

## Factors Affecting Herdsmen's Grassland Transfer in Inner Mongolia, China

Fulin DU<sup>1</sup>, Zhijuan LIU<sup>1</sup> and Shunji ONIKI<sup>2</sup>

<sup>1</sup> College of Economics and Management, Inner Mongolia Agricultural University (Hohhot, 010019, China)

<sup>2</sup> Social Sciences Division, Japan International Research Center for Agricultural Sciences (Tsukuba, 305-8686, Japan)

### Abstract

Grassland transfer is an important management tool for the development of animal husbandry, yet the factors affecting herdsmen's grassland transfer activity have seldom been investigated. This study analyzes the factors affecting grassland transfer in Hulunbuir and Xilingol, Inner Mongolia, China, using a multinomial logistic regression model. The results suggest that the educational level of the head of the household, their position as a leader of the village, the form of grassland transfer contract, distance from village to town, and height of forage grass have significant effects on the practice of grassland transfer. The quantity of livestock, grassland area per capita, income from animal husbandry as a proportion of total household income, and period of contract for grassland transfer are the main factors affecting grassland inflow, while the number of laborers has a great influence on grassland outflow. As a result, households actively engaged in livestock management tend to borrow more grassland, while households facing labor shortages tend to lend out their grasslands, thereby entailing adjustments to grassland area based on the household management situation. The results also imply that while these land transfers contribute to balancing livestock and grass on grasslands, transfer contracts and human resources must be further developed.

**Discipline:** Agricultural economics

**Additional key words:** livestock, multinomial logit model, grassland inflow, grassland outflow

### Introduction

As humankind's most precious natural resource since ancient times, land is the material basis of human survival; for herdsmen, grassland is the source of their survival and security in life (Bao 2011). Grassland transfer is a basic tool for the development of animal husbandry, while also being one of the ways of solving the problem of decentralized and extensive production (Yu et al. 2011). At the end of the 1980s and beginning of the 1990s, the practice of lending and renting grassland appeared in Inner Mongolia. The practice of herdsmen's grassland transfer did not appear until the mid to late 1990s. Grassland transfer is the exchange of grassland utilization rights under the situation of constant contract land ownership in China.

Grassland transfer thus refers to changes in grassland management rights or grassland utilization rights, while the national government retains ownership of the land. Both parties voluntarily conclude a legal contract for the transfer, which entails the activity of pastoral management by leasing, subcontracting, interchanging, assigning, or undertaking other forms of grassland transfer, while the herders retain the land utilization rights (Yu & Wang 2011).

Grassland transfer is a form of land circulation. Many scholars have investigated the factors affecting land circulation from both theoretical and empirical aspects. As one example, Luo et al. (2012) and Han (2008) elaborate the issue from the angles of supply and demand, policy, and property rights. From another perspective, Chen et al. (2008), Yue (2010), and Zhao

---

This paper reports the results obtained by the research projects "National Social Science Foundation (15XMZ094)" (2015-2018) and "Development of risk-reducing livestock farming systems coping with extreme weather events in Northeast Asia" (2011-2015).

\*Corresponding author: e-mail [oniki\\_shunji@affrc.go.jp](mailto:oniki_shunji@affrc.go.jp)

Received 8 March 2016; accepted 25 August 2016.

et al. (2012) found the factors that affect farmers' willingness to accept land outflow. Furthermore, Zhai et al. (2013) show that age, household income, number of laborers, and social security level all affect farmers' land outflow; while Lin et al. (2009), He et al. (2011), and Xu et al. (2012) put forward the factors affecting farmers' land inflow.

Grassland transfer combines development of the pastoral economy with modern grassland animal husbandry. With increases in both population and livestock, grassland transfer can effectively assure the long-term sustainability of grasslands by ensuring adequate stocking rates in China (Ji 2011). While many studies have been conducted on the effects of grassland contracting policy and its influence on herdsman's cooperation (Andreas et al. 2010, Li & Huntsinger 2011, Conte 2014), little research has been done on grassland transfer. Hu et al. (2014) studied the resolution of grassland transfer problems, particularly the relation between grassland transfer and the protection of grassland sustainability, as well as methods of increasing herdsman's income and achieving large-scale livestock operations in Inner Mongolia and Gansu province in China. Oniki et al. (2008) found that households with small areas of grassland relative to the number of household members tend to borrow more grassland in Inner Mongolia. Bian (2012) pointed out that the householder's age and educational level, income from animal husbandry, animal husbandry policy, and degree of grassland transfer market development have significant effects on herdsman's grassland inflow; in addition, Yang (2014) indicated that the educational level of householders, number of laborers, grassland areas, whether herdsman have been trained in the past two years, and how much herdsman know about grassland transfer policy all affect herdsman's grassland inflow practices, based on data from Abaga Banner in Xilingol League of China. However, none of these studies examined the factors affecting grassland outflow. As the inflow and outflow of grassland are determined simultaneously, multinomial analysis would yield more efficient estimation results. So far, very few studies have revealed the factors that affect the total activity of grassland transfer (i.e., inflow of grassland, outflow of grassland, no change). Based on survey data from Hulunbuir City in Inner Mongolia and Xilingol League, we use multinomial logistic regression to identify the factors affecting herdsman's grassland transfer behavior, thus forming a theoretical basis for improving the grassland management system and providing appropriate guidance to herdsman regarding grassland transfer.

