Research on the Value-Added Process of the Value Chain of Tibetan Sheep Based on the Rotational Grazing

Shengfu Zhang

School of Computer Science, Qinghai Minzu University, Xining, China
Email: 904455065@qq.com

***Abstract*—In the mode of rotational grazing, the herds of sheep from 11 herdsmen were monitored in such aspects as the plant yield of the grasslands, the production process of the herds of sheep and the corresponding market prices of mutton, the structure of the herd and the changes of the number, the cost composition and its change, and the process of value transfer among the entities of the external value chain within 15 months. On this basis, this paper attempted to deconstruct the relationship between the above factors and the value chain as well as the model of the value-added process of the value chain. Besides, it further analyzed the key factors which can affect how the value of the value chain can be added so as to optimize the rotational grazing, the grass-and-grazing balance, and the key points of management and control.**

***Keywords*—plant yield of the grasslands, the production process of the herds of sheep, the market prices of mutton, the structure of the herds of sheep, the value-added process of the value chain, the rotational grazing**

I. Introduction

In this paper, the grassland fragmentation shall be investigated, the dynamic productivity of the grassland shall be calculated, and the number and species of livestock shall be dynamically distributed. That is to say, the rotational grazing under the dynamic grass-and-grazing balance shall be researched, and the interaction between the production process of the Tibetan sheep and the factors of the value chain shall be investigated, especially the value chain-oriented influence on the production mode, so as to control the key points of the production process of the Tibetan sheep.

Li published 6 relevant articles successively from 2011 to 2012 [1–5] on "the series of studies of the administration of the grass-and-grazing balance", analyzed and evaluated the current calculation methods of the grazing capacity of the grasslands, and put forward "the technical ideas of limiting the resources of grasslands, adjusting the time mechanism and restricting with the economic leverage based on the calculation and administration mode to realize the grass-and-grazing balance". In the three articles published in 2014 [6–8], Xu further summarized the problem and calculation models of the grass-and-grazing balance in China". it was also suggested that "the future research of the grass-and-grazing balance in China shall focus on dynamically managing grasses and livestock of an adaptive nature and coordinating the ecological, social and economic functions of the production of grasslands".

In terms of the theory of value formation, forming the value of grazing the Tibetan sheep is determined by numerous links and factors in the value-added process of the value chain. The links include the grazing mode, the system of management, and such links as the breeding, the grazing, the transferring of pastures, the supplementary feeding, the producing, and the feeding, while the relevant factors include the weights, the numbers, the direct materials, the direct manpower, the manufacturing costs, the duration costs and the costs, benefits and profits. Based on these factors, it is the significant node of grasping the value-added process of the value chain to monitor how the performance, weights and quantities of the ewes, the lambs, the wethers, the eliminated sheep, and the rams change in the whole process, and to research on the production, the marketing, the slaughtering, the retailing and the logistics of the Tibetan sheep.

Hence, it is necessary to study the value-added process of the value chain corresponding to the production process, and then research the distribution of the incomes, costs, and profits in the process of production.

In monitoring the breeding process of "the integration and demonstration of the supporting technology for the efficient and comprehensive breeding of the Tibetan sheep in alpine grasslands" [9] based on the rotational grazing, the dynamic grassland productivity, the changing laws of the number of sheep and the main nodes of the appreciation of value under this breeding mode are mastered from the whole process of the pregnancy of the ewes, the period of lactation of the ewes, the early weaning of the lambs and the delivery of the fat lambs, which represents the current development direction of breeding livestock in the alpine grasslands.

The value-added process of each link in the production process of animal husbandry is the basic path to form the final incomes and profits. According to the survey, there are mainly two processes from the internal and external

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aspect. The main subjects of the external value chain are successively the production of the animal husbandry, the acquisition, the slaughtering and processing, and the retail, while the main internal production links include the breeding, the mating, the production, the lactation, the weaning, and other breeding links of the female animals, the fattening of wethers, and the management of eliminated sheep and breeding rams.

II. Monitoring the Production Process

A. An Overview of the Study Area

The study area is located in Heka Town of E 99°84'–100°03' and N 35°80'–35°96' in Heka Town, within the Sanjiangyuan National Natural Reserve in the eastern part of Qinghai Province. Diverse as the types of landforms in this area are, it is mainly characterized with mountains, with an elevation of 2,590–5,305 m. The average annual temperature is 0.5–6.1°C, the winter is durable while the summer is transient, the average annual precipitation is about 240–600 mm, the wind is strong with blowing sand, the yearly sunshine hours are 2670–2790 h, with strong solar radiation. The grasslands are of the cold and dry type, mainly with perennial bunch grasses.

To write this section, you will need to do a thorough literature search on different studies that relate to the broad topic of your research. This will introduce the readers to the area of your research. It would be ideal to organize them thematically and discuss them chronologically so that readers are aware of the evolution and progress in the field. In other words, separate themes should be discussed chronologically to highlight how research in those fields has progressed over time. This will highlight what has been done and what future directions need to be worked upon.

B. The Project for Trial

1) The performance test of the high-efficiency breeding of Tibetan ewes [10, 11]

2) Measurement of the internal value chain [11]

Indexes: What were monitored mainly include the periodic direct materials, the direct labors, the manufacturing costs, the period costs, the costs, the benefits, and the profit indicators of the natural cost status and the natural cost control status in correspondence to the value structure.

3) Measurement of the external value chain

First, the test duration and the experimental location. The experiment was conducted from August 1, 2018 to November 15, 2019 in three relevant enterprises or entities in Xinghai County, Gonghe County, and Xining City of Hainan Province, including herdsmen, purchasers, slaughterhouses, mutton stores, and consumers.

Second, the tested contents and the indexes. What were tested include the responsibility of relevant entities and the process of value transmission, the slaughter time and the prices of lambs, wethers, rams, and eliminated sheep, and the value-distribution structure of herdsmen, purchasers, slaughterhouses, mutton stores, consumers, and other related enterprises or entities.

