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(73) Titulaire(s):
ZAOZHUANG UNIVERSITY – 277160 Zaozhuang City, Shandong (Chine), CHEN Hongkai – 277160 Zaozhuang City, Shandong (Chine), WANG Shengjuan – 277160 Zaozhuang City, Shandong (Chine)

(72) Inventeur(s):
CHEN Hongkai – Chine, WANG Shengjuan – Chine

(74) Mandataire(s):
Patent42 SA – 4081 Esch-sur-Alzette (Luxembourg)

(54) **Method for restoring vegetation ecosystem in rocky desertification area.**

(57) The invention discloses a method for restoring vegetation ecosystem in rocky desertification areas, belonging to the technical field of rocky desertification control. The restoration method is to rebuild the vegetation ecosystem in rocky desertification areas according to the order of trees, shrubs and herbaceous vegetation under the condition of artificial intervention, and to adjust the natural succession rule of the ecosystem from herb to shrub to tree to artificial intervention mode from arbor to shrub to herb, and to adjust the time of vegetation ecological restoration in rocky desertification areas within the tenth grade time scale, effectively promoting the poverty alleviation and rural revitalization of residents in rocky desertification areas.

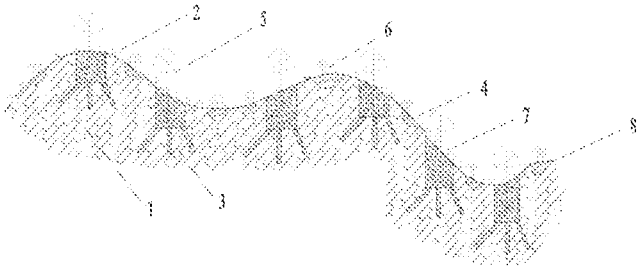

Fig. 1

DESCRIPTION

Method for restoring vegetation ecosystem in rocky desertification area

TECHNICAL FIELD

The invention relates to a method for restoring vegetation ecosystem in rocky desertification areas, belonging to the technical field of rocky desertification control.

BACKGROUND

Rocky desertification is a major global environmental problem, which refers to the phenomena of surface soil loss, bare bedrock, loss of agricultural use value of land and degradation of ecological environment caused by soil erosion. Rocky desertification mostly occurs in limestone areas, with thin soil layers (most of which are less than 10cm), and the surface shows the evolution process of gradually exposing rocks similar to desert landscape, which is called "earth cancer".From the cause of formation, the main factors leading to rocky desertification are human activities. Under the conditions of human engineering activities, overgrazing, extreme arid climate and so on, the ecosystem in rocky desertification areas deteriorates rapidly, the vegetation coverage is poor, the soil erosion is serious, the water conservation is poor, the bedrock is exposed in a large area, and the land productivity drops sharply, which seriously damages the human living environment.

Ecological restoration is the key scientific path to solve the world problem of rocky desertification and promote the strategy of rural revitalization. The existing ecological restoration of rocky desertification focuses on comprehensive control of soil erosion, mainly adopting measures such as closing hillsides for afforestation, aerial seeding, changing slopes to ladders, etc., and following the natural succession law of the ecosystem of herbs → shrubs → trees. However, the natural succession of the ecosystem takes thousands or even ten thousand years, which is not conducive to the rapid restoration of the ecosystem.

Therefore, it is necessary to put forward a method for rapid restoration of vegetation ecosystem in rocky desertification areas.

SUMMARY

In order to solve the above technical problems, the present invention regulates and controls the natural succession rule of the ecosystem of "herb → shrub → tree" into "artificial intervention mode of tree → shrub → herb", and provides a method for quick restoration of vegetation ecology in rocky desertification areas.

To achieve the above objective, the present invention provides the following scheme:

The invention provides a method for restoring vegetation ecosystem in rocky desertification areas. Under the condition of manual intervention, vegetation ecosystem reconstruction is carried out in rocky desertification areas according to the order of trees, shrubs and herbaceous vegetation, with trees planted in tree planting bases, shrubs planted in shrub growing bases and herbaceous vegetation planted on geotextiles.

Further, the tree planting base is composed of tree planting base matrix and tree planting base wet roots, and nutrient soil is filled in the tree planting base matrix and tree planting base wet roots, and the bottom of each tree planting base matrix is provided with three tree planting base wet roots, one of which is arranged along the axis direction of the planting base matrix matrix, and the other is arranged at a large angle intersecting with the rock stratum.