## Grassland utilization system in China

### 1. Institutional changes for grassland utilization

The household contract responsibility system was implemented in 1983. The grassland contract responsibility process that distributes grasslands to herders' households is basically divided into two steps. First, the grasslands are subdivided for allocation to each *haote* (group of herders' households), that is, allocating grasslands of the village to the herders' households of the *haote*. The *haote*, an indispensable product of nomadic life and animal husbandry production, refers to a small village generally composed of three to five herders' households. Each village has an average of six to eight *haotes*, with a maximum of 15. The grassland areas of each *haote* are not precisely determined, only being roughly ascertained according to the population in each *haote*. The rotational grazing of herders' households is undertaken on a seasonal basis within a *haote*. When special circumstances arise, such as the occurrence of a natural disaster and no guarantee of rotational grazing, then with the consent of the leaders of other *haotes*, the herders can use the grasslands of other *haotes* without having to pay grassland utilization royalties, and grassland disputes rarely occur. Following the division of grasslands on a *haote* basis, herders' households have developed a preliminary recognition of their respective usable grassland areas, although the boundaries between herders' households are not clear.

Grasslands were distributed to herders' households a second time in 1991. At this time, the boundaries between herders' households were made clear and these households had to use the grasslands allocated to them. There were three types of criteria for the division: the first was division by the actual population at that time; the second was division based on the actual population when livestock was distributed to the herders' households, meaning that if livestock were distributed to the herders' households in 1983, then the grasslands were divided by the actual population in 1983. This second criterion meant that people born after 1983 did not obtain grasslands. The third criterion for the division was through a comprehensive consideration of the population and livestock numbers. It can be seen that the criteria for the division of each village were different. After being distributed to herders' households, the grasslands were divided on a single household basis; the nomadic mode of production then began to progressively wither away. The grasslands of each household comprised dozens or hundreds of hectares in the surrounding area. In order to prevent the livestock of other herders' households from

entering their own grasslands, the herders' households set up steppe netting, thus resulting in even more serious grassland segmentation. The narrowing scope of grassland utilization and decline of nomadism were symbolic of the vicissitudes of the various methods of using grasslands.

The second round of the grassland contracting system was accomplished from 1996 to 1998, resulting in further clarification that herders' households owned the grassland management rights. In August 2000, the livestock and forage balance provision in Inner Mongolia was published. In 2003, a project for returning grazing land to no grazing land was launched, while the banning and delaying of grazing, and the introduction of rotational grazing in terms of grassland utilization that comprises the so-called "systems of animal husbandry, herdsmen, and pastoral areas" were implemented in Inner Mongolia. Since 2011, a subsidy and incentives system for grassland ecology protection has been implemented in major grassland pasturing areas. In order to protect grassland ecology, the subsidy and incentive policy was carried out to promote the banning of grazing and the project for returning grazing land to no grazing land.

The household contract responsibility system, a basic economic arrangement in rural and pastoral areas, is the core of the grassland property rights system. Under this system, grassland ownership belongs to the collective, the contract rights belong to herders' households, and the market owns the tenure or management rights of the grassland; thus, the three rights are separate. Therefore, it is necessary to establish fixed grassland ownership, stabilize the contract rights, and free up the tenure or management rights of grasslands. Fixed grassland ownership is for the consolidation of collective ownership, which is the basis of public ownership. The stability of the contract rights is the abiding cornerstone of the household contract responsibility system. Freeing up the tenure or management rights of grasslands allows the promotion of grassland transfer and the formation of new operating bodies, such as family ranches, herdsmen cooperatives, or animal husbandry enterprises, thus realizing large-scale management, enhancing productivity, and ultimately achieving extensive modern grassland animal husbandry.

## 2. Types of animal grazing

Since the birth of grassland animal husbandry, the patterns of grassland utilization have been constantly evolving. In sum, there are three grassland utilization patterns: the nomadic, semi-settled and semi-nomadic, and settled grazing patterns (Du 2008).

The nomadic pattern was formed in the Bronze Age,

when the mode of production was based on nomadic animal husbandry. Then in the modern age, the practice of rotational grazing over four seasons as conditioned on vast grasslands encountered predicaments due to a growing population, contradictory tensions between cropland and grassland, and a gradual reduction of nomadic distances. And since the 1950s, the settlement of herdsmen has been accelerated and nomadic distances have been further reduced.

