe, increasing drinking water sources
- Organic farming improves the ecosystem, flora, fauna and increases biodiversity

SODIS

Safe, Affordable and Environment-friendly Water Purification



What is SODIS?

SODIS or Solar Water Disinfection is a simple low cost disinfection method that you can apply yourself, using the rays of the sun to make water safe for drinking. SODIS uses sunlight to kill bacteria in water. The UV-A rays in sunlight or solar radiation kill germs such as viruses, bacteria and parasites in just six hours.

SODIS has several advantages, these are:

- · Safe and easy to apply even by children
- Reduces incidents of water borne diseases and epidemics
- Lowers mortality and morbidity rates
- Doesn't change the taste of water
- Process

Resources Required

Transparent scratch-free PET Bottles
 (Eg. Coke, Pepsi, Mineral water bottles

Steps

- 1. Wash PET plastic bottles well before using it for the first time
- 2. Fill the bottle with clear drinking water till half way, then shake the bottle 15 times

and fill it until the water level is just below the cap

- Put them in the sun on an aluminum sheet for six to eight hours under a clear sky (and for 2 consecutive days under cloudy conditions)
- 4. Once you collect the bottles, ensure that the water is either drunk straight from the bottles, or transferred into a clean prewashed container for storage

How will SODIS enable me to adapt to the effects of Climate Change?

- SODIS purifies water, reducing water borne diseases and infant mortality, building overall resilience in households
- Contributes to savings of money and fuelwood
- Can be used to provide safe water during natural disasters and extreme weather events (which may increase in frequency as a consequence of climate change) such as floods, cyclones, and earthquakes

- Relies on local resources and renewable energy - environment friendly
- Replicable with low investment cost

Things to remember before using SODIS are:

- SODIS works only in full sunlight. In case, it is very cloudy like during the rainy season, you need to keep the bottles out in the sun for two days or boil the water instead
- SODIS only works on clear water (water with low turbidity)
- The method works better if the bottles are placed in an inclined position on a sun reflected surface. Eg. Aluminum sheets

Solar Lantern

Enhancing Quality of Life





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What is a Solar Lantern?

A solar lantern is a portable light fixture composed of a light emitting diodes (LED) lamp or compact fluorescent lamp (CFL), a photovoltaic solar panel and a rechargeable battery. Solar lanterns generally charge during the day and give 4-8 hours of light depending on the kind of lantern. Some lanterns can be charged in a few hours, at a solar-powered charging station that is being set up all over the country.

Solar lanterns have several advantages, these are:

- Extends the working day for households, allows enterprises, such as shops to remain open for longer
- Improves health issues by lowering fumes from kerosene lamps and reduces fire hazards
- Improves literacy rate
- Saves energy
- Reduces local air pollution and reduces greenhouse gases as solar lanterns have no carbon emissions

How do I get a solar lantern?

Price: The price of solar lanterns vary, however they are in the range of Rs.400 to Rs.1000.

Availability: There are several types of solar lanterns available in markets today, a good example is 'Kiran' (Rs. 400-450) which is five times brighter than a kerosene lantern and can be fully charged in a day under the sun. It provides bright, 360-degree illumination for working, studying, or traveling. There are two light settings, which offer up to 8 hours of light on a full charge (7 hours of charging). It has a solar panel and a multiple-setting handle; the lantern is extremely flexible and easy to use.

For households with access to grid electricity, Kiran can also be AC-charged with a standard Nokia phone adapter (fully charged in 4 hours). Other available solar lanterns in the market are the Reliance 'CFL Based Solar Lantern' and 'Arushi Solar LED Lantern', the TATA 'Jugnu Solar Home Lighting', and 'Heera'.

Solar charging stations are being set up and solar lanterns are also being made available for a nominal fee through an initiative taken by The Energy Resources Institute (TERI) in partnership with several organisations all over the country.

How will a solar lantern enable me to adapt to the effects of climate change?

- A solar lantern is an environmentally friendly way of accessing light, which can enable improvements in the household, such as the uptake of livelihood and education related activities in the evening
- Empowers women and children
- It runs on renewable energy and thus cuts down on costs of kerosene, which reduces GHG emissions and helps fight climate change



What is a Peoples Biodiversity Register?

