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## Is Microcredit a Form of Risk for Pastoral Households of Inner Mongolia's Semiarid Rangelands? ☆

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### ABSTRACT

Microcredit loans are now common for Inner Mongolian pastoralists and are encouraged by government policy on the basis of their previous success for poverty alleviation. However, the effects of the highly variable weather characteristics of many semiarid rangelands on the efficacy of microcredit have not been fully examined. Pastoralists in our study area are often trapped in a vicious cycle of borrowing more each year to pay for previous debt and the next year's production. Instead of helping to maintain herds through bad years, microcredit has often led to reduced herds and assets. To understand why, a qualitative, interview-based approach was used to determine the kinds of loans taken out and why they are taken out, as well as to assess household livestock sales, income, and costs in three villages. In poor years, 82% of households used loans to purchase winter forage. However, borrowers sold more livestock because the standard 1-yr loan term, combined with weather and market conditions, often forced sales for repayment. Weather and market variation made annual income and costs difficult to anticipate. Loans became an added household risk, another way that environment can influence the social and economic interactions of a rangeland social-ecological system. Longer-term loans could smooth the uncertainty of weather and market conditions, and supplementary measures such as government subsidies or forage insurance could buffer the inevitable but unpredictable bad years. Globally, study of the impacts of nonequilibrium ecological dynamics on economic and policy institutions would help to understand why many development initiatives have failed in such systems.

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### Introduction

The implications of climatic variability and unpredictability for vegetation management and stocking rates on rangelands are obvious and the topic of much research (Coppock, 2011; Cox et al., 2015; Duan et al., 2017; Hamilton et al., 2016; Joyce et al., 2013; Torell et al., 2010). Uncertainty in forage production and weather conditions on semiarid and arid rangelands also has strong implications for the social aspects of rangeland social-ecological systems, though this is not as well studied. Here we examine the effects of arid and semiarid rangeland climatic conditions on the use of microcredit as a means of poverty alleviation for herders (livestock producers or pastoralists) in Inner Mongolia, China. Microcredit has been promoted as a contributor to poverty alleviation

in many parts of the developing world (Hartarska and Nadolnyak, 2008; Hossain, 1988). It has been suggested as an effective short-term way to help herders overcome climatic disasters like droughts or snow storms and has been advocated globally by governments and international organizations such as the World Bank (Addison and Brown, 2014; Barrett and Luseno, 2002; Carter et al., 2007; McPeak and Barrett, 2001; Niamir-Fuller, 1998; Ouma et al., 2011; Turner and Williams, 2002; World Bank, 1994).

A financial service supplying small amounts of funds for low-income groups, microcredit is easy to mortgage and guarantee and has been encouraged and adopted worldwide, especially in developing countries, since the second half of the 20th century. Some successful cases have been recorded, such as programs by the Bangladesh Grameen Bank, Bancosol of Bolivia, and the Bank Rakyat Indonesia (Hartarska and Nadolnyak, 2008; Hossain, 1988). These cases showed that microcredit contributed to the improvement of local people's income, education, and social status (Hartarska and Nadolnyak, 2008; Hossain, 1988). Compared with the limited availability of legal loans in other developing countries, China's official rural credit programs have developed swiftly in response to the country's rapid economic development and

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government encouragement over the past 30 yr. Especially since 2004, the annually issued No. 1 Document of the Central Government has consistently emphasized the importance of rural financial development and has promoted microcredit as the core of the evolution of rural financial systems. Consequently, the opportunities for herders to get loans through legal channels have greatly increased and the use of loans has become common in China's pastoral areas.

Although most research about pastoral areas refers to microcredit as an effective way to help herders overcome climatic disasters and commonly recommends that herders have good access to loans (Addison and Brown, 2014; Carter et al., 2007; Ouma et al., 2011), such research has seldom if ever taken note of the fact that the highly variable and uncertain annual precipitation and temperatures in semiarid areas, the integration of herders into markets, and evolving rangeland management policies might make the microcredit itself a source of risk for herders.

