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Evaluation of ecological migrants' adaptation to their new living area in Three-River Headwater wetlands, China

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Abstract

Ecological migration is an important policy for sustainable ecosystem management, which usually relocates a large number of residents from their traditional living regions with high ecological sensitivity to other areas with low ecological sensitivity as part of the government's initiative to restore and recover seriously degraded ecosystems. Evaluation of ecological migrants' adaptation to their new living area is essential for assessing the success of migration and directing the design and implementation of measures to improve the effectiveness of migration. In this research, the adaptation of ecological migrants to their new living area was investigated and analyzed in Three-River Headwater region, a typical and significant migration area in China. The questionnaire survey method was applied. Three many issues related to migrants' adaptation were discussed, namely the determination of suitable migration population size, the choice of follow-up industry and the integration issue in ecological migration. The result indicated that the majority of migrants could adapt to their new living places and could live with a better life standard. In spite of this, the unsuitability for new work was the major problem for the ecological migration with 72% people unable for their new work.

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1. Introduction

Over the past several decades, great economic development has taken place in China. However, it is accompanied with severely environmental degradation in many regions of China [1]. To protect or restore the degraded environment, many measures have been designed and implemented, among which ecological migration is a relatively new one. Ecological migration can be simply defined as the

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immigration of people due to environmental causes. The migration can mitigate human's damage to the ecologically fragile ecosystems, providing recover and restoration opportunities to these ecosystems. Ecological migration stems from the ecological causes, i.e., excessive population that exerts too much pressure over the ecological carrying ability, rather than the change of socio economic factors. In spite of this, ecological migration also seeks to improve the migrant's life standard through relocating them from region with low economic development degree to those with high or relatively high development degree, and through helping them working in the new regions [2].

Ecological migration first occurred in 2001 in the Inner Mongolia Autonomous Region, China, where herders were relocated by the Chinese government from the traditional grazing land to agricultural or urban area to restore and recover the seriously degraded grassland ecosystems. Then, ecological migration took place in many regions of China, such as Three-Gorge region and Three-River Headwater region. Ecological migration has been regarded as an essential measure to protect the ecosystems that are very fragile and of great ecological significance.

Many studies have been published on discussing the strategic and ecological significance of ecological migration. For example, Ge and Wu [3] argued that the successful implementation of ecological migration can accelerate the process of "well-off society" construction in the pasturing area of China. Yang et al. [4] pointed out that the migration can effectively promoted the implementation of the strategy of the development of West China. Cui et al. [5] proposed that implementation of ecological migration in the fragile area in Western China should become China's basic national policy in this century. Ma et al. [6] investigated the effects of ecological migration on Xiyama natural preservation region and found the ecosystem in this region was obviously restored.

Many researches are performed to examine the necessity and feasibility of ecological migration. Hou [7] suggested that ecological migration from the poor and over-grazing grassland area was not only effective to protect the ecosystems, but also was economically efficient compared to other ecosystem protection and restoration measures. Meng and Bao [8] summarized the four reasons of ecological migration, namely 1) the severe ecological degradation trend in some regions, 2) the demands to address the conflict among population size, distribution and land's ecological carrying ability, 3) the requirement to change people's attitude and working style and to realize urbanization, and 4) the approach to addressing the conflict between improving people's life standard and protecting environment.

In terms of the difficulty and policies related to ecological migration, much literature is published. Liu and Chen [9], Meng and Bao [8] and Yang summarized the difficulty related to ecological migration, generally including eight aspects: 1) the migration policies are not efficient, 2) the investment needs to be increased; 3) the cooperation among the government department needs to be improved; 4) the law related to ecological migration is not enough; 5) more science and technology need to be incorporated; 6) the market development degree is low; 7) the follow-up industry should be developed; and 8) the esthetic problem should be emphasized. Many scholar and experts have contributed to address these problems. Yang [10] proposed the method of integrating population centralization, industry development and urban construction; Liu and Yan [11] focused on the western villages with fragile environment and proposed some suggestions, such as improving the education and training, birth control and migration population size control.

The researches mentioned above make great contribution to the theory and implementation of ecological migration. To further extend the researches on ecological migration, this research focuses on the ecological migration in Three-River Headwater region, a typical and significant migration area in China, and highlights the migrants' adaptation to the new living area.