Biodiversity is the variety of life in the world or in a particular habitat or ecosystem. For example, in your particular area you will have different animals, trees, crops, insects, algae and microorganisms that may differ from the trees and plants of another region, for example the biodiversity in Rajasthan's desert and the Himalayan Mountains will be different. Additionally within the trees, plants etc. in your area, you can have different variations. For example, there are several varieties of mangoes.

A Peoples Biodiversity Register is a document to record the existing biodiversity and traditional knowledge existing within your community on the use of bio-resources in your area. It is a document that can be developed together by members of the community to share knowledge and better management of the conservation of your biodiversity to reap its benefits.

Things to remember before maintaining a Peoples Biodiversity Register:

- Biodiversity Management Committees are being set up by a State Biodiversity Board who also provide technical assistance and training for these committees for the preparation of biodiversity registers
- The absence of technical knowledge and training from the State Biodiversity Board should not stop you from initiating efforts to maintain a biodiversity register in order to document knowledge in whichever form it exists in your village and panchayat

How do I maintain a Peoples Biodiversity Register?

Steps:

- 1. Formation of a Local **Biodiversity Management** Committee – A local committee biodiversity management needs to be decided at panchayat level. It can comprise of individuals who are knowledgeable about biodiversity such as Science School Teachers, Krishi Mitras, Forest Guards, Panchayat Representatives etc. The management committee can be decided upon during a Gram Sabha meeting by the members of your community.
- Sensitization of the public about the survey and need for biodiversity conservation and possible management needs to be undertaken by the committee and other responsible members from your community.
- Data needs to be collected for the biodiversity register. Data should be collected under the following heads –

- Agro-biodiversity Crop plants, fruit plants, fodder crops, weeds, pests of crops, markets for domesticated animals, people and their livelihoods e.g. – farmers, artisans etc., landscapes, waterscape, soil type
- Domestic Biodiversity Fruit trees, medicinal plants, ornamental plants, timber plants, domesticated animals, culture fisheries, markets for medicinal plants, domesticated animals etc.
- Wild Biodiversity Trees, shrubs, herbs, tubers, grasses, climbers, wild plant species of importance, aquatic species, wild aquatic species of importance, wild plants of medicinal value, wild relatives of crops, ornamental plants, fumigate/ chewing plants, timber plants, wild animals

Elders, women and the youth must be involved in the process because of the knowledge they can bring to the data. For instance, elders must be consulted on the state of biodiversity. They can tell which important species have declined or possibly disappeared from the locality in last 10-20 years

4. Preparation of Peoples Biodiversity Register – All the data collected needs to be collated in a format. Additional information relevant to each known species needs to be recorded, such as current management practices, uses, major users, associated technical knowledge and the member of the community who holds the knowledge regarding the species

How will maintaining a Biodiversity Register enable me to adapt to the effects of climate change?

- A biodiversity register will enable better conservation and management of biodiversity that is rapidly being altered because of climate change
- The conservation and management of biodiversity provides several ecosystem services essential for improving your wellbeing. For example, bees pollinate crops, earthworms make compost, trees provide a range of services like cleaning the air, fruits, etc. These are especially important in the face of climate change since an increase in biodiversity acts as a safety net
- Documenting traditional knowledge and the available biodiversity in your area, such as the use of certain species for medicinal or other purposes can enable you to conserve these resources and sustainably harvest them as a livelihood option
- It helps identify traditional species for agriculture and horticulture which can be promoted as they are generally more relisent to climate change
- It can help identify viable ways of increasing agro-diversity





How can I recharge ground water?

Several structures such as wells, ponds and tanks exist in villages for ground water recharge and storage; many such structures often fall into disrepair or dry up. Some methods of ground water recharge are:

- 1. Diversion of runoff to dried-up/ defunct wells
- 2. Building farm ponds



1. Recharging through dried-up wells

Advantages:

- Cost effective
- · Eco friendly and socially acceptable
- · Easy to construct and replicate
- Useful in harvesting maximum runoff (about 80%)
- · Effective use of defunct wells,
- Provides scope for life saving irrigation during dry spells

Resources Required:

Materials: PVC Pipe – 20ft length, 4 inches diameter, local stone for filling filter pit and pitching silt trap

