

Structural Analysis of Tibetan Minority Pastoralists in the Qinghai Plateau Area of Sichuan Province of China

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中国四川省青海高原地域のチベット族の畜産業に関する構造分析

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The objective of the research reported on in this article was to further develop a computer program on structure and production cost of livestock in China's pastoral areas. The program was expanded as part of the work to include Yaks and yak-cattle crosses and was found to be quite versatile and served its purpose well. This revised diagnostic tool was utilized to examine Tibetan minority livestock production in the Qinghai Plateau of Sichuan Province, China. One component includes division of household labor in which it was determined that the two women combined in the single household that served as the model for program development in this very high and cold area (over 3,000 meters) put in more labor time than the one man in the family. It was also found that net family income amounted to 8.0 Yuan per hour if only direct (cash) costs are taken into account. The net income drops to 7.7 Yuan per hour if family labor cost (using an opportunity cost method) is included. Adding in-kind income (valuation of commodities produced for household consumption) resulted in income of 9.3 Yuan per hour per household member if only direct costs are included and 8.9 Yuan per hour if the value of family labor is also included.

本稿の目的は、中国少数民族地域の畜産業の生産コストおよびその生産構造を分析するために開発されたコンピュータプログラムを改善することにある。開発されたプログラムに、新たにヤクおよびヤクと牛の雑種に関する変数を追加した。このように改定されたプログラムは、中国四川省青海高原のチベット族の畜産業生産構造を考察するに適用され、しかも、実にうまく機能した。このことは、開発されたプログラムが多くの地域の生産構造分析に活用されることが可能であることを証明した。

調査地の畜産業生産コストに関する分析では、以下のことが明らかにされた。

① 海拔が3000メートル以上である寒冷な青海高原では、家族労働力としての女性は、家事をこなす以外、その畜産業に従事する労働時間が男性の半分以上に達している。

② 生産コストを直接投入コスト（資本）のみで計算する場合、その労働生産性（家族労働力1人あたり時間あたりの純所得）は8.0元（約110円）であるが、家族労働力の機会費用を含んで生産コストを計算する場合、その労働生産性は7.7元まで下がる。

③ 所得には現物所得（牧畜農家が自家消費用に生産された生活必需品の見積価格）を加算すると、その労働生産性は、9.3元（生産コストが直接投入コストのみで計算される場合）と8.9元（生産コストが家族労働力の機会費用を含んで計算される場合）に上昇する。

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Problem and Objectives

Roughly half of China is designated as grassland (including deserts and other areas suitable for grazing livestock). The grasslands *per se* are immense, accounting for about 30 percent of the nation's total area. About 2.4 million km², or 85 percent of China's grassland and pastures, are in the temperate climatic zone. The prevalence of grassland in the Western region, low agricultural productivity of it, and general lack of water and other natural resources, are reasons for economic disparity between it and the other two areas of China, the East and Central regions. One problem facing planners and development strategists is what to do about the grasslands, and for that quantifiable data on livestock production is required. Provision of some of that information is a main purpose of the project being reported on in this article¹⁾.

Project Area

Sichuan province, located in the southwestern part of China has considerable remote and desolate areas, especially on the Qinghai Plateau, which are mainly arid plains that end abruptly at high mountain ranges. The province is inhabited by a number of China's 56 official national minorities, a substantial portion being Tibetan ethnic background, almost all of which live on the Qinghai Plateau, the site of the project reported on in this article.

Despite the large size of Sichuan province, only about 8 percent of China's 104 million cattle are found in it. However, the province has 8 percent of China's water buffalos attesting to the importance of work animals in this primarily rural society. The province has 3 percent of the nation's sheep, most of which are on the Qinghai Plateau. The province also has 5 percent of the country's goats, a substantial proportion of which are also on the Plateau.

China has about 140 million sheep and about 170 million goats. Data are not available on a regular basis on yaks and yak crosses in the world or in China. But, Porter (1991) reported there were about 12 million yaks in China, which represented about 85 percent of the world's total. Most yaks in China are found in Tibet but there are also a substantial number in Sichuan province, virtually all of which are on the Plateau.

Yaks and Yak-cattle Crosses

Yaks are essentially creatures of high altitudes and cold climates²⁾. They are vital to people who live at altitudes where domestic cattle cannot possibly survive. The species was domesticated long ago from the wild yak of Tibet (*Bos (Poephagus)mutus*) of which only a few thousand now exist. The domestic yak (*Bos (Poephagus)grunniens*) or grunting ox is native to the Tibetan Plateau and neighboring countries in the Himalayas and to the Altai ranges of Mongolia. Its main populations are in the mountains and plateau of Western China including the Autonomous Region of Tibet. China has about 85 percent of the world's yaks.

