European Journal of Scientific Research
ISSN 1450-216X Vol.65 No.4 (2011), pp. 572-580

http://www.europeanjournalofscientificresearch.com

Status and Challenges of Ecological Pastoral Farming in Qinghai, China: Evaluation of Initiatives in Ningxia Village

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Summary

Devastation of the grasslands in the Qinghai-Tibetan plateau is worsening due to overgrazing of livestock and changes in climate. To address this situation, the Qinghai government implemented an "ecological pastoral farming" policy aimed at developing pastoral farming practices that are compatible with the preservation of the natural grassland. However, the policy needs to be assessed both in terms of technical and economical aspects to promote its implementation. In this study, by looking at the case of a village that has actively implemented the policy and has distinct livestock rearing and marketing characteristics, we determined the effects of policy implementation on sales income and costs as well as assessed the status and challenges of policy implementation.

Keywords: Pastoral farming, grazing, grassland, effect on income and cost

1. Introduction

In recent years, devastation of grasslands in the Qinghai-Tibetan plateau has worsened due to anthropogenic factors such as overgrazing of livestock and natural factors such as changes in climate [1], [2]. This has severely affected the sustainable development of the national economy as well as the natural ecological environment [3], [4].

To address this situation, since 2008, the Qinghai government has implemented a shift to ecological pastoral farming, a policy aimed at developing pastoral farming practices that are compatible with the preservation of the natural grassland. In a previous study, we assessed the general policy implementation process using Su Jiwan Village as a case study and analyzed the effects mainly in terms of income [9]. This policy, however, has been implemented differently in different regions and has not been evaluated in terms of costs.

In this study, by looking at the case of a village that has actively implemented the policy and has distinct livestock rearing and marketing characteristics, we determined the effects of policy implementation on sales income and costs as well as assessed the status and challenges of policy implementation. This will help to clarify the best approach in implementing ecological pastoral farming in this particular region.

2. Research Methods and Conditions of the Study Area

We used the Ningxia Village in Qinghai as the subject of our study. We chose Ningxia Village because, among the model areas where the policy is being implemented, both farmers and government officials in Ningxia showed favorable response to the policy, and the village has shown remarkable progress in eliminating overgrazing of natural grasslands. In particular, the village has pioneered important changes in marketing schemes and cycles. First, we conducted interviews with the mayor of the village and gathered information from the village statistics office about the condition of the ecological environment and the extent of grazing and the process and progress of policy implementation. We also surveyed a total of eight groups composed of 27 farming households about the changes in their management style after policy implementation and, in particular, about actual changes in income and costs. We then conducted comparative analysis of the data we gathered.

Ningxia is part of Qinghai, China and located at an altitude of 3350 to 3500 m [6]. It has a population of 399 Tibetan villagers (as of 2009) composed of 78 farming households. Its main industry is pastoral farming, where 86,000 mu (1 mu equivalent to 0.067 ha) of grasslands are used for grazing. Due to its high elevation and low temperature, vegetation can only grow in the area for a short period from May to September. This results in two grazing seasons, wherein grazing has to be done in separate locations for summer when grasses grow well and for winter season when grass growth is limited.

3. Characteristics and Evaluation of Ecological Pastoral Farming

(1) Characteristics of Ecological Pastoral Farming in Qinghai

Ecological pastoral farming in Qinghai is characterized mainly, in terms of livestock management and sales, by the following features (Refer to [9] for details).

First is cooperativization of grazing. Conventionally, grazing was done individually, and the number of livestock was determined according to the discretion of individual farmers, which easily led to overuse of the grasslands. To avert this situation, the farmers divided themselves into groups composed of a certain number of farming households and are now grazing their animals in groups. This enabled planned use of grasslands and systematic grazing based on livestock ownership conditions and through a combination of grazing and confinement rearing. Other than grouping the farmers, grazing was also cooperativized so that manpower needed for grazing was reduced, and resulting surplus labor could be diverted to other industries.

Second is cooperativization of sale of livestock. Conventionally, selling was done through direct negotiations between farmers and livestock dealers, but now, it is done through group-based bidding. Not only were the farmers grouped, but, most importantly, private ownership of livestock and

grasslands was abolished in favor of cooperative ownership (group ownership), which was implemented after assessing the monetary value of grasslands and livestock to fairly distribute profits among the farmers.

(2) Technical Characteristics of the New Pastoral Farming System Implemented in Ningxia Village

1) Adjustment of number of livestock raised

Ningxia Village, which mainly grazes sheep, has implemented a livestock management system characterized by the following three main features, in addition to the above basic characteristics of ecological pastoral farming.

