

# Research on the Causes, Effects and Countermeasures of Overcultivation

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**Abstract.** In recent years, the overcultivation of land has become one of the major concerns of people. With the growing population, people have a greater demand for food and a greater desire for open areas, so more and more land is being reclaimed (wasteland, grassland, woodland). This paper discusses the harm of desertification to the surrounding environment and analyzes the causes of this phenomenon. The results show that soil erosion, water flow loss and vegetation destruction directly lead to the imbalance of ecosystem. By studying the classification of land desertification, soil pH and water content, vegetation coverage and other aspects, this paper believes that reducing overcultivation can effectively solve land desertification and other environmental problems, which also needs the help of the government, enterprises and the masses, promulgating laws prohibiting excessive overcultivation, and calling on the people to reduce overcultivation. Develop more advanced technology to improve the efficiency of land use. At the same time, this paper hopes that all sectors of society will have better ways to reduce the big problem of land overcultivation.

**Keywords:** Overcultivation, desertification of land, afforestation, soil pH value, law.

## 1. Introduction

In this scientific research activity, the research topic of the team is the situation of rocky desertification in southwest China. With the deepening of the project, one of the main causes of rocky desertification is the excessive reclamation of land by human beings. Even though the degree of rocky desertification has eased in recent years, environmental problems such as soil erosion and destruction of vegetation continue to occur. The thesis topic is to reduce overcultivation and reduce the degree of rocky desertification. As for the above important problems. This work hopes to apply the existing methods or find better ways to solve them. Nowadays, Desertification is mainly distributed in the following three regions in the north of China: the agricultural and animal husbandry area in the semi-arid zone, accounting for 40.5%; The undulating sandy grassland area in semi-arid zone accounted for 36.5%; The arid zone oasis margin and inland river downstream area accounted for 23.0%. Land desertification has a serious impact on China's social and economic development. In the areas seriously damaged by sandstorms, the efficiency of food production has been unstable for a long time because of the destruction of farmland by dust storms. Thus, China began to pay attention to the problem of land desertification and tried its best to solve it.

Actually, there are not some similar thesis topics with this study, but there are still a variety of scientific research on over-reclamation, for example, the harm caused by over-reclamation of land to the environment is like soil erosion. Solving the problem of over-reclamation of land is a very important problem for the world, and promoting ecological agriculture can effectively reduce the destruction of land. It also enhances people's awareness of ecological protection. However, its legal protection is not in place, this paper decided to call on the government to pay attention to this problem and give corresponding responses, which can be considered as a contribution to the protection of the environment.

The main purpose of this article is to analyze the background of human over-reclamation of land and find out reasonable solutions. First, this paper explained how soil, water and vegetation are affected by land destruction. Then, the study analyzed how to deal with this problem from the soil PH value and vegetation coverage. Finally, for the government, enterprises and the public, this work explain what measures they should take to effectively protect the environment.

## 2. Overcultivation

In recent years, the phenomenon of overcultivation has increased. Overcultivation includes the large-scale destruction of farmland for afforestation, reclaiming the land from the sea, unreasonable land clearing and so on.

### 2.1. Overcultivated Environment

There are a variety of environments which are overcultivated for human activities. For instance, Tarim River Basin in Xinjiang, Huang-Huai-Hai Plain, Bashang area of Hebei Province and so on. Generally, people always overcultivate wasteland for planting more cores. During almost 60 years, arid region of northwest China was one of the regions which expanded the area of plowland most fastly especially Hexi corridor in Gansu, Xinjiang and it has had the problems of overcultivation around 1961. There is a example that the region is overcultivated for the cultivation of oranges where is Linhai City. Driven by interests, farmers vigorously develop citrus and trees at the same time and the area of pine trees is also declining sharply [1]. Mentioned mountain, Alpine pastures have also deteriorated in recent years with the decreasing of rear livestock. Overgrazing theory holds that grassland degradation is inevitable as long as there is overloading [2].

