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Research on Coordinated Development between Animal Husbandry and Ecological Environment Protection in Australia

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Abstract. Australia is one of the countries whose scientific level of using grassland resources and animal husbandry development level is very high and the way to coordinate Australia's animal husbandry and ecological environment protection is worth using for reference. This study focuses on facilities about the Australian government's controlling and protecting of ecological environment in the process of development of animal husbandry, and combines with the current problems in the process of China's animal husbandry development, in order to explore a suitable path for implementing the animal husbandry sustainable development in China.

Keywords: Australia, animal husbandry, ecological environment, Intensive management

1 Introduction

The animal husbandry in Australia is rather developed where sheep and cattle are the main livestock. In addition, the number of sheep in Australia is the top in the world, and Australia is known as "riding on the sheep's back country". In the early, the development model of Australia's animal husbandry tended to rough grazing. Since the early 19th century, European settlers' increasing investment in science and technology, introducing high quality forage grass and implementing policies and measures are conducive to the development of animal husbandry. Especially after the Second World War, the number of Australia's livestock breeding stock and livestock production increased significantly. In 1972, compared with 1950, the number of cattle and sheep breeding stock increased by 87% and 44% respectively and wool production grew by 89% in comparison to the average output from 1947 to 1949. In addition, compared with 1955, the beef and egg production increased by 86% and 95% respectively^[1]. During this period, there are mainly three points about the cause of the rapid development of animal husbandry in Australia. The first point is that during the post-war, world economy began to recover and the demand for animal products increased at home and abroad. Developing animal husbandry can not only meet the domestic demand, can increase income through export animal products. So animal husbandry industry had more obvious competitive advantage than other industry. The second point is that the Australia government ordered the Italian prisoners of war to engage in livestock production, which increased the required labor input during the process of livestock production from 1941 to 1947. The third point is that combined with the domestic and international market demand, the Australia government guided the livestock farmers to adopt the latest Science and Technology and farming equipment, what is more, the government implemented financial support and policy inclination to development the animal husbandry. Considering the scarcity of resources and the protection of

ecological environment and basing on the conditions of natural resources and markets all over the world, the Australian government continuously adjusted the animal husbandry development policy in order to realize the coordinated development of animal husbandry and ecological environment protection.

Since the reform and opening, with the aid of the push of market economy, government policy support and irregular factors, China's animal husbandry were integrated and were in the transition period from extensive to intensive little by little. Extensive development pattern makes natural environment deteriorating surrounding China's pastoral areas, which make the protection of natural resources face great challenge. This study summarizes the current development situation, the characteristics of the development of animal husbandry in Australia and the policy support and emphasis on the measures to protect the ecological environment in the process of sustainable development of animal husbandry. Analysis of Australian animal husbandry development can guide to seek a suitable way for China to coordinate animal husbandry development and ecological environment protection.

2 Current development situation of graziery industry in Australia

Australia's land area is about 7.68 million Km², and the number of population is about 23.71 million people of which 80% distribute in the eastern coastal areas. Most area of Australia is plain region, the climate is relatively dry and seasonal temperature difference is inconspicuous. The unique climate conditions in Australia forms a perennial natural pasture grazing. 55% of the land area is used to develop animal husbandry whose output value accounted for about 80% of the agricultural output in 2014. Animal husbandry in Australia occupies an irreplaceable position in the agricultural and even the entire national economy. In Australia, over average, everyone owned 5.00 sheep and 5.00 cows in 2011. However, compared with the Australia, the Chinese person just has the number of sheep and cattle less than a quarter^[2].

