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Benefits and Drawbacks of Extensive Agriculture and Pastoralism in The Tibetan Plateau and Its Future Opportunities and Challenges

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Abstract

It is well-established that extensive development has damaged the grassland ecology, and the balance between ecological development and herders' income has become a bottleneck in the development of the livestock industry. The main objective of my investigation has been to obtain the effectiveness of intensive agriculture and pastoralism in the Tibetan plateau by summarizing the benefits and drawbacks of extensive agriculture and pastoralism in the Tibetan plateau. The present study was designed to determine how intensive pastoralism's effect can raise the Tibetan plateau's productivity level and enhance the living conditions of Tibetan herders and its pros and cons.

Keywords

Extensive Production, Intensive Production, Pastoral System, Pastoral Society, Nomadic Pastoralism.

1. INTRODUCTION

1.1. Defining traditional pastoralism in Tibetan plateau

Dong (2016) classified pastoralism as the primary industry in which humans domesticate, select and breed land mammals and birds to produce economic value. It is a broad branch of agriculture and is generally subdivided into farming, which provides animal products (mainly meat, eggs, milk, and fur), and domestication, which is responsible for breeding animals for service. Livestock farming is one of the oldest forms of human production, dating back to Roman times (Kron, 2014).

The plateau is home to three provinces: Qinghai, Xikang and Tibet. Lv and Liu (2021) declared that Qinghai has 40.34 million hectares of grassland in the province, of which 31.61 million hectares are available for use, divided into nine grassland categories, seven grassland sub-categories, 28 grassland groups and 173 grassland types. Among the various grassland types, the alpine meadows and alpine grassland types of total 24.48 million hectares, accounting for 60.9% of the total area of grassland in the province and are the mainstay of Qinghai's natural grassland. The number of grasslands contends that the unique geographical environment of the Qinghai-Tibet Plateau makes food production special. Suppose the ecological environment is fully protected and the unique natural and socio-economic conditions of the Qinghai-Tibet Plateau are used according to local conditions to form agriculture with plateau characteristics. In that case, the Tibetan plateau can become the future breadbasket of China.

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1.2. Purpose and content of the study

In seeking to raise the productivity level of the Tibetan plateau and enhance the living conditions of Tibetan herders, some have argued that traditional pastoralism on the plateau is a rough, backward, and inefficient way of production. More efficient and modern pastoralism and development measures such as grass farming, full-scale farming, mechanized farming, and urbanization of migrants had promoted in the United States, Australia and Northern Europe, which Tibetan herders could emulate.

2. PROS AND CONS OF EXTENSIVE AGRICULTURE AND PASTORALISM

2.1. Factors of extensive agriculture and pastoralism in Tibetan plateau

Human pastoral practices that depend on livestock products have shown remarkable resilience in arid environments or areas where resources are scarce. In the arid regions of Africa, the Middle East, Central Asia, Mongolia, the Tibetan plateau, and the Andes, as well as in Arctic Scandinavia and Siberia, pastoralists continue to graze their livestock (Fratkin, 1997). Based on Lv and Liu's study, they point out that grassland is an important resource for developing animal husbandry. The country has nearly 6 billion acres of natural grassland, equivalent to 3.2 times the area of arable land and 2.3 times the forest area, but the number of herders is relatively small. Herders have to choose extensive agriculture and pastoralism due to this situation. Tullberg and Rogers (1982) emphasized that this farming relies heavily on the availability of larger land and naturally more fertile soils to obtain agricultural products and increase production. The increase in total agricultural production is achieved mainly through expanding arable land. Because of the small amount of living and physical labor invested in a unit of land area, the output of crude agriculture is very low.

2.2. Benefits of extensive agriculture and pastoralism in Tibetan plateau

Wright (2006) illustrated that the origins of pastoralism arose from settled farming communities where external or internal forces prompted farmers with mixed food production economies to specialize and become mature mobile pastoralists. Extensive nomadism offers new possibilities for overcoming the problem of expansion. Extensive nomadic development implicitly views its expansion as a process into an effectively empty landscape or as an imposition on local tourism.