Investment: Rs. 750; Earthwork for silt trap pond and diversion channel (Rs. 150), stone pitching for silt trap and conical pond (Rs. 150), cost of PVC Pipe (Rs. 300)

Steps:

- Construct a silt trap with the size 2.0 x 1.0 x 0.5 m
- Construct a conical pond/ filter pit with the top area: 2.5 m diameter or 2.5m x 2.5m and the bottom area 0.5 diameter or 0.5m x 0.5m and depth of 1m
- Length of pipe needs to be decided based on the site condition
- The silt trap should be cleared at regular intervals by the farmers





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 Farm Pond: This is a small water harvesting structure dug in the gullies/ waterways where the flow of water exists for considerable period of time.

Advantages:

- Cost effective
- · Addresses drinking water needs of cattle
- For use in supplemental irrigation when stored water is available for longer period

Resources Required:

Investment: Cost of the unit: Rs. 5000, labour: Rs. 500

Steps:

- The pond is generally constructed in a square shape. The dimentions of a typical pond for a catchment area of 2 Ha is a pond of 2.5 m depth and a capacity of 250 m³. The depth should be limited to 3m depending on the exposure of hard stratum
- The spoils should be collected and deposited around the pond as an embankment
- A berm should be provided between pond and embankment, so that the spoils will not fall into the pond, the soil should be deposited in thin layers and rammed properly for better stability

How will recharging ground water enable me to adapt to the effects of climate change?

- Increases water availability for drinking purposes as well as irrigation
- Recharging ground water through infrastructure such as ponds or wells allows

water to be stored for future use for example, during dry spells

 Improves groundwater levels in overexploited aquifers





What are Efficient Irrigation Methods?

Efficient Irrigation methods include Drip and Sprinkler irrigation. These are micro irrigation systems that are engineered to apply water to the crop as per requirement, thus enhancing the water application and use efficiency and enhancing the production per unit of water (and energy for drawing water) drawn/lift.

Efficient Irrigation will give you several advantages including

- Up to 70% saving in water use
- Less weeds
- 30-40% saving in fertilizer application (carbon reduction)
- Enhanced production

	Water use efficiency	Production	Labor cost
Traditional System	25-40%	1 (bench mark)	High
Sprinkler System	70-80%	20-25% higher	Medium
Drip System	80-90%	20-25% higher	Low

Process

Resources Required

Cost of Sprinkler: Approx Rs 18,000 per acre

Cost of drip system approx Rs 35-40,000 per acre

Method

1. **Sprinkler irrigation** method distributes water to crops by spraying it over the crop area like a natural rainfall. The water under pressure flows through perforations or nozzles and sprays over the area. The pressure is provided by a pump of suitable capacity and horsepower. With careful selection of nozzle sizes, operating pressure and spacing, the actual water required for maintaining the soil moisture at field capacity is applied uniformly at a rate to suit the infiltration rate of soil thereby obtaining efficient water application.

Response of different crops under Sprinkler Irrigation:

Crop	Water Saving	Production	Productivity	Per ha	Enhanced
		enhancement	Qt / Ha	increase (Qt)	income
Wheat	35%	25%	24-32	6 to 8	Rs 8,000/-
Chick pea	65%	40%	5-7	2	Rs 6000/-
Ground nut	20%	30%	3-4	1	Rs 3200/-
Total				Rs 11,000 to Rs	
				14,000 per year	

Approximate Rs 12,000/- per year production enhancement is possible through adopting sprinkler systems. This is in addition to the water saving as mentioned in above table, which can be invested in other area to increase the cropping intensity of the area. 2. Under the Drip Irrigation system, water is carried to the plant under low pressure, through small diameter plastic pipes and delivered at the root zone, drop by drop through drippers.

Crop	Water Saving	Production	Selling price total prod.	Enhancement
		enhancewwment	(approx average)	(Min)
Cabbage	50-60%	30-40%	2,20,000	Rs 50,000/-
Tomato	40-50%	50-60%	1,25,000	Rs 60,000/-
Chilly	40-50%	25-30%	1,50,000	Rs 30,000/-

Response of different crops under Drip Irrigation:

How will efficient irrigation methods enable me to adapt to the effects of climate change?