Studying the change in livestock production from collective management to individual management caused by the disintegration of the Soviet Union in Mongolia's pastoral areas, Sneath (2012) noted that individuation led to increased herder demand for loans because each herder household had to cope with environmental and market changes independently—they lost the inherent “insurance” of being in a larger production unit. Taking loans became more and more common in Mongolia's pastoral areas, somewhat similar to what happened in the 1920s before the collectivization of the socialist revolution. At that time accumulated debts had become a potential cause of social instability in Mongolia. Other researchers found that in the Qing dynasty, from the 18th to 19th centuries, it was common for Mongolian herders to borrow from Han Chinese businessmen. By the late 19th century, more and more herders fell into serious debt. In some places, total household debt exceeded the total value of household assets. Debts continued to accumulate, and by the early 20th century some debts could not be repaid (Bawden, 1968; Sanjdorj et al., 1981). During the 1940s, there were about 200 Han Chinese businessmen and investors from Tsarist Russia and other countries lending money in Mongolia's pastoral areas. Almost all the herders fell into debt. Taking Siziwang Banner as an example, debt accounted for 30%–40% of annual livestock income (Dalintai and Zheng, 2010; Department of Agriculture and Animal Husbandry in Inner Mongolia Autonomous Region, 2000).

However, a systematic analysis of why herders come to require loans, and why herders with loans tend to fall into such a vicious cycle of increasing debt, is not found in the current literature. As an anthropologist, Sneath (2012) placed his research within the context of Mongolia's market reforms and discussed issues caused by loans from the perspective of neoliberalism economics. He did not consider the highly variable weather conditions of semiarid rangelands and how, under these conditions, loans put livestock production at risk and lead herders down the path of “taking loans, raising animals, repaying loans, and then taking even larger loans.” Therefore, this paper addresses the following questions using a case study approach and empirical analysis for three villages in Inner Mongolia's semiarid rangelands: Under climatic variation, why do herders need microcredit? What impact does microcredit have on herder livestock production? Is it hard for herders to repay their debts and why? We examine the kinds of

loans taken out, borrowing purposes, livestock sales, income, and costs for households in three villages in Inner Mongolia.

## Methods

### Case Study Sites

We selected three gachas (villages in Mongolian) with a total of 202 herder households as case study sites, located in Hexigten Banner, Inner Mongolia, for a qualitative interview-based approach. Field work was conducted from July to August in 2013. Sixty-three structured and semistructured interviews were randomly conducted with herder households, and open interviews were conducted with local government representatives. During this process, we focused mainly on herder loans and the impacts of the loans on livestock production from 2010 to 2012, including each household's loans, repayment history, livestock marketing, income, and expenditures, and the impacts of weather variation.

Hexigten Banner is a midlatitudinal region with a semiarid continental climate. The average annual precipitation is about 350 mm, with uneven spatial distribution, high annual variation, and obvious seasonal differences (Government of Hexigten Banner 2013). Between April and October, precipitation falls mostly as rain while it falls mostly as snow between November and March. During 1981 and 2012, the coefficient of variation in precipitation from April to October was 21.44% and from November to March it was 40.98%. Snow disasters in winter and droughts in spring and summer are the most frequent “climatic disasters” in this area (Government of Hexigten Banner 2013). Also during 1981 and 2012, the average temperature between April and October was approximately 13.2°C and between November and March it was –10.8°C.

In our case study sites, after a drought in the summer of 2009, the three gachas experienced disastrous severe snow and low temperatures at the beginning of 2010 followed by severe drought in the spring of that year. Rainfall conditions got slightly better in 2011. In 2012, rainfall was much better than in 2011 and 2010. Livestock prices and sales are typically on a per-head basis. Annual livestock prices are mainly driven by the external market, although the fatness of individual livestock, related to the timing of sales in a year, also affects prices. On the basis of the interviewed households' information collected by fieldwork in 2013, sheep prices in winter were usually about 60% of those in autumn and cattle prices in winter were only about 50% of those in autumn, so local herders normally avoid selling livestock in winter. Sheep prices in autumn steadily increased between 2009 and 2011 but fell in 2012. In 2010, cattle prices in autumn were lower than those in 2009 but increased in 2011 and 2012, exceeding 2009 price levels (Table 1).