The grassland utilization pattern has changed fundamentally since the household contract responsibility system was first implemented in 1983, gradually shifting from nomadism to rotational grazing and settled grazing, thereby resulting in seasonal rotational grazing (composed of summer and autumn, and winter and spring camps) and settled grazing both being set up in coexistence.

Rotational grazing is still practiced on a seasonal basis according to the situation of water sources and grassland, but since the borders of grazing grassland areas available for rotational grazing have now been fixed, the conditions for nomadism have basically been lost. Rotational grazing is divided into rotational grazing with four seasons, three seasons, and two seasons based on the water source, grassland growing situation, the area, and location of the grassland, so as to reduce the pressure on grazing grasslands, promote natural restoration and the rational use of vegetation, and have a positive effect on grassland ecological protection. However, the proportion of households adopting rotational grazing has been reduced due to the effects of grassland area and the number of livestock; consequently, grazing has become a relatively common method of grassland utilization.

## Data

The data used in this study were collected from herders' households during the period from July to August in 2013 in Hulunbuir City and Xilingol League in Inner Mongolia, China (Fig. 1). These areas are typical and traditional grazing areas in Inner Mongolia. The data were obtained through questionnaire surveys and face-to-face interviews. We selected 309 households by a random sampling method from lists of the total households in the areas. We then conducted 289 interviews (94%).

We have the samples of 132 households in Xilingol and 177 in Hulunbuir. Specific survey areas and the distribution of sample households were as follows: in Xilingol, 42 households from four villages in Baoligen Town of Xilinhot City, 43 households from four villages in Bieligitai Town of Abaga Banner, 36 households from three villages in Baogeduwula Town, and 11 households

from one village in Yihegaole Town were surveyed, with 121 valid samples. There were 177 questionnaires from 16 towns in Hulunbuir City, with 168 (95%) valid questionnaires being received. The survey areas were the towns of Alatanemole, Arihashate, Hulun, Dalai, Baogedewula, Keerlun, and Beier in Xinbarg West Banner.

According to our survey, there were 111 herders' households that rented grassland from other households (grassland inflow), accounting for 38.4%, 20 households that lent their grassland (grassland outflow), accounting

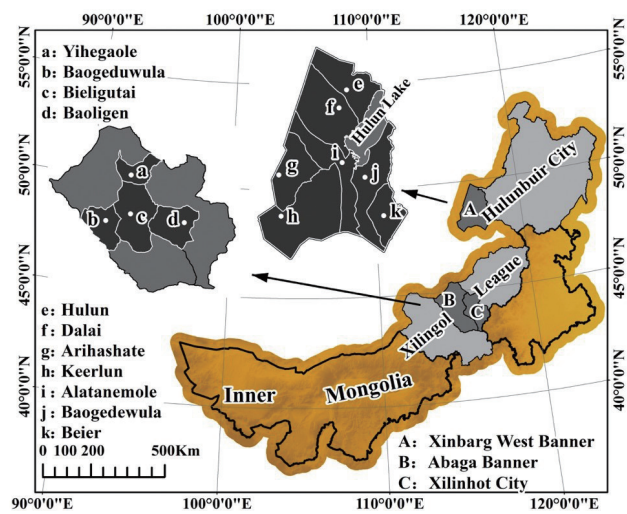


Fig. 1. Geographic locations of Hulunbuir City and Xilingol League in Inner Mongolia, China

for 6.9%, and 158 households that did not engage in grassland transfer, accounting for 54.7%. None of the households reported both grassland inflow and grassland outflow.

In terms of the basic characteristics of herders' households, from the standpoint of age, it was easy to see that animal husbandry operators in the pastoral areas aged 16-40 accounted for 28.37%, those between 41-65 accounted for 66.79%, and those older than 65 accounted for 4.84%. The educational level was generally low in that the junior high school level or primary school level of education and below accounted for 78.2%. As for the scale of the household, the presence of three or four members in each household indicates that the household structure in pastoral areas had shifted from large households to small and medium-sized households. The per capita total income of herders' households shows that those earning 80,000 yuan or more accounted for 34.96%, those earning 40,000-80,000 yuan accounted for 32.86%, and those earning 40,000 yuan or less accounted for 32.18%.<sup>1</sup> Overall, the middle- and high-income groups accounted for 67.82%, thereby showing that the income level of herdsmen was also rising along with economic development (Table 1).

