CONSERVE WATER AND SOIL – LET'S PRESERVE IT FOR TOMORROW

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Soil and water are two crucial natural resources and prerequisites for agriculture. Earth saves water through soil hence, the link between measures for soil and water conservation is always strong. Through soil conservation measures we can preserve water too. Over the years, our soil has lost its basic texture and water retention capacity due to soil degradation. Only through conservation practices we can keep soils alive. Vegetation and forest cover increases soil biomass, and improves water retention and water storage capacity of soils. This makes scientific conservation measures and increasing land under green cover are necessary to conserve land resources. Artificial systems should be set up where such natural measures are not possible.

SOIL & WATER CONSERVATION MEASURES IN ARABLE LAND

A major portion of rain water received is lost as surface runoff and runoff water also carries the top soil away resulting in degradation of cultivable land. If we can reduce the runoff and increase the time of interception of rain water and subsequent percolation through soil profile, we will be able to recharge the ground water table and reduce soil erosion. This can only be achieved by adopting various scientific cultivation measures and soil and water conservation measures.

AGRONOMIC MEASURES

Agronomic measures are cheaper, sustainable, and more effective. It has less impact on nature compared to structural measures. It is more ecofriendly. Scientific cultivation measures reduce the impact of raindrops by providing soil cover, and increasing infiltration time and rate. It will increase water absorption capacity of the soil by reducing runoff and soil loss. Agronomic measures have a positive effect on soil health and ground water recharge. It is applicable in areas with slope less than 2 percentage Important agronomic measures than can be adopted in arable land includes

Contour Cultivation: This cultivation method includes growing of crops across the slope along the consistent elevation. Contour cultivation reduces the incidences of runoff and erosion, and improves the rate of percolation and infiltration of rain water in to the soil.

Multi-tier Cropping: In this cropping system, instead of a single crop, crops of different heights are grown on the same piece of land at the same time. Here, competition among crops for resources is almost zero because of varying canopy levels and root depth of crops. The canopy level slows down the rain water and reduce its impact on soil. This prevents soil erosion and increase infiltration rate. Examples of this kind of cropping system

are growing crops like black pepper, banana, pineapple/ roots and tubers/ginger/turmeric and grass in coconut and arecanut gardens.

Strip Cropping: Strip cropping is a low-cost erosion control method in low slope areas. In this agronomic practice, erosion permitting and erosion resistant crops are grown in the form of narrow strips across the land slope. These strips are arranged in such a way that the strip of erosion permitting crops will be always separated by strips of close growing erosion resistant crops like 11pprox. or legumes. Legume crops help in improving the soil fertility through nitrogen fixation along with providing additional income to the farmer.

Mixed Cropping: Mixed cropping is also called poly cultures, which includes growing two or more crops consecutively or at the same time on the same field. In mixed cropping, deep rooted and shallow rooted crops are cultivated simultaneously. It will not only protect soil and increase ground water recharge but also double the income of farmer. Cultivation of Tapioca and ground nut or tapioca and legumes are examples of mixed crop.

Inter Cropping: Inter cropping is common in orchards, coconut or arecanut gardens. In inter cropping, usually the base crop (perennial crop) is grown in a distinct spacing and base crop utilize nearly 35% of available space. So, the base crop can be combined with suitable additional plant density of the associated crop(s) (mostly annual crops). The inter crop(s) utilize excess recourse and act as a soil cover, reducing soil erosion and evaporation loss of soil moisture. It will also reduce weed growth and provide additional income to farmer.

Mulching: Mulching provides a protective covering to the soil. It will reduce splash erosion and evaporation loss. Grass clippings, straw, bark chips, dried leaves, green manure plants or similar materials and inorganic materials such as stones, brick chips, etc can be utilized for mulching. Mulch will act like a sponge and it will absorb rain water and reduce runoff. Organic mulch will increase organic content and microbial activity in soil. It will improve soil structure, texture and fertility.

Crop Rotation: Crop rotation includes growing a series of different types of crops in the same area across a sequence of growing seasons. It will reduce over exploitation of one set of nutrients and soil moisture, reduce incidence of pest and diseases, weeds etc. In crop rotation we can grow erosion permitting and erosion resistant crops alternatively. For example, we can grow legumes after tuber crops like tapioca.

Agrostological Measures: It is one of the cost-effective soil conservation methods. Here, different grass species are used to moderate the impact of raindrops on soil that in turn prevents soil erosion and increases the infiltration time. Extensive root network of grasses tightly packs the soil particles hence, improves the water holding capacity of soil. Grasses add income to the farm family as in the form of fodder to the livestock. Agrostological methods can be used for strengthening contour bunds and stone pitched contour bunds.

Cover Cropping: Cover cropping will reduce the direct impact of rain water on soil by providing a protective cover to the exposed area. Usually, leguminous crops are grown as cover crops. It will increase nitrogen content in soil and improve soil health. It will also increase the water availability; smother weeds and helps to control pests and diseases.

Live Fencing: Plants like moringa, subabul, Gliricidia, and other green manure and medicinal plants can be planted across slopes as live fences to reduce soil erosion. It will also provide green manure and fodder.

Rotation of Cultivated and Barren Land: Usually practiced in topography with high slope. In this method land is kept barren alternatively with the cultivated land. Grass is allowed to grow on this barren piece of land and eroded soil, nutrients and runoff water will be collected at this area. During next cropping season this process will be reversed.

No-till Farming (Zero tillage): Zero tillage means growing crops without disturbing the soil through tillage. This method will reduce soil erosion and increase soil moisture content.

Agroforestry: It is a sustainable land use pattern in which agricultural crops are grown along with trees that are usually grown for timber or providing shade. It will help to control runoff and soil erosion. This method provides additional income to farmers.