Local herder households start cutting forage in late August or early September. In October, they start selling their livestock. The first use of the income is to purchase more forage if their own hay is not enough for feeding all the livestock through the winter. Secondly, they pay for their food and clothing and for equipment maintenance for the coming winter. Herder households start feeding their livestock in pens in

**Table 1**  
Median Autumn livestock price per head 2009–2012 (RMB) in the three Inner Mongolian case study villages

Year	Cow	Two-year-old calf	Calf	Ewe	Lamb
2009	3175	3100	3000	410	340
2010	2200	2500	1200	550	450
2011	4000	3500	3400	925	750
2012	5200	5600	5300	785	670
Mean ± S.D	3644 ± 1272	3675 ± 1348	3225 ± 1682	668 ± 231	553 ± 190
C.V	34.91%	36.67%	52.16%	34.62%	34.42%

Note: This data was collected by fieldwork in 2013. Different households sell livestock at different prices in the same year. The prices shown in this table are the median prices for the corresponding year.

early November. In February or March of the next year, they need to decide whether or not to purchase additional forage based on temperatures, snow melt, and how much hay they have left. Finally, in May or June when the grass turns green, all the livestock are put on pasture.

The loans of local herders can be classified into two types according to their source. One type is a regular loan from local financial institutions like Rural Credit Cooperatives. Herders are permitted to apply for this kind of loan from October to the end of the year at a monthly interest rate of 1.2%. The interest is calculated and paid every 3 months. Rural Credit Cooperatives consider livestock production to be a high-risk industry. They believe they will be exposed to a higher risk of not recovering the funds if they offer a long repayment period to local herders, so they normally offer loans for only 1 yr. Herders have to repay the principal and the remaining interest before October of the next year at the latest, or they are not allowed to apply for new loans from Rural Credit Cooperatives. As Rural Credit Cooperative loans are guaranteed by the household's livestock, households with few livestock are rarely able to get loans. Such households have to rely on another type of loan, usurious loans at 3% per month from individual businessmen or private microcredit companies. In contrast to loans from the Rural Credit Association, local herders can get this type of loan any time of the year.

#### Analytical Methods

The analytical framework is presented in Figure 1. With regard to the first question, in order to analyze why herder households need loans, household loan amounts, loan purposes, and production expenses in different years were collected for selected households in each case study site.

Then to address the impacts microcredit has on herder livestock production, household expenditure structure, the proportion of household annual income going to loan repayment and livestock sales by households with and without loans, was used to analyze the pressure on household livestock production imposed by loan repayment costs and why the expected benefits of the loan were not achieved.

Finally, for the third question about the reasons households generally cannot repay their debts, the impacts of weather and the livestock market on household annual incomes and expenditures over time, and thus repayment ability, were analyzed. Then the changes in loan

**Table 2**

Loans taken by interviewed household between 2010 and 2012 for the three Inner Mongolian case study villages

Year	2010	2011	2012
Households without loans	10	11	11
Households with loans	53	52	52
The proportion of households with loans	84%	83%	83%
Loan amount per household (thousand RMB)	39.3	34.5	41.0
Mean of loan amount $\pm$ S.D	38.3 $\pm$ 3.4		
C.V	8.81%		

amounts for households with loans were analyzed to examine further why households struggled with repayment and kept taking new loans.

