

# Evaluation of the Development Level of Animal Husbandry in Sichuan Province Based on Factor Analysis

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**Abstract:** The “Thirteenth Five-Year Plan” is a crucial period for China to build a modern animal husbandry industry, and it is also an important period for Sichuan Province to leap from a large animal husbandry province to a strong animal husbandry economy. In order to understand the development of animal husbandry in various regions of Sichuan Province, this paper uses factor analysis to comprehensively rank the development level of animal husbandry in 21 cities (states) in Sichuan Province. The results show that there are obvious regional differences in the level of animal husbandry specialization in various cities (states) in Sichuan Province. Further analysis found that the overall level of animal husbandry in Chengdu is in the forefront of cities (states), and the development capacity of animal husbandry in Panzhihua and other areas is weak.

## 1. Introduction

Animal husbandry is an important component of agriculture and plays an important role in meeting people's nutritional needs, increasing farmers' income and promoting farmers' development. Since the reform and opening up, with the rapid development of China's agriculture, the animal husbandry industry in Sichuan has gradually grown and grown. The total output value of animal husbandry has increased from 5.874 billion yuan in 1985 to over 255.174 billion yuan in 2016, accounting for 37.35% of the total agricultural output value. The pillar industry of Sichuan agriculture. This paper comprehensively evaluates the development of animal husbandry in Sichuan Province by constructing an evaluation index system for animal husbandry development status, in order to scientifically locate the development of animal husbandry in Sichuan Province.

## 2. Construction of evaluation index system for animal husbandry development

### 2.1 Index system construction

In order to objectively evaluate the development level of animal husbandry in each city (state) of Sichuan Province, understand the development trend of animal husbandry, comprehensive literatures of domestic and foreign scholars, and based on the principle of index selection, combined with the actual development of animal husbandry in Sichuan Province, a total of 14 indicators were selected as livestock in Sichuan Province. Industry development level evaluation index system (Table 1).

Table 1 Evaluation index system of animal husbandry development level

Target layer	Criteria layer	Indicator layer	unit
Animal husbandry development level evaluation system	Livestock and poultry output	Pig output (X1)	head
		Bull output (X2)	head
		Sheep output (X3)	head
		Poultry output (X4)	head
	Livestock stock	Pig stock (X5)	head
		Cattle stock (X6)	head
		Sheep stock (X7)	head
		Poultry stock (X8)	head
	Production of major livestock products	Pork production (X9)	ton
		Beef production (X10)	ton
		Lamb production (X11)	ton
		Poultry meat production (X12)	ton
		Egg production (X13)	ton
		Milk production (X14)	ton

### 3. Analysis of the development of animal husbandry in Sichuan Province

#### 3.1 Data source

The main source of data is 2017 Sichuan Statistical Yearbook and Sichuan Survey Yearbook. The data is preliminarily processed by excel software, and SPSS software is used for empirical research[1].

#### 3.2 Analysis of the current situation of animal husbandry in Sichuan Province

##### 3.2.1 Animal husbandry has become a pillar industry in agriculture

Judging from the situation of animal husbandry in various cities and counties in Sichuan Province, Chengdu has the largest number of stocks, which is 10,024,500 heads, which is 30,784,300 more than the second-ranked city of Deyang, which is 58.55 times of Ganzi Tibetan Autonomous Prefecture with the least amount of stalls. It can be seen that there is a significant difference in the amount of livestock slaughter between regions, indicating that the cities (states) such as Chengdu and Deyang have done better in terms of breeding environment, management measures, and scientific farming than other regions.

##### 3.2.2 The difference in the amount of livestock slaughter is obvious

From the total meat production in various cities and counties in Sichuan Province, Chengdu has the largest total output of 755,300 tons; followed by Nanchong City, Dazhou City and Liangshan Yi Autonomous Prefecture, respectively, between 45-55 tons; Aba Tibetan and Qiang Autonomous Prefecture, Ganzi Tibetan autonomous prefectures and Panzhihua City have a small total output of less than 100,000 tons. From this point of view, there are also obvious differences between the regions. On the one hand, Chengdu (Nanchong City) and other cities (states) have more demand for meat than other regions; on the other hand, Chengdu, Nanchong, etc. Livestock farming techniques and livestock epidemic prevention and control are better than those in other regions.