Indexes: What were monitored mainly include the periodic prices of livestock of the natural cost status and the natural cost control status in correspondence to the value structure, the direct materials, the direct labors, the manufacturing costs, the period costs, the costs, the benefits, and the profit indicators.

III. An Analysis of the Experimental Result

A. The Grazing Model Based on the Plant Yield and the Grazing Capacity in Rotational Grazing

In the previous test of the dynamic grass-and-grazing balance [11] the data showed the grazing model of the plant yield and the grazing capacity in the rotational grazing. Fig. 1 reflects the process of plateau plants from greening stage, flowering stage, fruiting stage, and withering stage with the change in plateau climate. At the same time, it showed that the grass yield of the experimental group gradually increased from June 3 to August 24 and reached the peak with a high growth rate, and then gradually decreased, reaching the lowest level on December 16, with a high decreasing range. After that, it experienced a slow decline until June 2 of the following year, then sharply increased to a high point on August 18, and finally decreased at a relatively rapid speed to November 3. The control group, however, slowly declined to a relatively lower level from June 3 to August 12, then increased and abruptly reached a high point on August 19, then slowly declined to another low point on October 28 and rose to a high point on 4 November. So, it happened in turns.

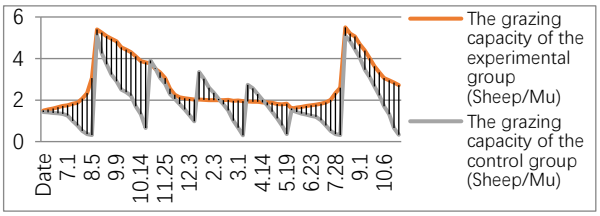

Figure 1. Plant yield per unit (author's self-painting).

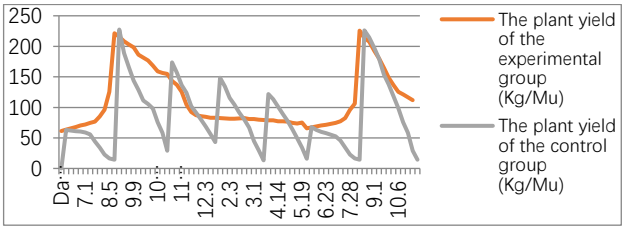

Figure 2. Grazing capacity (author's self-painting).

Fig. 2 shows that from June 3 to August 24, the grazing capacity of the experimental group gradually increased to the peak, with a large range of increase, and then gradually decreased, reaching a relatively lower level on December 16, with a large range of decrease. After that, it slowly decreased until June 2 of the following year, then sharply increased until August 18, and finally rapidly decreased until November 3. Similar laws with the grass yield were discovered in the grazing capacity, and similar distribution was also found in the control group.

B. Changes of the Weights

1) Changes of the weights of the Measurement of the external value chain

Fig. 3 shows the weight change, the weights of the ewes in the experimental group and in the control group both increased from August 1 to October 15, and the highest average weights of them appeared around October 15, which were 56.83 kg and 56.75 kg, respectively. Then, the weights began to decline. By the end of November, the pregnant ewes in the experimental group began to be fed supplementarily 45 days before delivery, the decline in the weights of them was relatively lower than that of the control group. The lowest point of the weights of the experimental group appeared around May 1 at 36.83 kg, while the lowest point of the weights of the control group appeared on April 15 at 28.52 kg. Each year, the grasses withered severely in April and May, after which the weights began to rise.

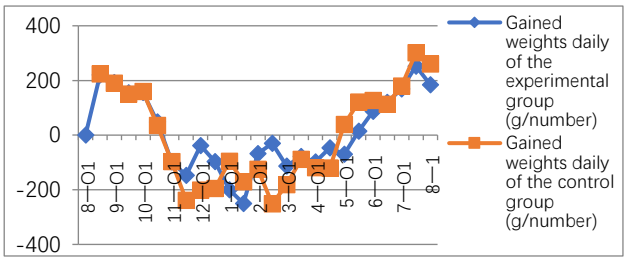

Figure 3. The gained weights of the ewes in pregnancy (author's self-painting).

2) Changes of the weights of the lambs and wethers

Fig. 4 shows that the birth weights of the lambs in the experimental group and in the control group were 3.66 kg and 3.23 kg, respectively, which were related to the supplementary feeding of the ewes in the experimental group in the late period. By the age of 6 months, the weights of the lambs of both the experimental group and the control group were in an upward trend, from the lowest point of the birth weight to the highest point on June 15. The growth followed a linear trend, and the highest growth point was reached on June 15 at 113.83 g. The growth of the experimental group was relatively stable, with an average increase of 106.23%. The highest growth point of the control group was reached on June 15 at 104.37. The average rate of increase was 83.48%. Fig. 5 shows that the weights of the wethers began to gradually increase from June of that current year to reach the highest point on October 1, with the experimental group and the control group at 32.16 kg and 27.91 kg, respectively, and with the growth rates of 50.56% and 63.79%, respectively. After that, the average increase rate of the experimental group was 10.13%. The control group decreased gradually from October 1 to the lowest point of 18.27 kg in mid-May of the following year, with a decrease rate of 33.65%, which was 23.37 kg lower than that of the experimental group during the same period. Then, its weight gradually increased to 29.65 kg when slaughtered in October of the second year, which was only 2.03 kg higher than the 27.62 kg in the same period of last year.

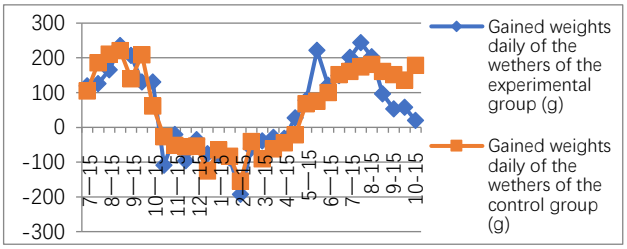

Figure 4. Gained weights daily of the lambs (author's self-painting).

