REPUBLIC OF SOUTH AFRICA

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PATENTS ACT, 1978

CERTIFICATE

In accordance with section 44 (1) of the Patents Act, No. 57 of 1978, it is hereby certified that:

XINJIANG INSTITUTE OF ECOLOGY AND GEOGRAPHY, CHINESE ACADEMY OF SCIENCES

Has been granted a patent in respect of an invention described and claimed in complete specification deposited at the Patent Office under the number

2022/03947

A copy of the complete specification is annexed, together with the relevant Form P2.

In testimony thereof, the seal of the Patent Office has been affixed at Pretoria with effect from the **29th** day of **June 2022**

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71	Full name(s) of applicant(s)/Patentee(s):
Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences	

71	Applicant(s) substituted:	Date registrered
71	Assignee(s):	Date registrered

72	Full name(s) of inventor(s):
(1) WANG Yongdong; (2) YOU Yuan; (3) WANG Xiaojing	

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54	Title of invention
Method For Constructing The Large-scale Sheet Forest	

Address of applicant(s)/patentee(s):
No.818, South Beijing Road, Urumqi, Xinjiang Uygur Autonomous Region, China

74	Address for service
Sibanda and Zantwijk, Oaktree Corner, 9 Kruger Street, Oaklands (PO Box 1615 Houghton 2041), Johannesburg, 2192, SOUTH AFRICA Reference no.: PT_CP_ZA00003993 ([InsID:])	

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COMPLETE SPECIFICATION
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FULL NAME(S) OF APPLICANT(S)

71	Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences

FULL NAME(S) OF INVENTORS(S)

72	WANG Yongdong YOU Yuan WANG Xiaojing

TITLE OF INVENTION

54	Method For Constructing The Large-scale Sheet Forest

Method For Constructing The Large-scale Sheet Forest

TECHNICAL FIELD

The application belongs to the technical field of shelter forest construction, and in particular relates to a method for constructing the large-scale sheet forest.

BACKGROUND

In arid and semi-arid regions, the shelter forest construction has become the key demand to resist the effects of natural disasters such as the sandstorm, the soil erosion, the soil conservation and the increase carbon sinks.

The construction of large-scale sheet forest originates from the perfection and improvement of some ecological engineering planning and design, which is mainly manifested in: (1) Some sheet forest belts are single in type, small in area and fragmented, and the ecosystem is still fragile; (2) The structure of some stands is unreasonable, forest diseases and insect pests are frequent, biodiversity is poor, and the growth and resistance of trees are weak; (3) It is difficult to give consideration to both ecological and economic benefits in some forest belts, and it is difficult to exert the benefit of "using forest to support forest", thus the problem of forest belt sustainability is prominent.

SUMMARY

The purpose of the application is to propose a method for constructing the large-scale sheet forest, based on full consideration of regional water resources, regional native tree species will be established as the main species, and economic tree species will be supplemented. Gradually, the construction will change from single tree

species to multi-type tree species, from single ecological forests to the coexistence of ecological forests and economic forests, from monotonous landscape layers to multi-level landscape layers, and from belt forests to sheet forests. Ultimately, a multi-tree, multi-level, multi-structural, and multi-type large-scale patchy forest ecosystem construction which fully reflects the scientific configuration of forest structure, the effective use of soil and soil resources, and the summation of ecological and socio-economic benefits is completed.

In order to achieve the above purpose, the present application provides the following technical scheme:

A method for constructing the large-scale sheet forest, which is to build a main forest belt with native tree species, and plant economic tree species in the open area formed by the main forest belt to build an economic forest to form a large-scale sheet forest.

Further, it also includes planting native tree species and suitable economic tree species in vacant areas of the first batch of sheet forests when they are closed, forming sheet forests with different forest age combinations. In the construction and planning of shelterbelt, the main function and the secondary function of shelterbelt should be distinguished according to the functional characteristics of shelterbelt, and the sheet forest with ecological and economic forests should be gradually established.

The economic tree species include red date trees, grape trees, walnut trees, apple trees, pear trees, blackcurrant trees, honeysuckles and the like.

Further, by combining tree species functions, the arbor and the shrub are selected

to be matched with local tree species and economic tree species to form a windbreak belt, to build the ecological protection forest, the economic protection forest and two types of coexistence of three-dimensional distribution of large-scale sheet forest.

The native tree species include Xinjiang poplars, Populus euphratica, Elaeagnus angustifolia, Acer compound, the elm, the birch and the like.

In the process of building large-scale sheet forest, it should be coordinated with external factors such as local climate conditions and water resources.

Compared with the prior art, the application has the beneficial effects that:

In the present application, the main forest belt is constructed with local tree species, and the economic forest is developed by planting economic tree species in the open area formed by the main forest belt. This achieves the goal of matching trees and shrubs, and coexistence of ecological forest and economic forest. so as to achieves three-dimensional distribution, different age combination and sustainable benefit. It reaches the goal of rational allocation of regional water resources, organic integration of artificial ecosystem with climatic and environmental conditions, and better promotion of the function of the whole ecosystem, so as to achieve the goal of "supporting forests with forests"..