As noted by Dong (2016), pastoralism has also been vital globally to maintaining large populations, providing immense ecological services, sustaining long-term civilizations, and contributing greatly to poverty alleviation in some of the poorest regions. The agricultural expansion, industrialization, and sedentary livestock farming practices of recent decades have overwhelmed pastoral practices. Under the pressure of global change, pastoral societies around the world will have an even more unpleasant fate in the future. However, the study fails to consider the differing categories of damage that the occurrence of unpleasant fates is based on the over-mechanization of agriculture. Instead, the extensive pastoralism on the Tibetan plateau has not been taken over by large factories. Extensive pastoralism is still not fully exploited due to a lack of human resources instead ecological resources on the Tibetan Plateau.

However, the benefit of extensive farming is that it is more environmentally friendly than the intensive alternative. Because it is such a low input, many of an area's natural ecosystems remain intact and do not require fancy or expensive conservation. Zhuang and Li (2017) conclude that extensive livestock farming accounts for 13% of the world's total anthropogenic emissions, while intensive livestock farming accounts for 5%, suggesting that GHG emissions are higher from extensive systems than from intensive. Even though intensive pastoralism reduces intestinal methane emissions by feeding high-quality forage compared to extensive pastoralism, the intensity of GHG emissions is still higher in intensive-type systems than in

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extensively-type. This suggests that changes in grazing systems encourage greenhouse gas emissions (Zhuang and Li, 2017).

2.3. Drawbacks of extensive agriculture and pastoralism in Tibetan plateau

For a long time, the masses have been following the traditional production methods of digging up mountains and cultivating land, planting extensively and harvesting thinly, and overloading grazing animals. This has not only failed to fundamentally solve the problem of food production and improve the living standards of the masses but has also exacerbated soil erosion, creating a vicious circle that has seriously constrained the development of the regional economy and caused the ecological environment to deteriorate. Yan et al., (2011) Traditional hay storage strategies are ineffective due to pasture degradation. The development of fenced and artificial pastures is rare among nomads. Because of this, they have adopted alternative strategies such as renting pastures, providing supplementary fodder, and diversifying their livelihoods. It shows that the degradation of the pastures has seriously affected the livelihood of the herders.

Extensive ranching output is low since the declining growth rate of grassland pastoralism is a long-term trend, it will not only hinder the current development of the pastoral economy but will also seriously affect the future development process (Deng, 1994). To fundamentally reverse this trend, the causes of the declining growth rate must first be clarified. The law of diminishing returns could illustrate the causes. Short-term output is influenced by both fixed and variable factors of production. Addition of variables to the fixed factors of production increases their efficiency and, consequently, marginal output increases. However, after a certain amount of increase, further increases in factors of production become inefficient due to the limited number of fixed factors of production, resulting in diminishing marginal returns (Brue,1993). On a piece of farmland, the farmer is the variable factor, and the farmland is the fixed factor. Initially there is only one farmer, who does not make full use of the farmland. If you keep increasing the number of farmers, if you use 10,000 farmers on a field of 10 square feet, and if each farmer tramples on the field once, the field will be devoid of grass and will certainly not be productive.

3. LEARNING FROM THE DEVELOPMENT EXPERIENCE OF EXTENSIVE AGRICULTURE AND PASTORALISM ABROAD

3.1. Insights from foreign pastoralism

Agriculture plays a crucial role in the overall economy of China and has been practiced for thousands of years. However, while China has achieved fruitful results, it is important to realize that the development of agriculture in China today is largely at the expense of resources and the ecological environment, resulting in the deterioration of the ecological environment, the reduction of resistance to natural disasters, the destruction of biodiversity and other negative issues, which have dealt an irreversible blow to agricultural production.

3.1.1 Policies in Switzerland

In their detailed analysis of agricultural production strategies, Zinsstag et al. (2016) concluded that the fragility of ecosystems and the fragile economic base of pastoralism, including in industrialized countries, also demonstrate the high resilience and impressive endurance of pastoralist communities. They point out that pastoralists need better and locally adapted social services for education, human and animal health and social security, such as micro-credit and insurance schemes. China could emulate the policy of pastoralists in the Tibetan plateau.