Furthermore, the tree planting matrix is a cylinder with a diameter of 30 cm and a height of 40 cm, and the wall material is self-decomposing organic material. The vertical and horizontal spacing of each tree planting matrix is 3 m×3 m-5 m×5 m, which is not more than 3 m×3 m in severe rocky desertification areas, 4 m×4 m in moderate rocky desertification areas and 5 m×5 m in light rocky desertification areas.

Furthermore, the self-decomposing organic material is polylactic acid or starch plastic.

Furthermore, the wet root length of the arbor planting base is 50-100cm, the diameter is 1.0-1.5cm, the middle part is a metal wire, which plays the role of skeleton support, the metal wire is wrapped with absorbent polymer material, the outer wall is geotextile (commercially available), and absorbent water-retaining nutrient soil is filled between the absorbent polymer material and the geotextile wrapping layer.

Further, the water-absorbent polymer material is polyacrylamide.

Furthermore, the nutrient soil comprises the following raw materials in percentage by weight: 12% of edible fungus residue, 5% of crop straw, 6% of poultry manure, 54% of loam, 7% of water-retaining agent, 9% of vermiculite powder, 3% of compound fertilizer and 4% of adhesive.

Further, the water-retaining agent is a super absorbent resin; The adhesive is one or more of starch, protein, dextrin, animal glue and shellac.

Further, the preparation method of the nutrient soil comprises the following steps: weighing the raw materials according to the weight percentage, grinding to 60 meshes, then adding water according to the material-liquid ratio of 5:2, and uniformly stirring to obtain the nutrient soil.

Furthermore, the shrub planting base is a miniature blasting pit, in which litters and sand soil are laid for the seeds of artificially sown herbaceous vegetation to naturally survive and grow, with a layout interval of 2m×2m.

Furthermore, the geotextile is laid around the arbor planting base and the shrub planting base, and the surface layer contains litter and sand soil, so that the seeds of artificially sown herbaceous vegetation can naturally survive and grow.

In rocky desertification areas, according to the mechanical hole-forming tree planting base → placing wet roots in the tree planting base → filling water-absorbing and water-retaining nutrient soil in the tree planting base → planting tree seedlings in the tree planting base → arranging shrub growth base and planting shrub seedlings under the tree forest → arranging herbaceous growth carriers under trees and shrubs, and planting herbaceous plants or sowing grass seeds, the rapid restoration of artificial intervention vegetation ecosystem following the principle of "trees → shrubs → herbs" has been achieved.

The invention discloses the following technical effects:

1) The water-absorbing and water-retaining nutrient soil in the tree planting base ensures the early survival and growth of the tree seedlings planted in the planting base, and the wet roots at the bottom of the planting base provide a good channel for the tree roots to quickly extend into the rock cracks, so that the tree roots can easily draw groundwater and nutrients from the rock cracks, ensure the sustainable growth of the tree seedlings in the later stage, and rebuild the tree forest phase of the vegetation ecosystem

in rocky desertification areas; micro-blasting pits in open space under trees are conducive to the collection of litter and sand soil carried by surface runoff, and geotextiles laid under forests are conducive to the adhesion of litter and sand soil carried by surface runoff. Planting shrub seedlings in undergrowth shrub growth base or sowing shrub and herb seeds, undergrowth micro blasting pit is beneficial to shrub growth, and litter attached to the surface of geotextile and sand soil carried by surface runoff are beneficial to herb growth.

2) The invention takes full use of the fissure water of rock mass in rocky desertification areas as the breakthrough point, solves the technical key of sustainable growth of trees and trees, and gives priority to rebuilding the tree forest phase in rocky desertification areas, so that undergrowth shrubs and herbs are easy to survive and grow under the shelter of the tree forest phase, and their litter is beneficial to the natural recovery of the undergrowth soil layer. Using economic trees, shrubs and/or herbs to consider economic crops, the ecological restoration time of vegetation in rocky desertification areas is controlled within the tenth grade time scale, and the time required for ecological restoration is 100-1000 times shorter than that required for natural succession.

BRIEF DESCRIPTION OF THE FIGURES

In order to more clearly explain the embodiments of the present invention or the technical solutions in the prior art, the drawings needed in the embodiments will be briefly introduced below. Obviously, the drawings in the following description are only some embodiments of the present invention, and for ordinary technicians in the field, other drawings can be obtained according to these drawings without paying creative labor.

Fig. 1 is a schematic diagram of rapid restoration of vegetation ecosystem in desert areas by manual intervention, in which 1- limestone, 2- tree planting base matrix, 3- tree planting base absorbing wet roots, 4- micro blasting pit, 5- trees, 6- shrubs, 7- herbs and 8- geotextile.

