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Review Article

Agriculture High-Quality Development and Nutrition

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Abstract

Modern Agricultural production wants to efficiently produce plant products and benefits to meet people's needs. However, because of better plant species and varieties, overuse of fertilizer and overdose of pesticide alters the plant resources relationship, resulting in soil degradation, vegetation decline, and crop failure or waste of resources, which influence the quality of fruit and benefit and are unfavorable for the sustainable utilization of nature resources and crops high-quality development. After a couple of years of study, the results showed that Agricultural development went into agricultural high-quality development in 2017, which is to use effective measures or methods to maximize yield and benefits and meet the need of people's need for better Agricultural produce and a better life. The theory foundation of the sustainable utilization of natural resources and Agriculture high-quality production is the resources use limit by plants, vegetation carrying capacity, and critical period of plant resources relationship regulation. The methods of Agriculture high-quality development are to select excellent plant species or varieties based on site conditions and market needs before planting crop young plants and sowing seeds, adopt appropriate initial planting density when planting crop young plants and sowing seeds, and regulate the relationship between plant growth and resources need in the process of crop production in a timely and appropriate amount, especially the chemical fertilizer and pesticide to obtain the maximum yield and benefits and realize the sustainable utilization of natural resources and achieve agricultural high-quality development.

More Information

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Introduction

Agricultural development has gone through a long process. There are different kinds of agriculture concepts such as ecological agriculture (Li, et al. 2023), organic agriculture [1], smart agriculture and data agriculture, and so on. Organic agricultural practices respond to and offer alternatives to the health and environmental problems related to conventional technologies and practices of production and embrace many alternative ideals such as alternative distribution and retailing networks and the counter-cultural whole foods movement. But there still are some questions, such as soil degradation, crop shortfalls, fertilizer overuse, excessive use of pesticides, high cost, and low economic benefit, which sever influence the quality of fruit and benefits and are unfavorable for the sustainable utilization of natural resources and crop high-quality development.

Study method

To solve these questions ensure the direction of agricultural development and establish a new method to promote Agricultural development in the new era, the Author reviews a lot of papers and finds according to the efficiency of resource utilization by plants based on the innovation study [2-13], the whole process of agricultural development can be divided into three stages: Low-level development stage or primitive agriculture, Level improvement stage and high-quality development new stage. The direction of Agriculture development is Agriculture High-quality development. Only in this way, land can produce better and healthier food and services to meet the people's needs for a better life and crop types, yields, and quality.

Results

Agricultural development has gone a long time. According to the efficiency of resources used, the whole process of agricultural development can be divided into three stages: The low-level development stage of primitive agriculture, the Level improvement stage, and the high-quality development stage. These are the Low-level development stage or primitive agriculture, the Level improvement stage, and Agriculture High-quality development.

Low-level agriculture development stage

At the Low-level development stage or primitive

agriculture, people pick up wild fruits and rely on nature for a living because science and technology are underdevelopment and people's labor productivity is low. People must live in nature. Today in some African primitive tribes, you can see this kind of Low-level agriculture development. However, with the economic and societal development, this kind of Low-level agriculture development will disappear.

Level improvement stage

At the Level improvement stage, people start to select or cultivate better plant species, weeding, producing and applying fertilizer, and irrigating, if there are water resources, to increase food kinds, and improve the quality and amount of food. The turning point from the low level of development to the Level of improvement is plant domestication and animal introduction domestication, the development of the gathering economy to the planting economy. There are some events such as the overuse of chemical fertilizer and the overdose application of pesticides and so on, which cause crop failure and resource waste, which is not good for Agriculture's High-quality development but easily cause environmental and health problems. In most of the farmland, you can see this kind of agricultural development. The level improvement stage is a transition stage from the Low-level agriculture development stage to agriculture high-quality development. With the economic and societal development, this kind of agriculture development will be developing into Agriculture high-quality development.

Agriculture high-quality development

At the high-quality development stage, people must take effective measures or methods to get the maximum yield and benefit and produce better and healthful food and service to meet the people's increasing needs for a better life and crop types, yields, and quality. To carry out high-quality development, we must overcome the overuse of chemical fertilizer and the over-dose application of pesticides and so on in the production process to ensure sustainable use of natural resources and agriculture high yield and benefit.