**Situation of grassland transfer in Inner Mongolia**

Representing the typical grasslands and pasturing areas in Inner Mongolia, Table 2 presents the situation of grassland transfer in Hulunbuir and Xilingol. We have

Table 1. Basic characteristics of sample herders' households

Statistical indicators	Proportion (%)	Statistical indicators	Proportion (%)
<b>Age</b>		<b>Number of family members</b>	
16 years old and under	0	1-2 members	10.38
16-40 years old	28.37	3-4 members	65.75
41-65 years old	66.79	5-6 members	22.49
More than 65 years old	4.84	7 members or more	1.38
<b>Educational level</b>		<b>Per capita total income</b>	
Primary school and below	48.44	Less than 20,000 yuan	13.49
Junior high school	29.76	20,000-40,000 yuan	18.69
Senior high school and technical secondary school	15.57	40,000-60,000 yuan	18.33
Junior college	4.15	60,000-80,000 yuan	14.53
University and higher	2.08	More than 80,000 yuan	34.96

The average income of the sample is 20,880 yuan, which is higher than the average per capita income of peasants (8596 yuan) in rural areas in Inner Mongolia in 2013, but lower than that of urban residents (25,497 yuan) (Inner Mongolia Statistical Yearbook 2013, Table 10-1). In August 2013, 1 yuan was approximately 0.1633 US dollar (Bank of China).

the samples of 168 households in Hulunbuir and 121 in Xilingol.

Looking at the proportions of different-sized grasslands herders' households engaged in grassland inflow and grassland outflow for the total samples in Hulunbuir, we can see that the grassland outflow proportion of small-sized grasslands (16.7%) is greater than the grassland inflow proportion (5.6%), where small-sized grasslands refer to those smaller than 200 ha. The grassland inflow proportion of large-sized grasslands (80.6%) is greater than the grassland outflow proportion (5.6%), where large-sized grasslands refer to those larger than 600 ha. Thus, compared with households with small-sized grasslands, those with large-sized grasslands are evidently more inclined to transfer grasslands inward to realize large-scale management, whereas herders'

households that have small-sized grasslands are more inclined to transfer grasslands outward, in order to go to urban areas for employment and earn higher incomes.

Looking at grassland inflow in Xilingol League, from the fact that the grassland inflow proportion of grasslands larger than 1,000 ha (28.6%) is smaller than the inflow proportion of those smaller than 200 (56.3%), but the proportion of grasslands of 601-800 ha (50.0%) is greater than that of grasslands of 201-400 ha and 401-600 ha. As for grassland outflow, the number of households in each group is very small and there is no significant difference between the groups. In conclusion, we cannot deduce a clear relation between the size of grasslands and the proportion of grassland inflow from this simple comparison in Xilingol.

**Table 2. Situation of grassland transfer in Hulunbuir and Xilingol**

Survey region	Grassland size of herdsman (ha)	Grassland inflow		Grassland outflow		No transfer		Total households	Std. Dev.
		Household	%	Household	%	Household	%		
Hulunbuir	Less than or equal to 200	1	5.6	3	16.7	14	77.8	18	78.34
	201-400	5	13.9	3	8.3	28	77.8	36	50.15
	401-600	3	12	1	4	21	84	25	70.53
	601-800	8	28.6	2	7.1	18	64.3	28	55.75
	801-1000	17	68	2	8	6	24	25	54.27
	More than 1000	29	80.6	2	5.6	5	13.9	36	300.17
Sub-total	—	63	37.5	13	7.7	92	54.8	168	442.78
Xilingol	Less than or equal to 200	9	56.3	1	6.3	6	37.5	16	61.89
	201-400	10	38.5	1	3.8	15	57.7	26	51.12
	401-600	10	34.5	2	6.9	17	58.6	29	54.3
	601-800	13	50	1	3.8	12	46.2	26	65.51
	801-1000	2	20	1	10	7	70	10	48.3
	More than 1000	4	28.6	1	7.1	9	64.3	14	197.57
Subtotal	—	48	39.7	7	5.8	66	54.5	121	323.97
Total of all regions	—	111	38.4	20	6.9	158	54.7	289	400.28



**Methods**

**1. Model**

In the model of decision making for grassland transfer, the action of a household is the explained variable (grassland inflow = 1, grassland outflow = 2, no transfer = 0) that examines how explanatory variables affect grassland transfer. This study uses a multinomial logistic regression model, because the explained variable is in the multinomial condition:  $y$  is the explained variable, namely the outcome variable, and  $x_1, x_2, \dots, x_p$  are explanatory variables. Because the explained variable has three categories, three outcomes—labeled A, B, and C—are set as the categories, where  $y = 1$  represents class A,  $y = 2$  represents class B, and  $y = 0$  represents class C—the reference group. The specific form of the regression model based on the three outcomes is as follows:

$$\begin{cases} \text{Logit}p_{1/0} = \ln \left[ \frac{p(y = 1|x)}{p(y = 0|x)} \right] = \alpha_1 + \beta_{11} + \beta_{12}x_2 + \dots + \beta_{1p}x_p = g_1(x) \\ \text{Logit}p_{2/0} = \ln \left[ \frac{p(y = 2|x)}{p(y = 0|x)} \right] = \alpha_2 + \beta_{21} + \beta_{22}x_2 + \dots + \beta_{2p}x_p = g_2(x) \end{cases}$$

The regression model is represented by an equation composed of two logit functions in which there are  $2 \times (p + 1)$  parameters, where  $p$  is the number of explanatory variables,  $a$  is the constant,  $g_1(x)$  is the probability that grassland inflow will occur, and  $a$  is the probability that grassland outflow will occur.