### 2.2. Reasons of Overcultivation

With the increasing of population, more and more wasteland are developed by humans. China is a traditional agricultural country. For a long time, due to the pressure of rapid population growth and relatively extensive agricultural production methods, a large number of forests, grasslands and wetlands have been changed for use, and the cultivation rate of mountainous and hilly land is getting higher and higher, and the farming slope becomes steeper and steeper. Land cultivation means that revert unused land and waste land into arable farmland. China's terrain is complex and diverse, in some regions, because of the restriction of climates, the original farmland is no longer available for cultivation. However, cultivation can improve land utilization such as cultivating more cores for humans' lives. Improving the ecological environment is also an important reason for cultivation of wasteland, human activities have affected most areas, the land has suffered serious damage, and the ecological environment has been destroyed, although cultivation of wasteland can restore these lands, but the area of the destroyed land is too large, so people will overcultivate the land. For the development of economy, in some regions, because of the lack of land resources, the economic situation always stops going. Huize County is the largest county of grassland resources in the province, with an area of 1.116 million acres of grassland, accounting for 12.6% of the county's area, of which: 119,330 acres of natural grassland, 0.0280 acres of artificial grassland, and 996,390 acres of other grassland. Monitoring data show that in 2021, the comprehensive vegetation coverage of grassland in the county will reach 86.3% and 106.4 million yuan was invested to restore 137,000 acres of grassland. In 2021, the comprehensive vegetation coverage of grassland in the county will reach 86.3%. Input capital 106.4 million RMB, the implementation of grassland ecological restoration area of 137,000 acres. With the help of the managers, the reclaimed land was treated and the economy of the grassland continued to develop [3].

## 3. Environmental Impact of Overcultivation

Initially, cultivated wasteland was cleared to improve the quality of food, plant, population and so on, but now, most people overcultivate the land resulting in the damage to the around environment. For example, water shortages in arid regions, desertification of land, water and soil loss and so on.

### 3.1. Soil

Soil is the basis for human survival and development, and soil nutrients can measure soil quality. Changing land use patterns will have an impact on soil. For example, in karst areas in China, soil nutrient content decreases after forest land is degraded, and land quality deteriorates, thus increasing

the harm of soil erosion [3]. Equation (1) is the formula to cumulate Soil quality index of each land use type. The higher the ISQI value, the better the soil quality, the smaller the ISQI value, the worse the soil quality [3].

$$ISQI = \sum_i^n f(x_i) * Q_i \quad (1)$$

Corn is a kind of crop with a long planting cycle. It is necessary to ensure the disease resistance of seeds to improve the survival ability of corn, and to analyze and compare according to the soil conditions on the ground. Corn seeds have higher requirements on the soil. For example, after the whole soil is turned over, the soil is not fully dried, resulting in high soil water content, resulting in wet soil, soft soil, and uneven land, which will affect the growth of corn seeds [4]. If the land is too much cultivated for corn, the soil will be destroyed, the quality of the soil will decline, most corn seeds will not flourish, and the quality of the corn will decline.

Through the study of the desertification status of the study, the area ratio between mild desertification, moderate desertification, severe desertification and extremely severe desertification is 20.6: 24.6: 53.1: 1.7. The proportion of extremely severe desertification is smaller, but the proportion of severe desertification is still higher. With the increase of population and the amount of food needed, the area of cultivated land is gradually increasing, but due to the lack of protection measures and water, the newly cultivated land will have desertification problems [5]. In Yongquan Town, Linhai City, there are many mountains and few fields. With the development of orange planting industry, serious deforestation has occurred in some areas, and a large amount of land is gradually bare and barren when the original plants are destroyed. In addition, the management staff did not do a good job of artificial grass planting, resulting in the current soil erosion problem intensified. The most important thing is that due to overcultivation, the ecological environment of the mountain has gradually deteriorated, the biodiversity has suffered serious damage, the surrounding ecological environment has become more fragile, and the restoration in the later stage is more difficult, often requiring more time, energy and funds to gradually restore the polluted or damaged mountain.