##### 3.2.3 The difference in the total amount of meat is obvious

From the total meat production in various cities and counties in Sichuan Province, Chengdu has the largest total output of 755,300 tons; followed by Nanchong City, Dazhou City and Liangshan Yi Autonomous Prefecture, respectively, between 45 and 55 tons; Mianyang City, Yibin City, Deyang City, Guangan City, Ganzhou City, Suining City and Bazhong City, the total output is between 300,000 and 400,000 tons; Aba Tibetan and Qiang Autonomous Prefecture, Ganzi Tibetan Autonomous Prefecture and Panzhihua City have a small total output of less than 100,000. Ton. From this point of view, there are also obvious differences between the regions. On the one hand, Chengdu

(Nanchong City) and other cities (states) have more demand for meat than other regions; on the other hand, Chengdu, Nanchong, etc. Livestock farming techniques and livestock epidemic prevention and control are better than those in other regions.

Overall, the development gap of animal husbandry in various cities (states) in Sichuan Province is more obvious. The development momentum of Chengdu, Nanchong City and Deyang City is relatively strong, while the development of Panzhihua City, Ganzi Tibetan Autonomous Prefecture and Aba Tibetan and Qiang Autonomous Prefecture is relatively weak; The development of animal husbandry in Chengdu Plain Economic Zone is the best, and the development of the economic zone in Northwest Sichuan is relatively poor.

Table 2 Production situation of animal husbandry in Sichuan Province

City (state)	The proportion of animal husbandry (%)	Livestock stocks	Livestock output	Total meat production
Chengdu	406100	100024500	44123700	755300
Zigong City	378700	30486000	13226600	213500
Panzhihua City	309500	4925300	3934400	53100
Quzhou City	395400	40795000	24880800	322100
Deyang City	517400	69040200	32167200	346900
Mianyang City	420400	68260500	36809900	396600
Guangyuan City	431300	22141600	19894900	284200
Suining City	461100	25742600	16981600	307800
Neijiang City	431300	31567300	20525300	264600
Leshan city	442500	40417100	19967500	296500
Nanchong City	518600	67188900	49551600	542600
Meishan City	456900	34455200	15715400	264100
Yibin City	464600	46041900	25343800	392300
Guang'an City	413500	34627700	25596300	330300
Dazhou	396200	68821200	34101300	485500
Ya'an city	365500	12239900	6803000	116900
Bazhong City	456900	15873300	11130400	304900
Ziyang City	474500	26630300	18060600	291000
Aba Prefecture	633800	2301800	3627600	86900
Ganzi Prefecture	563100	1708300	3893900	68700
Liangshan Prefecture	408700	26395100	24296600	455100

Source: 2017 Sichuan Statistical Yearbook, 2017 Sichuan Survey Yearbook

## 4. Empirical analysis of the development of animal husbandry

### 4.1 Analysis method selection

This paper will use the factor analysis method, which can replace the original more indicators with relatively few indicators on the basis of maintaining all the original information [2]. Using the 2017 Sichuan Statistical Yearbook to evaluate the livestock production status of 21 cities (states) in Sichuan Province, and scientifically determine the level and status of livestock production in each city of Sichuan Province.

### 4.2 Empirical analysis

#### 4.2.1 Model suitability test

The raw data were subjected to KMO test (Kaiser-Meyer-Olkin) and Bartlett sphericity test using SPSS.23 software to determine whether there was a strong correlation between the variables. It can be seen from Table 3 that the KMO value is close to 1, and the sphericity test probability P value is less than the significance level of 0.01, indicating that the original variable has strong correlation and can be evaluated by factor analysis.