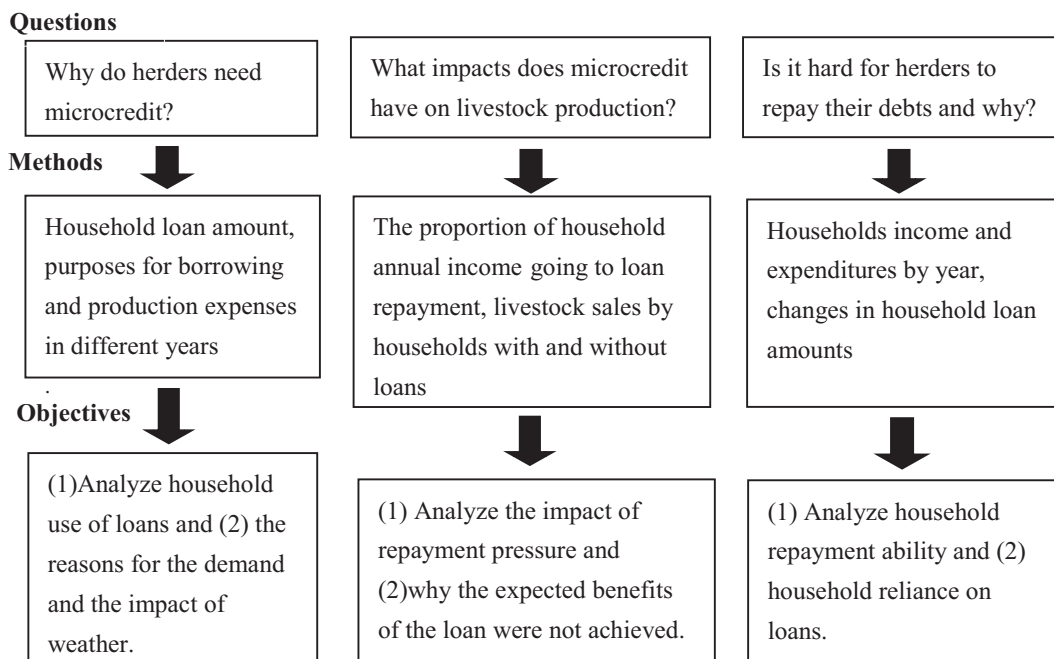
#### Results

Results address the three main questions of this study, about why herders need credit, the impacts of credit on livestock production, and household ability to repay debts.

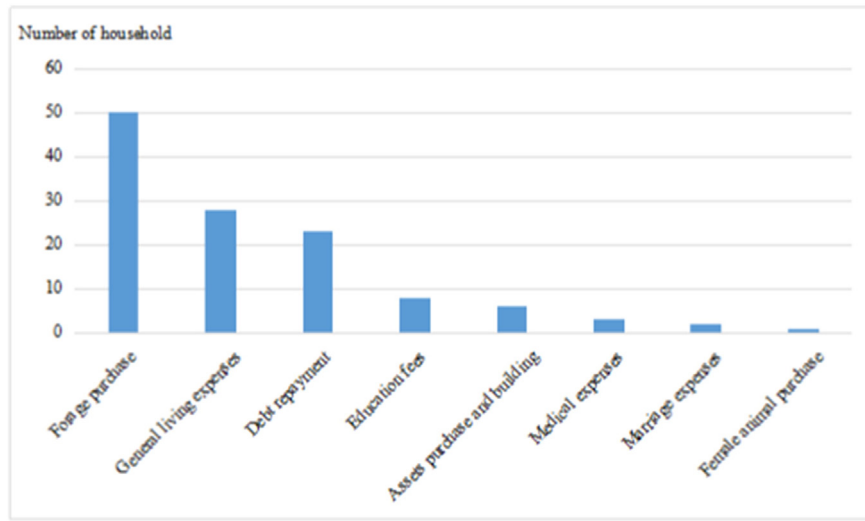
##### Why Do Herders Need Microcredit?

The Rural Credit Cooperatives in our case study sites began providing microcredit for herders in 1998. Only a few households could get a loan, and each household could only get 500 RMB at most, as total funds were limited at that time. However, the number of households taking loans has increased quickly since 2006. By the time we conducted our survey, loans were already common to local herder households. In our case study areas, > 80% of interviewed households had loans between 2010 and 2012 and the average amount per household was nearly 40 000 RMB (Table 2), including regular loans offered by the Rural Credit Cooperatives and usurious loans. Comparatively, an average midlevel livestock production income in these villages was just around 56 800 RMB between 2010 and 2012.

When we asked why so many households have loans, interviewed herders said: "Before that time (2006) we didn't borrow that much money. In 2006 and 2007, we suffered droughts. Buying forage cost each household tens of thousands of RMB. So we had to rely on loans." "Borrowing only 20 or 30 thousand RMB was useless. During this 2-yr continuous



**Fig. 1.** Analytical Framework.



**Fig. 2.** Reasons for taking loans given by the 61 households with loans between 2010 and 2012 in the three Inner Mongolian case study villages. Note: General living expenses refer to those daily expenses including food, clothes, and communication, etc.

