

# CONSERVATION OF OUR GREEN LINEAGE - THE SOIL<sup>i</sup>

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## INTRODUCTION

Soil conservation in short can be defined as “preservation of soil from erosion”. This means, protecting the top most layer of the soil from any kind of erosion, or preventing its fertility content due to over usage, salinization or due to any other form of soil contamination. Soil conservation is a set of farming techniques and procedure which are adopted to avoid soil erosion, soil degradation and depletion of fertility of the soil. To avoid these kinds of issues, it is the utmost priority to apply conservation methods to improve production on the same soil, by increasing irrigation facilities, proper fertilization's to be used in such a way which shall not affect the fertility of the soil, and imparting ourselves to various hybrid means.

In certain situations, ever after taking a lot of care about the soil, it does suffer damage and would be unfit for further cultivation purposes. Hence, the main objective of conservation is to “maintain the soil with proper standards”, so that it can be used for multiple cultivation and production purposes. Conservation of soil is the “investment” which has to be made, so that the same can be used fruitfully for future endeavors. Conservation of Soil policy generally depends upon the type of soil, purposes for which the soil has been used for, present value of the soil etc...

Before getting into the techniques, or objectives as to “Why Soil Conservation” has to be followed, firstly it is important for us to know what could be the important “*Problems*” which *has led to the concept of “Soil conservation”*.

1. **Soil Erosion:** The harsh action of wind or water on the soil generally pertains to remove the top layer of the soil which is fertile and hence turns out the soil unfit for further

cultivation purposes. Erosion can be occurred either due to human intervention or naturally as well. Some of the types of erosion is as follows:

- i. Water Erosion:* Under sufficiently intense rainfall or rapid flow of surface water, soil particles are detached from the land<sup>1</sup>. Erosion is said to be occurred which the soil particulars are detached from the top layer and are being carried away. There are two main producers as to how water erosion can be reduced. Firstly, the soil has to be protected from force of water, and the water infiltration rate have to be increased.
- ii. Wind Erosion:* Soil erosion due to wind occurs in different areas as per the climatic zones. It can be noted that, almost same practices as of to prevent water erosion can be followed to prevent wind erosion as well. “At some point near the surface, wind velocity will be zero. Above this is a layer of smooth flow, and above that an area of turbulent air flow”<sup>2</sup>. It is the turbulent air which causes soil particles to move, and hence this causes Wind erosion. The obvious reason to prevent such erosion is to cover the upper part of the soil with plantation, so that the particles can’t move. However, this can’t be acted as a permanent solution for the same.

Soil conservation in most of the areas is directly concerned with soil erosion. However, it is to be noted that there are types of soil damage as well which can be occurred.

*I. Agricultural issues:* The agricultural practice involves application of various substances, which would indirectly effect the soil. Since lot of water is used in cultivation practice, and how much ever pure water is used, it would still contain salts in it. Evaporation increases the salt content. Due to this water content and in case the drainage system to drain the same isn’t adequate, the excess water would get blocked which would increase the salt content in the water table. This would result in ‘accumulation of salt’ which would make the agricultural land infertile to carry out the production or cultivation purposes. This excess ‘accumulation of salts’ in the water table, is known as “**salinization**”. Proper drainage system, along with proper treatment of land can reduce the damage caused by salinization, however the more appropriate solution for the same would be to choose the best suitable land for irrigation purposes. “Legislation authorizing irrigation should require a technical report on suitability before allowing a project to proceed”<sup>3</sup>.

Also, in most of the cases it is observed that using of fertilizers, pesticides and insecticides would make the land rough, barren which would ultimately make the soil unfit for cultivation purposes. Usage of excessive amount of fertilizers get accumulated in the soil, and would deplete the fertility level of the soil which ultimately make the land unfit for the same after certain point of time. “Where concentrations of fertilizer elements in crops are not presently significant, the state may simply monitor the situation. If important dangers should arise, residue tolerances could be prescribed to control specific uses of suspect products”<sup>4</sup>.

**II. Non-Agricultural issues:** Non-agricultural issues do form a part in affecting the soil fertility, though there are very less chances for the same. One of such non-agricultural issue includes, deposits of heavy metals or strip-mining process. Harmful emissions such as lead<sup>ii</sup> which are being released, are getting deposited on the ‘road side walls of the soil’. These concentrations are increasing year by year which indirectly lead to deplete the fertile texture of the soil. Another cause of the soil is due to ‘Urbanization of farming land’.