Yaks are smaller than cattle. Bulls weigh 300-550 kg and cows 180-350 kg. Hair color cov-

ers a wide range, but most are black or rusty brown. Their use depends on location. In more remote areas they are known as "Ships of the Plateau" because they are essential for travel as well as food and clothing. Besides meat, they supply hides and dung (used for cooking fires and heating) as well as draught power for plowing. The hair, harvested by plucking, has traditionally been a major export and is used for ropes, high quality saddle blankets, bags, and for the tents that herders live in. The underwool is made into felt. Annual yields are about 1.6 kg of hair and 0.6 kg of underwool.

Yak milk is a very important product. The cows are milked from about two weeks after they calve in April or May and milking continues for about five months. Yield is at its peak in mid-summer, and declines as the grasses dry up. About half of milk production is taken by the calf so that "yield" is only the remainder. Butterfat content varies between 5 and 8 percent depending on environment and management, but averages 6.5-7 percent, about double that of cattle. Thus, yields from yak cows inseminated artificially by semen from domestic cattle bulls have lower butterfat content, but the quantity is higher. Milk is drunk fresh, fermented or converted into butter and cheese.

Crossbreeding between cattle and yaks, with the resultant progeny called "yakow" is common. The two species have the same chromosome diploid number ($2n=60$). The males are sterile and the females are fertile (like mules—the cross between horses and donkeys). The resultant yakow females mature earlier than yak cows and produce an annual calf. Daily milk yields are about double that of yaks. Crossing can take place either way, cattle X yak or yak X cattle, but generally yak cows are put to domestic cattle bulls. There is marked hybrid vigor so that growth rates are enhanced and mature size of both sexes is larger than the average of both parents. Yakows look more like the mother than the father in the cross, but have shorter hair than the yak and less underwool. The yakow cow can, and often is, bred back to either a cattle or yak bull.

Artificial insemination in China is used to mate yak cows to humpless yellow cattle bulls and the hybrid is known as the **Pian**. This is the yakow kept by the household reported on in this article. Pian crosses are about 3 percent taller and 17 percent heavier than the yak. The lactation period is longer by 21 percent and the milk yields twice as high. The butterfat content is about 6 percent. They are particularly well adapted to the tough climate of the Qinghai-Tibet plateau. In summer yaks and yakows graze alpine meadows. In winter they browse shrubs in deep snow at temperatures dropping to -40°C .

Herder Profile

The objective of the research reported on in this article was to significantly revise and improve the computer program to incorporate the intricacies of modeling yaks and yakows and to make the program flexible enough so that users can incorporate the combination of livestock that fits any livestock and household type they are modeling.

A specialist, Mr. Jing Fu Gao from the Sichuan Provincial Grassland Institute (headquarters

in Chengdu and substation in Hongyuan) served as the research coordinator and Chinese-Tibetan translator. Thanks to him, a herder cooperator was identified that was willing to suffer the considerable inconvenience of the several days required to gather data, make changes to the program, and check results. In addition, a participatory rural appraisal (PRA) was also conducted by Ou Li to really understand that particular household as well as the situation in the area³⁾. These activities, carried out in September, 2003, were with a mid-size settled producer residing about 15 Km from Hongyuan. He and his family are unusual in living in a house, but this case study is very valuable as it provides comparative data on a semi-market system. It was exceptionally beneficial as the range of inputs and outputs was much larger than in a typical traditional household.

The area around Hongyuan—and the Qinghai Plateau in general—is extensive and difficult to travel in because there are almost no paved roads. Furthermore, a substantial portion of herder families are not even accessible by vehicles. A total of five days was spent in the Hongyuan area. Naturally, a much longer time would be necessary to really understand intricacies and peculiarities of different groups, and especially to develop models for small and large size producers, but it was not possible due to funding limitations.

Interview Results

Selected production data for the mid-size settled producer modeled is given in Table 1. This household has 132 breeding age yaks of which 90 are mainly for milk and the other 36 mainly for production of meat or work oriented progeny. In addition, it has 16 mature Pian all of which are milk oriented. They also have 9 horses. The family resides on 245 Ha of which winter pasture is used 7 ½ months (Table 2). A tent is maintained there to provide shelter to the person taking care of the animals. All animals are brought back to the home site at night.