The theoretical foundation of agriculture high-quality development

So, to carry out sustainable use of natural resources and agriculture high-quality development, we must sustainably use the natural resources. The theoretical foundation of Agriculture's high-quality development includes the natural resources use limit by plants, which is the controlling limit plants use natural resources in soil water and nutrient-rich regions, expressed by the indicator plant. The natural resources use limit by plants includes space resources use limit by plants in soil water and nutrient-rich regions, soil water resources use limit by plants in water-limited regions [14], and soil nutrient-limited regions, which changes with plant species and location [15,16]. For example, in semiarid loess hilly regions, natural resources use limit by plants is the limit of soil water resources use limit by plants, which is the soil water resources of 212.7 mm in the maximum infiltration depth of 290 cm when soil water content is equal to wilting coefficient in red plum apricot [16]. The indicator plant for original vegetation is the dominant species, especially constructive species, the uppermost dominant species, which is native to the local region because, for a long time, they have developed a good relationship with the local condition. The indicator plant for non-Native vegetation is the goal or cultivated plant species.

The vegetation carrying capacity is the ability of nature or land resources to carry vegetation in a given time and space, expressed by the quality or plant density of the indicator plant. For example, in a water-limited region, the vegetation carrying capacity is soil water vegetation carrying capacity, which is the ability of soil water resources to carry vegetation in a given time and space because soil water is the most important factor in influencing plant growth, yield, and benefit. Plant resources relationship is very harmonious and plants grow well and bear fruit but the goods and services cannot meet people's needs in the stage of primitive agriculture, a lot of original vegetation has been changed into non-native plantations such as Saskatoon berries, red plum apricot, and corn in the semiarid region, China. Some plants such as Saskatoon berries, grow and develop well, are suitable for the local climate, easy to develop. But other plants, such as corn and red plum apricot, are not suited to the local climate and need to regulate plant resource relationships.

The critical period of plant resources relation regulation

Along with plant growth, plant canopy and root growth are great, and plants use more resources. Plant resources relation changes with time. When the resources plant use is equal to natural resources use limit by plants, plant resources relation enters the critical period of plant resources relation regulation. At this period, air temperature, soil water, or soil nutrients will influence the ending time of the critical period of plant resources relation regulation is an ineffective time of plant resources relation regulation, such as the ending time of fruit expansion for red plum apricots is June 15 in the semiarid loess hilly region [17]. The critical period of plant resources relation regulation is the most important time in the whole process of plant growth and yield and benefit cultivation, which can be expressed by the amount of available natural resources in the canopy or root zone. The carrying capacity in the critical period of plant resources relation regulation decides the maximum yield and benefit.

Methods of agricultural high-quality development

We must select excellent tree species or varieties and take appropriate initial plant density [9] and effective measures to regulate the plant resources relation and ensure plants grow well and get the cultivated goal because the carrying capacity in the critical period of plant resources relation regulation decides the maximum yield and benefit. We must take the theories of resource use limit by plants, vegetation carrying capacity, and the critical period of plant resources relation regulation as a guild, take weeding in time,

apply fertilizer, and so on. If the plant density exceeds the vegetation capacity, the plant resources relation should be regulated based on vegetation carrying capacity, especially the vegetation carrying capacity in the critical period of plant resources relation regulation, otherwise, the further increase in plant use of natural resources will lead to overuse of natural resources because available natural resources is more than natural resources used by the plant, which will lead to the decline of vegetation and the decline of grain yield and quality [3-5,8,9,11,15,18-21].

The vegetation carrying capacity is the function of plant species, time, and location [9,11]. For example, in water-limited regions, vegetation carrying capacity is soil water vegetation carrying capacity, which is the ability of soil water nature resources to carry vegetation, which changes with plant species, times, and location [9,11,13].

Conclusion

We must take excellent tree species or varieties, appropriate initial plant density, and effective measures or methods to regulate the plant resources relation and ensure plants grow well and reach the cultivated goal. Because of the large agricultural area and the increasing population, which has exceeded 8 billion at present, different regions have different climates, see 2 and 3 and crops suitable for growth, so it is necessary to strengthen the research on the selection of excellent tree species or varieties, determination appropriate initial plant density, resources use limit by plants, vegetation carrying capacity, the critical period of plant resources relation regulation to get maximum yield and benefit and realize sustainable use of nature resource and agricultural high-quality development and meet people's needs for a better life and crop types, yields and quality.