DESCRIPTION OF THE INVENTION

Now, various exemplary embodiments of the present invention will be described in detail. This detailed description should not be considered as a limitation of the present

invention, but should be understood as a more detailed description of some aspects, characteristics and embodiments of the present invention.

It should be understood that the terms used in this invention are only for describing specific embodiments, and are not used to limit the invention. In addition, for the numerical range in the present invention, it should be understood that each intermediate value between the upper limit and the lower limit of the range is also specifically disclosed. Any stated value or intermediate value within the stated range and any other stated value or every smaller range between intermediate values within the stated range are also included in the present invention. The upper and lower limits of these smaller ranges can be independently included or excluded from the range.

Unless otherwise specified, all technical and scientific terms used herein have the same meaning as commonly understood by the ordinary technicians in the field of this invention. Although the present invention only describes the preferred methods and materials, any methods and materials similar or equivalent to those described herein can also be used in the practice or testing of the present invention. All documents mentioned in this specification are incorporated by reference to disclose and describe the methods and/or materials related to the documents. In case of conflict with any incorporated documents, the contents of this specification shall prevail.

Without departing from the scope or spirit of the present invention, it is obvious to those skilled in the art that many modifications and changes can be made to the specific embodiments of the present invention. Other embodiments obtained from the description of the present invention will be obvious to the skilled person. The description and example of that present invention are exemplary only.

The words "including", "having" and "containing" used in this paper are all open terms, that is, they mean including but not limited to.

The following examples will further explain the technical scheme of the present invention.

The schematic diagram of quick restoration of vegetation ecosystem in rocky desertification area by manual intervention of the invention is shown in Figure 1, in which 1- limestone (the main component of land in rocky desertification area), 2- tree

planting matrix, 3- tree planting matrix, 4- micro blasting pit, 5- trees, 6- shrubs, 7- herbs and 8- geotextile.

The nutrient soil used in the examples of the present invention is prepared according to the following method: according to weight percentage, the following raw materials are weighed: 12% edible fungus residue, 5% crop straw, 6% poultry manure, 54% loam, water-retaining agent (super absorbent resin) 7%, vermiculite powder 9%, compound fertilizer (nitrogen, phosphorus and potassium compound fertilizer) 3% and binder (one or more of starch, protein, dextrin, animal glue and shellac) 4%, all of which are in the market It can be purchased, grind to 60 mesh, then add water according to the material-to-liquid ratio of 5:2, stir evenly to obtain nutrient soil.

The tree planting base wet root 3 used in this embodiment of the present invention is made into three sizes: 50cm in length, 1cm in diameter, 100cm in length, 1cm in diameter, 80cm in length and 1.5cm in diameter. The middle of wet root 3 is provided with a wire, and the wire is wrapped with water-absorbent polymer material (polyacrylamide), and the outer wall is made of civil fabric.

The materials used in the invention are all commercially available.

The tree planting matrix 2 used in the embodiment of the invention has a diameter of 30cm and a height of 40cm, and the wall material is self-decomposing organic material (polylactic acid or starch plastic).

Example 1

In severe rocky desertification areas, according to the vertical and horizontal spacing of 3m3m, mechanically pore-forming tree planting bases are installed, and then three tree planting bases with a length of 50cm and a diameter of 1cm are installed (one of them is arranged along the axis direction of the planting base matrix, and the other is arranged at a large angle with the limestone 1 rock stratum). The matrix 2 of the arbor planter is filled with nutrient soil, the arbor 5 saplings are planted in the arbor planting base, the micro blasting pits 4 are arranged under the arbor forest at the arrangement interval of 2m2m, the shrubs 6 saplings are planted, the herbaceous plants 7 are arranged under the arbor bushes, the growth carrier civil fabric 8 is arranged, and the herbaceous plants or grass seeds are spread.

Example 2

In the moderately rocky desertification area, according to the vertical and horizontal spacing of 4m4m, mechanically hole-forming tree planting bases are installed, and then three tree planting bases with a length of 100cm and a diameter of 1cm are installed to absorb wet roots 3 (one of them is arranged along the axis direction of the tree planting base matrix 2, and the other is arranged at a large angle intersecting with the limestone layer 1). The matrix 2 of the arbor planter is filled with nutrient soil, the arbor 5 saplings are planted in the arbor planting base, the micro blasting pits 4 are arranged under the arbor forest at the arrangement interval of 2m2m, the shrubs 6 saplings are planted, the herbaceous plants 7 are arranged under the arbor bushes, the growth carrier civil fabric 8 is arranged, and the herbaceous plants or grass seeds are spread.