According to the principle of "adjusting measures to local conditions" when selecting tree species, the application realizes the tree species allocation mode of the shelter forest, which takes native tree species as the main part and suitable economic species as the auxiliary part and takes ecological and economic benefits into consideration, and builds ecological shelterbelt, economic shelterbelt and large-scale

forest with three-dimensional distribution of both types. At the same time, according to the growth of tree species, the sheet forest composed of different forest ages is formed. The method described in the application has been used in the Kekeya Desert in Aksu of Xinjiang and in the “Green Ring Project” in Nur Sultan, the capital circle of The Republic of Kazakhstan.

DESCRIPTION OF THE APPLICATION

Various exemplary embodiments of the present application will now be described in detail, which should not be regarded as a limitation of the present application, but rather as a more detailed description of certain aspects, characteristics and embodiments of the present application.

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

Unless otherwise stated, all technical and scientific terms used herein have the same meanings as commonly understood by those skilled in the art to which the present application relates. Although the present application only describes preferred

methods and materials, any methods and materials similar or equivalent to those described herein may be used in the practice or testing of the present application. All documents mentioned in this specification are incorporated by reference to disclose and describe 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 application, it is obvious to those skilled in the art that many modifications and changes can be made to the specific embodiments of the specification of the application. Other embodiments derived from the description of the present application will be apparent to the skilled person. The specification and examples of this application are only exemplary.

As used herein, the terms "including", "comprising", "having", "containing", etc. are all open terms, which means including but not limited to.

The application provides a method for constructing large-scale sheet forest, which is to build a main forest belt with native tree species, and plant economic tree species in open areas formed by the main forest belt to build an economic forest to form a large-scale sheet forest.

It also includes planting native tree species and suitable economic tree species in vacant areas of the first batch of sheet forests when they are closed, forming sheet forests with different forest age combinations. In the construction and planning of shelterbelt, the main function and the secondary function of shelterbelt should be distinguished according to the functional characteristics of shelterbelt, and the sheet forest with ecological and economic forests should be gradually established.

By combining tree species functions, the arbor and the shrub are selected to be matched with tree species to form a windbreak belt, and an ecological protection forest, an economic protection forest and a large-scale sheet forest with three-dimensional distribution of the two types coexist are built.

In the process of building large-scale sheet forest, it should be coordinated with external factors such as local climate conditions and water resources.

In the present application, the main forest belt is constructed with local tree species, and the economic forest is developed by planting economic tree species in the open area formed by the main forest belt. This achieves the goal of matching trees and shrubs, and coexistence of ecological forest and economic forest. so as to achieves three-dimensional distribution, different age combination and sustainable benefit. It reaches the goal of rational allocation of regional water resources, organic integration of artificial ecosystem with climatic and environmental conditions, and better promotion of the function of the whole ecosystem, so as to achieve the goal of "supporting forests with forests"..

According to the principle of "adjusting measures to local conditions" when selecting tree species, the application realizes the tree species allocation mode of the shelter forest, which takes native tree species as the main part and suitable economic species as the auxiliary part and takes ecological and economic benefits into consideration, and builds ecological shelterbelt, economic shelterbelt and large-scale forest with three-dimensional distribution of both types. At the same time, according to the growth of tree species, the sheet forest composed of different forest ages is

formed. The method described in the application has been used in the Kekeya Desert in Aksu of Xinjiang and in the “Green Ring Project” in Nur Sultan, the capital circle of The Republic of Kazakhstan.

Embodiment 1

Kekeya, located on the diluvial terrace in the northeast of Aksu City and Wensu County, this large wasteland means "Cyan cliff" in the uygur language. Kekeya terrace is criss-crossing and steep; the terrace soil is brown desert soil developed on gravel base, with dense gravel and serious saline alkali, mainly containing sulfate and nitride, with an average salt content of 2.87% and a maximum salt content of 9.87%, which greatly exceeds the stipulated afforestation standard that the saline alkali content shall not be greater than 1.0%; the soil is barren and the vegetation is very sparse; the terrace climate is arid, the precipitation is 56.7 mm, the evaporation is 1972.9 mm, the average wind speed over the years is 1.7 m/s and the maximum wind speed reaches 40 m/s; during the monsoon season, the loess is filled with dust, which causes serious influences and harms to the production and life of people of all ethnic groups in urban and rural areas of Aksu.

According to the principle of suitable land and suitable trees, Xinjiang poplars, Populus euphratica and Elaeagnus angustifolia, which are used for the forestation in windbreak and the sand fixation forest, in addition, red dates, grapes and walnuts with early profits, apricots with middle profits and apples, pears with late profits are selected as the main eco-economic forest trees.