**2. Variables**

Following Zhang and Qian (2014) and Chen et al. (2015), the behavior of herdsmen’s grassland transfer is determined by (1) characteristics of the head of the household, (2) characteristics of the household, and (3) other characteristics of grassland transfer, which are explained below. Table 3 lists the definitions, descriptive statistics, and expected signs of the explanatory variables.

(1) The characteristics of the head of a household include age, educational level, and a variable to indicate whether he or she is the leader of the village. As the household head grows older and their experience in animal husbandry increases, the person may be inclined to transfer in grassland. However, after reaching a certain age marked by declining physical ability and a loss of vitality, the household head may tend to transfer out the grassland. Therefore, the age of the household head is expected to have an uncertain effect on grassland transfer.

The effect of the household head’s educational level on grassland transfer is also uncertain. Educational level is a core variable to measure the ability of laborers. The higher the educational level of the household head,

the more reasoned his or her judgment of what is right and wrong; thus, the stronger the ability to respond to market changes. For one thing, such a household head is more likely to transfer out grassland for getting more non-animal husbandry employment opportunities. For another, owing to his or her easy acceptance and use of new animal husbandry technologies, the household head may not be willing to transfer out grassland, while the process of grassland inflow will occur more easily. Assuming that the educational level is continuous, we use 1 for no education, 2 for primary school, 3 for junior high school, 4 for high school, 5 for junior college, and 6 for university or higher.

If the household head is the leader of the village, then he or she will be more successful than other herdsmen in acquiring information. In such a situation, it is easier to expand grassland areas by taking advantage of the available leadership experience. Therefore, a household head who is leader of the village will likely have a positive impact on grassland inflow. The dummy variable for currently working as a leader of the village is 1, and that for not being a leader is 0.

(2) The characteristics of a household consist of the number of laborers, quantity of livestock, grassland area per capita, proportion of the total household income accounted for by the subsidy amount, and proportion of total household income accounted for by the income from animal husbandry. The larger the size of the herd, the higher the breeding requirements of herders’ households and the larger the area of grassland needed, under permissible conditions, and the more likely that herdsmen will transfer in grassland to realize large-scale management and exploit the economies of scale. The higher the proportion of livestock income in total revenue, meaning the higher the degree of specialization in livestock, the more likely animal husbandry operators will transfer in grassland so as to increase the number of livestock. In fact, it may be the most direct and effective way of improving herdsmen’s income levels. The larger the grassland area per capita or average grassland area of one sheep unit, the theoretically more likely a scope to transfer out grassland to some extent. However, this possibility rarely occurs in our field research as herdsmen are more inclined to transfer in grassland. As a result, the three variables mentioned above are likely to have positive effects on herdsmen engaging in grassland inflow.

To prevent inequality in the allocation of subsidized capital caused by the great disparity in grassland area per capita, the government takes into account poor and vulnerable groups as much as possible in the process of implementing the subsidy and incentive system of

grassland ecology protection, adopting the principle of incomplete unification when setting standards for this system. Consequently, compared with the vast majority of households that obtain subsidies and incentives based on the size of their grassland, small groups of herders' households receive subsidies on the basis of a single family or on a per capita basis. Therefore, the subsidy as a proportion of total household income has an uncertain effect on herdsmen's grassland transfer behavior.

In cases where cooperation is not feasible or no one is hired throughout the year, households with a larger number of laborers engaged in animal husbandry are likely to transfer in grassland, due to the labor surplus. Therefore, the number of household laborers has a positive effect on grassland inflow, but a negative effect on grassland outflow.

(3) Other characteristic variables of grassland transfer include the contract period, form of the contract,

**Table 3. Descriptions and descriptive statistics for variables**

	Name	Code	Description and assignment	Mean	Std. dev.	Expected impact direction	
						Grassland inflow	Grassland outflow
Explanatory variable							
Personal characteristics of the householder	Age	x <sub>1</sub>	Continuous variable	47.38	11.42	+/-	+/-
	Educational level	x <sub>2</sub>	1 = Illiteracy; 2 = Primary school; 3 = Junior middle school; 4 = Senior high school and technical secondary school; 5 = Junior college; 6 = University or higher	2.72	1.1	+/-	+/-
	Whether the householder is leader of the village	x <sub>3</sub>	Yes = 1 No = 0	0.19	0.39	+	-
	Number of laborers	x <sub>4</sub>	Continuous variable	3.09	1.53	+	-
Family characteristics	Quantity of livestock	x <sub>5</sub>	Continuous variable	741.67	481.64	+	-
	grassland area per capita	x <sub>6</sub>	Continuous variable	184.7	136.8	+	-
	Subsidy income accounted for the proportion of total household income	x <sub>7</sub>	Continuous variable	12.71	2.33	+/-	+/-
	Income of animal husbandry accounted for the proportion of total household income	x <sub>8</sub>	Continuous variable	67.09	21.75	+	-
Other characteristic variables of grassland transfer	Period of contract for grassland transfer	x <sub>9</sub>	Continuous variable	4.54	1.85	+	-
	Form of contract about grassland transfer	x <sub>10</sub>	1 = doesn't matter; 2 = verbal contract; 3 = written contract	1.76	0.51	+	+
	Distance from village to town	x <sub>11</sub>	Continuous variable	28.96	22.35	+	-
	Height of forage grass	x <sub>12</sub>	Continuous variable	23.31	10.46	+	-