3.1.2 Policies in Vietnam

ISSN: 2472-3703 DOI: 10.6911/WSRJ.202307_9(7).0020

The Vietnamese coffee industry started out as a low-level, unknown country, but within 20 years it became the second largest coffee exporter in the world after Brazil with roughly 500,000 hectares of coffee, 90% of which is traded, producing 800,000 tons of green coffee annually (Guingato et al., 2008). Based on the model's analysis of the logical growth of coffee in Vietnam, it is likely that the next decade will be the last period of growth for coffee production in Vietnam. As a result of intensive agriculture, the country's production will likely peak annually due to environmental and socioeconomic factors. However, the authors overlook the fact that pollution from intensive agriculture. Xiang and Tang (2005) also state that agricultural intensification has radically increased food crop yields using high-yielding crop varieties, fertilizers, pesticides, irrigation and agricultural mechanization. However, due to limited resources, a one-sided emphasis on the benefits of intensification is undesirable and environmental problems such as water pollution, nitrate contamination of soil and agricultural products, soil sludge, reduced biodiversity, and atmospheric pollution caused by surface pollution in intensified farming areas require a cautious view of intensive agriculture.

3.1.3 Policies in Germany

Germany has implemented organic agricultural production to improve the ecological and agricultural environment. Since 2009, the German government has declared that to reduce the damage caused to the land by harmful substances, especially heavy metals, and agricultural producers are forbidden to use sludge as fertilizer, except in exceptional cases permitted by the state (Zhao et al. 2015). Zhang et al. (2012) defined that the use of bio hormones, pesticides, fertilizers, and other chemical substances to accelerate the growth of crops is prohibited in ecological agriculture; ordinary agricultural products are only eligible for acceptance after six months of conversion to ecological production, and there is a two-year transitional period during which the products can be labelled with the "BIO" ecological agricultural product label if the inspection is satisfactory for public sale on the market. Conducting farming operations under such regulations and policies will not only preserve the ecological environment and move agriculture towards a sustainable development path but also objectively provide a reliable guarantee for the safe production of agricultural products. China could emulate the policy of pastoralists in the Tibetan plateau.

4. FUTURE OPPORTUNITIES AND CHALLENGES OF PASTORALISM IN TIBETAN PLATEAU

4.1. Current Chinese agricultural policy

There is currently a tendency in academia to accept the Chinese state’s approach to environmental management as a positive shift toward environmental sustainability in the context of ecological modernization without considering the risks that arise when environmental issues become technical and thus manageable. Levine (1999) classified that “a good central government and a bad local government” is often used to express appreciation of the central government’s overall intention to protect rangelands and criticism of the local government’s destruction of rangelands through inappropriate fencing. Zhang (2018) also points out that the involvement of the environmental, economic and social sectors, the increasingly scientific way of talking about environmental problems and solutions, allows for an examination of a larger ongoing shift - the environmentalist of China.

4.1.1 Inner Mongolian agricultural policy

However, due to the damage caused to the grassland ecology by traditional rough development, balancing ecological development and herders' income has become a bottleneck in the development of the livestock industry. Since 2011, the central government has implemented a subsidy for grassland ecological protection to promote the development of

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pastoral areas and improve the grassland ecological environment. The annual subsidy and incentive fund of RMB 18.76 billion in 13 major pastoral provinces, including Inner Mongolia, raised the standard and expanded the scope in 2016(Grassland pastoralists to achieve a win-win situation for all three sides China Government, 2018). The grassland protection system has been effectively implemented, the application of scientific grassland utilization techniques has been promoted, and the mode of production of grassland livestock has been accelerated, resulting in a win-win situation for all three parties: grassland ecological protection, high-quality development of the pastoral industry and income generation for herders. These policies can be implemented on the Tibetan Plateau.

4.2. Opportunities and challenges for the future

4.2.1 Opportunities of developing intensive pastoralism in Tibetan plateau

Chinese Academy of Sciences (2016) contrasted that at present, the average annual total biological production of arable land in China is about 1.2 billion tons, while that of grassland is only 300 million tons, and the biological productivity per unit area is only 7.5% of that of arable land. Studies have shown that the biological yield of intensive artificial grassland can reach the average level of crops. It is estimated that if China can use suitable land in pasture areas of 10% of the grassland area and in areas where agriculture and animal husbandry intermingle to establish intensive artificial grassland, more than 300 million tons of forage can be produced each year. Grassland livestock farming is a traditional industry in which herbivorous animals are grazed or housed to produce livestock products, with the main emphasis on the livestock production function of natural grasslands. "Grassland agriculture" encompasses the output of several production levels but emphasizes the importance of artificial grasslands more than anything else. On the other hand, grassland pastoralism emphasizes the synergistic development of the "natural-economic-social complex system", highlighting the rational allocation and coordinated development of grassland production and ecological functions to achieve healthy and sustainable development of grassland pastoral areas (Fang et al., 2018).