- Installation of efficient irrigation methods such as drip and sprinkler irrigation improve control over water resources as compared to the practice of rain-fed agriculture which is becoming increasingly unpredictable
- It uses less water and energy than flood irrigation and is more equitable
- It enhances the productivity of crops and income of farmers
- Decreases soil erosion, common in surface irrigation, making farming more sustainable







What is Poultry Farming?

Poultry farming is the practice of raising domesticated birds such as chickens for the purpose of meat and eggs.

Poultry Farming has several advantages, these are:

- Great demand for poultry meat and eggs in national as well international market
- The efficiency of poultry as a productive unit is more because of rapid growth of chickens
- A poultry unit can be started with small investment on a small piece of land
- Less manpower is required to start a small unit
- Credit may be accessed easily from various banks with insurance facility
- Poultry may be a full time enterprise or a subsidiary one of a general agricultural farm, in a village or elsewhere for men, women or children
- It can be started under almost any geographical condition
- It leads to the reduction of pathogenic microorganisms thus leading to better hygiene and health in your area

Things to remember before undertaking Poultry Farming are:

- The amount of net profit increases with the flock size, management of 1000 broilers can be carried out as an additional source of income by a single family
- Products from poultry farming include birds, manure and gunny bags



Process

Resources Required:

Cost of Rearing 100 Broilers (Fortnightly Batches) **Total – Rs. 64,300**

A. Capital Cost

 Construction of shed – brick and mud wall, bumboo, purlins, thatched roof @ 1 sq. ft. per bird for 5 batches of 100 birds each

i.e. 500 sq. ft. @ Rs.70 per sq.ft. Rs. 35,000.

2. Equipment @ Rs.15 per bird for 500 birds Rs. 7,500

TOTAL – Rs. 42,500

B. Recurring Cost

- Cost of day old chicks 4 batches of 100 + 5% extra i.e. 420 chicks @ Rs.15.00 each-Rs. 6,300
- Cost of feed for 4 batches of 102 birds each
 @ 3.2 kg. Per bird @ Rs.8.60 / kg. Rs. 12,852
- 3. Cost of medicines, vaccines and misc. charges for 4 batches of 102 birds each -**Rs. 2,040.00**
- Insurance of birds 420 birds at Re.1/- per bird Rs. 420.00
- 5. Insurance of sheds @ Rs.5.05 per Rs.1000/per year **Rs. 177.00**

Total - Rs. 21,789

Finance may be available to the farmers in the following ways:

- Agricultural Cash Credit/ Kisan Credit Card/ Cash Credit: This type of finance facility is for those farmers who have already constructed shed and obtained equipments. It covers all the recurring expenses like cost of day old chick, feed cost etc. It is payable on demand i.e. at the end of each batch
- Agricultural Term Loan: It covers fixed costs like cost of sheds, equipments etc.

This facility can be given to those farmers who want to establish a new unit for poultry or are engaged in contract farming

Financial Assistance from Banks/ NABARD

Steps

- Poultry Shed Construction: Construction of a proper shed at a proper site is the primary requirement for starting poultry. The site should be dry and devoid of water logging, easily accessible (should be near the main road) for better marketability, water and feed should be easily available nearby.
- 2. Management practices for Poultry Husbandry: This includes
- Brooding: It is the care of chicks from one day old to six weeks of age. It primarily consists of provisions of adequate heat, air, water and feed to the chicks. Rearing is the period between brooding and the point of lay i.e. it is the process of development of growers
- Debeaking: It is mechanical removal of some parts of the beak of the bird when pecking or cannibalism is noticed in the poultry
- Culling: Removal of unhealthy or sick birds from the flock regularly is called as culling. It is necessary to avoid any risk of pests to the whole crop
- Sexing: Separation of males and females is known as sexing. It is necessary for economic advantage. The males may be marketed first and the females may be given the extra floor space and retained higher for heavier weights
- Routine checking and record keeping.
- **3. Post-production management** including timely vaccinations for poultry.

How will poultry farming enable me to adapt to the effects of climate change?

- Poultry farming can contribute to improved food security
- Keeping poultry can provide an additional source of income
- Additionally, it provides quality food, energy, fertilizer and is a renewable asset
- Poultry can provide a source of livelihood to women and have multiple benefits for the family
- It diversifies the agricultural economy