**III.** It can be noted that there might be many other reasons as well for the depletion of soil fertility which would ultimately result in soil erosion and makes the soil barren as well as unfit for any further activities to be performed. Since we have covered the important reasons as to why it is essential to conserve soil, now let us look the “**Objectives**” which are to be achieved in this soil conservation process.

## MAIN OBJECTIVES OF THE POLICY

The main objective to draft the ‘soil conservation policy’, is to enhance the morale of the farmers and other cultivators by “**boosting the performance of their fields**” for further years to come.

1. The utmost priority, to conserve the soil is to maintaining the biodiversity, environment which helps in contributing to the fertility of the soil in its own natural ways. The addition of the organic matter through microbes or any other kind of organisms, which would release the nutrients, improve water flow from the soil, and aeration.

2. The other objective include, to provide the tiny living organisms in the soil with sufficient means of livelihood, since those microbes would help the soil to provide proper organic matter for the plants to grow in healthy way.

3. One of the objective of the soil conservation is to prevent the soil from runoff, pollution and sedimentation. The soil is to be protected from cracking and erosion due to excessive wind, water and heat.

4. Also, it isn't just important to conserve the soil for present purposes, rather sustainable development of the soil should be our priority i.e usage of land resources in a planned way ensures its availability for future generations and thus there wouldn't be any crises in terms of food availability in coming years.

5. Some of the other objectives would include: "Boosts earth quality and productivity"<sup>5</sup>, "Mitigates soil erosion"<sup>6</sup>, "Promotes water infiltration and increases the storage facility"<sup>7</sup>, "Aids air as well as water pollution"<sup>8</sup>, "Gives food, shelter for wildlife"<sup>9</sup>.

## STAKEHOLDERS

From the above jst, we are evolved with an idea that Soil conservation is our individuals' responsibility, since there are many reasons as discussed above, as to how the soil is being damaged, and is being depleted. Also, the main "Objectives" of our soil conservation policy has been mentioned above. From all these we can have an idea that the policy formulated would be favoring "*cultivators*" and "*farmers*". It is to be noted that "*Agriculture is the primary source of livelihood*" for many of the individuals in our country. More than 58% of India's population depend upon agriculture as their means of livelihood. Lot of revenue is being generated from the agricultural, and forestry areas. As per source in the year 2021, Total agricultural products has summed up to US\$ 41.25 billion. With this itself we can estimate as to how many individuals are dependent on "Soil" for their means of livelihood. Hence, it can be clearly observed that soil conservation and its related policies would enhance the lives of cultivators and farmers. Farmers believe that soil is their "*Motherland*", and farming is their "*Birth right*". Thus, the main stakeholders who would be effected by this policies generation is farmers themselves. Along with them, the other individuals mostly who belong to

construction sector and its related sectors, would be benefited with soil conservation since most of their work is also in connection with soil.

Hence it can be derived that “SOIL” is the best natural resource and nature’s gift which would play a vital role in every living beings life (that can be humans, plants, animals, <sup>iii</sup>microbes as well). Policy to conserve our nature’s gift would play a beneficial role in every individual’s life who is dependent on the soil in some or the other aspect.

## **STRATEGIES TO BE IMPLEMENTED**

Now, it’s the time to formulate the “**Strategies**” as to how the soil can be conserved from all the above mentioned problems.

Soil helps the individuals to meet the needs in the society, by providing food, nutrients and other essentials as well. Soil helps in maintaining a balanced ecosystems. Soil is useful for us in many ways, but in order to summarize the same, it can be said that Soil is utmost important to us in these three ways:

1. ***It acts as home to many living beings:*** Organisms live in the soil, which helps in mitigating erosion of the soil, Plants and animals rely on soil for their shelter and food. Microbes such as bacteria, algae, fungi etc improves the soil structure, drainage system which makes soil more fertile.
2. ***Soil is the main source of Carbon cycle:*** “Soil plays a critical role in the carbon cycle the continuous process by which carbon atoms travel between the atmosphere and Earth”<sup>10</sup>. Soil also absorbs Carbon which exists in the atmosphere, and this process of absorption is called as “sequestration”. This process works as a reducing agent from the effect of greenhouse gases.
3. ***Essential roles of soil:*** The soil is treated as goddess by the farmers, since they completely rely on the soil for their livelihood. They produce crops, feeding people, and maintain livestock. Soil acts as purifier which replenish the resources, drain out the toxic impurities. Soil is the one which provides the factories, and organizations with necessary raw materials which later turns out to be a finished product. These finished products would later reach the consumers.