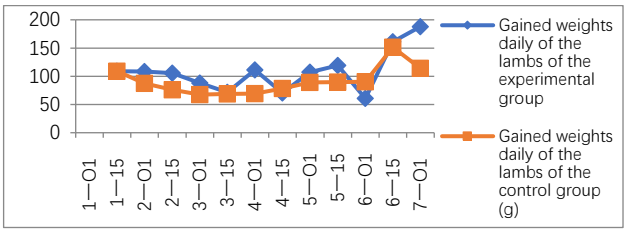

Figure 5. Gained weights daily of the wethers (author's self-painting).

C. The Quantitative Structure of the Herds and the Changes

1) Results of the investigation

An investigation on the structure of the herds of sheep, the Marketing Conditions and the Herdsmen's Incomes, Fig. 6 shows that the survival rate of the experimental group was higher than that of the control group, and the survival rate of the experimental group and the control group decreased gradually, at a steady 91.49% and 76.67%, with a decline of 8.51% and 23.33%, respectively. The average decrease rates were 93.97% and 86.41%, respectively. The lowest points of the experimental group and the control group were 91.49% on April 1 and 86.67% on March 15. The statistical data show that the lambing rate of the ewes in the experimental group at 95.73%was higher than the 78.20% of the control group, and the loss and death rate of the experimental group at 2.14% was lower than the 9.38% of the control group.

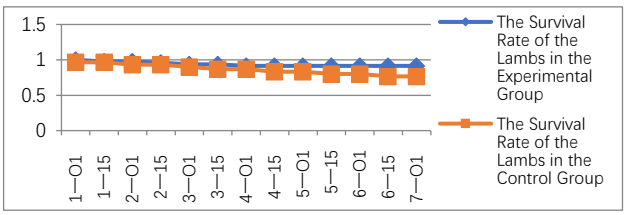

Figure 6. Survival rate of the lambs (author's self-painting).

Tables I and II show the structures of herds and the marketing numbers of the experimental group and the control group on November 1, 2018 and November 1, 2019. The quantity of the ewes for delivery was basically stable, and the sum of the quantities of the backup ewes and the backup rams was about equal to the number of the eliminated sheep. In addition to the eliminated sheep, the marketing numbers of lambs and wethers were relatively higher. In general, the number changed in January and October, and the types and numbers were shown in the sequence of the lambs, the ewes for delivery, the eliminated ewes, the backup ewes, the backup rams, and wethers.

TABLE I. THE STRUCTURE OF THE HERDSMEN' HERDS AND THE MARKETING CONDITIONS (2018.11) UNIT: SHEEP (AUTHOR'S SELF-PAINTING)

Proportion of the ewes for delivery (%)	Herds of sheep in total	Structure of the herd					Marketing quantity						
		Ewes for delivery	Breeding rams	Back-up ewes	Back-up rams	Two-year-old wethers	Eliminated ewes	Eliminated rams	Fat lambs	One-year-old wethers	Two-year-old wethers	In Total	Marketing Rate (%)
90	260	234	7	38	2	17	41	2	148	12	17	220	45.32
89.14	175	156	5	26	1	13	26	1	73	4	13	117	36.94

TABLE II. THE STRUCTURE OF THE HERDSMEN' HERDS AND THE MARKETING CONDITIONS (2019.11) UNIT: SHEEP (AUTHOR'S SELF-PAINTING)

Proportion of the ewes for delivery (%)	Herds of sheep in total	Structure of the herd					Marketing quantity						
		Ewes for delivery	Breeding rams	Back-up ewes	Back-up rams	Two-year-old wethers	Eliminated ewes	Eliminated rams	Fat lambs	One-year-old wethers	Two-year-old wethers	In Total	Marketing Rate (%)
88.76	258	229	7	39	2	17	41	2	143	20	17	206	43.01
82.46	171	141	5	26	1	14	27	1	119	11	13	171	26.53

2) The changes of the number of the herds of sheep

Figs. 7 and 8 show that the experimental group and the control group developed in the similar trends, and the change of the total number of the herds of the experimental group was greater than that of the control group. There was little change in the number of the ewes for delivery, and there was loss and death in the late period of pregnancy and lactation in the relatively cold winter. The loss and death of the experimental group was less than that of the control group. In June, about one sixth of the backup ewes were transferred to the herds of the ewes for delivery, and at the same time, about one sixth of the ewes for delivery were transferred to the herds of the eliminated sheep, but there was scarce any change in the total number. The breeding rams were generally arranged according to the one-to-four proportion of the ewes for delivery, and the number of them was relatively stable. After the mating each year in September, one fourth of the breeding rams would be listed as the eliminated sheep, but in August, the same number of the eliminated breeding rams would be supplemented from the backup breeding rams. Lambs began to be born at the end of December, and the delivery of ewes ended at the end of January, with the number of the lambs reaching the peak. The experimental group had less loss and death than that of the control group, and the curve was basically linear. In June, backup rams and backup ewes were selected from the lambs through the breeding selection, and the number of them was related to whether the herders would expand their production scale. If the production scale would be expanded, more backup rams and backup ewes would be retained, and vice versa. In general, the same number of the eliminated ewes for delivery would be supplemented by the backup ewes. The remaining ones would be sold as fat lambs before the grasses turned green again. The information of the fat lambs is not shown in the figure. Part of them would be raised as mutton sheep, and for most of them were male lambs, they would be raised as one-year-old wethers after castration. The herds of the wethers were composed of the one-year-old wethers of the current year and the two-year-old wethers of last year. The number of the wethers varied greatly from August to October, and began to decrease from October. After that, it remained stable until June of the next year, and began to increase again, and then decreased after October, indicating that the one-year-old wethers and the two-year-old wethers of the last year would be sold before the yellow grass withered in mid-October of the current year, and according to the conditions of the fodders and labors, some one-year-old wethers would be reserved for sale as the two-year-old lambs to be sold in mid-October of the next year.