Note: The number of livestock is calculated using the standard unit of one sheep.

distance to the center of town, and grassland quality. A longer period of grassland transfer may have a positive effect on grassland inflow and a negative effect on grassland outflow. In pastoral areas, the longer the period of the grassland transfer contract, the more stable the grassland tenancy fee, which reduces the cost of grassland inflow while preventing dramatic price fluctuations. Therefore, more grassland inflows occur over longer contract periods. However, from the aspect of grassland outflow, the longer the period of the contract, the more likely the grassland renters will refuse to transfer out grassland over concerns about falling revenues.

The closer the distance from the village to the center of a town, the higher the openness of the herdsman's ideas, and thus the better the household members become at acquiring information as well as communication skills when entering the city. And if they live near the center of town, they will also have more non-animal husbandry employment opportunities. As mentioned previously, this variable is likely to have a positive effect on grassland inflow, but a negative one on grassland outflow.

While some herders rent or lend a plot of grassland by exchanging a formal document, many do so by informal oral consent. If the form of the contract for grassland transfer is official, namely a written contract, it will be beneficial in protecting the rights and interests of the grassland contractor and the grassland operator. Furthermore, the presence of a formal contract also plays a positive role in settling grassland disputes and conflicts. As a consequence, it is more likely that grassland transfer will be conducted under a formal contract.

The height of forage grass is selected to reflect grassland quality as a factor affecting grassland transfer. The herdsman's emphasis on herbage-animal balance and grassland management directly determines the grassland quality. In general, the higher the grassland quality, the more inclined herdsman are to undertake animal husbandry production. In order to protect grassland better and increase their income levels, the herders' households are more likely to transfer in such grassland; that is to say, high quality grassland has a positive effect on grassland inflow, although grassland outflows will be less likely to occur.

## Results

An empirical analysis using a multinomial logistic regression model was conducted. This paper uses three categories for the explained variable: incidence of grassland inflow, incidence of grassland outflow, and absence of grassland transfer.

Table 4 presents the estimation results. The

coefficient of educational level is positive for grassland inflow and negative for grassland outflow, suggesting that the higher the educational level, the more likely grassland inflow will occur, while the lower the educational level, the more likely grassland outflow will occur. At present, as many as 78.2% of household heads in pastoral areas have attained primary or junior high school levels of education, while the percentage of households with a senior high school level of education or higher is less than 20%. The household head with higher education who transfers out grassland to create more non-animal husbandry employment opportunities is not evident among those herders that still depend on the operation of grassland animal husbandry; therefore, the educational level does not have a positive effect on behavior regarding grassland outflow, which is in tune with reality.

The coefficient of the variable indicating whether the household head is the leader of the village is negative for grassland inflow, while the coefficient for grassland outflow is positive and contrary to the research hypothesis, meaning that, for the leader of a village or an ordinary herdsman, there are no significant differences in their production and management behavior. In other words, even the leader of the village may be unwilling to transfer in grasslands due to his or her additional wage income or busy affairs to increase income, which is in tune with reality.

The coefficients of the grassland transfer contract type are positive for both grassland inflow and grassland outflow; as a result, the herders' households are generally more likely to transfer their land under written contracts. The coefficients of the variable of distance to the town for grassland inflow and grassland outflow are positive and negative, respectively. That is to say, the closer the distance from the village to the town, the more likely grassland outflow will occur, and the less likely grassland inflow will occur. The higher the height of forage grass, the more likely grassland inflow will occur. Otherwise, grassland outflow is more likely to occur. The results obtained by the model for the five variables above are generally consistent with the research hypotheses.

The coefficients of the number of livestock, grassland area per capita, proportion of total household income represented by income from animal husbandry, and period of contract for grassland transfer are all positive for grassland inflow, in accordance with the research hypotheses.

The coefficient of the number of laborers, which was expected to have a positive effect on grassland inflow, is found not to be significant at the 10% level. This may be due to the fact that the number of laborers is basically the same or shows little difference between households.



However, the number of laborers has a negative and significant correlation with grassland outflow, the coefficient of the variable of the number of laborers being negative for grassland outflow, which is consistent with the expected direction. The result illustrates that the fewer the laborers in a household, the more easily the grassland is transferred out.