### 3.2. Water

Since overcultivation is needed to increase crop yields, water is an essential factor. The prairie provinces of Alberta, Saskatchewan and Manitoba are the key areas of Canadian agriculture, accounting for 80% of the country's arable land, and the overcultivation of these areas is the destruction of grassland vegetation, water pollution and other problems [6].

As shown in the Table 1 and Table 2, razing is one of the main utilization ways of grassland. Artificial lakes built on grazing grassland can form an ecological environment similar to wetland with adjacent areas, and change the water content, pH, electrical conductivity (EC) and vegetation diversity in the soil of adjacent grazing grassland to a certain extent. From the data in the figure, we can conclude that in the National Field Scientific Observation Station of Guyuan Grassland Ecosystem in Hebei Province, pH value tended to decrease with the increase of lake distance in 2014. In 2015, soil pH showed inconsistent performance in all soil layers and increased with the increase of distance. Soil pH in the 0-10 cm soil layer increased first, and then decreased with the increase of the distance, but the pH between the other lake distances in the 0-10 cm soil layer was not significant. In 2014, the soil conductivity increased significantly with the increase of lake distance, and the EC value decreased with the increase of soil depth. In 2015, the EC value of 0-10 cm soil layer first increased and then decreased with the change of lake distance. EC in 0-20 cm soil layer increased first and then decreased with the increase of lake distance [7].

**Table 1.** Variation of the soil pH in July 2014 to 2016 [7].

| Time/year | Deepth/cm | pH   |       |       |       |       |       |
|-----------|-----------|------|-------|-------|-------|-------|-------|
|           |           | 30 m | 60 m  | 100 m | 250 m | 400 m | 600 m |
| 2014      | 0~10      | 9.61 | 8.19  | 7.59  | 7.68  | 8.15  | 7.88  |
|           | 10~20     | 9.93 | 9.08  | 8.17  | 8.17  | 8.26  | 8.23  |
|           | 20~40     | 9.84 | 9.35  | 8.89  | 8.57  | 8.50  | 8.8   |
|           | 40~60     | 9.87 | 9.27  | 9.04  | 8.84  | 8.72  | 9.05  |
| 2015      | 0~10      | 8.39 | 9.32  | 9.61  | 9.55  | 9.49  | 9.48  |
|           | 10~20     | 8.69 | 10.52 | 9.91  | 10.37 | 9.70  | 10.06 |
|           | 20~40     | 8.96 | 10.50 | 10.17 | 10.64 | 9.88  | 10.41 |
|           | 40~60     | 9.1  | 10.39 | 10.12 | 10.60 | 9.89  | 10.50 |
| 2016      | 0~10      | 9.34 | 9.32  | 9.79  | 9.06  | 9.36  | 9.45  |
|           | 10~20     | 9.41 | 9.44  | 9.64  | 9.13  | 9.39  | 9.88  |
|           | 20~40     | 9.22 | 9.26  | 9.49  | 9.32  | 9.56  | 10.29 |
|           | 40~60     | 9.09 | 9.21  | 9.28  | 9.34  | 9.41  | 9.41  |

**Table 2.** Variation of the soil moisture in July 2014 to 2016 [7].

| Time/year | Deepth/cm | pH   |      |       |       |       |       |
|-----------|-----------|------|------|-------|-------|-------|-------|
|           |           | 30 m | 60 m | 100 m | 250 m | 400 m | 600 m |
| 2014      | 0~10      | 39   | 22   | 21    | 19    | 13    | 11    |
|           | 10~20     | 28   | 25   | 24    | 18    | 18    | 12    |
|           | 20~40     | 23   | 20   | 20    | 16    | 18    | 16    |
|           | 40~60     | 21   | 20   | 19    | 17    | 18    | 18    |
| 2015      | 0~10      | 40   | 32   | 26    | 21    | 15    | 16    |
|           | 10~20     | 27   | 24   | 18    | 16    | 18    | 17    |
|           | 20~40     | 23   | 19   | 17    | 17    | 16    | 15    |
|           | 40~60     | 22   | 22   | 19    | 17    | 19    | 17    |
| 2016      | 0~10      | 32   | 26   | 24    | 27    | 19    | 20    |
|           | 10~20     | 26   | 20   | 20    | 20    | 20    | 15    |
|           | 20~40     | 23   | 19   | 16    | 13    | 17    | 16    |
|           | 40~60     | 22   | 20   | 16    | 16    | 17    | 18    |