Before getting to the strategies or methods as to how the soil can be conserved, we need to first know what are the “*characteristics of a healthy soil*”, and then in order to retain those characteristics, we need to proceed with the strategies. The characteristics are as follows:

1. Organic content in the soil should be high
2. Sufficient nutrients and appropriate pH levels to be maintained.
3. Proper drainage system to be maintained to promote water infiltration.
4. No contamination of excess water or pesticides which drives out the nutrients present in the soil.
5. No compaction layer.

In short we can conclude that it's the “Soil” is the most essential creation and it's our duty to conserve it, protect it and sustain it for our future generations. Now, the below mentioned are some of the most important practices, which have to be followed in order to conserve the soil.

1. ***Crop rotation***: This strategy enables the cultivators and farmers to enhance organic texture of the soil, its structure and rooting depth. In this method, instead of planting the same crop every year on the same soil, it is suggested to plant variety of crops every year as per climatic conditions and as per seasons as well. This strategy not only helps in improving the soil texture, rather this also reduces the usage of fertilizers and pesticides. The most suitable rotation can be like as:

I. First year: Root crop, II. Second year: Grain under-seeded to forage, III. Third year: Forage.

2. ***Cover cropping and Mulching***: This is the other form of strategy which can be adopted effectively to reduce soil displacement. This soil displacement is generally associated with rain droplets hitting the particles inside the soil. In order to adopt this method, the following points have to be kept in mind:

- i.* How much the soil would be covered with the crop supply?
- ii.* Can the same crop be harvested in the next season, on the same field?
- iii.* Importance as to weed and other insecticides control
- iv.* Soil improvement

v. How to conserve the nutrients in the soil after continuous harvesting.

**Mulching** is the process of applying organic matter, on that part of the soil which is highly exposed to wind, water and heat. Mostly this procedure is practiced during the season of spring to make the soil fertile with organic matter.

**3. Cross slope farming:** It is the practice which is conducted in the field operations perpendicular to the slope. This includes:

i. Tillage and seeding<sup>11</sup>

ii. Planting strips of different crops<sup>12</sup>

iii. Diversion terrace<sup>13</sup>

This method if effectively used in order to control large runoff of water or pesticides that flow throughout the field. This practice can be indulged along with other soil conservation practices. In this strategy itself “Diversion terraces” are built in order to decrease the slope length and remove excess flows of water from the filed which also carries way the fertilizers and nutrients which helps plant to nourish effectively.

**4. Buffer stripping:** Buffer strips in the field act as a bridge between the cultivated soil and water bodies. These buffer strips effectively works at preventing the minute contaminated particulars enter into the soil. Hence these strips prevent the cultivated field from losing its fertility, and also cultivated crops are protected from any kind of damage.

**5. Terrace farming:** In this method, farmers use terrace or steps which are constructed mostly in sloppy, hilly or mountain areas in order to create a water barrier system for grown crops, and this is most suitable for rice. These constructed steps carry the nutrients from one terrace to another hence maintaining the soil healthy. This construction reduce soil displacement and maintains the fertility of soil even after continuous cultivation.

**6. Wind breaks:** In this process, the cultivators plant small bushes and saplings between the main crops so that the exposed part of the soil doesn't get affected by erosion due to the flow of wind. “From economic view, planting trees that produce fruits and nuts in wind breaks can diversify farm income”<sup>14</sup>

**7. Earthworms and other living microbes:** Earthworms along with other micro-organisms act as most productive living organisms in the soil, they help in digesting the plant matter, also release the necessary nutrients which nourishes the soil, and their tunnel network creates a spacious air channels that helps the water to flow into the entire soil rather than just being stagnant at one place.<sup>iv</sup>

**8. Grassed waterways:** As the name suggests itself, this is a bushy layer of water streams covered with grass. It is connected to a pit which has been dug to collect water, and “the grass roots keep the earth in place”<sup>15</sup>, acts as a guard from water erosion and thus conserves the soil.

Along with the above mentioned strategies, there was a recent development as well which is known as “**ESO Crop Monitoring**”. In technology helps the farmers to reveal the defects, bare territories in mean time so that they could work towards keeping their soil fertile and productive for a long period of time. “The online software assists in field scouting and can point out critical areas relying on satellite-retrieved data. Once the problem is suspected, farmers can assign tasks to scouters via the mobile application to check it with a human eye, monitor the task completion, and take proper actions”<sup>16</sup>.