2. Study site

The Three-River Headwater region, covering an area of 363,000 km², is located in the core of the Tibet Plateau, China. It is rich in biodiversity. Its mean altitude is 4,200 m. and is the world's highest altitude region. China's highest elevation and largest area wetlands are also in this region. The region acts as China's and even Asia's water tower. It is the headstream of the Yangtze River, the Yellow River and the Lancang River. It provides 25% of the water volume of the Yangtze River, 49% of the Yellow River, and 15% of the Lancang River [12]. Due to the ecological and political significance of the Three-River Headwater region, the Chinese government established it as the reserve. The reserve covers an area of 152,300 km² [2].

The Three-River Headwater region is experiencing degradation due to the global warming and the explosive increase in the intensity and extent of human activities, such as overgrazing, over exploring of plants and wildlife and gold mining, etc. [13]. The grassland has been overgrazed with 58% of rangelands being moderately to severely degraded. Nearly one-fifth of the species in this region are threatened. The environmental degradation is also associated with economic losses and even so-called "ecological refugees". To address these problems, the ecological migration is launched by the central and local government in this region.

3. Method

The questionnaire survey method was adopted in this research. Two typical migration villages were surveyed, i.e. Changjiangyuan village and Kunlun cultural village. Changjiangyuan village is formed from 20 December, 2004. There are 135 families and 420 people in the village. They moved from the six animal-husbandry villages with an altitude of 4800m that are 400 km away from the Geermu City. The Changjiangyuan village is managed by the Geermu government. Kunlun cultural village is moved from the seven villages in Qumahe town and Yege town. Now there are 264 family and 1748 people. The village is managed by the Three-River headwater region management committee. In the process of sample choice, 64 and 41 families are chosen for Changjiangyuan village and Kunlun cultural village respectively according to the size of the two villages. To ensure the random of the sample, The families are chosen randomly. The investigators survey one person for each family. 100 questionnaires are collected with the 95% satisfying the requirements [14].

In this survey, 98 families belong to Zang nationality and the other two are Han nationality. This is the same as the nationality proportion in the region. 54 persons are male and 46 are female. The gender rate is almost the same as the rate in the Three-River headwater region. 8 persons are in the age of 17-19 with 17 person in the age of 20-30, 36 person in the age of 31-40, 15 person in the age of 41-50, 15 person in the age of 51-60 and 9 person older than 60. This is also similar as the age distribution in the region [14]

4. Results and discussion

Based on the questionnaire survey, the migrants' adaptation to their new living places can be analyzed. Many results can be found. 40% people thought their lives became obviously better after ecological migration, 22% people thought their lives were slightly improved, 4% thought the migration did not change their life standard, and 34% were not sure about the influence of migration on their lives. Thus, in generally, the ecological migration is beneficial to improve the life standard of migrants. In addition, 32% people thought the overall environmental condition of their previous places was good or relatively good, with 56% thinking normal and 12% thinking bad or relatively bad. Regarding the overall environmental condition of the new living places, 12% people thought it was good or relatively good, with 41% thinking normal and 47% thinking bad or relatively bad. Thus, only a small proportion of people like the environment of their new living places and a very high proportion of people do not like the new

environment. However, 83% people said they have adapted to the new environment, and only 17% still do not adjust to the new environment.

Adaptation to new work is an essential issue in ecological migration. In the case of the Three-River Headwater region, most of the migrants need to change their previous life style and to learn new producing skills to adapt to the present production mode. 12% people said they can were very able for the new work, 16% people thought they were just qualified for the new work and the remaining 72% people were not suitable for their new work. Thus, the unsuitability for the work is a very severe problem for the ecological migration in the Three-River Headwater region.

Regarding the adaptation to the custom in the new living places, 34% people thought the custom in the new living places is the same as their previous living place and the remaining 65% thought the custom difference between the two places is very small. Thus, the migrants are suitable for the custom of the new place and they can participate in their normal religious activities in their new places. Foods play an important role in everyday life for the migrants. 51% people have adapted to them well or very well, with 40% adapting to them normally and 9% not adapting to them. The results indicated the adaptation to foods was just normal.

The migrants were investigated about the willingness of moving back to their previous places if it is allowed. 71% migrants said they would not move back even if it was allowed, which indicated the migrants have recognized the new places and thought they belonged to the new places. The reasons for not liking to move back include that: 1) they have get used to the new places (23%); 2) there are no cow and sheep in the previous places any more (7%); 3) it is easier for the children to go to school in the new place (12%); and 4) it is easier to get sick in the previous place due to the bad climate (16%) [14].

Based on the survey to the Three-River Headwater Region, there key issues need to be further discussed to direct the ecological migration in this region and other cases, namely the determination of suitable migration population size, the choice of follow-up industry and the integration issue in ecological migration.