The construction of windbreak and sand-fixation forest: The row spacing of the

main plants is 2×2m or 2×3m, and the forest belt is planted with 2-3 rows. The distance between the two main forest belts is 150-250 m; a secondary forest belt is arranged on the downwind surface, 2-3 rows of trees are planted, and the interval distance between the two secondary forest belts is 30-500 m;

The construction of ecological economic forest: In 2-5 years after the construction of windbreak forest, the construction of ecological economic forest will begin. The allocation ratio of tall trees (Xinjiang poplars and Populus euphratica) to short or medium-sized trees (Elaeagnus angustifolia) is 1:9, and the row spacing of economic forests (walnuts, apples, pears, grapes, red dates, apricots) follows the difference of plant species, forming a planting pattern of 2m×3m or 4m×4m.

During the implementation of the project, a demonstration base of eco-engineering in Kekeya with an area of 1,153,000 mu has been built. The forest coverage rate in the project implementation area has increased from 3.8% in 1986 to 6.8% in 2015. The net income per capita of farmers in the forest and fruit industry is 4,992 yuan, accounting for 33.46% of the net income per capita, reaching 500,000 beneficiaries.

Embodiment 2

Nur sultan, the capital of The Republic of Kazakhstan, is located in the inland region of Asia, far away from the sea, forming a temperate continental climate with cold winter, hot summer and the scarce precipitation. Nur sultan, the capital of Kazakhstan, is also known as the "capital of wind" and "capital of cold".

The selection of tree species: Tree species such as Acer negundo, the elm and

birch, and shrub species such as blackcurrant, honeysuckle and small apple suitable for local environmental conditions are screened.

The construction of windbreak forest: The afforestation is carried out in spring, and 2-year-old seedlings are selected for large-scale mechanical planting. All the plants used in windbreaks are cold-resistant and drought-tolerant trees. The forest belt structure adopts the configuration mode of "6 rows form one belt, 1×2 meters of mixed forest spacing". The two rows on the edge of the forest belt are shrubs, and the two rows in the middle are arbor trees. A width of 12m is reserved between trees and belts for ecological and economic forest constructions.

The construction of ecological economic forest: 8-10 years after the completion of the windbreak, gradually in the reserved space between the two belts, planted pinus sylvestris, black currant economic forest.The plant row spacing can be 1×2 m or 2×2 m of pure forest economic plants.

Since its construction in 1997, the forest in the capital region of Kazakhstan has been growing at an annual rate of 5,000 hectares. Until 2020, the planting area has reached 200,000 hectares, which not only provides wind protection, but also effectively improves the microenvironment of the capital City of Nur sultan.

The foregoings are only preferred embodiments of the present application and is not intended to limit the application. Any modifications, equivalents, and improvements that come within the spirit and principles of the application are intended to be included within the scope of the application.

THE CLAIMS DEFINING THE APPLICATION ARE AS FOLLOWS

1. A method for constructing the large-scale sheet forest, characterized in that native tree species are used to build a main forest belt, and planting economic tree species in the open area formed by the main forest belt to build an economic forest to form a large-scale sheet forest.

2. The method for constructing the large-scale sheet forest according to claim 1, characterized in that it also includes planting native tree species and suitable economic tree species in vacant areas of the first batch of sheet forests when the forests are closed, forming sheet forests with different forest age combinations.

3. The method for constructing the large-scale sheet forest according to claim 1 or 2, characterized in that the native tree species and economic tree species are tree species matched with arbor and shrub to form windbreak belt.

4. The method for constructing the large-scale sheet forest according to claim 1 or 2, characterized in that the native tree species include xinjiang poplars, Populus euphratica, Elaeagnus angustifolia, Acer compound, the elm, birch, etc.

5. The method for constructing the large-scale sheet forest according to claim 1 or 2, characterized in that the economic tree species include red date trees, grape trees, walnut trees, apple trees, pear trees, blackcurrant trees, honeysuckles and the like.

DA van Zantwijk
Sibanda & Zantwijk Patent Attorneys

ABSTRACT

The application discloses a method for constructing the large-scale sheet forestand, which belongs to the technical field of shelter forest construction. The construction method comprises that following steps: The main forest belt is constructed with native tree species, and economic tree species are planted in the open area formed by the main forest belt to construct economic forest, forming large-scale sheet forest. it also includes planting native tree species and suitable economic tree species in vacant areas of the first batch of sheet forests when they are closed, forming sheet forests with different forest age combinations. On the basis of taking regional water resources into full consideration, in the application, regional native tree species will be established as the main species, and economic tree species will be supplemented. Gradually, the construction will change from single tree species to multi-type tree species, from single ecological forests to the coexistence of ecological forests and economic forests, from monotonous landscape layers to multi-level landscape layers, and from belt forests to sheet forests. Ultimately, a multi-tree, multi-level, multi-structural, and multi-type large-scale patchy forest ecosystem construction which fully reflects the scientific configuration of forest structure, the effective use of soil and soil resources, and the goal of ecological and socio-economic benefits is completed.