**Soil conservation acts as a key factor for reducing the disturbances caused by climatic changes:** The effect on agricultural soil due to n-number of factors, might also lead to changes in global climate which would again solely affect the soil and living conditions of beings. Any soil which hasn't been maintained well, has prone to soil erosion or displacement of soil would result in excessive emissions of carbon-dioxide, and other greenhouse gases such as nitrogen and sulphur which causes damage to the climatic conditions. It has been observed that restoring the soil, and using above mentioned soil conservation strategies can effectively curb the excessive emissions of carbon-dioxide along with other greenhouse gases in the air.

“Soil conservation also promotes sustainable and economic development to meet the U.N. Sustainable Development Goals (SDGs): 17 goals focused on providing a ‘sustainable future for all’.”<sup>17</sup>. As per the details furnished by ‘European Environment Agency’, the following three SDGs would directly proportionate, with the soil conservation practices.

1. **SDG 6- Clean water and Sanitation:** Through effective drainage and purification system, the soil would be provided with clean water for farming purposes. This would also help in facilitating with clean water for drinking purpose as well.



2. **SDG 13- Action Climate:** Through the process of sequestration, Soil plays a vital role in fighting against the climatic changes and hence reduce the greenhouse gases emissions into the atmosphere.

3. **SDG 15- Life on Land:** Healthy soils are very much responsible for sustainable development, maintaining of forests, reversing land degradation etc...<sup>v</sup>

## HOW THESE STRATEGIES WOULD EFFECTIVE IN TERMS OF LEAGL, SOCIAL AND ECONOMIC PERSPECTIVE

- **LEGAL ASPECTS:** The above discussed conservation strategies and the idea of sustainable development of soil encompasses a wide range of legal, social and economic aspects as well. The strategies mentioned above are to be followed by the cultivators and farmers to protect the soil from erosion or from the depletion of fertility. However, the Government has also worked towards the soil conservation and implemented certain approaches, laws and procedures to help the living beings in protection of the soil. National policies, plans and nature conservation steps acts as a base to protect the soil from erosion and other natural resources from depletion. In order to enhance the idea of conserving soil, the government should initiate a programme which would require large institutional set up. In this, the first and foremost to be undertaken by government should be **“Soil and Crop research”**. After this research is done, it is then the duty of the government agencies to publish a blue print of the results which would in turn help the cultivators to decide as to what steps has to be adopted to protect the soil even after continuous usage of the same. Even after these results, it bears emphasis on the cultivators that soil conservation requires important decision making before the same is put into practice. In this way, the government also has a primitive role to play in conservation of the soil.
- **ECONOMIC ASPECTS:** The allocation of essential resources, along with the funds to manage the soil has to be determined with the highest integrity. “A national resources planning body reporting either to the Cabinet or to a legislative committee is an appropriate solution. This entity would be responsible for identifying national resources, for calculating the effects of resource uses, and for determining resource needs”<sup>18</sup>. Apart from

the availability of resources, it is the responsibility of the cultivators as to how these resources or funds to be used. It all depends upon the sound planning of the cultivators, after carefully analyzing the allocation aspects.

The main basics of all these decisions is to help the cultivator in choosing right track as to how the soil must be protected and maintain the fertility of the soil without any kind of displacement of the soil layer. “A national plan must be made, so the situation of the individual farmer, crazier, or forest user be analyzed”<sup>19</sup>.