As to the matching conditions of the grasses, the number of sheep began to increase sharply from January, but the demand for natural forage grasses did not increase due to the supplementary feeding of the ewes from December. Except that, the lambs had been in the period of lactation, and they rarely consumed any natural forage, so there was instead a decrease to a certain degree. In April, the lambs in the experimental group were weaned. Although there was a certain amount of supplement feeding, they began to feed on forage grasses in grazing process. In addition, the number of sheep per unit also increased, and the total number was larger than that in October of the previous year. For these reasons, the demand for forage grasses was also large, but at this time, the grass yield and the nutrient requirement has been declining until the beginning of June. Most of the lambs would be sold soon, so there was necessary need for lambs.

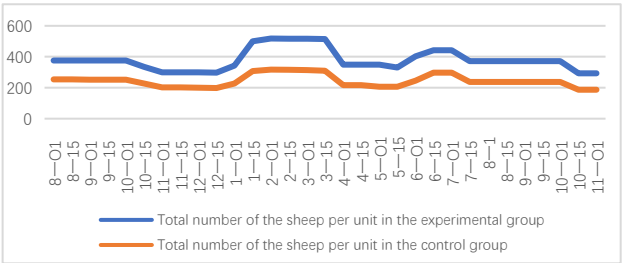

Figure 7. Changes of the total quantity of the herds (author's self-painting).

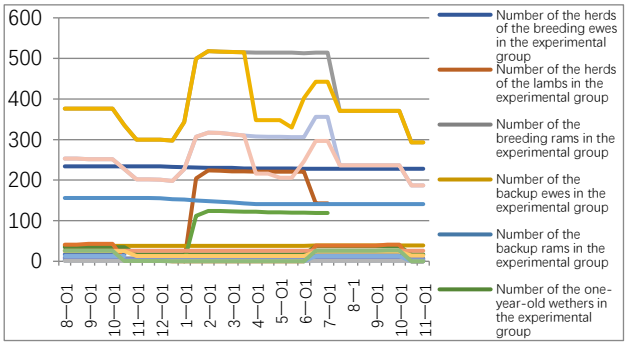

Figure 8. The changes of the ewes for delivery, the lambs and the wethers (author's self-painting).

3) The distribution of the sale prices of the mutton and lamb in the experimental period

According to the price trend of the beef and mutton in Qinghai Province released by the National Development and Reform Commission of Qinghai Province and the prediction for the later period, the retail prices of beef and mutton from August 2018 to October 2019 were 28.2, 29.6, 29.6, 30.5, 31.5, 32, 31.5, 31.30, 31, 29.6, 31, 31.8, 33, 34.1, and 35, respectively. By investigating the cost-benefits and the profit status of different stakeholders of the value chain, the distribution of prices among different stakeholders is shown in Figs. 9 and 10:

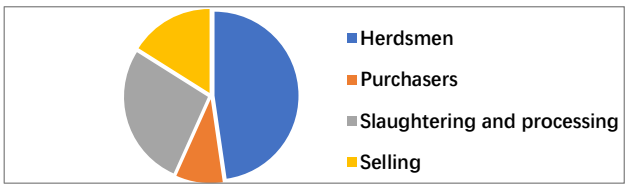

Figure 9. The main unit of price distribution in external value chain (author's self-painting).

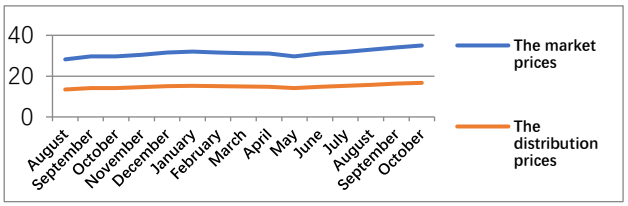

Figure 10. The market prices of Mutton and the Herders distribution prices (author's self-painting).

The survey and its data show that the herdsmen, the purchasers, the slaughtering and processing plants, and the sellers were the main sales in the industrial chain, and the interests of the entities were a dynamic process of game, affected by the price, the cost of each link, the degree of information acquisition, the strength of the entities and other factors.

According to the above data, the proportion distributions of the pie chart were 37.8%, 9.08%, 35.12%, and 18.06%, respectively. The herdsmen's wholesale prices of mutton were 13.64, 14.12, 14.62, 15.09, 15.57, 16.06, 16.54, 17.03, 17.51, 17.99, 18.48, 18.96, 19.44, 19.93, and 20.41 in each correspondent month. In this period, the herdsmen's income was relatively higher. The data of the previous year shows that the herdsmen had only 10.2% in some years, while the slaughterers and the sales accounted for as high as 48.79% and 32.14%, respectively. For the long cycle of the herdsmen's production with large investment, their income and investment were disproportionate.

IV. The Appreciation of the Value Chain

The realization of the Tibetan sheep's value is reflected in every aspect of the production process, as well as in the cost-benefits and profits of the value composition. Therefore, the monitoring of the cost-benefits and the profits of each type of sheep in each growth cycle is the basic link of the analysis of the value chain.

A. The Value Chain and Its Appreciation

Michael Porter first proposed the concept of the value chain in his book Competitive Advantage. He believes that each enterprise is a collection of the design, the production, the marketing, the delivery, and various activities supporting raw products, and all these activities can be expressed in the value chain. He points out that the value chain of a certain level is a combination of various activities within a particular industry [12].

Porter mainly expounds the value chain from the identification of value activities and the internal connection of the value chain and so on.

B. The Route of Analyzing the Value Chain

According to the theory of the value chain, the activities and the operations of the high-efficiency breeding and the general breeding based on the value chain are sorted out, and the value-added structure of the value chain is constructed (Fig. 11). According to the sequence of the process of biological reproduction, the individual costs, are calculated, thus forming the value-added chain of the production process of the herds of sheep under the supplementary feeding and the natural grazing. Combined with the selling and transporting, the slaughtering and processing of the later phase, the retailing, and other links, a complete process of the value chain is formed, so as to analyze the process of the value chain.