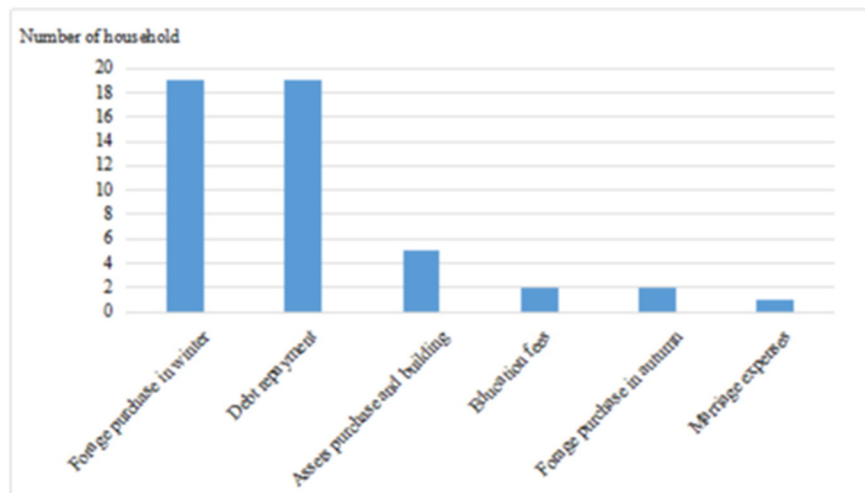
drought, buying forage cost us quite a lot of money” (so the loans were large and hard to repay). “Starting at that time, for 3 or 4 yr, livestock were cheap. The money earned by selling livestock was not enough to repay the last year’s loan” (so we had to continue to take out loans).

Of the 63 interviewed households, there were only 10 without loans in 2010 and 11 without loans in 2011 and 2012. For the 61 households with loans between 2010 and 2012, the purposes for borrowing that they reported included basic production and living needs (forage purchase, general living expenses, child education fees, medical expenses, and marriage expenses); production expansion demands (asset purchases, pen building and maintenance, and female animal purchase); and debt repayment (Fig. 2). Among these needs, forage purchase was one of the most common reasons for borrowing, with 82% of households (50) mentioning that forage purchase was their primary purpose for borrowing overall. Nearly half, 46% of households (28), mentioned they had taken loans to support general living expenses. In addition, 38% (23) of households used new loans to repay previous debts. In comparison, only five households borrowed funds for asset purchases and house building. One household used loans to purchase female animals.

There were 40 households that took out usurious loans between 2010 and 2012, or 63% of the interviewed households. The purposes of taking such loans are mainly forage purchase in winter and debt

repayment (Fig. 3). It is worth noting that local herders divide forage purchase activities into forage purchased in autumn and in winter. Only two households took usurious loans to purchase forage in autumn, when regular loans are available. Most forage purchasing happens in autumn for livestock feed for winter, but households have to purchase additional forage in late winter if forage reserves from autumn turn out to be insufficient or spring green up is delayed.

The use of usurious loans is linked directly to this weather uncertainty. When herder households start to reserve forage for winter, the amount of forage they purchase depends mainly on the winter weather conditions they anticipate. However, it is difficult to make accurate predictions in semiarid, highly variable, and unpredictable climatic conditions. If the forage reserved in autumn turns out to be insufficient, households must purchase additional forage early in the new year when Rural Credit Cooperatives are no longer lending. By this time households are lacking monetary resources due to earlier forage purchases, debt repayment, and purchases of other commodities necessary for winter. Additionally, forage prices in winter are much higher than in autumn (Table 3) and livestock prices are often depressed (60% of autumn prices for sheep and 50% of autumn prices for cattle). As a result, households have no alternative but to rely on usurious loans for unanticipated winter forage needs.



**Fig. 3.** Reasons for taking usurious loans given by the 40 households with usurious loans between 2010 and 2012 in the three Inner Mongolian case study villages.