First, to avoid overgrazing, they reduced the number of livestock raised. Like what has happened in other regions, for many years in Ningxia, farmer and livestock population has continued to increase despite of the limited grassland area available, resulting in deterioration of the ecological grassland environment and reduction in livestock productivity. A report showed that, due to these anthropogenic factors causing environmental degradation and because of the harsh natural environment, livestock productivity has decreased by approximately 30 to 50% of productivity in the 1950s [5].

As of 2007, the number of sheep grazed in the area has reached 4,958, with a 3.6-mu grazing area per head (1.32 times the reasonable grazing capacity). In 2009, however, after implementation of the policy, the number of sheep was reduced to 3,732, which was achieved mainly by selling rams and old animals, thereby increasing the grazing area per head to 5 mu. Ningxia Village became the first in Qinghai to achieve the ideal grazing population.

2) Herd adjustments and changes in marketing schemes

Second, while the number of livestock raised was reduced, particularly the number of sheep grazed, the number of breeding ewe lambs and young lambs was increased. And, most importantly, they shifted from marketing mature sheep to marketing lambs instead (Table 1).

After 2007, due to the improvement in ratio of breeding ewe lambs among the total sheep raised, their number increased from 2,727 in 2007 (before policy implementation) to 3,215 in 2009 (after policy implementation), subsequently resulting in an increase in number of lambs produced from 2,181 to 2,583, increasing the ratio of lambs among the total number of sheep (more than one year old) from 55% to 85%. Also, the number of mature sheep marketed was reduced from 1,520 in 2007 to only 389 in 2009, completely reversing the proportion of mature sheep and lambs being marketed. As will be discussed later, this shift was also driven by the increase in demand for lamb meat.

In addition, the farmers had also conventionally raised one breeding ram per farming household. In the new system, however, breeding rams are raised in one location by the whole village[*1]. This system enables maintaining breeding rams of superior and healthy stock. Since a good breeding stock is essential in improving the livestock industry, the government subsidized the purchase of breeding stocks to improve quality of sheep being raised in the village. This also contributed to the improvement of reproductive rate and increase in number of lambs produced in the village.

Table 1: Changes in sheep population after policy implementation

	Number and percentage of sheep raised							Lambing ewes		Number of sheep sold and sales ratio			
Year	Total	Breeding ewe lambs		Breeding rams		Other sheep				Lambs sold		Mature sheep sold	
		Heads	Ratio	Heads	Ratio	Heads	Ratio	Heads	Ratio	Heads	Sales ratio	Heads	Sales ratio
2007	4958	2727	55%	96	2%	2135	43%	2181	44%	443	8.9%	1520	30.7%
2009	3782	3215	85%	0		567	15%	2583	68.3%	2193	58.0%	389	10.3%

Table 1: Changes in sheep population after policy implementation - continued

% Increase		17.9%		-100%		-73.4%		18.4%		395%		-74%	

Source: Results of survey on 27 households belonging to eight cooperative groups conducted in Ningxia Village in Qinghai
Notes:
1) "Number of sheep raised" refers to the total number of sheep at the beginning of the year when the survey was conducted (does not include lambs less than one year old). "Other sheep" refers, for 2007, to unproductive mature ewes and rams (for marketing), and for 2009, to unproductive mature ewes only (for culling).
2) "Sales ratio" = number of heads sold/ total number of sheep raised

3) Changes in marketing cycle

Third, in the new system, changes in the marketing cycle were made so that livestock population is kept within the reasonable number. This is done by keeping 15% of the lambs produced for breeding and marketing the remaining 85%. Likewise, 15% of breeding ewe lambs (old and unproductive ewe lambs) are culled.

Breeding is also done seasonally so that lambs are born between January to February. Lambs are marketed nine months after they are born: for the first six months they nurse from the ewes, and for the next three months they graze in the grasslands while nursing. Animals are grazed during the summer (June to August) when the quantity and quality of the grass are at its best. By mid-August, they are moved to graze on winter grassland areas. Since the lambs are usually sold in September, grassland areas for winter grazing are only used for one month, reducing the burden on the grasslands. Otherwise, if they are not sold and have to continue grazing after September, burden on the grasslands would increase because grazing capacity significantly decreases during the winter months.

Changing the marketing cycle has resulted in shortening the period that the natural grasslands are used, thereby maximizing use of limited resources and reducing risks and accidents during livestock rearing.

(3) Comparison of Income and Costs in the Old and the New System

An important point of consideration in the new system is how to prevent reduction in farmer income due to the reduction in number of livestock, and how to instead create more income for the farmers. In the previous system, mature sheep were raised until three years of age before they were marketed. In the new system, however, the total number of livestock is controlled and lambs instead of mature sheep are marketed to prevent overgrazing.