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References

1. Squalli J, Adamkiewicz G. The spatial distribution of agricultural emissions in the United States: The role of organic farming in mitigating climate change. J Clean Prod. 2023;414:137678. DOI: 10.1016/j.jclepro.2023.137678. Available from: https://doi.org/10.1016/j.jclepro.2023.137678
2. Guo Z. An approach to the method for optimal cutting rate for the headwater conservation forest. In: Yu Y, Zhang J, editors. Protection and Mountain Forest. Beijing: Science Press; 1994; 1990.
3. Guo Z, Shao M, Zhang Y, Wu Q. A layer-dividing approach to the soil water in forest land. In: Shao M, editor. Proceedings of Soil Physics and Ecological Environmental Construction. Xi'an: Shanxi Science and Technology Press; 2002; 74-79. Available from: http://ir.igsnrr.ac.cn/handle/311030/4789
4. Guo Z, Shao M. Vegetation carrying capacity of soil water and soil desiccation in artificial forestry and grassland in the semiarid regions of Loess Plateau. Chin J Ecol. 2003;23:1640-1647.
5. Guo Z, Shao M. Mathematical model for determining vegetation carrying capacity of soil water. J Hydr. 2004;35(10):95–99. Available from: https://www.semanticscholar.org/paper/Mathematical-model-for-determining-vegetation-of-Guo/9c7f6fb57c9c0daf5dae8a7eb6e1106ddfdc35db
6. Guo Z, Li Y. Initiation stage to regulate the Caragana growth and soil water in the semiarid area of Loess Hilly Region, China. Chin J Ecol. 2009;29:5721-5723. Available from: https://www.researchgate.net/publication/286514133_Initiation_stage_to_regulate_the_caragana_growth_and_soil_water_in_the_semiarid_area_of_Loess_Hilly_Region_China
7. Guo Z. Limit of vegetation rehabilitation for soil and water conservation in semi-arid region of Loess Plateau. Chin J Sci Soil Water Conserv. 2009;7:49-54.
8. Guo Z, Shao M. Effect of artificial Caragana (Caragana korshinskii) forest on soil water in the semiarid area of Loess Hilly Region. Chin Forest Sci. 2010;46:1-8.
9. Guo Z. Theory and practice on soil water carrying capacity for vegetation. Beijing: Scientific Press; 2014; 45-100.
10. Guo Z. Estimating method of maximum infiltration depth and soil water supply. Sci Rep. 2020;10:9726. Available from: https://www.nature.com/articles/s41598-020-66859-0
11. Guo ZS. Soil water carrying capacity for vegetation. Land Degrad Dev. 2021;1–11. Available from: https://doi.org/10.1002/ldr.3950
12. Guo Z. High-quality development of agriculture. Encyclopedic Forum. 2022;(01):64-66.
13. Guo Z. Forest restoration, resource sustainable use, and high-quality sustainable management. Glob J Ecol. 2023;8(1):007-010. Available from: http://dx.doi.org/10.17352/gje.000075
14. Guo Z. Soil water resource use limit in semi-arid loess hilly areas. Chin J Appl Ecol. 2010;21:3029-3035. Available from: https://www.researchgate.net/publication/50890123_Soil_water_resource_use_limit_in_semi-arid_loess_hilly_area
15. Guo ZS. Soil hydrology process and sustainable use of soil water resources in desert regions. Water. 2021;13:2377. Available from: https://www.preprints.org/manuscript/202106.0159/v1
16. Guo Z. High-quality production of food plants. Biomed J Sci Tech Res. 2023;53(4):44856-44863. Available from: https://biomedres.us/pdfs/BJSTR.MS.ID.008422.pdf
17. Gui Y, Wang Y, He S, Yang J. Self-powered smart agriculture real-time sensing device based on hybrid wind energy harvesting triboelectric-electromagnetic nanogenerator. Energy Convers Manag. 2022;269:116098. Available from: https://doi.org/10.1016/j.enconman.2022.116098
18. Guo Z, Shao M. Impact of afforestation density on soil and water conservation of the semiarid Loess Plateau. J Soil Water Conserv. 2013;68:401-410. Available from: https://www.jswconline.org/content/68/5/401
19. Guo Z, Zhang W. Impact of initial planting density on soil water resource use limit by plants. Geoinfor Geostat: An Overview. 2016;4:1. Available from: https://www.scitechnol.com/peer-review/impact-of-initial-planting-density-on-soil-water-resource-use-limit-by-plants-IGZq.php?article_id=4642
20. Guo Z. A review of soil water carrying capacity for vegetation in water-limited regions. Chin J Forest Sci. 2011;47(5):140-144.
21. Guo Z. Rice carrying capacity and sustainable production of rice in resource-limited regions. Int J Agric Sci Food Technol. 2019;5(1):054-057. Available from: http://dx.doi.org/10.17352/2455-815X.000042