**Table 3**

Weather conditions, forage expenses and prices between 2010 and 2012 for the 63 interviewed households in the three Inner Mongolian case study villages

Year	2010	2011	2012
Climatic conditions	Spring and summer droughts	Only spring drought	No droughts
Forage price in autumn (RMB per kilogram)	0.46	0.79	0.58
Forage price in winter (RMB per kilogram)	1.45	1.18	1.08
Forage expenses per household (thousand RMB)	32.3	23.6	22.5
Mean of forage expenses $\pm$ S.D		26.1 $\pm$ 5.4	
C.V		20.54%	

In short, it is obvious that the primary purpose of taking either kind of loan is to purchase forage to prevent livestock from declining in winter. Especially in years when droughts in spring and summer have reduced overall forage supplies, households have to purchase more forage in order to avoid selling large numbers of livestock, especially breeding females, and losing the ability to recover production in the future without having to purchase new animals. Drought greatly increases forage expenses during such years. The forage expense per household in 2010, a drought year, was much higher than in 2011 and 2012 (see Table 3). Households had to rely on loans to cope. Further, even though the weather in 2011 and 2012 got better and the forage expenses per household decreased, the number of households that took loans and the loan amount per household did not correspondingly decrease (see Tables 2 and 3). The reason is that many households (81% in 2011 and 56% in 2012) did not have enough money to sustain production and pay for living expenses after repaying debts from the previous year. Consequently they had to rely on new loans again to sustain their production and pay for their living expenses in the following year, falling into a cycle of borrowing that they could not escape.

#### What Impacts Does Microcredit Have on Herder Livestock Production?

Loan repayment pressures reduce productive capacity and income. Maintaining a certain number of livestock, especially of reproductive animals, is the key to the sustainability of livestock production for local herders. Prices for repurchasing female animals are much higher than the prices obtained when herders must sell them at low weight in winter or during drought. Therefore, households are not usually willing to sell female animals. However, when the due date for repayment comes, households with loans have to consider the repayment expense in addition to forage and living expenses for the year to make decisions about selling livestock. As an interviewed herder said: *"In the past we didn't borrow that much money. The biggest expense every year for us was forage purchase. But now it is often loan repayment. Every year most of our earnings go to paying our debt."*

In 2011 and 2012, for interviewed households needing to repay loans, debt repayment accounted for 40% and 38% of their total annual expenditures per household, respectively. In 2011 and 2012, loan repayment was the biggest part of total household expenditures for 79% and 78% of the households with debt, respectively. In 2011 and 2012, the interviewed households with debt had to spend 72% and 42% of their total annual household income on loan repayment. This kind of pressure

**Table 4**

Livestock sales for interviewed households with and without loan repayment in 2012 (head/per household) in the three case study villages, Inner Mongolia

	Households with loan repayment (52 households)	Households without loan repayment (11 households)
Total sheep in summer	76	72
Total cattle in summer	44	49
Sheep sold	16	12
Cattle sold	12	14
Sheep sales rate	21.1%	16.7%
Cattle sales rate	36.4%	28.6%

Note: Sheep and cattle sales rates refer to the proportion of household sheep or cattle sold.

on income forced households with debt to increase livestock sales. When we look at household livestock sales in 2012, households needing to repay loans sold more than those that did not (Table 4). The increased livestock sales caused by repayment pressure had a negative impact on household livestock productive capacity. Due to the impacts of repayment pressure, the expected benefits of the loans are rarely achieved. As an interviewed herder said: *"Taking loans was supposed to help us avoid selling too many livestock in disaster years in order to maintain and further increase livestock numbers in the next few years, as it takes a couple of years to increase herd size even when climatic conditions are good. However, the repayment period for the loan is only 1 yr, so we have to sell livestock to repay our loan before livestock numbers have increased."*

#### Is it Hard for Herders to Repay Their Debts and Why?

Local herders mainly sell their livestock through external markets, and as they are in a perfect market, others in the livestock market have greater market power and livestock prices are mainly under the influence of external factors. As a result, herder households are mostly price takers, without much room to negotiate. Whether microcredit can help increase the resilience of household livestock production apparently depends mainly on the weather and livestock market, and the nonequilibrium dynamics of local rangelands means both are relatively unpredictable. The timing and amount of herder household income and expenses are largely influenced by weather and market factors, which though somewhat connected are not within the control of herders. In our case study sites, spring and summer droughts and winter snow disasters occur frequently and are difficult to anticipate, so households must essentially gamble on whether or not their forage stocks will get them through the winter months or a drought. If they lose, they have to borrow.