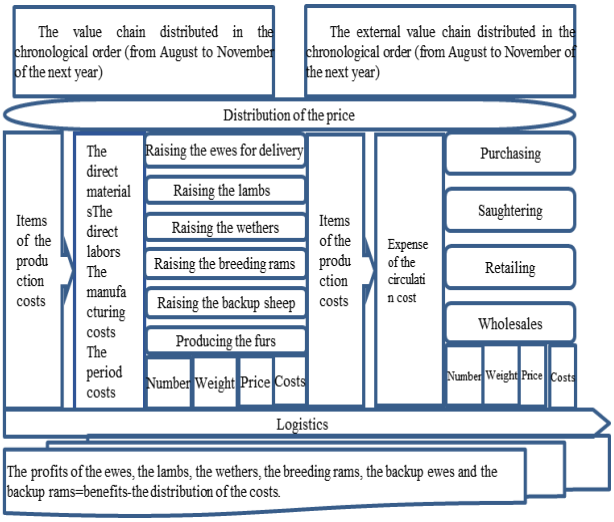

Figure 11. The figure of the structure of the appreciation of the value chain (author's self-painting).

C. The Factors and the Construction of the Appreciation of the Value Chain of Breeding Tibetan Sheep

The main factors in analyzing the appreciation of the value chain in this paper include the changes in the numbers, weights and prices of the ewes, the breeding rams, the lambs, the back-up ewes, the back-up rams, the wethers, and the eliminated sheep in each period. Meanwhile, the cost components in the production stage mainly include the direct materials, the direct labors, the manufacturing costs, and the period costs. In addition, such aspects as the breeding of the herds of sheep, the human resources, the facilities and equipment, the sales, the customers and the finance are also considered.

D. The Business Process of Value Appreciation

Through monitoring, it was found that the business process of breeding the Tibetan sheep develops like this: the ewes for delivery enter oestrus in August, the mating period begins, the supplementary feeding should be practiced in the late period of pregnancy, the supplementary feeding continues to January for the ewes to give birth to lambs, the lambs are weaned in March or June, some of the lambs are sent to the market in June, the backup ewes and the backup rams are selected to be bred and the wethers are castrated, some of the one-year-old wethers and 2-year-old wethers of the last year shall be sent to the market in October, and the two-year-old wethers should be sent to the market in October of the second year.

E. The Calculation Methods of the Appreciation of the Value Chain of the Link of Production

Activity-Based Costing (in short, ABC) refers to the indirect cost-allocation method that takes the activity as the object of the indirect cost collection, collects the resource costs to the activity through the confirmation and measurement of the resource motivation [13].

Activity-Based Costing can be applied to the cost accounting in sheep farms. The specific process is to treat a sheep farm as a whole activity, and then allocate resources to the herds of sheep according to the motivation.

F. Relevant Agreements and Calculation Methods

In the grazing mode, the natural costs of the experimental group and of the control group refer to the calculation methods of the appreciation of the value chain without considering the costs of the grassland for grazing.

The calculation period: It takes 15 months to breed the backup ewes. The production cycle of the ewes for delivery is usually 6 years, and the breeding of the backup rams needs 17 months. The production cycle of the breeding rams is generally 4 years. After the production cycle, the ewes for delivery and the breeding rams can be eliminated and sold after 5 months and 2 months of fattening respectively. The wethers are sold in October (9 months) of the current year or in October (18 months) of the next year. Therefore, the monitoring time is defined as the process from the mating of the ewes for delivery to the selling of the fat lambs and the selling of the one-year-old and two-year-old mutton sheep, which covers the basic process of grazing and breeding livestock. Namely, 15 months should be taken as the calculation cycle. The number of sheep will change significantly in October, January, February and June of each year.

$$\begin{aligned}&\text{The distribution of the labor costs} = \text{the unit price} \times \text{the number of people} / \text{the total number of sheep} \times \text{the number of this kind of sheep}\end{aligned} \tag{1}$$

$$\begin{aligned}&\text{The distribution of the fixed costs in the same period} = \text{the purchasing cost} / \text{the service life} / \text{the times of annual use} / \text{the total number of sheep in the same period} \times \text{the number of this kind of sheep} \\ &+\text{the construction cost of sheep houses} / \text{the service life} / \text{the times of annual use} / \text{the total number of sheep in the same period} \times \text{the number of this kind of sheep}\end{aligned} \tag{2}$$

$$\begin{aligned}&\text{The expenses for the same period} = \left(\begin{array}{l}\left(\begin{array}{l}\text{the fuel consumption per kilometer} \times \\ \text{the price of diesel per unit}\end{array}\right) \\ \times \text{kilometers}\end{array}\right) \\ &/\text{the total number of sheep per unit} \times \text{the number of the sheep of the same type} + \\ &\left(\begin{array}{l}\text{the drinking water per day of the adult sheep} \\ \times \text{the number of the sheep of the same type} \\ /2000 \times \text{water price} \times 30 \text{ days}\end{array}\right)\end{aligned} \tag{3}$$

$$\begin{aligned}&+\left(\begin{array}{l}\text{the electricity price per unit} \times \\ \text{the number of electrical appliances} \\ \times \text{the hours of application per day} \times \\ 30 \text{ days}\end{array}\right) \\ &/\text{the total number of sheep} \times \text{the number of the sheep of the same type} + \\ &\left(\begin{array}{l}\text{the coal price per} \\ \text{unit} \times \text{the coal} \\ \text{consumption}\end{array}\right) / \text{the heating months} \\ &/\text{the total number of the herds of sheep} \times \text{the number of the sheep of the same type}\end{aligned} \tag{4}$$

$$\text{The distribution of the direct material costs} = \begin{pmatrix} \text{the quantity of the supplementary} \\ \text{feeding} \times \text{the price of fodders} \\ \text{per unit} + \text{quantity} \times \text{the price} \\ \text{of the hay per unit} \end{pmatrix} \times \text{days} \quad (5)$$

$$\text{The costs} = \text{the direct labor} + \text{the direct fodders of grasses} + \text{the manufacturing costs} + \text{the period costs} \quad (6)$$

$$\text{The profits} = \text{the incomes} - \text{the costs} \quad (7)$$

The slaughter rate is recorded as 48%. The losses are accounted into the expense of the current month. The cumulative cost of selling sheep together with sheep of the same number is included in the value of these batch of sheep. Like the costs, the profits and the incomes are divided into the incomes and profits of each kind of sheep in the current month and at the end of the period, and simultaneously, they are also accounted as the total interests and profits of each kind of sheep in the current month.