Analysis of family labor use by gender and season for this household reveals that females play a very important role in the production process (Table 3). The wife and teenage daughter are occasionally helped by relatives when they have time. Their main livestock related work is milking and processing milk into cheese, butter and other dairy products. They also assist in general care of animals, and guard duty at night to prevent theft and attacks by wolves. The total amount of time spent per household by the two females in the past year was 5,760 hours, most of which occurs from April to October, the principal lactation period. In contrast, the one male spent 3,739 hours, mainly on daytime herding of animals. Time spent by the females was 2.4 more than the male in the warm season, and their total time was about the same as the male in the cold season.

The value of family labor was determined using the opportunity cost method. The household members based their estimates on pay from work that they could do if they were in Hongyuan or some other urban location, or the value of income from alternative work they might or actually do such as sewing or preparing clothing for other individuals, preparing handicrafts, working for other herders etc. It was found that, on a monthly basis, females estimated their opportunity cost to be 90 Yuan each and the male 105 Yuan (Table 4). An hourly rate was determined by asking

producers about the time worked per day, which turned out to be 10 hours for females and 9 hours for the male. The calculated hourly rate to determine family labor was 0.38 Yuan per female and 0.39 Yuan for the male. The value of annual family labor was calculated from those rates.

Most pastoralists on the Qinghai Plateau live at a subsistence level (meaning they are only marginally connected with the market economy) and thus use very few purchased inputs. The household interviewed uses a higher level because it is heavily oriented toward sale of milk products. It was found that 23 percent of direct cost (essentially meaning cash costs) was for animal medicines and veterinary services, and another 23 percent for miscellaneous (Table 5). The next significant categories were purchased forage, and repairs on buildings, each at 15 percent, and taxes at 7 percent.

There are 4 categories of annual cost provided by the computer program, as shown in Table 6. The first, and most basic, is direct production cost, in effect out-of-pocket or cash costs. The second includes family labor in addition to direct costs. The third also includes ownership costs such as depreciation on buildings and machinery. The fourth category has capital costs added in. These are opportunity costs incurred by investing in their own production unit rather than putting their money into an alternative use such as a bank or some other investment.

The direct annual production cost was 6,454 Yuan (Table 6). The value of family labor was a significant cost, raising the total to 10,068 Yuan, which is 1.6 times the direct cost (Table 7). When ownership costs are included, the total rises to 2.6 times direct cost, and adding in capital costs makes the total 5.8 times greater than direct cost. This producer's capital costs are quite high because of the large investment in buildings.

The cost of production for each of the four categories is given in Table 8. The direct cost per kg is 0.4 Yuan for yak progeny sold, and 0.6 Yuan for Pian progeny. In contrast, the sale prices (shown at the bottom of the table) are 5.8 and 5.4 Yuan per kg, respectively for the two animal species. The cost per kg was derived by allocating costs between species, as well as between commodities. Producers, in consultation with officials and interviewers, decided the allocation. Prices per kg in all cases were significantly above costs even when family labor and capital costs were included. For example, the prices of butter, cheese and raw milk were 19.0, 8.5 and 1.8 Yuan per kg respectively, compared with total production costs for all milk products of 0.8 Yuan for yaks and 1.4 Yuan for Pian.

Income was divided into two parts, cash income and in-kind income (the value of the commodities which are consumed by the family rather than being sold). The great benefit from favorable location of the household is evident in that 87 percent of income from yaks was cash income and 91 percent for Pian (Table 9). It is worth emphasizing again that the household interviewed was a significant exception to almost all other households on the Qinghai Plateau in that it is located by a road and near a town and thus can sell dairy products. Sale of milk products is important, but the majority of cash income was derived from sales of progeny. In contrast, the value of milk products consumed by the household (value in-kind) was greatest from milk products reflecting

the minimal consumption of meat in the diet.

Over 90 percent of net cash income was derived from yaks, not surprising since yaks make up 90 percent of animal inventory (Table 10). Naturally, net income falls as additional cost categories are added. For example, net cash income from all sources was 76,317 Yuan when only direct cash costs were included. However, it was still 45,040 Yuan when all costs were included. It is instructive that in commercial livestock operations in most of the world total costs (including capital costs) are seldom covered.

Addition of in-kind income to cash income increased the total by about 15 percent (compare Tables 10 and 11). This increase would be much higher in households operating at a subsistence level in which most products are consumed or used by the family rather than being sold.