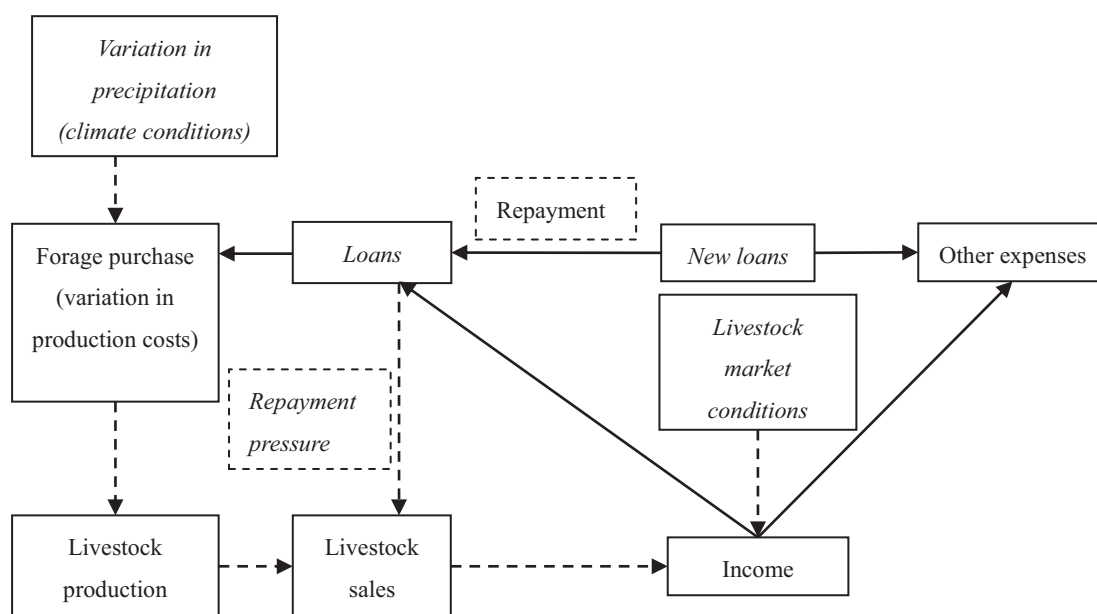
As in Table 5, livestock sales per household in 2010 and 2011 were higher than in 2012, but the annual income from livestock production per household was far lower than in 2012 due to depressed livestock prices during those 2 yr because many herders had to sell livestock due to poor weather conditions. At the same time, as spring and summer rainfall in 2010 and 2011 was inferior to that in 2012, forage expenses per household in these 2 yr were higher than in 2012 (see Table 3).

The unpredictability of weather and market conditions not only affects costs but makes the ability to repay loans within a 1-yr period uncertain, adding another source of risk for herder households. For instance, among the interviewed households, 53 took loans in 2010. Most of them (81%) found that their annual income (livestock production income plus a small amount of other income from things like dairy products and hay) couldn't cover their annual expenditures (the sum of forage expense, loan repayment, and other expenses) due to

**Table 5**

Livestock sales amount and income for the 63 interviewed households between 2010 and 2012 in the three case study villages, Inner Mongolia

Year	2010	2011	2012
Sheep sales amount per household	29	25	15
Cattle sales amount per household	17	11	12
Livestock production income (thousand RMB)	44.5	47.6	78.4
Mean of livestock production income $\pm$ S.D	56.8 $\pm$ 18.7		
C.V	32.98%		



**Fig. 4.** Interactions among climate variation, household production, and loans. Note: Each dotted arrow here means the effect of one module on other one. For instance, variation in precipitation and temperature would cause variation in forage expense. The solid arrows here mean actual fund flows.

the poor weather and market conditions in 2011. So these households had to bridge the gap with new loans. And this situation led to more repayment pressure on households and drove them into a cycle of borrowing and repayment that only led to greater debt and excessive annual livestock sales. Even 2012, when weather and market conditions improved, of the 52 households with loans, 29 of them (56%) still couldn't cover their annual expenditures with their annual income and had to rely on borrowing more to sustain their production and maintain their household. This situation of repeatedly borrowing is reflected in the fact that, among the 53 households with loans in 2010, 36% borrowed more money in 2011 and still more in 2012, while 38% of them borrowed similar amounts each year. Only 16% of households were able to reduce the amount they had to borrow each year.

