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REVIEW ARTICLE

Rethinking forest management issues in China in the context of the new era

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ABSTRACT

The contradiction between the ability of forestry that provides high-quality and abundant forestry products and good ecological services, and the demand for high-quality and diversified forestry products and service in order to meet the people's rapid growing, has become the main contradiction faced by forestry development in new era. Since the area of forest resources in China is restricted by the expansion space, expanding the effective supply of forestry must mainly depends on the improvement of the quality and structure of forestry resources. Therefore, the focus of promoting forestry development is to comprehensively improve the level of forest management in the new era. Based on the analysis of the causes for the low level of forest management, it is proposed that forestry development in the new era should focus on the positively stimulating and strengthening the human capital development, etc., which come from the current following aspects: innovating forest management theory and model, clarifying the relationship between government and market.

Keywords: New Era; Forestry Development; Forest Management

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1. Introduction

Since the reform and opening up, China's forestry development once fallen into the dilemma of resources and economy. After years of afforestation and large-scale construction projects, the area of forestland and the total scale of forest resources in China have grown rapidly, and the forest resources have stepped into the track of sound development. Data from the Ninth National Forest Inventory (2014–2018) showed that China's forest area increased from 122 million hm2 to 220 million hm2 in the early days of reform and opening-up, and the forest coverage rate increased from less than 13 % to 22.96%[1].

The report of the 19th CPC National Congress indicated clearly that socialism with Chinese characteristics has entered into a new era, which is the new historic orientation in China's development. As the largest green industry in the national economy, forestry shoulders the dual tasks of guaranteeing the supply of basic forest products and ecological services. The new features of socialism with Chinese characteristics in the new era put forward new problems and requirements for forestry, which will definitely affect and determine the direction of forestry development in the future. On the contrary, forestry development must meet the requirements of building a strong, democratic, civilized, harmonious and beautiful modern socialist country on the basis of comprehensively winning the well-off society.

For forestry, the connotation and extension of its concept are

closely related to the changes of social and economic development level and people's living needs. In the past, forest was mainly regarded as a source of wood. At present time, society gets down to paying attention to a series of ecological benefits and social services provided by forest[2]. The report of the 19th CPC National Congress clearly pointed out that the modernization we want to build is one in which human beings and nature live together peacefully. In 2019, China's GDP reached 99.1 trillion yuan, and its per GDP has exceeded 10,000 dollars[3]. The level of people's income has significantly improved, and the economy has stepped into a stage of high-quality development from high-speed growth. Income growth has motivated the transformation and upgrading of the consumption level and structure, and people's living requirements have changed from satisfying the average quantity in the past to pursuing a better life with higher standard and quality. The way of economic improvement requires to concentrate on harmonious development of human beings and nature. Therefore, forest, the largest terrestrial ecosystem on earth, is an important force to realize harmonious symbiosis between man and nature. It should not only meet people's demand for material products such as high-quality wood and other green non-wood forest products provided by forests, but also create and provide ecological and spiritual services such as good ecological environment, recreation and entertainment, health preservation, culture and technology and other ecological and spiritual services, so as to adapt to the transformation of the principal contradiction facing Chinese society into the contradiction between unbalanced and inadequate development and the people's ever-growing needs for a better life.

After decades of ecological forestry construction, the total amount and quality of China's forest resources have increased, but there is still a big gap from the requirements of building a beautiful China with sufficient quantity, reasonable distribution and ecological stability of forest ecological system[4]. Therefore, the main contradiction facing forestry will also turn into the contradiction between forestry's ability to provide high-quality and abundant forest products and good ecological services, and meeting people's rapidly growing demand for high-quality and diversified forestry products and services. On the basis of maintaining the steady growth of the total amount of forest resources, we should pay more attention to improving the quality and structure of forest resources, excavating and effectively bringing into play the various functions and benefits of forest ecosystem, which are supposed to become a new economic growth point of forestry.