Example 3

In the light rocky desertification area, according to the vertical and horizontal spacing of 5m5m, mechanical hole-forming tree planting bases are installed, and then three tree planting bases with a length of 80cm and a diameter of 1.5cm are installed (one of them is arranged along the axis direction of the tree planting base matrix 2, and the other is arranged at a large angle with the limestone 1 rock stratum). The matrix 2 of the arbor planter is filled with nutrient soil, the arbor 5 saplings are planted in the arbor planting base, the micro blasting pits 4 are laid under the arbor forest at the interval of 2m2m, and the shrubs 6 saplings are terminated, and the herbaceous plants 7 growth carrier civil fabric 8 is laid under the arbor forest and the herbaceous plants or grass seeds are spread.

Comparing the restoration results of vegetation ecosystem in rocky desertification areas with those of existing rocky desertification ecological restoration methods in severe, moderate and light rocky desertification areas, the coverage rate in the first year after planting, the coverage rate after 3 years of vegetation growth and the coverage rate after 10 years of vegetation growth are shown in Table 1.

Table 1 Comparison of repair results

	Coverage of vegetation in the first year after sowing (%)	Coverage of vegetation after 3 years of growth (%)	Coverage of vegetation after 10 years of growth (%)
Example 1	56	76	92
Existing (severe areas)	13	18	26
Example 2	58	79	95
Existing (medium area)	23	36	52
Example 3	66	83	97
Existing (light area)	46	58	73

The above-mentioned embodiments only describe the preferred mode of the present invention, and do not limit the scope of the present invention. Without departing from the design spirit of the present invention, all kinds of modifications and improvements made by ordinary technicians in the field to the technical scheme of the present invention should fall within the protection scope determined by the claims of the present invention.

CLAIMS

1. A method for restoring vegetation ecosystem in rocky desertification areas, which is characterized in that the vegetation ecosystem is rebuilt in rocky desertification areas according to the order of trees, shrubs and herbaceous vegetation, with trees planted in tree planting bases, shrubs planted in shrub growing bases and herbaceous vegetation planted on geotextiles.

2. The method according to claim 1, characterized in that the tree planting base consists of a tree planting base matrix and tree planting base wet roots, nutrient soil is filled in the tree planting base matrix and tree planting base wet roots, and three tree planting base wet roots are arranged at the bottom of each tree planting base matrix.

3. The method according to claim 2, characterized in that the tree planting matrix is a cylinder with a diameter of 30cm and a height of 40cm, the wall material is self-decomposing organic material, and the vertical and horizontal spacing of each tree planting matrix is 3m×3m-5m×5m.

4. The method according to claim 3, wherein the self-decomposing organic material is polylactic acid or starch plastic.

5. The method according to claim 2, characterized in that the wet root length of the arbor planting base is 50-100cm, the diameter is 1.0-1.5cm, the middle part is a metal wire, the metal wire is coated with water-absorbent polymer material, and the outer wall is geotextile.

6. The method according to claim 5, wherein the water-absorbent polymer material is polyacrylamide.

7. The method according to claim 2, characterized in that the nutrient soil comprises the following raw materials in percentage by weight: 12% of mushroom residue, 5% of crop straw, 6% of poultry manure, 54% of loam soil, 7% of water-retaining agent, 9% of vermiculite powder, 3% of compound fertilizer and 4% of adhesive.

8. The method according to claim 7, characterized in that the preparation method of the nutrient soil comprises the following steps: weighing the raw materials according to the weight percentage, grinding to 60 meshes, then adding water according to the material-liquid ratio of 5:2, and uniformly stirring to prepare the nutrient soil.

9. The method according to claim 1, characterized in that the shrub planting base is a miniature blasting pit, in which litter and sand soil are laid with an interval of 2m×2m.

10. The method according to claim 1, characterized in that the geotextile is laid around the arbor planting base and shrub planting base, and the surface layer contains litter and sand soil.

PATENTANSPRÜCHE

1. Verfahren zur Wiederherstellung des Vegetationsökosystems in steiniger Desertifikation, dadurch gekennzeichnet, dass das Vegetationsökosystem in steiniger Desertifikation in der Reihenfolge von Bäumen, Sträuchern und krautiger Vegetation wiederhergestellt wird, wobei Bäume in Baumpflanzbasis, Sträucher in Strauchpflanzbasis und krautige Vegetation auf Geotextilien gepflanzt werden.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, dass die Baumpflanzbasis aus einer Baumpflanzbasis-Matrix und Baumpflanzbasis-Nasswurzeln besteht; in die Baumpflanzbasis-Matrix und Baumpflanzbasis-Nasswurzeln wird Nährerde gefüllt, drei Baumpflanzbasis-Nasswurzeln werden am Boden jeder Baumpflanzbasis-Matrix angeordnet.