4.1. The determination of suitable migration population size

The economic development in Three-River Headwater Region is slow. In this region, the classical stockbreeding is the main economic type, and the education degree for the herders is very low. The sizes of their living towns are small. Besides, the infrastructures of these towns are bad, which limited the population acceptance capacity. The tenet for ecological migration is to protect and restore the environment without decreasing the living standard of the migrants. The migration population amount is one key factor influencing the adaptation of migrants to their new living places. It lies on the carrying capacity of the natural grassland, the economic and environmental difference between the migration and new living regions, the condition of the new living region and the policies related to ecological migration.

The carrying capacity of the natural grassland is a key factor influencing population size, consumption standard and livestock carrying amount. It is an important scientific basis to effectively allocate population, and also acts as a key factor determining the migration population amount, directing the ecological migration. The carrying capacity of the natural grassland is dynamic as the change in science and technology and the development of modern animal husbandry. Science and technology development can increase the grass-meat transfer rate and the livestock quality, associating with the improvement of herders' incoming and the increase of the grassland's carrying capacity. From the long-term perspective, the adjustment of population distribution according to carrying capability is scientific and is closely related to the implementation of ecological migration. In the case of the Three-River Headwater region, the migrant will be allocated to the nearby regions, usually in the towns surrounding the city. The

migration from the grassland can obviously reduce the pressure of humans on grassland and offer valuable opportunity for it to recover.

Natural environment is the basis for human living and development. The greater the natural environmental difference between the migration and new living places, the greater the frequency of migration. The difference of farm resources is one major driver of migration. The new living places for the ecological migrants in Three-River Headwater Region are not very far from their previous ones, but the natural environment difference is obvious. In the migration region, the environment undergoes obvious degradation. For the herders, the average grassland area influences their incoming. Their living standard is low with the mean annual income of 1550RMB and even 1000RMB for around a half of them. The citizen income in the new living region is relatively higher, which can stimulate the implementation of ecological migration.

Ecological migration can effectively stimulate the construction of small villages. The village construction can increase the development of the second and third industry and build the basis of population migration. The ecological migrants in the Three-River Headwater Region are mostly allocated in 24 towns. These towns have good transportation, water supply and other infrastructures. However, the second and third industries are less developed, and the manufacture is limited. In this region, the eco-culture tour industry is relatively good, and can be further improved to provide more employment opportunity for the ecological migrants. The attractive ability of the new living region still has room to improve. Nowadays, the majority of the present grassland is rented by the local herders. If the rental mechanism and regulation are kept, the grassland is limited for the new migrants. In addition, most of the herders in Three-River Headwater Region belong to Zang nationality, who used to the life style of grazing and are difficult to make living without grasslands.

Favorable policies are also important to stimulate migration. With the great investment from the central and local government, for a family the average housing area is 45 m² and the compensation fee is 62000 RMB. The herders are also cultivated by specialized education in the aspects of grazing, manufacture and vegetable greenhouse etc.

The analysis above indicates that the attractive ability of ecological migration is just medium, and thus the migration population amount should not be very large. In the core zone, only limited number of managers can stay there; while in the buffer and experiment zones, suitable amount of population should move out.

4.2. The choice of follow-up industry

In order to recover and restore the unique ecosystem function in the Three-River Headwater region, the industry types that can be chosen is limited. However, unique resources advantage is available in this region, added by the favorable policies and investment from the government. With these advantages, it is feasible to reasonably utilize the local resources and emphasize its characteristics to establish new industrial chain. Environment protection is the premise of industrial development. From the perspective of address the conflict between environment protection and migrant welfare, suitable follow-up industry should be chosen.

Grassland is the basis for animal husbandry. Especially after the herders live in permanent places, grass and forage are the key requirement for stable breeding. After the natural grassland is forbidden to graze, artificial grassland will serve as the key source of food for livestock. Constructing high quality artificial grassland and basis for forage storage and seed breeding and developing the industry of grass manufacture will address the problem of forage for stable breeding, and meanwhile provide employment opportunity for some herders, supporting their lives.

Animal husbandry is a characteristic industry in Three-River headwater region and plays an important role in regional economic development. However, the traditional animal husbandry leads to the ecological degradation of grass plain. The animal husbandry mode needs to be improved from grazing to stable breeding. The leading companies should be encouraged to construct benefits chains with herders, in which the two sides share risks, depend on each others and develop together. With the support of investment and technology, the exchange of grassland and animal husbandry should be encouraged as well as the change of herders to workers.