2. Forest management level is the key to the development of forestry in the new era

Having a stable, healthy and sustainable forest resource system is the fundamental guarantee for increasing effective supply, improving supply quality, improving supply structure and enhancing comprehensive benefit. The fundamental task of forestry supply side structural reform under the guidance of market demand is to expand the effective supply of products, the main direction is to improve the quality of product supply, and the core link is to optimize the product supply structure[5]. However, it is undeniable that the realization of all these above must be based on the forest ecology and production system with rich resources, stable quality and optimized structure. Improving the quantity and quality of forest resources is the fundamental and key to ensure the effective supply of forestry. National Forest Management Plan (2016–2050) clearly points out that the problems of insufficient total amount of forest resources and low quality and weak function of forest resources are the shortcomings of China's modern forestry construction, among which the low quality, low efficiency and fragile function of forest resources are the most prominent problems of China's forestry[6].

The shortage of total forest resources will be an objective long-term problem. China's per capita forest area is only 1/4 of the world's average level, and the quantity of forest resources is relatively insufficient. On the one hand, due to the limitation of land resources, the expansion capacity of forest resources is strictly restricted, and there is not much room for growth. On the other hand, based on the

analysis of population growth and forest area growth potential, even if forest coverage increases by 2050 and stable above 26%, China's per capita forest area will still be at a low level. Therefore, the relative shortage of total forest resources is determined by our country's actual national conditions and forest conditions, and it is difficult to change significantly in the short and medium term.

Since the area of forest resources is restricted by the expansion space, the expansion of effective forestry supply must depend on the improvement of forest resources quality and structure. Since the reform and opening up, the growth rate of China's forest resources is fast. However, it is undeniable that while pursuing the increase of the number of resources, the quality improvement and structure improvement of forest resources have not attracted the corresponding attention. The data from the Ninth National Forest Inventory and the National Forest Management Plan (2016–2050) shows that the forest stock in China is 89.79 m^3/hm^2, which is 69% of the world average. The average annual growth of the forest was 4.23 m^3/hm^2, which is only 53% of the average level of forestry developed countries. The value of forest ecological services has not been fully exploited. The annual value of main ecological services provided by each hectare of forest is only 61,000 yuan, only equivalent to 40% of that in Japan and other countries. In the actual stands, only 31% of the total forest yield per hectare reached 50% or more, while 43% of the total forest yield per hectare did not reach 20%. Although China has the largest area of plantation forest in the world, there is still a big gap in the quality of plantation forest management and a large space for structural optimization. Sheng[7] studied the quality of artificial forests in China and pointed out that the most prominent problem of forest quality in China was productivity. The stock per hectare of main artificial afforestation tree species in China is far lower than that of similar tree species in Japan. Chinese fir is less than a quarter of that in Japan, larch is less than a third, and their actual annual growth is only 1/4 and 1/2 of the standard of fast growing and high yield forest in China respectively. At the same time, the problems of planted forest exist as followings: coniferization and pure forestry issues, mixed forests account for only 15% of plantation area, and serious continuous cropping and lack of scientific management after forest.

It can be seen that there is still a big gap in the overall quality and structure of China's forest resources, whether it is the ecological service value provided by forests or the timber supply capacity, and there is a huge space for improvement. Improving the quality and structure of forest resources is closely related to the level of forest management. The main reason for the low quality and structure of forest resources in China is the low level of forest management. "The forest quality is not high, which is the most prominent problem of our country forestry. To improve forest quality, the key lies in strengthening forest management[6]." It can be seen that the low level of forest management is the biggest shortcoming that restricts the effective supply, quality improvement and structure optimization of forestry in China. It should become the most important task of forestry development in the new era to strengthen forest management. Only good forest management can accurately enhance and improve the quality and structure of forest resources, improve the effective supply capacity of forest products and services, and effectively meet people's growing demand for forest goods and services.