Table 2 shows income and costs before and after policy implementation. As already shown in Table 1, the number of mature sheep and lambs sold was reversed between 2007 and 2009. What is more remarkable is the change in average price per head. Average price per head for mature sheep increased by 28% from 320 yen to 400 yen, while for lambs, price increased by 56% from 135 yen to 210 yen. Also, in 2007, prices varied widely, but by 2009, price variations were greatly reduced.

One reason for this, as previously mentioned, is the difference in marketing style (shift from individual negotiations to group-bidding) that resulted in increased trade volumes and stronger competitiveness. Another reason is the improvement in livestock quality brought about by having achieved the reasonable grazing number. According to data from Ningxia's policy implementation committee and the Pastoral Farming Management Center, for 100 lambs, the average weight at birth increased by 0.15 kg from 3.28 to 3.43 kg, and increased by 1.2 kg from 14.4 kg to 15.6 kg for five-month old lambs, indicating that lambs being marketed now are valued more highly than before.

A more important reason is the increase in demand for lamb meat, which is softer and has become more popular in recent years, accounting for the increase in unit price for lamb. For six years from 2000 to 2005, the demand for lamb meat nationwide has continued to increase by more than 11% every year [10]. In a survey by the Qinghai Pastoral Farming Management Center, price per kilogram

of mutton was 30 yuan, while lamb was sold 11.1% higher at 34 yuan per kilogram in January 2009. This translates to a remarkable increase of 12.8% in total sales income (mature sheep and lamb).

Increase in "other pastoral income" is due to the creation of jobs arising from the cooperativization of grazing. "Non-pastoral income" refers to income arising from the redistribution of labor to non-grazing activities as a result of the grouping and cooperativization of grazing. Although not shown in the Table, labor export to and income from non-livestock industries also significantly increased (more than twice in total)[*2].

Total income increased by 27% from 680,000 yuan before policy implementation to 859,000 yuan (31,200 yuan per household) after policy implementation.

The costs, however, increased by 260% from 76,000 yuan before policy implementation to 271,000 yuan after policy implementation. It must be noted, however, that this is largely due to how the costs were calculated, i.e., since, conventionally, farming was done by the family, labor costs for grazing and shearing, fencing and other maintenance costs, and breeding stock costs were not included. A proper comparison cannot be made unless this factor is included in the calculation, and the data is included here only for reference.

The above results show that total profits have increased from 677,389 yuan in 2007 to 858,533 yuan in 2009, notwithstanding the discrepancy in cost calculation. As previously mentioned, this increase in income is largely due to the increase in sales of lamb.

Table 2: Comparison of income and expenses before and after policy implementation

	Average price per head of sheep (Yuan)		Income (Yuan)						Cost	Profit
			Income from sales of sheep			Other pastoral income	Non-pastoral income	Total		
	Lamb	Mature sheep	Lamb	Mature sheep	Total sales					
2007	135 126 -148 210	320 280 -340 400	59,805	486,400	546,205	84,684	122,300	753,189	75,800	677,389
2009	195 -220	380- 415	460,740	155,600	616,340	234,189	279,193	1,129,722	271,189	858,533
% Increase	55.6	28.1	670.4 %	-68.0%	12.8%	176.5%	128.3%	50.0%	257.8%	26.7%

Source: Surveys in Ningxia Village in Qinghai

Notes:

1) "Other pastoral income" refers to income from sale of wool and from employment of workers for cooperative grazing.

2) "Non-pastoral income" refers to income from employment in other industries.

4. Pastoral Farming Management Situation of the Different Groups

Table 3 shows the farming management situation of the eight groups in Ningxia Village. Number of sheep (from 226 for Group E to 800 for Group B) and income (from 37,903 yuan for Group E to 150,165 yuan for Group B) widely varied, showing that the scale of the groups varied considerably in terms of livestock number. In looking at the group differences, attention should be given to "profit," which is obtained by deducting "farming costs" from "farming income," because it serves as an index for efficiency of group farming management. Using the ratio of the profit against income as the "pastoral farming profitability ratio," we examined the factors that affect profitability. (In Table 5, groups are arranged in decreasing order of their "pastoral farming profitability ratio" shown in the lowermost column.)