Net income per hour of family labor is one of the most interesting, and perhaps the most useful, item in this analysis. It turns out that net income per hour (considering income from all sources) was 8.0 Yuan if only basic production costs are taken into account (Table 12). If family labor is also included it was 7.7 Yuan, and 7.0 when ownership costs are included. It was 4.7 Yuan when capital costs are taken into account.

Addition of in-kind income resulted in a total of 9.3 Yuan if only direct production costs are accounted for, and 6.0 Yuan if all costs are taken into account (Table 13). It was estimated that an unskilled male working in large and mid-size towns in the province would earn no more than 2-4 Yuan per hour. From this it can be concluded that, from an economics viewpoint at least, members of this household are probably much better off remaining where they are rather than attempting to migrate to an urban area. It is also instructive that members of this household cannot speak Chinese which, like virtually all herder families on the Qinghai Plateau, severely limits their job possibilities.

Conclusions

Funding limitations restricted visits to one site, and much more time would be needed to formulate definite conclusions about herders as a whole on the Qinghai Plateau in Sichuan province. Nevertheless, the one case study is very useful for it shows the great benefit from being able to participate in the market economy. The computer program was developed to a high level of perfection on this field trip and found to adequate for the research work.

Table 1. Production data input for Do Bo yak-pian medium size herder with house, Dongyuan, Sichuan, China, 2003

Item	Units	Yaks	Pian	None	Camels and horses
Breeding Inventory					
Mature females	Head	126	14	0	
Breeding males	Head	6	2	0	
Total breeding	Head	132	16	0	
Progeny age at					
Weaning	Months	18.0	6.0	0.0	
End of growing season	Months	72.1	24.1	0.0	
End of fattening phase	Months	0.0	0.0	0.0	
Progeny potentially available after subtraction of death loss, and use for personal and contract purposes					
Total number born	Head	50	5	0	
Weaned	Head	47	5	0	
Sales, progeny					
Sold at weaning	Head	0	0	0	
Sold at end of growing	Head	33	3	0	
Sold at end of fattening	Head	0	0	0	
Total progeny sold annually	Head	33	3	0	
Sales mature animals					
Cull females	Head	4	1	0	
Cull males	Head	1	0	0	
Total breeding animals	Head	5	2	0	
Cows mainly for milk	Head	90	4		
Cows mainly for beef or work progeny	Head	36	10		
Camels	Head				0
Horses	Head				9
Total annual fine hair/wool production					
Mature females	Kg	57	0	0	
Breeding males	Kg	3	0	0	
Growing phase	Kg	94	0	0	
Fattening phase	Kg	0	0	0	
Total production	Kg	176	0	0	
Total annual coarse hair/wool production					
Mature females	Kg	50	0	0	
Breeding males	Kg	2	0	0	
Growing phase	Kg	73	0	0	
Fattening phase	Kg	0	0	0	
Total production	Kg	135	0	0	

Table 2. Pasture use by Do Bo yak-pian medium size herder with house,
Dongyuan, Sichuan, China, 2003

		Seasonal pasture use calendar			
		Days	Months	Dates	
Season					
Warm			138	4.5	
Cold		227	7.5		0
Total			365	12.0	0

Optimal and actual amount of land used per sheep unit by season			
Item	Total	Warm	Cold
Optimal Mu per one sheep unit	0.0	4.5	4.5
Optimal Ha per one sheep unit	0.3	0.3	0.0
Optimal sheep unit months (sum)	9,732	4,866	4,866
Actual sheep unit months (sum)	9,157	3,461	5,696
Actual over optimal sheep unit months	-575	-1,405	830
Percent overgrazing (minus sign means under-used)	-6	-29	17

Table 3. Family labor use by gender and season Do Bo yak-pian medium size herder with house, Dongyuan, Sichuan, China, 2003

Item	Units	Total	Yaks	Pian
Time spent by gender				
Females				
Warm	Hours	3,036	2,346	690
Cold	Hours	2,724	2,270	454
Total	Hours	5,760	4,616	1,144
Males				
Warm	Hours	1,242	1,118	124
Cold	Hours	2,497	2,384	114
Total	Hours	3,739	3,501	238
Whole year total males and females	Hours	9,499	8,117	1,382
Females as a percent of males				
Warm	Percent	244	210	556
Cold	Percent	109	95	400
Total	Percent	154	132	481
Time use by type of animal species				
Females				
Warm	Percent	100	77	23
Cold	Percent	100	83	17
Total	Percent	100	80	20
Males				
Warm	Percent	100	90	10
Cold	Percent	100	95	5
Total	Percent	100	94	6
Whole year total	Percent	100	85	15

Table 4. Opportunity cost of family labor use Do Bo yak-pian medium size herder with house, Dongyuan, Sichuan, China, 2003.