Table 3 KMO and Bartlett test

KMO sampling suitability		.558
Bartlett sphericity test	Approximate chi square	633.555
	Degree of freedom	91
	Significant	.000

#### 4.2.2 Commonness of variables and extraction of common factors

It can be seen from Table 4 that except for milk production (X14), the publicity of each index variable is above 80%, indicating that the extracted factor can reflect most (more than 80%) information, only less information loss, factor extraction The effect is ideal[3].

It can be seen from Table 5 that the cumulative variance contribution of the first three factors reaches 89.404%, which can reflect most of the information of the indicator. Therefore, three main factors are selected to describe the development level of animal husbandry in Sichuan Province.

Table 4 variables common results

Common factor variance					
	initial	extract		initial	extract
Pig output	1.000	.921	Poultry stock	1.000	.916
Cattle output	1.000	.941	Pork production	1.000	.923
Sheep output	1.000	.944	Beef production	1.000	.915
Poultry output	1.000	.941	Lamb production	1.000	.959
Pig stock	1.000	.897	Poultry meat		
Cow stock	1.000	.951	production	1.000	.939
Sheep stock	1.000	.949	Egg production	1.000	.825
			Milk production	1.000	.495

Table 5 Factor variance contribution rate

Total variance interpretation						
ingredient	Initial eigenvalue			Extracting the sum of squared loads		
	total	Percentage of variance	Cumulative %	total	Percentage of variance	Cumulative %
1	6.827	48.764	48.764	6.827	48.764	48.764
2	3.979	28.420	77.184	3.979	28.420	77.184
3	1.711	12.220	89.404	1.711	12.220	89.404

#### 4.2.3 Factor rotation

The maximum orthogonal rotation method is used to process three common factors to obtain the load matrix, so that the variable has a larger load value on a common factor, and the other common factors have a smaller load value, so the actual meaning of the common factor is It is easier to determine. The factor load matrix after rotation is shown in Table 6[4].

As can be seen from Table 6, F1 has a large load on X14, X12, X8, X1, X9, X5, X13, which can be named as pig and poultry production capacity factor; F2 has a large load on X2, X10, X6, X14 Therefore, it is defined as the cattle production capacity factor; F3 has a large load on X11, X7, X3, and is named as the sheep production capacity factor.

Table 6 Component matrix after rotation <sup>a</sup>

index	ingredient		
	F <sub>1</sub>	F <sub>2</sub>	F <sub>3</sub>
Poultry output (X4)	.968	-.050	-.036
Poultry meat production (X12)	.968	-.030	-.044
Poultry stock (X8)	.939	-.150	.104
Egg production (X13)	.899	-.128	.029
Pig output (X1)	.879	-.158	.351
Pork production (X9)	.875	-.156	.364
Pig stock (X5)	.816	-.115	.468
Bull output (X2)	-.164	.938	.182
Beef production (X10)	-.105	.928	.209
Cow stocks (X6)	-.328	.896	.200
Milk production (X14)	.036	.698	-.076
Lamb production (X11)	.249	.108	.941
Sheep stock (X7)	-.064	.298	.925
Sheep output (X3)	.288	.075	.925

#### 4.2.4 Comprehensive ranking

According to the data, the SPSS.23 software is used to calculate the scores of each of the three common factors in each city, so as to obtain the comprehensive score of each city to express the status of animal husbandry development in each city, and rank the animal husbandry according to the scores of each indicator. The specific score rankings are shown in Table 7.