3. Analysis of the reasons for the low level of forest management in China

Generally speaking, the poor quality and structure of forest resources in China is the result of not paying attention to forest management for a long time, and the enthusiasm and creativity of forestry management subjects having not been brought into full play. The restrictive factors that cause the low level of forest management are mainly reflected in the supply side of forestry. Some scholars mostly put forward from the technical level how to strengthen forest management[7-9]. In fact, forest managers should also seriously reflect on and break through the constraints of institutional and policy arrangements.

3.1 Long-term "harvesting and planting but not management" policy guidance

Since the establishment of the New China, the transformation of China's forestry supply structure can be approximately divided into two stages: The first stage is from the establishment of the new China to the end of the 20th century. The main purpose of the forestry is to pursue wood production and attach importance to the economic value, with emphasis on harvesting rather than manufacturing as the main policy feature. The second stage is that since the 21st century, the main purposes of forestry are to focus on ecological construction and to attach importance to ecological value. The main policy features of forestry are forbidding cutting and encouraging afforestation. The forestry policy orientation of these stages is too biased towards the two extremes of "harvesting" or "planting", while ignoring the key intermediate links in the supply of effective forest products and services–forest management and maintenance, making the technology of this link backward and investment insufficient. Although the formulation of the policy was influenced by the historical and social economic conditions at that time, as well as the shortage of capital and talents, the long-term "harvesting and planting but not management" mode of forestry production and management has resulted in the overall poor quality and structure of China's forest resources.

3.2 Forest management guidelines that do not attach importance to the micro practical level

Developing and strengthening forest scientific management needs modern advanced forest management theory and management technology as guidance. However, the research on this aspect in our country is relatively insufficient. Many researches focus on tracking foreign forest management theories and management models, such as forest multi-function theory, forestry division theory and near-natural forestry management theory, etc. However, the construction of forest management theory and technology system based on the national conditions of China's forest is relatively lagging behind, and the theoretical guidance often fluctuates. *National Forest Management Plan (2016–2050)* put forward the multi-functional forest management technology system on the basis of establishing multi-functional forest management theory as the guiding management thought. However, there is still a lack of planning and management guidelines at the regional and specific forest level, which makes it difficult forestry micro-managers to operate in practice. Technical guidelines and standards for the practical operation of specific forest are still in need of construction and improvement.

3.3 Forestry science and technology promotion ability is seriously inadequate

The key to weak ability of forestry science and technology promotion lies in the lack of a perfect forestry science and technology promotion system. The weakest link of forestry science and technology extension system is the serious shortage of talents in forestry departments at the grassroots level. Extensive operation with low benefits for a long time, rigid system and mechanism, changeable policies and the poor working condition of grassroot level unit of forestry have led to a serious brain drain and difficulties in bringing in professionals in the forestry field, especially in the grassroots forestry sector. Scientific and efficient forest management cannot be achieved without the professional personnel according to the national macroscopic forestry management goal and related standards, guidelines and so on, taking into account the local or the unit's forest resources status, geographical location, vegetation characteristics, operating status and management objectives, such as formulating scientific and reasonable forest management strategies, planning, and technical operating procedures at the forest level, and provide classification guidance for specific implementation. However, in reality, there are many problems such as serious aging of employee's age structure, generally low cultural quality and shortage of professional and management talents in forestry departments and forestry management units at the grassroots level. This leads to a serious break in the link of extension system of forestry science and technology. It is difficult to promote and implement the new mode and technology of modern forest management, and it is hard to form and develop

new ideas, new formats, new technologies and new modes of forest management within the forestry.