Item	Units	Cost		
		Estimated cost of family labor		
Monthly basis				
Females	Yuan	90		
Males	Yuan	105		
Annual basis				
Females	Yuan	1,080		
Males	Yuan	1,260		
Hours per day to get hourly rate				
Females	Yuan	8		
Males	Yuan	9		
Days per month to get hourly rate				
Females	Yuan	30		
Males	Yuan	30		
Calculated hourly rate used to determine family labor cost per year				
Females	Yuan	0.38		
Males	Yuan	0.39		
		Total	Yaks	Pian
Calculated family labor value per year				
Females	Yuan	2,160	1,731	429
Males	Yuan	1,454	1,362	92
Total	Yuan	3,614	3,093	521

Table 5. Direct (cash) annual cost by Do Bo yak-pian medium size herder with house, Dongyuan, Sichuan, China, 2003

Item	Units	Total	Yaks	Pian
Animals given to employees	Percent	Not shown as a cost, rather as a reduction in income because fewer animals are sold		
Concentrate feed, maize, grains	Percent	4.8	6.0	1.3
Forage	Percent	15.5	3.1	53.8
Pasture expenses (hay land)	Percent	0.0	0.0	0.0
Hay harvesting cost	Percent	0.0	0.0	0.0
Salt	Percent	2.3	2.6	1.4
Minerals	Percent	0.0	0.0	0.0
Protein Supplement	Percent	0.0	0.0	0.0
Repairs, maintainance				
Buildings (only part for business)	Percent	15.5	17.5	9.5
Fence	Percent	7.7	8.7	4.7
Vehicle repair (only part for business)	Percent	0.0	0.0	0.0
Veterinarian other medical products	Percent	7.7	8.7	4.7
Animal medicines	Percent	15.8	18.8	5.7
Gas, water, electric(only business)	Percent	0.0	0.0	0.0
Telephone (only business)	Percent	0.0	0.0	0.0
Vehicle fuel (only business)	Percent	0.0	0.0	0.0
Other fuel (only business)	Percent	0.0	0.0	0.0
Taxes, government management fee	Percent	7.3	8.3	4.5
Marketing costs	Percent	0.0	0.0	0.0
Transportation	Percent	0.0	0.0	0.0
Brokerage, other	Percent	0.0	0.0	0.0
Insurance	Percent	0.0	0.0	0.0
Contract labor	Percent	0.0	0.0	0.0
Miscellaneous, other	Percent	23.2	26.2	14.2
Total direct costs	Percent	100.0	100.0	100.0

Table 6. Annual costs based on cost type Do Bo yak-pian medium size herder with house, Dongyuan, Sichuan, China, 2003

Item	Units	Total	Yaks	Pian
Direct production cost	Yuan	6,454	4,861	1,579
Direct and family labor	Yuan	10,068	7,953	2,101
Direct costs, family labor and ownership costs	Yuan	16,640	13,539	3,086
Direct costs, family labor, ownership, and capital costs	Yuan	37,732	30,762	6,015

Table 7. Ratio, other to direct production cost Do Bo yak-pian medium size herder with house, Dongyuan, Sichuan, China, 2003

Item	Units	Total	Yaks	Pian
Family labor	Ratio	1.6	1.6	1.3
Family labor and ownership costs	Ratio	2.6	2.8	2.0
Family labor, ownership and capital costs	Ratio	5.8	6.3	3.8

Table 8. Cost per kg by commodities and cost type Do Bo yak-pian medium size herder with house, Dongyuan, Sichuan, China, 2003