Table 7 Ranking of factor scores

City	F <sub>1</sub> score	F <sub>1</sub> Ranking	F <sub>2</sub> score	F <sub>2</sub> Ranking	F <sub>3</sub> score	F <sub>3</sub> Ranking	F score	F Ranking
Chengdu	2.31	1.00	0.16	8.00	1.45	2.00	1.35	1
Nanchong	1.68	2.00	0.60	5.00	-0.07	10.00	0.98	2
Liangshan	0.46	6.00	3.06	1.00	-2.44	21.00	0.79	3
Dazhou	0.75	4.00	0.94	4.00	1.19	4.00	0.78	4
Mianyang	0.84	3.00	0.19	7.00	0.39	7.00	0.51	5
Deyang	0.52	5.00	-0.77	18.00	1.00	5.00	0.16	6
Yibin	0.28	7.00	-0.31	10.00	0.17	9.00	0.07	7
Luzhou	0.08	10.00	-0.55	13.00	-0.10	11.00	-0.13	8
Meishan	-0.25	15.00	-0.33	11.00	0.56	6.00	-0.14	9
Guang'an	0.18	8.00	-0.76	17.00	-0.19	12.00	-0.15	10
Leshan	0.10	9.00	-0.82	20.00	0.17	8.00	-0.17	11
Bazhong	-0.37	17.00	0.21	6.00	-0.37	13.00	-0.17	12
Ziyang	0.07	11.00	-0.28	9.00	-1.28	20.00	-0.20	13
Suining	-0.03	12.00	-0.58	14.00	-0.41	15.00	-0.23	14
Neijiang	-0.10	13.00	-0.69	16.00	-0.50	17.00	-0.31	15
Ganzi	-1.96	21.00	1.49	2.00	1.69	1.00	-0.33	16
Aba	-1.80	20.00	1.27	3.00	1.38	3.00	-0.35	17
Guangyuan	-0.24	14.00	-0.63	15.00	-0.43	16.00	-0.35	18
Zigong	-0.31	16.00	-0.45	12.00	-0.87	18.00	-0.38	19
Yaan	-1.00	18.00	-0.80	19.00	-0.38	14.00	-0.76	20

#### 4.2.5 Comprehensive analysis

##### (1) Analysis from a geographical perspective

It can be seen from Table 7 that the development level of animal husbandry in each city (state) is quite different and the distribution is uneven. The comprehensive score of Chengdu is much higher than other cities and states. The highest scores of the comprehensive scores of the development level of animal husbandry in all cities (states) of Sichuan Province are 2.34, which is a big gap.

First, Chengdu, Nanchong City, Liangshan City, Dazhou City, and Mianyang City have a good development status for animal husbandry, and have comparative advantages over other cities. Among them, Chengdu has the highest score, followed by Nanchong City. The main reason is that the pig and poultry ability factor F1 is much higher than the other cities, indicating that pigs and poultry are the dominant industries in Chengdu and Nanchong, and the output efficiency is high. The development of animal husbandry has a certain promotion effect; because the production capacity factor F2 of Liangshan City ranks first in the cities, it plays a vital role in the development of animal husbandry in Liangshan City. Therefore, the overall development level of animal husbandry in Liangshan Prefecture It is in the forefront of cities in Sichuan Province.

Second, the development of animal husbandry in Ganzi Tibetan Autonomous Prefecture, Aba Tibetan and Qiang Autonomous Prefecture, Panzhihua City and other cities (states) is generally weak. This shows that the city (state) has a disadvantage in the level of animal husbandry development. Among them, Panzhihua City has the lowest comprehensive score, indicating that the city's animal husbandry development level is the lowest in Sichuan Province, the main reason is that the cattle production capacity F2 factor score is the lowest, the pig and poultry production capacity factor F1 and the sheep production capacity factor F3 comprehensive score are at Countdown, the number of cattle, sheep, pigs and poultry in Panzhihua City is only one-tenth of that in Chengdu. On the whole, Panzhihua City's animal husbandry business has a single main body and a small scale of development. The development level of animal husbandry in Panzhihua City is constrained.

#### (2) Analysis from the perspective of factors

In the development of animal husbandry in Sichuan Province, the pig and poultry production capacity factor has the largest weight, and its contribution rate is as high as 48.76%; the cattle production capacity is second, 28.42%; the sheep production capacity contribution rate is the smallest, at 12.22%.