At the same time, according to the characteristics of the region, the development of special planting and special breeding, and the protection, restoration and moderate use of other large areas of natural grassland, the development of grassland cultural tourism to enhance its ecological barrier and cultural service functions, and ultimately achieve a higher income for pastoralists and the comprehensive and coordinated development of production, life and ecology in pastoral areas. This emphasizes cultural transformation, conceptual change, technological diffusion, exchange, and cultural co-existence in the spread of farming. Davies and Hatfield (2007) highlight two broad categories of value. Direct values include measurable products and outputs such as livestock sales, meat, milk, wool and hides; indirect values include tangible assets such as inputs to agriculture and tourism, and less tangible values such as financial services, ecosystem services and socio-cultural values. If intensive agricultural production is guided by the scientific concept of development and under the premise of protecting the ecological environment, considering local conditions, winning by high quality and high yield and following the path of sustainable development, the Tibetan plateau will certainly develop in a positive way.

4.2.2 Challenges of developing intensive pastoralism in Tibetan plateau

Meat production is synonymous with commercial livestock production and is promoted to control livestock numbers and promote livestock marketing. Many pastoralist communities are experiencing changes in how livestock is sold as a commodity. However, the impact of increased livestock commercialization on pastoralist social institutions is still very much in evidence. Davies et al. (2013) conclude that in some communities, social ties may inhibit the commercialization of livestock by introducing transaction costs into livestock sales or selling certain livestock products, such as camel milk, through cultural norms and taboos. Pastoralists

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often tradeoff between livestock and livestock products and between their assets' use value and commercial value.

The global warming of the Tibetan Plateau is not only a sensitive response to regional surface processes but also affects the entire northern hemisphere and the global climate and environmental system on a long-time scale and a large spatial scale, thus having a direct impact on the plateau itself and the human environment in Asia (Bollasina and Benedict, 2004). Liu and Chen (2000) point out that the annual mean temperature at almost all stations above 2000 m elevation and 59 stations showed an increasing trend. As the birthplace of Asia's great rivers, the increased melting of glaciers on the Tibetan Plateau will, within a short period, lead to an increase in the flow of rivers recharged by glacial meltwater, resulting in frequent flooding in the middle and lower reaches of the plateau, particularly in the inland river basins of northwest China, and directly threatening the sustainable development of oases in arid regions (Yao and Zhu, 2006). These facts show that environmental change on the Tibetan Plateau is not only a response to global change from the region itself but also impacts the surrounding areas and the global scale through a series of processes.

5. CONCLUSION

The present study was designed to determine the effect of intensive pastoralism can raise the Tibetan plateau's productivity level and enhancing the living conditions of Tibetan herders and its pros and cons. As a transformation and upgrading industry for China's agricultural restructuring, the grass-pastoral industry has specific scientific connotations and development ideas. How to realize the systematic development of the grass-pastoral industry, and through the concrete implementation of grass-pastoral pilot areas, a new model of grass-pastoral development can be explored to crack the problems in the sustainable development of China's Tibetan plateau pastoral industry. This study was limited by the absence of the views of pastoralists on the Tibetan plateau and the results of local research on intensive agricultural development in the past two years. Combining the benefits of extensive and intensive farming and the amelioration of its disadvantages to achieve the best of both worlds would be a fruitful area for further work.

REFERENCES

[1] Bollasina, M., & Benedict, S. (2004). The role of the Himalayas and the Tibetan Plateau within the Asian monsoon system. Bulletin of the American Meteorological Society, 85(7), 1001-1004.

[2] Brue, S. L. (1993). Retrospectives: The law of diminishing returns. Journal of Economic Perspectives, 7(3), 185-192.

[3] Davies, J., & Hatfield, R. (2007). The economics of mobile pastoralism: a global summary. Nomadic Peoples, 11(1), 91-116.

[4] Davies, J., Niamir-Fuller, M., Kerven, C., & Bauer, K. (2013). Extensive livestock production in transition. Livestock in a Changing Landscape: Volume One, 285-308.

[5] Deng, A. (1994). The limitations of extensive grassland pastoralism: A study of the economic growth trajectory of pastoralism in Gansu minority areas. Journal of Northwest University for Nationalities: Philosophy and Social Sciences, (4), 10-11.