3.4 Ineffective market incentives, lack of enthusiasm of forestry business entity

It is very important to clarify and definite the relationship between government and market, and to encourage the voluntary behavior of ry business entity and the active participation of social capital. Forest management cannot merely rely on government investment and coercion. Under the new situation of economic development, it is very difficult to significantly increase financial input, and forestry input must depend on the market[5]. It has been proved that government support and financial investment alone cannot meet the demand for capital and human resources in intensive forest management. Therefore, it is necessary to pay attention to the decisive role of the market in realizing the efficient allocation of forest resources, good quality, reasonable structure and coordinated function of forest supply pattern. The transformation of forest management from extensive management to scientific intensive management requires more energy, material and financial resources, and continuous investment of human and capital from forestry business entity. Only forest intensive management can bring more substantial income, can forestry management subjects be motivated and attracted to voluntarily change the management patterns, actively absorb social investment and talents, and successfully realize the upgrading and transformation of forest management. However, in practice, too much emphasis is placed on the attributes of public goods and public welfare of forestry, while the attributes of private products and economic characteristics of forestry are ignored. The government gives too much administrative control and direct intervention to forestry production and management, making it difficult for the automatic adjustment function of market resource allocation to full play its role, and inhibiting the initiative and enthusiasm of forestry business entity to carry out forest management.

4. Focus of comprehensively improving the level of forest management

The development of forestry in the new era requires comprehensive improvement of forest quality and systematic optimization of forest structure. There is still a great potential for the development of forest resource quality in China[10,11], and forest management is the fundamental method to improve forest quality[7]. Cultivating a healthy, stable and well-functioning forest ecosystem is the fundamental purpose of modern forest management, as well as the basic way to improve the effective supply of forest products and services and meet people's demand for a high-quality life. This needs to start from the in-depth improvement of forest management level and capacity, and lead and promote the development of forestry in the new era.

4.1 Re-examine and establish the forest management theory and model with Chinese characteristics

Effective forest management practice must be guided by the advanced forest management theory in line with national conditions and forest conditions. At present, China's forest management is basically guided by the forest classification management theory established in the early 1990s, which is of basic guiding significance from the overall situation. However, as China has a vast territory, plus there are huge differences in natural conditions and social and economic conditions across the country, so this inevitably results in distinction in distribution, growth status, abundance of forest resources and diversification of management objectives. The practice of classified management should not fall into the "two extremes" of single pursuit of economic benefit or ecological benefit for a certain forest. Generally, China is a country lacking of forests, and the per capita water level of forest resources is low. If the classified management mode is strictly followed which means the forest is cultivated solely for wood or protected purely for forest ecological benefits, it is not conducive to the full play and utilization of the multifunctional benefits of the forest in the whole growth period. At the same time, with the improvement of people's income and living standards, the demand for forest recreation, health care, culture and other

close-to-nature activities is increasing. Therefore, on the basis of overall classified management, it is necessary to emphasize the ecological principle of forest resource cultivation and close-to-nature management, and pay attention to the full utilization of all functions and values of the whole growth cycle of forest. This should be the adjustment direction of the theory and mode of forest management in China.

4.2 Deepening the reform of forestry system and mechanism and giving full play to the role of market resource allocation

The key to effective system supply lies in straightening out and handling the relationship between the "decisive role" of market and the "better role" of government. It has to be said that compared with other industries, forestry has a long operation cycle and has its particularity in the reasonable positioning of the relationship between government and market, which is mainly reflected in the public welfare characteristics of forestry and has significant positive externalities. According to economic theory, the market mechanism has "failure" in forest resource allocation, but it cannot deny the key role of the market in forest resource allocation, and be completely handled by the government.

The reform and innovation of forestry management system and management mechanism must first make clear the position and function of market in forestry resource allocation. "Government action" is a necessary condition for "efficient market". The key of the government action is to intervene moderately, prevent and dissolve the "market failure", guide and standardize the market behavior, stimulate the enthusiasm and innovation vitality of the market entities to invest and manage forestry. Secondly, the "action" of the government should be reflected in the scientific planning and formulation of forest resources quantity growth, quality improvement and related ecological protection standards and targets for each forest management unit, and strict monitoring and supervision. Specific forest management behavior can be carried out by introducing strategic investors and professional operators into the market through exploring various effective forms. Finally, as rational units, forestry management and investment subjects pursue the maximization of forest management income. Therefore, only when there are sufficient economic benefits to be derived from improved forest management, will there be a real incentive for investors and operators to participate voluntarily and take corresponding positive actions. It is necessary to scientifically determine and clarify the best meeting point of forest protection and utilization in forest management, and apply it in the forest protection, protect the forest in the utilization, accelerate the integrated development of primary, secondary and tertiary industries, and promote the protection and utilization of forest resources to complement each other and grow together.