First is the relationship of grassland area to profitability. The grasslands in Ningxia Village were ranked into A, B, and C, in accordance with the extent of grass growth and grazing capacity. Groups A to C (with profitability ratio of 60% or above) had a higher percentage of rank-A grasslands but had no rank-C grasslands. On the other hand, for groups D to H (with profitability ratio of less than 60%), rank-C grasslands consisted approximately 10% of total grassland area. Furthermore, the difference in profitability ratio appears to be directly related to price of livestock sold. For example, the price per head sold by Group A is 220 yuan, but only 195 yuan for Group H, a difference of 25 yuan.

Second is whether they have barns or not in their grasslands. Group G and H had zero expense for "barn use," meaning that they did not have barns in their grasslands. On the contrary, costs arising from losses due to death of breeding ewe lambs were higher for these groups. Likewise, as mentioned earlier, the value for livestock they sold was also lower. Barns are important in Qinghai because temperatures become extremely low from October to May, and daytime and nighttime temperature differences are extreme. Without the use of barns, grazed livestock are exposed to cold and strong winds, severely affecting their growth. Using barns, therefore, is important in preventing death of animals and maintaining proper body weight, pointing to the need for these groups to build barns for their sheep.

Third is the relationship with grazing area per head. In this region, the reasonable grazing number set as the target is 5 mu of grassland per head, a criterion that has been met by all the groups in the village, which is an indication that the policy was effective in this respect for the entire village. It is notable, however, that Groups A and B, which had higher grassland area per head, also had higher profit ratio and average selling price, indicating that further increasing the grassland area available per animal is beneficial. Group G, which did not have a barn, had low profitability ratio despite having higher area per animal, indicating the importance of barn use, as mentioned above.

On the basis of cost per head, differences among the groups for many of the expenses were minimal (particularly for grazing labor cost, disease prevention costs, breeding stock costs, and fencing and other maintenance costs). This is attributed, as mentioned earlier, to the grouping and cooperativization of management, wherein grazing methods and material inputs have become standardized.

Even though losses due to death of breeding ewe lambs have been pointed out to be related to barn use, differences were still observed among groups having the same farming conditions. This could be due to incidence of scours and other livestock diseases, indicating that groups and farmers differ in their livestock management techniques and practices.

Table 3: Pastoral farming management situation of the different groups (arranged according to profitability ratio)

Pastoral farming group	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Number of households	6	4	3	3	3	3	3	2
Grassland area*[1]	3,218	4,670	1,967	2,463	1,132	2,383	2,132	1,854
Rank-A grassland (%)	80	70	70	68	70	65	62	60
Rank-B grassland (%)	20	30	30	26	15	30	25	28
Rank-C grassland (%)	0	0	0	6	15	5	15	12
No. of livestock at start of year (Heads)	585	800	393	493	226	477	388	370
Grassland area/head (mu)	5.5	5.8	5.0	5.0	5.0	5.0	5.5	5.0
Income*[2]	104,273	150,165	69,372	85,805	37,903	79,434	62,630	58,842
Income from sale of mature sheep (Yuan/head)	415	412	413	400	382	390	380	380
Number of mature sheep sold (Heads)	60	87	40	52	23	49	40	38
Income from sale of lambs (Yuan/head)	220	218	218	208	206	205	196	195
Number of lambs sold (Heads)	338	491	227	292	133	275	225	212

Table 3: Pastoral farming management situation of the different groups (arranged according to profitability ratio) - continued

Income from sale of wool (Yuan/head)	8.6	9.1	8.6	8.7	7.6	8.3	8.6	8.3
Farming costs*3 (Yuan/head)	38,158	58,401	27,011	36,112	16,674	34,993	30,445	29,395
Grazing labor cost	36.9	36.0	36.6	36.5	39.8	37.7	37.1	38.9
Disease prevention cost	3.8	4.1	3.9	3.9	3.4	3.8	3.9	3.9
Losses due to deathof mature sheep	11.1	15.2	12.0	11.9	12.8	16.0	28.7	28.8
Feed supplement cost	7.6	7.5	7.1	7.0	9.4	7.1	7.1	7.3
Barn use cost	6.2	5.0	6.1	10.6	5.3	6.7	0	0
Shearing labor cost	1.3	1.4	1.3	1.4	0.9	1.3	1.4	1.4
Breeding ram cost	4.3	4.2	4.9	4.4	4.5	4.9	4.2	4.8
Maintenance (fencing) cost	0.7	0.7	0.7	0.6	0.8	0.6	0.7	0.7
Lamb sale profit per head*4	72.8%	69.1%	70.6%	67.4%	67.7%	65.9%	62.0%	60.5%
Pastoral farming profitability ratio*5	63.4%	61.1%	61.1%	57.9%	56.0%	55.9%	51.4%	50.0%

Source: Results of surveys conducted in Ningxia Village in Qinghai

*1. Grasslands in Ningxia were divided into three ranks (A,B,C) in accordance with grassland quality, as rated by farmer representatives and village officials (Pastoral Farming Innovation Committee).