[6] Dong, S. (2016). Overview: Pastoralism in the world. Building Resilience of Human-Natural Systems of Pastoralism in the Developing World, 1-37.

[7] Fang, Q., Jing, H., Zhang, W., Gao, S., Duan, Z., Wang, H., & Huang, Z. (2018). On the theoretical system and practice of grass-farming. Science Bulletin, 63(17), 1619-1631.

[8] Fratkin, E. (1997). Pastoralism: governance and development issues. Annual review of anthropology, 235-261.

ISSN: 2472-3703 DOI: 10.6911/WSRJ.202307_9(7).0020

[9] Grassland pastoralists to achieve a win-win situation for all three sides China Government. Big5.gov.cn. (2018). Retrieved 20 August 2022, from http://big5.www.gov.cn/gate/big5/www.gov.cn/xinwen/2018-08/07/content_5312164.htm.

[10] Guingato, P., Nardone, E. L. V. I. R. A., & Notarnicola, L. U. I. G. I. (2008). Environmental and socioeconomic effects of intensive agriculture: The Vietnam case. Journal of Commodity Science, Technology, and Quality, 47, 135-151.

[11] How to understand "grass-farming" - Institute of Botany, Chinese Academy of Sciences. Ib.cas.cn. (2016). Retrieved 18 August 2022, from http://www.ib.cas.cn/2019gb/kepu/yuandi/201603/t20160330_4577154.html.

[12] Kron, G. (2014). Animal husbandry. The Oxford Handbook of Animals in Classical Thought and Life, 109-35.

[13] Levine, N. (1999). Cattle and the cash economy: Responses to change among Tibetan nomadic pastoralists in Sichuan, China. Human Organization, 58(2), 161-172.

[14] Liu, X., & Chen, B. (2000). Climatic warming in the Tibetan Plateau during recent decades. International Journal of Climatology: A Journal of the Royal Meteorological Society, 20(14), 1729-1742.

[15] Lv, C., Liu, Y. (2021). Division map of agricultural development in the Tibetan Plateau (2020). National Tibetan Plateau Data Center, DOI: 10.11888/Geogra.tpdc.271125. CSTR: 18406.11.Geogra.tpdc.271125.

[16] Tullberg, J. N., & Rogers, I. L. (1982). Time costs in extensive agriculture. In Agricultural Engineering Conference 1982: Resources, Efficient Use and Conservation; Preprints of Papers: Resources, Efficient Use and Conservation; Preprints of Papers (pp. 57-61). Barton, ACT: Institution of Engineers, Australia.

[17] Wright, J. S. C. (2006). The adoption of pastoralism in northeast Asia, monumental transformation in the Egiin Gol Valley, Mongolia. Harvard University.

[18] Xiang, J, & Tang, Y. (2005). Intensive agriculture and its environmental effects. World Science and Technology Research and Development, 27(6), 81-87.

[19] Yan, J., Wu, Y., & Zhang, Y. (2011). Adaptation strategies to pasture degradation: gap between government and local nomads in the eastern Tibetan Plateau. Journal of Geographical Sciences, 21(6), 1112-1122.

[20] Yao, T., & Zhu, Li. (2006). Response of the Qinghai-Tibet Plateau to global change and its adaptation. Advances in Earth Sciences, 21(5), 459-464.

[21] Zhang, Q. (2018). Managing sandstorms through resettling pastoralists in China: how multiple forms of power govern the environment at/across scales. Journal of Political Ecology, 25(1), 364-380.

[22] Zhang, T., Gao, S., & Zhou, L. (2012). Characteristics and inspiration of agricultural environmental protection in Germany. Environmental Protection, (5), 76-79.

[23] Zhao, J., Wang, P., Xie, Y., & Chen, F. (2015). Experience and lessons from the German agricultural production service system. World Agriculture, (4), 135-138.

[24] Zhuang, M., & Li, W. (2017). Greenhouse gas emission of pastoralism is lower than combined extensive/intensive livestock husbandry: a case study on the Qinghai-Tibet Plateau of China. Journal of Cleaner Production, 147, 514-522.

[25] Zinsstag, J., Bonfoh, B., Zinsstag, G., Crump, L., Alfaroukh, I. O., Abakar, M. F., ... & Schelling, E. (2016). A vision for the future of pastoralism. Rev Sci Tech, 35(2), 693-699.