4.3 Perfect positive incentive policies and measures to stimulate the enthusiasm of forestry business entity to carry out forest management

Fundamentally, advanced forest management concept, modern forest management technology and good forest management measures are inseparable from the effective allocation of human resources and capital and other elements. The "market failure" of forestry comes from its positive external effect. The principle of the internalization of external demand and the policy thinking of solving the "market failure" of forestry should be adjusted to the afforestation or good forest management behavior such as positive incentives like subsidies, tax (or cost) reduction or cancellation, rewards, rather than just emphasize the negative incentives such as the use of administrative controls and imposing of punitive taxes and fees. The government should deepen the reform of system and mechanism, perfect the positive incentive policies and measures, encourage the enthusiasm and creativity of forestry management subjects and investment subjects, and guide them with the goal and direction of decision-making in line with government policy objectives.

On the one hand, for commercial forest and private-operated forest management, it is necessary to clarify the scope of government control and the method for controlling it in place. In addition, intensive efforts should be made to reduce or eliminate some unnecessary forestry policies, regulations,

taxes fees etc., which may influence the enthusiasm of the market entity to invest and manage forestry. More positive incentives should be adopted, such as fiscal subsidies, incentives, government purchase or compensation for forest ecological service and strengthening of social services. At the same time, the entity of forestry operation should be guided and encouraged to take measures such as cooperation, forestland circulation, and strengthening the integration of primary, secondary and tertiary industries, to expand the scale of operation, extend the industrial chain, and effectively expand the profit space of forestry operation. On the other hand, we should pay attention to the efficiency and effect of positive incentive measures. In reality, there are market actors who adjust their decision-making goals and behavior directions to obtain as much government subsidies as possible, regardless of whether they can achieve the policy goal expected by the government[12]. This may lead to some forestry management departments, local governments and state-owned forest farms and other forestry operators to generate inert ideas, i.e., "waiting, depending and demanding", not thinking about progress and innovation, but focusing on how to get more government subsidies and preferential policies. Deepening the reform of forestry management system and operation mechanism should not only emphasize and stay at the level of increasing financial support. "The government" has to take action according to objectives management as the policy guidance, strict forest management standards and management objectives, clear responsibility parties, strengthen the dynamic monitoring and regulation of resources.

4.4 Strengthen the cultivation and development of human and capital resources and enhance the new driving force of forestry economic growth

Forestry development in the new era must adapt to the change of social demand and accelerate the adjustment of forestry supply structure with new industries, new technologies, new business forms and new economic growth drivers, for which talent is the key. In view of the shortage of forestry grass-roots professional and management personnel, the government should make great efforts to further improve the cultivation and development of human capital. Firstly, establishing a special training funds and cooperate closely with universities and research institutes to develop a detailed training plan and re-education for forestry management and technical staff, including those from state-owned forestry farms and grassroots forestry bureaus. Secondly, establishing a publicly-funded targeted training program in conjunction with forestry universities or other forestry-related majors in other universities for forestry students to prepare and deliver technical extension personnel to the grassroots level in state-owned forest farms or townships. Thirdly, improving and perfecting forestry technology popularization system. This should not only intensify cultivation and introduction of forestry professionals at the grass-roots level to strengthen the construction of practical platform, but also should use the modern communication technologies such as internet to build technology service network. Fourth, the establishment of a regular system of science and technology services to the countryside. Researchers from research institutes and universities at all levels are encouraged to go down to the forest, go to the countryside, regularly or as needed from time to time to carry out scientific and technological guidance and advisory services.

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Conflict of interest

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