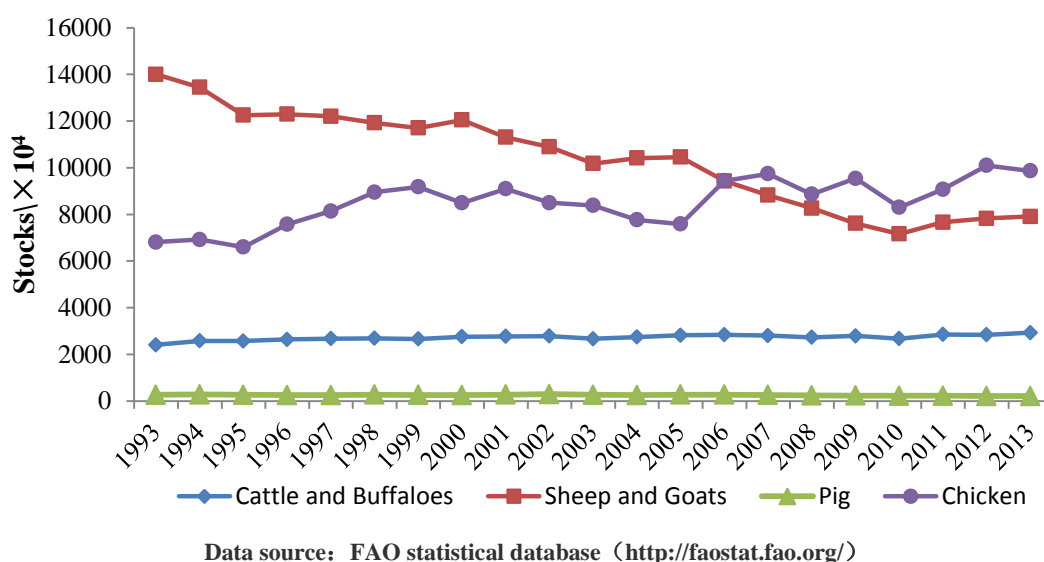


Fig.1 Main livestock number of Australia from 1993 to 2013

Australia's sheep and goat breeding stock is the largest, followed by chicken and beef. From 1993 to 2013, Australia mainly livestock breeding stock is on the decline on the whole. From

figure 1, we can see that the sheep and goats breeding stock decline relatively obvious, down from 1.40 million in 1993 to 2013 in 0.71 million, dropping about 49.28%. The number change of beef cattle and pig breeding stock is not obvious, of which the former increased but pig breeding stock has a downward trend.

From 2006 to 2011, the number of beef, mutton and red meat production decline year by year (table 1). Combined with figure 1, it can be seen that the Australian animal husbandry is in the transition to a new development model. There are two possible reasons: the first one is that animal products exports accounts for a large proportion of total output in Australian^[3]. With the rapid development of animal husbandry in emerging countries, the international market for Australia's livestock reliance declines, resulting in the decrease of breeding stock. The second one is that with the all-round development of economy, the international market increases demand for some of the agricultural economic crops, such as soybean and rapeseed, so planting economic crops has more competitive advantage than raising livestock, which makes laborer to increase the crop planting area in parts of Australia animal husbandry area.

Table 1 Main livestock products of Australia from 2006-2010

| Year | Beef | Veal | Mutton | Lamb | Pig | Total red meat | Chicken(a) |
|---------|-----------|--------|---------|---------|---------|----------------|------------|
| 2006-07 | 2 195 714 | 30 578 | 270 988 | 412 584 | 381 866 | 3 291 730 | 811 591 |
| 2007-08 | 2 105 706 | 26 417 | 243 119 | 428 388 | 374 409 | 3 178 038 | 797 280 |
| 2008-09 | 2 098 615 | 26 489 | 219 820 | 415 867 | 321 005 | 3 081 798 | 832 456 |
| 2009-10 | 2 056 514 | 52 262 | 161 774 | 412 537 | 331 261 | 3 014 347 | 834 409 |
| 2010-11 | 2 089 233 | 44 133 | 123 245 | 391 340 | 342 101 | 2 990 052 | 1 014 978 |

Data sources: Bureau of Statistics of Australia(2012).

Note: Excludes Northern Territory, Tasmania and the Australian Capital Territory

According to above analysis, the Australian animal husbandry is transforming from a single animal husbandry to planting-culture combined animal husbandry development model gradually.

3 The characteristics of harmonious development between graziery and ecology environment in Australia

Since the idiographic climate in Australia, natural pasture is the main food of animal composite feed. After more than 200 years of development, animal husbandry in Australia has completed transformation and upgrading and the ecological environment is protected simultaneously in the process of animal husbandry industry in Australia. In extensive development phase, the utilization of grassland resource in Australia also experienced overgrazing, pasture degradation and desertification process. In the early 20th century, the grassland in Australia has reached the ceiling of the bearing capacity and the deterioration of ecological environment has endangered the healthy development of animal husbandry. The stockholder took positive and effective cooperation to prohibit overgrazing behavior and improved ecological environment finally.

3.1 Seeding to revive ranch, formulating appropriate grazing capacity

According to soil conditions and climatic environment, planning different varieties of forage can

not only balance the year's yield, but also helps to improve the quality of soil and increase the yield and to optimize the quality. Grassland yield of forage planting is five times as much as natural grassland^[4]. Grassland yield and regeneration ability determine the grassland grazing capacity. The Australian government boosted grassland ecological construction and decided appropriate grazing capacity according to the production capacity of grassland and grassland recovery ability to prevent the grassland desertification caused by overgrazing grassland. Each family determines reasonable scale of breeding according to suitable grazing capacity to avoid the behavior of grassland overgrazing.

3.2 Rotation grazing on an area basis and grazing off season

According to the different growth stages of herds, combining with the carrying capacity of grassland, the herdsman adjusts grazing stages scientifically and manages grassland pasture to guarantee the sustainable utilization of grassland resources. In addition, Australian government divided grazing area all over the country into four different types of the grassland animal husbandry according to the precipitation, temperature, and soil conditions such as low density livestock grazing district, natural grassland grazing area, mixed farming zone and high density grazing area^[5]. In the same zone, livestock farmers divided family farm into several small areas of which 20% of the pastoral areas of grazing to protect other pasture grass growing in order to maximize the grassland biomass.