*2. "Farming income" was computed separately for mature sheep ("income from sale of mature sheep per head") and for lambs ("income from sale of lambs").

*3. Details of cost computation:

- "Losses due to death of mature sheep" were divided by the number of sheep sold (the price of one dead sheep was provisionally computed as equivalent to 400 yuan).
- "Maintenance (fencing) costs" refer to costs incurred for fencing and maintenance of the grasslands.
- "Grazing labor cost" was computed at 150 yuan per month per 50 heads (number of sheep rounded to next higher increment of 50, i.e., labor cost for Group A that has 477 heads was computed for 500 heads). Farmers coming from the same group were hired for grazing.

*4 "Lamb sale profit" is the "income from sale of lambs" minus "cost" divided by "income from sale of lambs"

*5. "Pastoral farming profitability ratio" = (Income – Costs)/ Income

5. Conclusion

Like in other regions in Qinghai, Ningxia village has implemented a new pastoral management system aimed at preserving the ecology of natural grasslands and improving the livestock industry. First, they restructured the production system by creating production groups that cooperatively shared grassland and farming resources. Unique to Ningxia village, however, is how they were able to reduce the total livestock population without resulting in decrease of farming income, which they have achieved by marketing lambs instead of mature sheep and changing the marketing cycle to effectively use their grassland resources. This has resulted in a 26.7% increase in total sales income after policy implementation.

This increase in income and productivity observed for the entire Ningxia Village is attributed to the following factors. First is the appropriate implementation of techniques for changing the marketing cycle, for imposing seasonal breeding, and for centralized livestock management (use of common breeding stock, etc.). Second is the consideration of social economic factors in implementing the shift in marketing (mature sheep to lambs) in response to increase in demand for lamb meat. Third is the farmers' proper comprehension and technical ability to carry out cooperative grazing and management. That is, all the three components needed to successfully implement the policy were present, namely, appropriate technical background, favorable economic conditions, and able human resources. Noteworthy is how they have adopted a system to increase profits while working together to manage their livestock as a group. How do the farmers assess their own situation? According to the survey, aside from the increase in income, which, as expected, was cited by all the households as a good result,

90% of the farmers cited the reduction in burden to the grasslands, and 50% cited the increase in lamb production, as notable improvements to their livelihood.

There remains, however, a need to implement further measures in the future. In terms of facilities, particularly for the groups with low profitability ratio, construction of barns to protect the animals from the cold and installation of proper watering and feeding systems are imperative. Likewise, measures to address the deterioration of the grasslands, such as rotational grazing, resting, and restricting some areas for grazing, and initiatives to improve sown grasslands and degraded grasslands are also necessary. It is also important to study how the government can provide assistance in implementing these measures.

In terms of technical know-how, further instruction on how to improve farmers' techniques to manage their livestock is needed. To a certain degree, adoption of new techniques has been successful, but other practices in pastoral farming, such as management of grazing period, lamb-nursing period, feed supplementation amounts, and feed ingredients, are still according to conventional procedures. Proper management of barns to further improve lamb quality also remains to be an important issue to address. Likewise, the technical differences observed among groups also point to a need for improving the technical standards for policy implementation.

Another issue peculiar to this region that is mainly populated by Tibetan villagers is the inability of many of the people to speak Chinese, putting them at a disadvantage in finding jobs in other industries. Thus, enhancement of education and training of pastoral farmers and creation of employment support programs are imperative.

In this paper, we discussed the effects and challenges of policy implementation in Ningxia. We would like to stress, however, that farmers need to have an even deeper understanding of the significance of the ecological pastoral farming management policy and the conditions surrounding its successful implementation by having a stronger grasp of the technical and economic factors involved and the short-term and long-term implications of the policy.

There is also a need to study other technical aspects, such as how to optimize grassland grazing capacity and length of time for growing the grasses. We would like to carry out further research on these aspects with the collaboration of experts in the field.

*1) Conventionally, breeding rams and ewes were raised together, but in the new system, breeding rams are raised at a centralized location by the village. This enables providing breeding stock of superior quality to all farmers and facilitates seasonal breeding and centralized fertilization of ewes.

*2) With regards to shared use of resources as groups, according to the survey in Ningxia, grazing and rotation based on livestock reproductive stage resulted in reduced number of persons needed for grazing from 48 to 22. Since grazing was conventionally done by families, one farming household required at least one person for grazing, but in the new system, only two to four persons are needed for each group. Surplus labor was diverted to activities other than grazing.

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