The survey data show that, from the perspective of age, householders between 45 and 59 years old who engaged in grassland transfer accounted for 33% of the total households that undertook grassland transfer, householders who are 40 years old and younger accounted for 27%, and householders who are 60 years old or older accounted for 7%. As a matter of fact, householders of all ages engaged in grassland transfer. Therefore, the variable of age does not have a significant effect on the

patterns of grassland transfer.

The subsidy as a proportion of total household income did not have a significant effect on grassland transfer activity. This may be due to the small proportion of the subsidy in terms of total household income being insufficient to motivate herders' households toward changing their inclinations regarding grassland utilization.

## Conclusions

Through empirical research on herdsmen's conduct of grassland transfer in Inner Mongolia, typical of the region's grasslands and pasturing areas, several conclusions can be made. The process of grassland transfer is influenced by the characteristics of the

**Table 4. Estimation results for herdsmen's grassland transfer activity using multinomial logistic regression**

Explanatory variable	Grassland inflow			Grassland outflow		
	Coefficient	Std. dev.	P >  Z	Coefficient	Std. dev.	P >  Z
x <sub>1</sub>	-0.016	0.018	0.386	0.034	0.033	0.3
x <sub>2</sub>	0.401**	0.194	0.038	-1.570**	0.625	0.012
x <sub>3</sub>	-0.845*	0.511	0.098	1.450*	0.862	0.093
x <sub>4</sub>	0.01	0.131	0.942	-1.099***	0.379	0.004
x <sub>5</sub>	0.002***	0.001	0.001	0	0.001	0.931
x <sub>6</sub>	0.005***	0.002	0.005	0.001	0.004	0.825
x <sub>7</sub>	0.123	0.083	0.139	0.107	0.051	0.478
x <sub>8</sub>	0.018*	0.011	0.081	0	0.016	0.997
x <sub>9</sub>	0.762***	0.159	0	0.202	0.28	0.471
x <sub>10</sub>	1.560***	0.404	0	2.056***	0.803	0.01
x <sub>11</sub>	0.016*	0.009	0.06	-0.050*	0.027	0.063
x <sub>12</sub>	0.044**	0.019	0.024	-0.230***	0.059	0
Constant	-13.579	2.191	0	0.894	3.475	0.797
Log likelihood				-125.502		
LR Chi-square (24)				259.070		
Prob > Chi-square				0.000		
Pseudo R <sup>2</sup>				0.508		

Note: "\*" denotes the 10% significance level, "\*\*" the 5% significance level, and "\*\*\*" the 1% significance level.

P > |Z| is the p-value for the coefficient estimate. If the estimate is below 0.01 for example, it is significantly different from zero at 99 percent probability. Log likelihood is the log of the likelihood function: a higher value indicates a better fitting model. LR Chi-square (24) is the likelihood ratio chi-square test with 24 degrees of freedom. If the test statistic exceeds the Chi-square table value, we conclude that the model is fitted. Prob > Chi-square is the result of the LR chi-square test. Pseudo R<sup>2</sup> is McFadden's pseudo r-squared for goodness of fit.

household head, such as educational level and social position, the form of the grassland transfer contract, the degree of market access, and the quality of the grassland vegetation. The number of livestock, grassland area per capita, income from animal husbandry as a proportion of total household income, and period of the contract for grassland transfer have significant effects on the patterns of grassland inflow, whereas the number of laborers has a significant effect on the patterns of grassland outflow.

Based on the conclusions above, several policy implications may be put forward. For herdsmen, grassland transfer is a self-decided optimization process, with the grassland area being adjusted according to their management conditions. Poor herder households will take their own resource endowments into account regarding operations, and if they have the possibility of acquiring employment in secondary and tertiary industries or working in cities, they will transfer out grassland to increase their income. New operational bodies such as family ranches, herdsmen cooperatives, or professional investors may realize the benefits of large-scale animal husbandry management and enhance productivity by transferring in grassland.

Since those who have more livestock tend to obtain more grassland from others, the practice of grassland transfer helps to prevent overstocking. Without grassland inflows, it is difficult to maintain the balance between livestock and grass on a given grassland. In this sense, the government should promote grassland transfer to achieve sustainable development in pastoral areas. In order to promote grassland transfers, the development of human resources, such as improving the educational levels of rural people, is very important.

Policies and regulations for grassland transfer must also be implemented to promote formal contract systems of grassland transfer for herders. The relevant departments should issue specific laws and regulations on grassland transfer, actively cultivate intermediaries and institutions to promote grassland transfers, and speed up the confirmation of grassland rights to better protect the rights of both the supply and demand sides, and make grassland transfers more plausible, orderly, and consistent in the case of the grassland management contract system.