Item	Units	Yaks	Pian
Animals produced			
Direct production cost	Yuan	0.4	0.6
Direct and family labor	Yuan	0.6	0.9
Direct costs, family labor and ownership costs	Yuan	1.0	1.3
Direct costs, family labor, ownership, and capital costs	Yuan	2.2	2.5
Milk products			
Direct production cost	Yuan	0.1	0.4
Direct and family labor	Yuan	0.2	0.5
Direct costs, family labor and ownership costs	Yuan	0.3	0.7
Direct costs, family labor, ownership, and capital costs	Yuan	0.8	1.4
Yak hair			
Direct production cost	Yuan	0.3	0.0
Direct and family labor	Yuan	0.5	0.0
Direct costs, family labor and ownership costs	Yuan	0.9	0.0
Direct costs, family labor, ownership, and capital costs	Yuan	2.0	0.0
Wool			
Direct production cost	Yuan	0.0	0.0
Direct and family labor	Yuan	0.0	0.0
Direct costs, family labor and ownership costs	Yuan	0.0	0.0
Direct costs, family labor, ownership, and capital costs	Yuan	0.0	0.0
Mohair			
Direct production cost	Yuan	0.0	0.0
Direct and family labor	Yuan	0.0	0.0
Direct costs, family labor and ownership costs	Yuan	0.0	0.0
Direct costs, family labor, ownership, and capital costs	Yuan	0.0	0.0
Prices used in the analysis, per kg			
Progeny (average)	Yuan	5.8	5.4
Milk products			
Butter	Yuan	19.0	19.0
Cheese	Yuan	8.5	8.5
Raw milk	Yuan	1.8	1.8
Fine hair, fine wool and mohair	Yuan	50.0	0.0
Coarse hair and coarse wool	Yuan	8.2	

Table 9. Annual income based on commodities Aorizhabu

Item	Units	Total	Yaks	Pian
Cash income (sales)				
Animals sold	Percent	53.9	52.2	67.3
Milk products (sold)	Percent	23.2	23.1	23.8
Mohair (sold)	Percent	0.0	0.0	0.0
Yak hair (sold)	Percent	10.5	11.8	0.0
Wool (sold)	Percent	0.0	0.0	0.0
Total cash income	Percent	87.7	87.2	91.2
Personal use value (value in kind)				
Animals	Percent	3.7	4.2	0.0
Milk products	Percent	8.6	8.6	8.8
Mohair	Percent	0.0	0.0	0.0
Yak hair or sheep wool	Percent	0.0	0.0	0.0
Other	Percent	0.0	0.0	0.0
Total value in kind	Percent	12.3	12.8	8.8
Combined cash income and value in kind				
Animals sold	Percent	57.7	56.4	67.3
Milk products (sold)	Percent	31.8	31.7	32.7
Mohair (sold)	Percent	0.0	0.0	0.0
Yak hair and sheep wool (sold)	Percent	10.5	11.8	0.0
Other	Percent	0.0	0.0	0.0
Total combined cash and value in kind	Percent	100.0	100.0	100.0

Table 10. Annual net cash income based on cost type Do Bo yak-pian medium size herder with house, Dongyuan, Sichuan, China, 2003

Item	Units	Total	Yaks	Pian
Direct production cost	Yuan	76,317	68,250	8,081
Direct and family labor	Yuan	72,703	65,157	7,560
Direct costs, family labor and ownership costs	Yuan	66,132	59,572	6,574
Direct costs, family labor, ownership, and capital costs	Yuan	45,040	42,348	3,645

Table 11. Annual net cash and in-kind income for Do Bo yak-pian medium size herder with house, Dongyuan, Sichuan, China, 2003

Item	Units	Total	Yaks	Pian
Direct production cost	Yuan	87,962	78,958	9,018
Direct and family labor	Yuan	84,348	75,865	8,497
Direct costs, family labor and ownership costs	Yuan	77,776	70,280	7,511
Direct costs, family labor, ownership, and capital costs	Yuan	56,684	53,056	4,582

Table 12. Net cash income per hour of family labor Do Bo yak-pian medium size herder with house, Dongyuan, Sichuan, China, 2003

Item	Units	Total	Yaks	Pian
Direct production cost	Yuan	8.0	8.4	5.8
Direct and family labor	Yuan	7.7	8.0	5.5
Direct costs, family labor and ownership costs	Yuan	7.0	7.3	4.8
Direct costs, family labor, ownership, and capital costs	Yuan	4.7	5.2	2.6

Table 13. Net cash and in-kind income per hour of family labor Do Bo yak-pian medium size herder with house, Dongyuan, Sichuan, China, 2003

Item	Units	Total	Yaks	Pian
Direct production cost	Yuan	9.3	9.7	6.5
Direct and family labor	Yuan	8.9	9.3	6.1
Direct costs, family labor and ownership costs	Yuan	8.2	8.7	5.4
Direct costs, family labor, ownership, and capital costs	Yuan	6.0	6.5	3.3

Notes

- 1) Explanation of the problem, the modeling and computer program is available in (Simpson, Li and Li, 2003).
- 2) Most of the information on yaks is derived from Porter (1991).
- 3) Information on the PRA method and its use in the author's grassland research is described in Simpson, Li, and Li (2002).

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