3.3 Grazing in accordance with the law and utilizing the water resource rationally

The Australian government had strict rules on grassland construction, the development of environmental protection, water conservancy etc. The government would impose severe penalties on violators, which ensured the coordinated development between animal husbandry and ecological environment protection and cultivated the ecological environment protection consciousness of farmers and herdsman at the same time. The weather of Australian outback is drought where the average annual rainfall is less than 200 mm. In order to protect the grassland yield, it is indispensable to exploit and utilize water resources. In Australia, livestock farmers built small water storage low dam, reservoir and other water engineering project generally. Storage of water resources ensures livestock drinking water and grassland irrigation.

4 Australian animal husbandry development model for China's enlightenment

As people living standard rising, for Chinese people, demand for animal products is on the rise. What's more, the price of domestic beef and mutton market is higher, which causes part of the pastoral areas overgrazing phenomenon, resulting in bearing pressure increasing and grassland ecological environment destructed^[6]. In recent years, in order to maintain sustainable use of grassland, the Chinese government is strengthening the construction of grassland ecology and intensifying the efforts on ecological protection, such as returning farmland to grassland project and ecological compensation mechanism. However, support on the investment of pastoral animal husbandry development still has a lot of space^[7]. At the same time, livestock farmers list livestock production as the first goal at the current stage and lack the protection environment

consciousness about grassland ecological [8]. Although there are some difference about the basis of existing on the animal husbandry between Australia and China, China can combine their own development period of animal husbandry and existing problems to explore a sustainable development way to coordinate animal husbandry development and ecological environment protection.

4.1 Planning and constructing regional and special pastoral areas

According to the climatic conditions all over China and the annual average precipitation, China should divide and construct pastoral area and set up the appropriate grazing way to achieve balanced development in breeding according to the local territory characteristic to protect grassland resources and ecological environment eventually. Referring to ecological grassland division from Ren Jizhou [9], we can divide Chinese grassland animal husbandry into the following areas, such as north desert scrub area, qinghai-tibet alpine region, onobrychis uiciacifolia, the northeast forest district, southwest karst mountain thickets grassland ecological economic zone and southeast evergreen broad leaved forest area. Planning and constructing regional and special pastoral areas is beneficial to promote the development of animal husbandry and ecological environment protection.

4.2 Planting grass and improving pastures

To alleviate the prairie excessive load problem, Australia government promoted to cultivate grass artificially. This move can not only guarantee the supply of grass feed and improve the soil but accelerates the sustainable development. One of the methods to improve pasture construction is cultivating artificial grassland in the pastoral areas of China. In different area, herdsman should cultivate and plant suitable grass according to local climate and soil conditions. At the same time, the aid of soil testing and fertilizer technology on the shortage of trace elements in soil can promote the growth of grass. In addition, the same pastoral areas should be divided into different farming area and the shepherd also should delimit the pasture use ratio to ensure the rest of the time grazing plot of grass growing.

4.3 Conducting water conservancy facilities construction

Water resources is the necessary means of production in the process of herbage growth, in pastoral areas with less precipitation, effective supply of water resources is a necessary condition for the sustainable development of animal husbandry. According to pasture area and grazing capacity, the farm family can select suitable water conservancy project, such as the construction of reservoirs, small reservoirs, deep well and so on. If the condition is appropriate, the government can also construct large water conservancy facilities.

4.4 Strengthening the grassland ecological protection ability and passing relevant laws and regulations for the protection of grassland ecological environment

The protection of the ecological environment is dependent on the government's support and

guidance. The Chinese government should be on the basis of the existing ecological construction projects, strengthen ecological environmental protection, return grazing land to grassland continually, moderate grazing capacity and implement the effective governance of desertification and sandstorm. In recent years, the Chinese government issued some laws and regulations about ecological environment protection and the construction of grassland, which has obtained the good effect. These measures played a significant role in promoting transformation of animal husbandry and ecological breeding. However, under the comprehensive effect of the inherent mode of production and the external economic environment, ecological protection consciousness of farmers still need to be further improved. The Chinese government should draw lessons from the Australian government's relevant measures, such as strengthening the professional training of herdsmen, intensifying the communication and collaboration between different pastoral areas, etc.

5 Conclusions

This study argues that the animal husbandry of China should be based on the long-term view, pay attention to ecological environment protection in the process of animal husbandry and implement sustainable development strategy. Through summarizing the measures to coordinate the animal husbandry and ecological environment protection in Australian, combining with the current problems in the development of animal husbandry in China, this paper puts forward the planning and construction of regionalization and specialization, the construction of cultivated grassland in pastoral area and improvement of grassland, promoting water conservancy facilities construction, strengthening the protection of grassland ecology and introducing relevant laws and regulations for the protection of grassland ecological environment policy suggestions, meanwhile, should develop modern animal husbandry and improve the ecological environment to promote the sustainable development of animal husbandry in China ultimately.

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