## References

- Andreas, W. et al. (2010) The myth of community and sustainable grassland management in China. *Frontiers of Earth Science in China*, 4(1), 59-66.
- Bao, W. (2011) To promote the rights protection in our status quo of the study. *Inner Mongolia University*, 2011 [In Chinese with English summary].
- Bian, M. Q. (2012) Analysis and thinking on the transfer of land contracting right of grassland in agricultural and pastoral areas in Xinghai County. *Chinese Qinghai Journal of Animal and Veterinary Sciences*, 3, 34-35 [In Chinese].
- Chen, M. Q., Deng, A. Z., Zhou, B. J., Xiao, H. L. and He, W. J. (2008) An empirical study on factors of influencing farm households' behavior in cultivated land transfer. *China Soft Science*, 7, 6-13 [In Chinese with English summary].
- Conte, T. J. and Tilt, B. (2014) The Effects of China's Grassland Contract Policy on Pastoralists' Attitudes towards Cooperation in an Inner Mongolian Banner. *Human Ecology*, 42(6), 837-846.
- Du, F. L. (2008) Researches on grazing systems and special management behavior in Hunshandake Sandy Rangeland Area. *Chinese Journal of Grassland*, 6, 106-112 [In Chinese with English summary].
- Han, J. (2008) Establish a sound, strict and normative rural land management system. *Ren Min Ri Bao (People's Daily)*, 11-10007 [In Chinese].
- He, J. R., Li, J. G. and Li, Q. (2011) Analysis on the farmer household's behavior in land transfer in and its influencing factors—Basing on the survey data from 427 farmer households of the three gorges reservoir area. *Economic Problems*, 8, 77-81 [In Chinese with English summary].
- Hu, Z. T. et al. (2014) The ecological and environmental efficiency of grassland transfer—Based on the empirical study of Inner Mongolia and Gansu. *Issues in Agricultural Economy*, 6, 90-97 [In Chinese].
- Ji, H. Z. (2011) The problems and suggestions existing in the grassland transfer in Haibei state. *Hei longjiang Animal Science and Veterinary Medicine*, 4, 16-17 [In Chinese].
- Li, W. and Huntsinger, L. (2011) China's grassland contract policy and its impacts on herder ability to benefit in Inner Mongolia: tragic feedbacks. *Ecology and Society*, 16(2), 1.
- Lin, S. L. and Zhang, L. H. (2009) Research on factors influencing farmers' willingness of transferring in and transferring out agrarian land: evidence from Fujian province. *Finance and Trade Research*, 4, 35-41 [In Chinese with English summary].
- Luo, B. L., He, Y. L., Wang, S. and You, N. L. (2012) Land contract management right: analysis of farmers' willingness to quit and its influential factors—Based on the questionnaires of farmers in Guangdong Province. *Chinese Rural Economy*, 6, 4-19 [In Chinese].
- Oniki, S., Gensuo, B. and Du, F. L. (2008) Population Pressure, Grazing Pressure and Pastoral Management in Xilingol Grassland, Inner Mongolia. *Journal of Rural Economics*, Special Issue 2008, 424-431 [In Japanese].
- Xu, M. Y., Lu, C. L. and Chen, G. B. (2012) A study on the farmers' wishes about rural land circulation in Jiangsu province. *Research on Economics and Management*, 7, 66-74 [In Chinese with English summary].
- Yang, W. (2013) Analysis on the influential factors of land circulation based on the modernization. *Inner Mongolia Statistics*, 5, 13-15 [In Chinese].
- Yu, L. and Wang, L. X. (2011) Exploring the path of the development of grassland transfer in pastoral areas—Take Ningxia pastoral area of salt pond as a case. *Issues in Agricultural Economy*, 4, 105-109 [In Chinese].
- Yue, Z. (2010) Farmers' willingness and interpretation of land transfer—An empirical analysis based on the survey data of thousands of farmers in ten provinces. *Issues in*

- Agricultural Economy*, **2**, 64-70+111 [In Chinese].
- Zhai, Y. N. and Liang, D. H. (2013) Impact factors for farmers' behavior of transacting farmland in traditional agricultural area. *Journal of Nanjing Agricultural University (Social Sciences Edition)*, **3**, 78-83 [In Chinese with English summary].
- Zhang, Y. D., Meng, H. J. and Ta N. (2010) The transfer of the right to grassland contractual management in pastoral areas and its impact on pastoralists' livelihoods—Take the pastoral areas in Inner Mongolia for example. *Pratacultural Science*, **5**, 130-135 [In Chinese with English summary].
- Zhang, Z. M. and Qian, W. R. (2014) Study on farmers' willingness of land transfer under different levels of concurrent business—Based on the investigation and evidence in Zhejiang province. *Issues in Agricultural Economy*, **3**, 19-24 [In Chinese].
- Zhao, G. and Li, F. (2012) Non-agricultural employment, social security and farmer's land transfer: An empirical analysis based on 476 farmers in 30 towns and 49 villages. *China Population, Resources and Environment*, **10**, 102-110 [In Chinese with English summary].