Figure 1: A view of (a) Intercropping (b) Cover cropping (c) Live fencing

MECHANICAL MEASURES

Mechanical measures primarily include engineering structures, which are used to modify the land slope, and to reduce erosion and runoff. Mechanical measures can be combined with agronomic measures to improve the performance and sustainability of the control measures. Mechanical measures can be permanent or temporary structures for a particular location considering the landscape characteristics like slope, severity of erosion, soil type, topography, and climate

Contour Bunds: Contour bunds are proposed in areas with slope less than 15%. Earthen embankments are constructed across the slope of the land through the contour. These structures will reduce surface runoff and soil erosion. The earthen bunds can be strengthened with agrostological measures

Stone Pitched Contour Bunds: If jungle stones are available in the area, it can be used to construct stone pitched contour bunds. Jungle stones of 15 to 22 cm thickness will be tightly packed with soil and it will increase the durability of the bund. This structure will intercept the runoff and will reduce erosion. It will increase percolation of rainwater into the soil by increasing the time of concentration of rainwater. It can also be strengthened by planting grass species or pineapple.

Strip Terrace: In this method, long slopes are cut into shorter ones. It is one of the costly measures to control soil erosion at highly sloped areas. At each level it helps to conserve soil moisture and improves groundwater recharge by reducing runoff. The width and spacing of strip terrace is based on soil property, slope and rainfall of the area.

Contour Trench: It is one of the cost-effective methods to protect areas with less than 15% slope. Trenches are constructed in trapezoidal shape across slopes in contour with 45-50 cm depth. It is not suitable for landslide prone areas.

Moisture Conservation Pits: It is one of the cost-effective methods to protect areas with slopes less than 20%. Pits of varying size are constructed across slopes. The size and number of pits are decided based on the soil type, slope and rainfall data of the area. These structures improve groundwater recharge by reducing runoff and increasing infiltration rate. This method is also not suitable for landslide prone areas.

Centripetal Terrace: This refers to the circular basins made around tree crops or plantation crops like coconut, arecanut etc. These basins act as moisture conservation pit and helps recharging the groundwater resources. While taking basins 2-3 layers of coconut husk or leaf can be buried to capture and conserve the moisture in the upper soil layers.

Agrostologically Strengthened Bunds: It is a cost-effective way to protect slopes. Grasses (fodder grass or vetiver) are planted across the slope or on the brim of bunds. The fibrous root system of grass holds soil particle and prevent erosion and run off.

Percolation Ponds: Small farm pond can be constructed to capture runoff water and sediments. The sides of ponds can be strengthened by planting grass species. It increases infiltration rate and rise ground water levels.

Figure 2: A view of (a) Stonepitched contour bunds (b) Centre petal terracing (c) Moisture conservation pits

DRAINAGE LINE TREATMENT MEASURES

These measures are used to protect drainage channels, control floods and associated damage, and prevent saline intrusion. It reduces flow of water and protects the banks. Major drainage line treatment includes.

Check dams: Check dams are generally built across the stream flow to reduce velocity of water and collect entrapped sediments. They also promote ground water recharging. Check dams are built considering the slope of land, land use pattern, rainfall intensity, width of the drain and velocity of water. They can be built using a variety of materials such as live plants, clay, stones, cement etc. If local availability of woods and stones are sufficient, temporary logwood or loose boulder check dams are the best for small streams. Permanent masonry and reinforced cement concrete (RCC) check dams are ideal for fast-moving, high-flow streams. Gabion check dams are good for degraded locations like high rainfall areas with torrential streams/drainage lines.

Retaining Wall/Stream Bank Stabilization: Retaining walls are constructed to protect drains from stream bank erosion and prevent over flow of water to adjacent land. Stream bank stabilizing helps to regulate flow of water. Materials like stones, dry rubble or RCC are used for building permanent structures whereas, low cost and eco-friendly way of stream bank stabilization is planting 13pprox., bamboo, pandanus etc. along the banks.

Coir Geo textiles: These bio-degradable fabrics made using coir yarn, are widely used to strengthen earthen structures meant for erosion control and protect river banks. Coir mesh mattings allow vegetative growth and their dense root network helps in erosion control.

Water Harvesting Structures: These structures can be used to store excess rain water for irrigation as well as to replenish ground water. Rain water harvesting allows collection of large amounts of water for drought season and lessen our dependence on wells by providing high-quality water. Ferrocement tanks can also be used to collect rain water fall on roof tops through PVC pipes.

Farm Ponds: These are the water harvesting structures constructed in the low-lying areas of agricultural fields for the purpose of storing the surface runoff. Farm ponds

are generally constructed as masonry structures. Water stored in this structure can be used for life saving irrigation and to replenish ground water.

Well Recharge: Open wells are main source of drinking water in majority of households. But most of them dries up during summer months. Well recharge is an effective way to replenish open wells. Here, rain water collected from roof tops is diverted to wells or pits near the wells after proper filtration. This allows ground water recharge and make well water available during summer months.

Figure 3: A view of (a) Log wood check dam (b) stream retaining wall (c) Geotextile walls

PROTECT EACH DROP ……..

Most of us are aware about importance of water, but what about its judicious use? The terms like water literacy and water budgeting is becoming more important. Water literacy means the sustainable water resource use and management, while water budgeting means quantifying the flow of water in and out of a system. Soil and water are limited resources. Soil fertility is decreasing worldwide day by day due to over exploitation, erosion and pollution. Severe droughts are happening all over the world and the limited supply of fresh water is becoming one of the most precious resources. It is the responsibility of each and every one of us to make wise use of these basic elements of life. Water conservation should be a culture. Water security should be our goal. It is essential for the survival of us and future generations.

FOR FURTHER READING

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