V. An Analysis of the Process of Appreciation of the Value Chain

Based on the above analysis, the costs, incomes, and profits of the herdsmen are the results of the comprehensive accounting of all the above products, and are also formed by the comprehensive transformation. On the whole, as shown in Fig. 12, the incomes and profits mainly come from the sale of the wethers and the eliminated sheep in October and the sale of the fat lambs in June, while the costs mainly derive from the ewes in the late phase of pregnancy and lactation from November to March of the following year, the supplementary feeding of the lambs during the lactation from January to February, and the changes in the numbers of the wethers, the backup ewes and the backup rams in June and October. The costs also include the direct labors, the machinery, the depreciation of sheepfolds, the water and electricity and the consumption of fuels, etc.

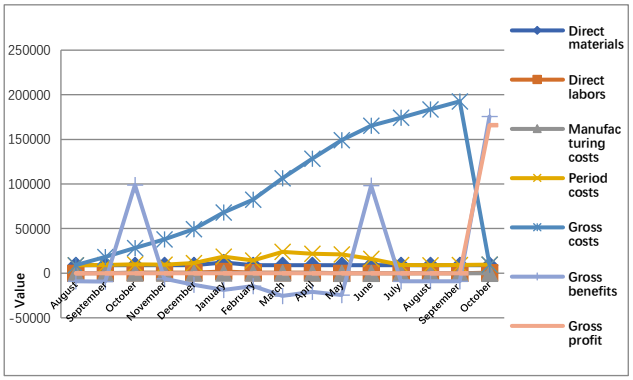

Figure 12. The distribution of the appreciation of the comprehensive value chain (author's self-painting).

VI. An Analysis of the Factors of Appreciation of the Value Chain and the Weights

The incomes of raising sheep are determined by the incomes, the quantities, the weights, and the prices, and follow the law of the incomes = the quantities × the weights × the prices. The weight of each factor can be measured from the monthly and the vertical (of various types of sheep) comparison. From the range of values, Fig. 8 shows that the range of changes in the herd number of the sequential order of changes is the numbers, the weights and the prices of sheep.

With the index factor analysis method.

$$\text{The index of the total incomes} = \text{product quantity index} \times \text{productweight index} \times \text{product price index} \quad (8)$$

$$\frac{\sum a_1 b_1 c_1}{\sum a_0 b_0 c_0} = \frac{\sum a_1 b_0 c_0}{\sum a_0 b_0 c_0} \times \frac{\sum a_1 b_1 c_0}{\sum a_1 b_0 c_0} \times \frac{\sum a_1 b_1 c_1}{\sum a_1 b_1 c_0} \quad (9)$$

$$\sum a_1 b_1 c_1 - \sum a_0 b_0 c_0 = (\sum a_1 b_0 c_0 - \sum a_0 b_0 c_0) + (\sum a_1 b_1 c_0 - \sum a_1 b_0 c_0) + (\sum a_1 b_1 c_1 - \sum a_1 b_1 c_0) \quad (10)$$

a_0, b_0 and c_0 are the quantity, weight and price of the base period, respectively. a_1, b_1 and c_1 are the quantity, weight and price of the reporting period, respectively.

TABLE III. The Incomes of the Experimental Group Unit: Yuan (Author's Self-Painting)

Products	$a_0 b_0 c_0$	$a_1 b_0 c_0$	$a_1 b_1 c_0$	$a_1 b_1 c_1$
Fat lambs	2762.64	8405.48	53211.76	61229.97
Wethers	5827.14	18509.75	23363.68	25042.31
Eliminated lambs	24879.77	27413.54	33513.75	50147.78
In total	3346s9.55	54328.77	110089.19	136420.06

TABLE IV. The Incomes of the Experimental Group Unit: Yuan (Author's Self-Painting)

Name of the products	Quantity of the products (a)		Weights (b)		Prices (yuan) (c)	
	Base period a_0	Report period a_1	Base period b_0	Report period b_1	Base period c_0	Report period c_1
Fat lambs	47	143	3.66	23.17	16.06	18.48
Wethers	17	54	25.13	31.72	13.64	14.62
Eliminated lambs	39	43	46.77	57.14	13.64	20.41

According to Tables III and IV.