The three-river headwater region is rich for economic vegetation resources. There are more than one hundred of Chinese herb medicine plants, which have very good development values and perspective. Suitable region can be chosen to develop the industry of herb cultivation and material processing. Meanwhile, the medicine plant resources should be fully utilized by inventing new medicine and promoting Zang medical science through combining the advantage of the traditional medical science and new technology. The spring water industry can also be encouraged due to the advantage of rich spring water resources. Particularly, the plant healthy drink is the typical product of this region. The development of these industries will greatly promote the development of the third industry.

The three-river headwater region has unique and rich natural landscape resources as well as old and pristine cultural resources. They provide strong basis for ecological tour. The average altitude of the region is above 4000 meter. The region has many glacier, wetlands, lakes and rivers, proving ideal places for scientific research and exploration. The region is the headwater place for three major rivers in China and is very attractive for the people all over the world. The tour industry in this region has great opportunity and huge potential.

4.3. The integration issue in ecological migration

Integration issue is essential for ecological migration. Ecological migration integration can be defined as the adaptation and combination of environment, economy, society, culture and organization among the migration groups and between the migrants and native residents though utilizing the internal energy within the migration system. From the macro-perspective, its main research topics include the integration of natural environment, economic benefits and society in the migration process, among which the environment integration is the basis, benefit integration is the key element, and social integration is the core.

The grassland in the Three-River Headwater region is the protection objective and also the resources for economic development. The carrying capacity of natural grassland is the scientific basis for reasonable population distribution planning. Most of the migrants are allocated in the nearby region and are centralized from the previously separate way. From the perspective of easing the ecological pressure of grassland, the migration and grazing-prohibited region will gain good opportunity for recovering. Conversely, for the region with high population density and along the traffic lines, due to the fast concentration of population, the pressure of natural resources will be inevitably increased. In addition, the common method to address the employment problem for the government is to explore the local industries. Nowadays, more attention is paid to economic benefits, while seldom emphasis is on the objective assessment of ecosystem function values. Although the migrants or local residents can benefit from the project development, the traditional development way unavoidably destroys the environment and increases the conflict between human and environment in population-concentrated regions.

The integration of economic benefits includes the integration of benefits, producing mode, the infrastructure in the new living region and other public facilities etc. among the individual migrants, migrants and local residents in the new living region. To centralize people through ecological migration can help them get rid of the previous life condition of depending on natural resources. Although the

change of living location can help the migrants enter the modern living environment through great-leap-forward development, it is difficult for them to change their life style that they have used to for hundred of years. The majority of the migrants lack the ability to live in modern society. Especially, most of them have low education level with even 1/3 of them are illiteracy. Thus, it is critical to train the migrants to adapt to the modern life style by training and education. Benefits are the basic drivers for many social conflicts and are also the causes of many conflicts in the process of ecological migration. At different stages of migration, the benefit conflict reflects different types. If the migrants are allocated to different destinations, the problems will occur related to the choice of destinations. The competition for better new living will lead to the conflicts. In the case of the Three-River Headwater regions the problem of competition for new living is possible to occur.

The integration of societies is to eliminate the migrants' feeling of migration and integrate themselves to the new society through the adjustment of mechanism and regulations. Nowadays, in the Three-River Headwater region the original family structure and relationship do not destroyed because the migration distance is not far and the whole migration is executed. Relatively, the core of social integration is the protection and combination of the characteristic cultures and the integration of education. Education includes many aspects, such as culture, skill and policies. When ecological migrants enter into a new region, new education system is required. The children of the migrants need sufficient opportunity for education to improve their cultural standard, grasp new producing skills and receive new economy theories, which can ensure their development opportunity after growing up. The labors in the migrants must be adapted to the new animal husbandry in modern facilities and equipments, or find suitable work opportunity in society.

5. Conclusions

The migrants in the Three-River Headwater region used to live in the environment with very low living standard. After migration, most families have to depend on the living allowances offered by the government. The compensation from the government can not change the migrants' lives radically. Migrants' unsuitability for new work is the key problem for the ecological migration in the Three-River Headwater region, with 72% migrants not suitable for their new work. Most migrants' producing skills can not adapt to the job requirements in the new living places. It is difficult for the migrants to make rich lives by themselves.

In order to help the migrants to improve their life standards, more measures should be launched by the governments. More investments are required for infrastructure construction, education and training to improve migrants' ability to adapt to new jobs, and follow-up industry development to create more employment opportunity.

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