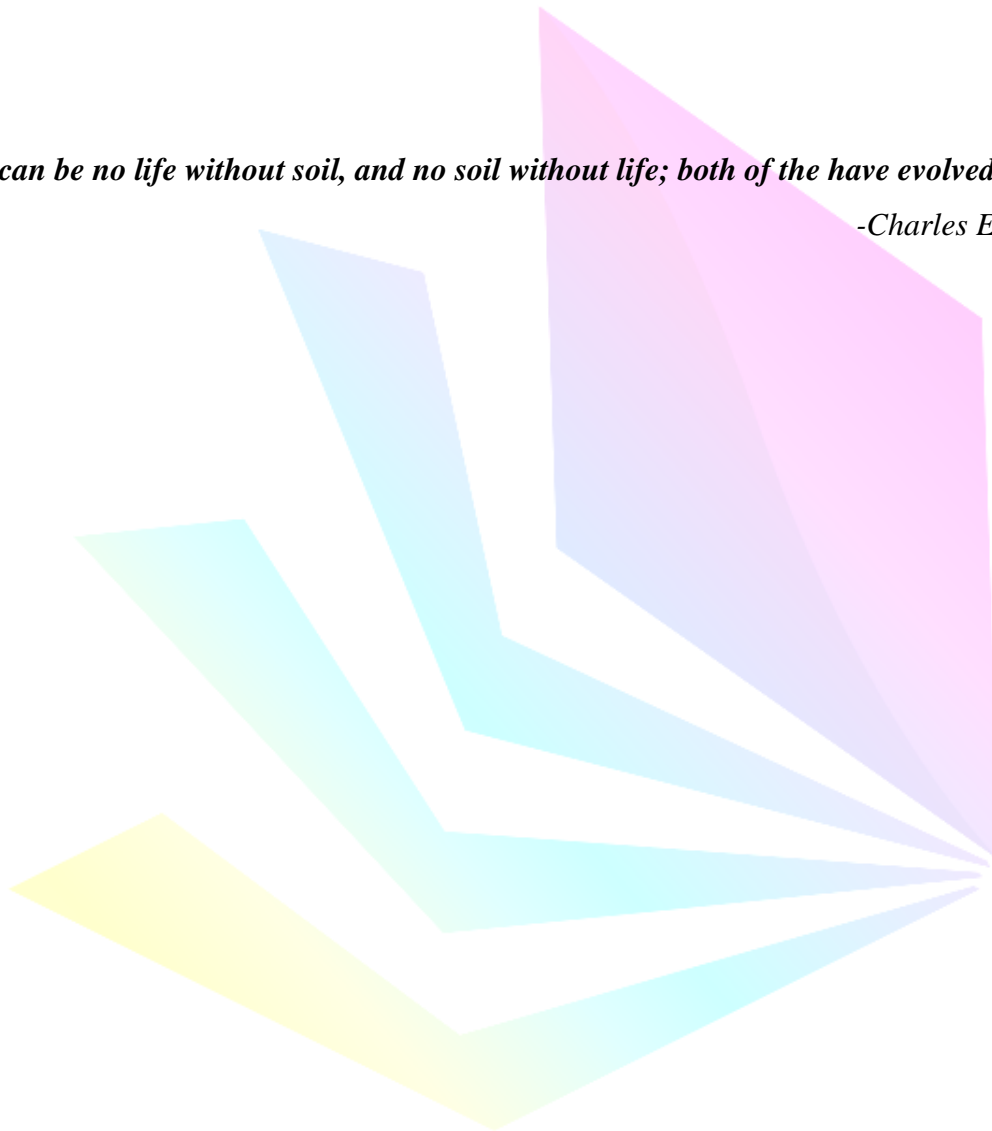
- **SOCIAL ASPECTS:** The policies and strategies formulated would be helpful for cultivators and farmers in most of the cases, yet these formulated policies has to reach around the corner to every individual since “soil conservation” is everyone’s responsibility. A soil conservation programme requires national level planning to have a wide reach. “Within the context of national policy there must be a director of soil conservation who will represent the conservation interest in national councils and direct conservation research, education and implementation”<sup>20</sup>. In field level, there must be other agents or officers appointed who would be working effectively towards soil conservation which would in turn help every cultivator or individual or farmer in field of agricultural services. All the information received, research results and assistance must be directed towards the society (I.e general public) those who are the main consumers of the soil.

## CONCLUSION

After all the above analysis, it is to be noted that it isn’t just the duty of the government or any other agency to frame the policies which are necessary for the conservation of soil, rather it is the duty of every individual to protect the soil from being affected by any means. It is the prime facie responsibility of every citizen, for his own welfare to support and fight to initiate the possible measures for conserving of soil, water and other natural resources. It is the duty of us individuals as well to conserve our “*Motherland - Soil*”. Any nation who destroys its soil, has in-fact destroyed its own self.

Also, the legal department under the guidance of Central government, can develop the effective policies with reference to other legal aspects which were established by our neighbouring countries. Countries like *Cyprus, Nali, New Zealand, United States and Venezuela*, have developed requisite policies as a measure of “Soil Conservation”. All the individuals together, should aim towards the conservation of Soil, since it is a sense of Harmony between “*Men and Land*”.

*There can be no life without soil, and no soil without life; both of the have evolved together*  
-Charles E. Kellogg



## ENDNOTES

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<sup>i</sup> Food and agriculture Organization, Legislative Principles of Soil Conservation, <https://www.fao.org/3/c3439e/c3439e.pdf>

<sup>ii</sup> Food and agriculture Organization, Legislative Principles of Soil Conservation, <https://www.fao.org/3/c3439e/c3439e.pdf>

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