Index of the total incomes of the experimental group:

$$\frac{\sum a_1 b_1 c_1}{\sum a_0 b_0 c_0} = \frac{136420.06}{33469.55} = 407.59\% \quad (11)$$

The absolute number of the changes in the total incomes of the experimental group:

$$\sum a_1 b_1 c_1 - \sum a_0 b_0 c_0 = 136420.06\text{-}33469.55=102950.51(\text{yuan}) \quad (12)$$

Index of the number:

$$\frac{\sum a_1 b_0 c_0}{\sum a_0 b_0 c_0} = \frac{54328.77}{33469.55} = 162.32\% \quad (13)$$

The absolute number of the influence of the changes of the number on the total incomes:

$$\sum a_1 b_0 c_0 - \sum a_0 b_0 c_0 = 54328.77\text{-}33469.55=20859.22 \text{ (yuan)} \quad (14)$$

Index of the weights:

$$\frac{\sum a_1 b_1 c_0}{\sum a_1 b_0 c_0} = \frac{110089.19}{54328.77} = 202.64\% \quad (15)$$

The absolute number of the influence of the changes of the number on the total incomes:

$$\sum a_1 b_1 c_0 - \sum a_1 b_0 c_0 = 110089.19\text{-}54328.77=55760.42(\text{yuan}) \quad (16)$$

Index of the price:

$$\frac{\sum a_1 b_1 c_1}{\sum a_1 b_1 c_0} = \frac{136420.06}{110089.19} = 123.92\% \quad (17)$$

The absolute number of the influence of the changes of the price on the total incomes:

$$\sum a_1 b_1 c_1 - \sum a_1 b_1 c_0 = 136420.06\text{-}110089.19=26330.879(\text{yuan}) \quad (18)$$

The above calculation results can be shown as:

$$407.59\% = 162.32\% \times 202.64\% \times 123.92\%$$
$$102950.51 = 20859.22 + 55760.42 + 26330.87 \quad (19)$$

The calculation results show that the total incomes of the three products in the experimental group increased by 307.59% compared with the base period, due to the increase of 62.32% in number, 102.64% in weight and 23.92% in price. The total income increased by 102,950.51 yuan in the reporting period compared with that of the base period, 208.592 million yuan of which resulted from the production growth of 62.32, 55,760.4 yuan of which resulted from the weight growth of 102.64%, and 26,330.8 yuan of which resulted from the price increases of 23.92%. Therefore, the contribution was in turn made by the changes in the weights, the quantities, and the prices.

Similarly, a single product can also be analyzed, other stages can also be calculated, and the corresponding control group can also be compared.

VII. An Analysis of the Mechanism of Appreciation of the Value Chain

The rainfall volume and the temperature were positively correlated with the grass yield, and the correlation coefficients from March to August were 0.645 and 0.70 [14], respectively. The grass yield was positively correlated with the weights of sheep, and the correlation coefficient was 0.936 [15]. The grass yield was positively correlated with the number of sheep. The weather determined not only the grass yield, but also the weights of sheep. The weight of sheep and the performance of sheep were also positively correlated, which determined the performance of sheep. In addition, the number of sheep was also determined by the performance of sheep and the grass yield.

The transformation of the form and value of the ewes to the lambs was not only the process of the appreciation of the value chain, but also the transformation from the costs to the benefits and profits. With the advancement of the pregnancy, the costs were converted to the growth of the fetus month by month. For the delivery of the lambs, the costs were converted to the lambs, and the incomes of the lambs were formed. Through the gradual advancement of the periods of lactation and weaning of the lambs, the value of the lambs was partially realized in June, and part of the cumulative costs were converted into value. Furthermore, after the selection for breeding, the lambs were transformed into the wethers and the backup ewes (the backup rams). Through the continuous transformation of the cycle of delivery, the ewes completed the depreciation costs in the seventh year, and the costs were converted into value in the stage of eliminating sheep. The product form of the backup ewes (the backup rams) was transformed into the ewes for delivery (the breeding rams).

VIII. The Distribution Model of the Appreciation of the Value Chain

A. The Morphological Chang

Fig. 13 shows the process of sheep value pattern change.

Changes of the ewes for delivery = The backup ewes selected in June from the lambs to be bred + The ewes for delivery – (The ewes for delivery/6) × The ewes for delivery transformed to the eliminated ewes.

The morphological changes of the rams = The backup rams selected in June from the lambs + The breeding rams – (The breeding rams / 4) × The breeding rams transformed to the eliminated sheep.

The morphological changes of the eliminated sheep = (The ewes for delivery / 6) + (The breeding rams / 4).

The morphological changes of the lambs = The fat lambs + The backup ewes selected from the lambs + The backup rams selected from the lambs + The one-year-old wethers selected from the lambs.

The morphological changes of the wethers = The two-year-old wethers of the previous year + The one-year-old wethers of the current year.