First, from the perspective of pig and poultry production capacity factors, Chengdu is at the forefront of the province and far higher than other cities (states), indicating that Chengdu has a strong ability to develop pig and poultry production. The reason is that Chengdu has actively carried out research on local breed resources of livestock and poultry, carried out work on breeding, breeding, expansion, breeding of new strains and utilization of livestock and poultry, and completed the work of Chenghua Pig, Yanan Pig and Pengxian Yellow. The chicken resource farm was rebuilt, and the production performance measurement center of Yanan pig and Pengxian yellow chicken was basically established[5].

Second, from the perspective of cattle production capacity, Liangshan Yi Autonomous Prefecture ranks first, followed by Ganzi Tibetan Autonomous Prefecture and Aba Tibetan and Qiang Autonomous Prefecture. Due to factors such as geography, climate and natural environment, grassland animal husbandry is mainly concentrated in Liangshan Prefecture and Ganzi Prefecture and Aba Prefecture in northwest Sichuan. The pastoral areas in this region are rich in pasture and livestock resources, and are suitable for breeding livestock such as cattle.

Thirdly, judging from the production capacity factor of sheep, the Ganzi Tibetan Autonomous Prefecture has made the animal husbandry industry develop due to special natural conditions. Chengdu has relied on the transformation and upgrading of animal husbandry, innovative business model, strengthened technical support, promoted the breeding cycle, optimized policy support, etc. In terms of the development of animal husbandry. For example, the Chengdu Mayang and Jintang black goat resource fields were rebuilt, and the Chengdu Mayang and Jintang black goat production performance measurement centers were established. The newly built Dumayang and Jintang black goats were expanded in 8 fields, etc., and developed in a scientific way. Animal husbandry.

In summary, this paper studies the production status of animal husbandry in Sichuan Province, and the interpretation capacity of pig and poultry production capacity, cattle production capacity and sheep production capacity reaches 89.404[6]. Comparing the animal husbandry of various cities (states) in Sichuan Province, the scores and rankings of animal husbandry in 21 cities (states) in Sichuan Province were obtained. Among them, Chengdu had the highest comprehensive score, and the development of animal husbandry was good. The overall ranking of Panzhihua Animal Husbandry

was the lowest. It is a short-board to promote the development of modern animal husbandry. The overall ranking of the ecological economic zone in northwestern Sichuan is lower, mainly due to the weak production capacity of pigs.

## **5. Suggestions for developing animal husbandry in Sichuan Province**

### **5.1 Development of ecological grassland animal husbandry**

The animal husbandry industry in Sichuan Province has significant regional advantages. The Sichuan Northwest Ecological Economic Zone, where Ganzi Prefecture and Aba Prefecture are located, has an absolute significant advantage in grassland animal husbandry. On the one hand, on the basis of the development of traditional animal husbandry, the grassland specialty industry should be fully developed to create products with grassland characteristics; on the other hand, combined with the geographical conditions and natural environment of the ecological region in northwestern Sichuan, rational use of natural resources can continue to develop. And healthy reasons.

### **5.2 Development of large-scale operation of animal husbandry**

Panzhihua City needs to intensify efforts to cultivate new business entities and vigorously develop large-scale operations. Encourage the development of new business entities such as large professional households, farmers' professional cooperatives, family farms, leading agricultural industrialization enterprises, and fully develop various forms of moderate scale operations. At the same time, it will promote the small-scale and decentralized operation of Panzhihua City to a moderate scale and cooperative operation, and promote the development of Panzhihua animal husbandry in the direction of standardization, intensification and scale.

### **5.3 Increase the investment in science and technology in animal husbandry**

The development of modern agriculture is currently the main goal of China's agricultural development. The development of modern agriculture is inseparable from the development of science and technology. Our province is a large province for animal husbandry development. Promoting the development of animal husbandry with science and technology is an indispensable part of promoting the modernization of animal husbandry in our province. On the one hand, it is necessary to promote modern scientific aquaculture technology, realize scientific, professional, technical and organizational scale farming; on the other hand, it is necessary to strengthen the research of current farming facilities, scientific breeding facilities and equipment, and achieve the goal of healthy and sustainable development.

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