### 3.3. Vegetation

Although most people are for planting more cores and plants, more and more vegetation will be destroyed by overcultivation. Overcultivation can lead to the reduction of vegetation and desertification. The rate of vegetation recovery is gradually slowed down during grazing, and after a point, it cannot be restored naturally. After the vegetation is destroyed, the water content of the soil decreases, the adhesion decreases, the small soil particles are easily left by the large particles in the wind zone, and the capillary action of the soil decreases, resulting in the further reduction of water content. Such a vicious cycle, until desertification.

Afforestation refers to the means of artificial greening and planting in the territorial space of a certain region. Its main purpose is to repair the ecosystem, prevent the adverse effects of extreme weather and soil erosion on human life, and human over-cultivation and uncontrolled exploitation are the main reasons for these phenomena [8]. Grassland is the largest terrestrial ecosystem in China. As the environment changes, high-quality grassland is gradually reduced and desertification is increasing. For example, Songnen Plain and Sanjiang Plain are both important grassland areas in Heilongjiang Province. Because there is no long-term effective use of cultivated land, crops are abandoned, and human beings continue to develop new grasslands, which leads to the destruction of the ecological balance of grassland [9].

## 4. Measures

Hundreds of measures have been taken by China to address the problem of overcultivation for sustainable development.

### 4.1. Government

Government refers to the organs of state governance and social management. They can fully use the power of the government to promote ecological agriculture, which is a sustainable agricultural model that attaches great importance to ecological protection and reduces land damage. At present, the uncontrolled cultivation of wasteland has had a serious impact on desertification, and people's living environment has been threatened. In order to solve this problem, the government departments actively encourage all regions to carry out natural forest management and protection work, invest reasonable funds and improve the main equipment and transportation facilities to protect forests [10]. Implement in accordance with the Forestry Law of the People's Republic of China, the Grassland Law of the People's Republic of China and the Grassland Law of the Xinjiang Uygur Autonomous Region, The government announced that the prohibition of grassland cultivation without approval, illegal cultivation of woodland and grassland, from now on immediately stop cultivating artificial forage grass, crops and cash crops, and actively restore forest grassland vegetation.

### 4.2. Enterprise and Public

In order to solve the problems of overcultivation, there are some advice for the firm. Firstly, factories are built around no suitable living environment, so that the land used will not endanger the environment, will not erode the soil and cause natural disasters such as grassland and forest. Then, for enterprises, in order to reduce land desertification, it can completely build ecological greenhouses, by adjusting the temperature to divide the environment in the shed, both to increase ecological benefits, but also to protect the environment. As a member of the national life, people have the obligation to stop overcultivation and protect the environment on which human survival depends. People can voluntarily participate in some projects such as forest protection, visiting forest parks and nature reserves to raise human awareness of environmental protection.

## 5. Conclusion

Reducing overcultivation and protecting the environment on which human beings live are closely related to human activities and social support. Regarding the soil, the small number of protection measures, the lack of water resources, and the inadequate cultivation of artificial turf are all measures that human beings need to improve to protect the existing environment. After the vegetation is destroyed, the soil moisture content is reduced, the adhesion is small, and then it becomes a vicious circle, and the grassland will be further reduced until the desertification of the land. In the future, with the country's emphasis on land issues, the government will take corresponding measures, such as issuing more laws and regulations, and enterprises developing the latest scientific research to ensure the efficient cultivation of a piece of land. The ultimate intention of this paper is to hope that everyone will pay attention to the problem of overcultivation of land, so that the environment will be suitable for human habitation for a long time.

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