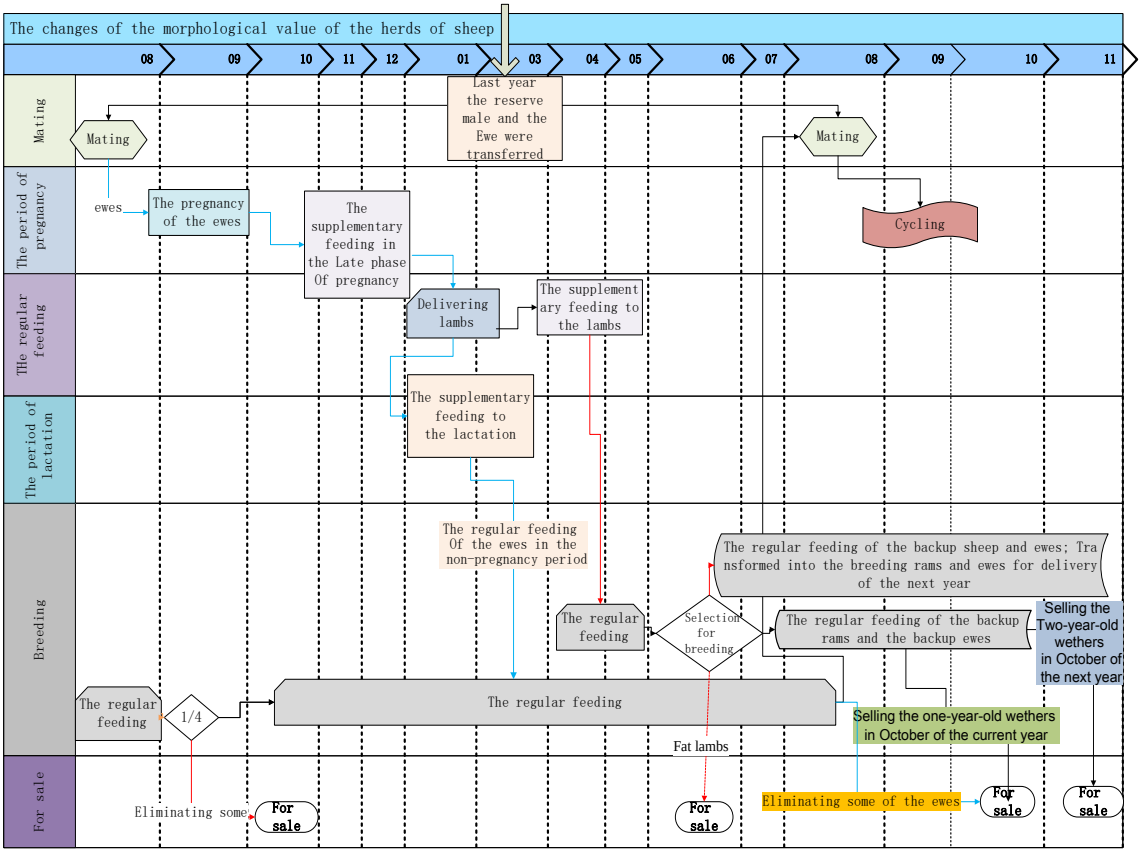

Figure 13. The morphological changes of the herds of sheep (author's self-painting).

B. *Changes of the Value*

Figs. 9 and 14 show that October, June, and October of the following year are the main stages of value appreciation from the perspective of value realization.

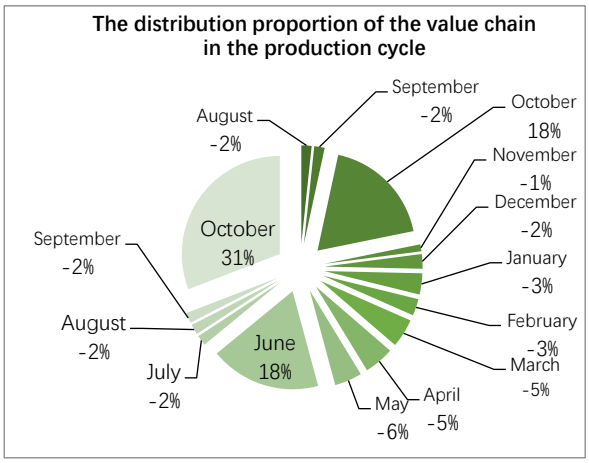

Figure 14. The proportion of the appreciation of the production of each month.

IX. Conclusion

A. *The Relationship between the Rotational Grazing and the Appreciation of the Value Chain*

The meteorological conditions, the biomass of forage grasses and the grazing capacity. The rainfall volume dominates the biomass of forage grasses, and the grass yield dominates the grazing capacity.

B. *Activities and Connections Recognition of the Value Activities*

Basic activities: Raising rams and ewes to breed and give birth to lambs, and increasing the pregnancy rate and lambing rate of the ewes, and reducing the loss and death rate through the supplementary feeding in winter. Improving the mortality rate and the survival rate of lambs through the supplementary feeding. Supplementary activities: repairing the sheepfolds, managing the labors, and managing the sales. Internal Relations of the Value Chain. First, the changes in weights and the appreciation of the value chain. the weights of the pregnant ewes were largely transformed into the constitution of the lambs during the periods of pregnancy and lactation, which laid the foundation for the breeding of the lambs and the transformation into the backup ewes and the backup rams. Second, the changes of the structure of herds of sheep and the process of production. After October, there were more pregnant ewes, and a small number of two-year-old wethers in the structure of the herds of sheep. A relatively larger number of new lambs were added after January. Until June, the backup ewes and the backup rams were selected from the lambs. At the same time, about the same number of sheep as the backup ewes and the backup rams were eliminated, and most of the remaining lambs were sold, leaving the male lambs as the one-year-old wethers. In mid-October, most of the eliminated sheep, the one-

year-old wethers and the two-year-old wethers of last year were sent to the market. In this way, the process cycles. Third, changes of the quantity and the appreciation of the value chain. The lambs, the eliminated sheep, most of the one-year-old wethers and the two-year-old wethers of the last year were sent to the market to produce the direct value. The backup ewes and the backup rams of last year were put into the herds of the ewes for delivery Fourth, the distribution of mutton prices and the appreciation of the value chain.

C. The Formation of the Current Grazing Mode of the Alpine Steppe and Its Factors

The ecological changes affect the biomass and the grazing capacity, and the meteorological rhythm is transmitted from the biomass to the grazing capacity. The grazing mode was formed with the breeding of the ewes as the leading factor, the growth of the lambs as the main line, the back-up ewes and the back-up rams as the driving force, and the benefits of the fat lambs, the wethers and the eliminated sheep as the goal. Its influencing factors and composition overlap with each other and affect the degree and range of the appreciation of the value chain.

CONFLICT OF INTEREST

The author declares no conflict of interest.

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Shengfu Zhang was born in Huangyuan County, Xining City, Qinghai Province, People's Republic of China in November 1965. He received his master's degree in computer application technology from School of Physics, Qinghai Normal University, People's Republic of China in July 2010. His research fields include animal husbandry informatization and data analysis.

He is now a professor at the School of Computer Science, Qinghai University for Nationalities. Published: S. Zhang, "Electronic commerce commodity entity identities based on hierarchical probability model," Cluster Computing (1437), article number: 10.1007/s10586-017-1437-8, first online: 9 December 2017; S. Zhang, "Surface biomass monitoring of rotational grazing in alpine grassland based on satellite multi-spectral images," E3S Web of Conferences, vol 257, 03051, 2021; H. Sheng, S. Zhang, L. Zuo, *et al.*, "Construction of sheep forage intake estimation models based on sound analysis biosystems engineering," 2020.

Professor Zhang used to be Secretary General of Qinghai Higher Education Computer Education Society of the People's Republic of China.