## Discussion

As a financial service supplying small amounts of funds, microcredit has been used to support some small rural industries like handicraft production and poultry farming in many areas of the world and has successfully improved the incomes of local people (Hossain and Mahabub 1988; Hartarska and Nadolnyak, 2008; MKNelly and Dunford, 2013). But in our case study sites, the microcredit approach did not act as it did in many other previous successful cases. We argue that the reason is that weather conditions on semiarid rangelands are highly variable, with unpredictable annual precipitation. The interactions among climatic variation, household production, and loans are outlined in Figure 4.

The high levels of uncertainty in annual production are contrary to the predictability needed to anticipate the ability to repay a loan, for the borrower and lender, increasing risk. Annual variation in precipitation leads to uncertainty in production costs (here mainly due to forage expense). Intended as short-term funds from outside, loans were initially used by households to meet basic production demands, especially for purchasing forage in a year with bad weather. However, the unexpected repayment pressures of emergency usurious loans taken out in winter led households with loans to increase livestock sales the next year in order to get sufficient money to cover their debts, as well as their normal production and living expenses, which ironically was what herders wanted to avoid through loans. What's worse, due to frequent and unpredictable variation in weather and market conditions, more livestock

are sold in bad years and prices are lower, so income from sales can be much lower than in years with better market conditions. Under such circumstances, when poor climatic or market conditions occur, large numbers of households are unable to cover their total expenditures with their annual income and consequently have to take more loans to repay previous debts and sustain next year's production and livelihood needs.

On the basis of this analysis, we make the following conclusions. First, herder households seek microcredit when weather is poor, with the goal of using the microcredit to purchase sufficient forage to avoid selling too many livestock in order to keep livestock numbers and level of production stable. Unfortunately, poor years are inevitable but not predictable.

Second, after loans become part of the livestock production process, repayment pressure forces households to increase the number of livestock sold the year after taking a loan, with negative impacts on livestock production.

Third, the reason why herder households were unable to repay debts and had to keep taking new loans is that the high variation in weather combined with somewhat related market conditions in arid areas imposes large uncertainty on household production income and expenditures. This further made it difficult for herders to predict their repayment ability and adjust their production decisions the year after taking a loan. Thus, when there was a year with poor weather or market conditions, it was hard for households to cover their total expenditures with their annual income and they had to rely on new loans to repay previous debts. Then under the cumulative impact of repayment pressure, as well as weather and market uncertainty, they fell into the cycle of "take loans, produce, repay, and then take loans again," leading to reduced herd sizes and/or larger loans.

Future research could benefit from incorporating risk, Monte Carlo simulation, and stochastic efficiency analysis. These tools would add to the study of risk and how weather, input and output prices, and other macroeconomic factors influence the viability of pastoral households.

## Implications

From our study, we can see that the problems caused by microcredit in arid and semiarid areas largely result from the uncertainties of production income and expenditures due to the high annual weather and

market variation. For policy recommendations to counter this phenomenon, we suggest that extending the repayment period to accommodate the variation in weather and market conditions should be considered. The 1-yr repayment period is not enough to help herders to cope with increased production expenditures caused by unpredictable weather conditions and markets, so a relatively longer repayment period should be allowed to “smooth” this uncertainty. Secondly, some supplementary measures such as government subsidies for forage and support for livestock prices, or some form of forage insurance, might be better ways to help herders get out of the vicious loan cycle created by bad years. A “steady state”—based lending industry, which counts on being able to reasonably predict repayment ability, is in conflict with the fundamental uncertainties of pastoral livestock production on arid and semiarid rangelands. Compromises must include both conventional (longer repayment periods) and adaptive, unconventional programs (emergency loans, insurance, or subsidy programs that come into play during bad weather and market conditions). As it is, microcredit programs are adding another layer of economic risk for pastoralists in a highly dynamic social-ecological rangeland system that has traditionally focused on coping with already high levels of uncertainty and risk. More study of the impacts of nonequilibrium ecological dynamics like those on many rangelands on economic and policy institutions would help us understand why so many well-funded development initiatives have failed in such systems.

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