3. Verfahren nach Anspruch 2, dadurch gekennzeichnet, dass die Baumpflanzbasismatrix ein Zylinder mit einem Durchmesser von 30 cm und einer Höhe von 40 cm ist, das Wandmaterial selbstzersetzendes organisches Material ist, und der vertikale und horizontale Abstand jeder Baumpflanzbasismatrix 3 m×3 m - 5 m×5 m beträgt.

4. Verfahren nach Anspruch 3, dadurch gekennzeichnet, dass das sich selbstzersetzende organische Material Polymilchsäure oder Stärkekunststoff ist.

5. Verfahren nach Anspruch 2, dadurch gekennzeichnet, dass die Länge der Nasswurzeln der Baumpflanzbasis 50-100 cm beträgt, der Durchmesser 1,0-1,5 cm beträgt, der mittlere Teil Metalldraht ist, der Metalldraht mit wasserabsorbierendem Polymermaterial beschichtet ist und die Außenwand aus Geotextil besteht.

6. Verfahren nach Anspruch 5, dadurch gekennzeichnet, dass das wasserabsorbierende Polymermaterial Polyacrylamid ist.

7. Verfahren nach Anspruch 2, dadurch gekennzeichnet, dass die Nährerde die folgenden Rohstoffe in Gewichtsprozent enthält: 12% Pilzreste, 5% Erntestroh, 6% Geflügelmist, 54% Lehmboden, 7% Wasserrückhaltemittel, 9% Vermiculitpulver, 3% zusammengesetzter Dünger und 4% Klebstoff.

8. Verfahren nach Anspruch 7, dadurch gekennzeichnet, dass das Verfahren zur Herstellung der Nährerde die folgenden Schritte umfasst: Abwiegen der Rohstoffe

entsprechend dem Gewichtsprozentsatz, Zerkleinern auf 60 Maschen, anschließend Zugabe von Wasser entsprechend dem Material-Flüssigkeits-Verhältnis von 5:2 und gleichmäßiges Rühren zur Herstellung der Nährerde.

9. Verfahren nach Anspruch 1, dadurch gekennzeichnet, dass die Strauchpflanzbasis eine Miniatursprenggrube ist; es gibt in der Sprenggrube abgestorbene Äste und Blätter sowie Sandboden im Abstand von 2 m×2 m.

10. Verfahren nach Anspruch 1, dadurch gekennzeichnet, dass das Geotextil um die Baumpflanzbasis und den Strauchpflanzbasis gelegt wird und die Oberflächenschicht abgestorbene Äste und Blätter sowie Sandboden enthält.

FIGURES

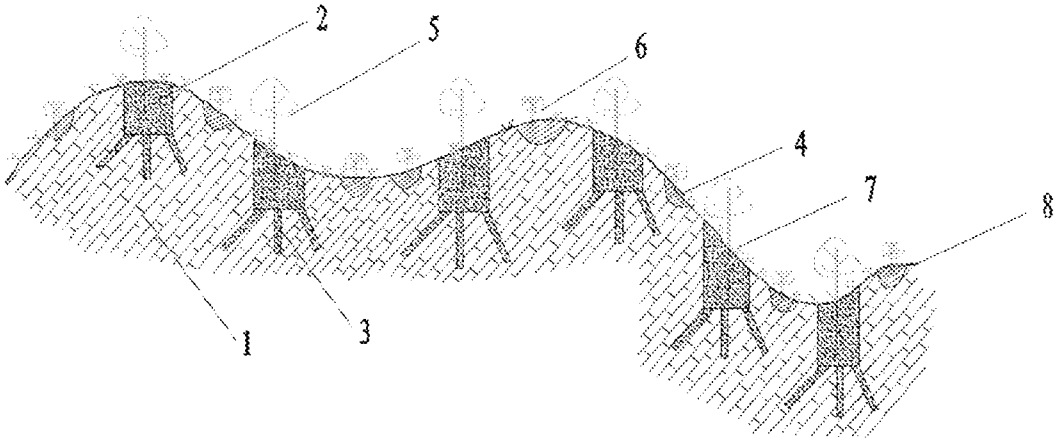

Fig. 1