



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

The Impact of Changes of the Internal Agricultural Structure in Sichuan Province on Farmers' Income

GAO Rui-fang* , JIA Xian-wei

School of Economics and Management, Sichuan University, Yaan 625014, China

Abstract After introducing the status quo of farmers' net income and gross output value of agriculture of Sichuan Province, and the changes of agricultural output structure, the regression analysis was conducted on the impact of the changes in agricultural structure on the farmers' net income per capita on the strengthen of the data from Sichuan statistical yearbook and by the way of econometrics. The multiple linear regression analysis was conducted on the impact the changes in crop farming on farmers' net income by using logarithmic demand model. The results show that the agricultural structure has transformed from the dominant crop farming to the all-around developmental trend covering the dominant industry, animal husbandry and forestry, fishery and the other industries; the animal husbandry has greatest impact on famers' income per capita and the impact of crop farming is slightly weaker than animal husbandry; the crop farming and animal husbandry develop fairly rapid simultaneously and the two all have great impact in farmers' income; among animal husbandry, the meat and eggs have relatively great impact on farmers' income, while in crop farming, grain plays the dominant role in affecting farmers' income, followed by cash crop. Hence, the relevant countermeasures applied to increase farmers' income are put forward in terms of optimizing the internal structure of agriculture, adjusting the internal structure of crop farming, adjusting the internal structure of animal husbandry and strengthening the support of farmers.

Key words Agricultural structure, Farmers' net income, Contribution rate, China

Sichuan is a granary province, in recent years, many farmers go to cities to find jobs and the non-agricultural income increases annually, but at present, farmers' income mainly comes from agricultural production. The realization of all-around well-off society needs to flourish rural economy, accelerate urbanization and improve farmers' living and consumption level; however, the key to realize it is to increase farmers' income. After China entering the WTO, the import of agricultural products has increased and the increase of farmers' income goes slow, so the adjustment of agricultural structure is an important channel for increasing farmers' income. Since the reform and opening up, Sichuan Province has conducted several adjustment on its agricultural structure and farmers' net income has increased greatly. It demonstrates that reasonable agricultural structure is the basis for agricultural system to display the overall function and interest of it. In addition, reasonable agricultural structure can well facilitate the increase of farmers' income^[1]. However, in the late 1990s, farmers' income went slow, so in the paper we will introduce the impact of agricultural structure changes on farmers' income by using econometric estimation, and then analyze the reasons of the slow increase of farmers' income. In the end, a series of suggestions will be proposed so as to provide reference for policy-making of rural economic development of Sichuan Province.

1 The farmers' net income and the status quo of agricultural output

1.1 The status quo of farmers' net income Since the 30 years' reform and opening up, rural economy of Sichuan Province has experienced fairly rapid development and farmers' income and living standard have been greatly improved. The average net income of farmers has increased from 187.9 yuan in 1980 to 4 121.21 yuan in 2008, 20.9 times against that in 1980. However, the growth rate of farmers' average net income went slow gradually and even showed the descending trend. In 1981, the increase rate of farmers' average net income was 18%, but from 1981 to 1994, the increase rate of farmers' maintained around 10%, and the increase rate came to 36% in 1994. From 1994 to 1997, the increase rate was around 25%, which was fairly larger. In the late 1990s, the farmers' net income went slow.

1.2 The status quo of gross output of agriculture With the execution of the household contract responsibility system, the implementation of a series of preferential policies for farmers and strong support from government, the gross output value of agriculture in Sichuan Province increased rapidly and showed the annually increase trend. For example, the gross output value of agriculture has increased from 147.02 in 1980 to 3 903.40 in 2008. Especially after entering the 21st century, Chinese government paid much attention to "the three agricultural problems" concerning agriculture, countryside and farmers and the policies enacted for benefiting farmers are much more diversified and more forceful, so the gross value of agriculture developed more rapidly from 178.449 billion in 2003 to 390.340 billion in 2008, the growth rate reached 120%. From the development trend, it can be seen that the growth trend of

Received: May 28, 2010 Accepted: June 16, 2010

Founded by the "211" Construction Item of Sichuan Agricultural University

* Corresponding author. E-mail: ruifang1015@163.com

the gross output value is similar to the farmers' average net income per capita.

1.3 The changing trend of the structure of agricultural value With the deepening of new village construction and the advancement of rural economic reform, internal structure of agriculture in Sichuan Province has entered a rapid adjustment period. In the recent 30 years, the weight of crop farming has dropped from 72% in 1980 to 41.2% in 2008; the weight of forest has remained fairly unchanged with the proportion around 3%–6%; the proportion of animal husbandry has increased greatly from 25% to 52%; forest and fishery account for modest proportion, for example, in 2008 the output of fishery account for only 3% in the aggregate agricultural output. Regarding it as a whole, agricultural structure in Sichuan Province has changed from the long-term structure, in which crop farming played a dominant role to the diversified structures, in which the animal husbandry played a dominant role and the crop farming, forest, animal husbandry and fishery develops hand in hand. The weight of agriculture presents the changing rate, but it still takes important position and the weight accounted by animal husbandry has surpassed agriculture gradually.

2 Data source and research method

2.1 Data source The data in this paper mainly comes from the *Sichuan Statistical Yearbook of the Sichuan Bureau of Statistics*^[2].

2.2 Research method In the first place, the contribution rate of agricultural added value' growth rate of each section is analyzed. And then the impact of the changing agricultural output structure on farmers' net income is researched and analyzed by employing multiple linear regression and log-linear model.

Agricultural added value is the sum of various kinds of industries such as agriculture, forest, animal husbandry, fishery and other industries, the formula is as follows:

$$\Delta a = \sum_{i=1}^4 \Delta a_i \quad (1)$$

In the formula, Δa refers to agricultural added value; Δa_i is the added value of i .

RC_i refers to the contribution rate of agricultural added value' growth rate of each industry, the formula is as flows:

$$RC_i = \Delta a_i / \Delta a \quad (2)$$

3 Result and analysis

3.1 The impact of the changing agricultural structure on farmers' net income

3.1.1 Analysis of the contribution of agriculture, forest, animal husbandry and fishery to agricultural added value^[3]. According to the original data and by the use of formula (2), the average contribution rate of various industries in Sichuan Province to agricultural added value from 1980 to 2008 can be worked out (Table 1).

From 1980 to 2008, the growth rate of the added value of the gross output value of agriculture is 20%. From Table 1, it can be seen that the added value of the gross output value of

agriculture mainly comes from animal husbandry and its contribution rate is 50%, followed by agriculture of 43%, forest of 4% and fishery of 3%. The contribution rate of crop farming, forest, animal husbandry and fishery to agricultural growth rate is unstable with great ups and downs; however, it still illustrates the important role played by animal husbandry of the agricultural output in Sichuan Province and its importance to the contribution of farmers' income^[4].

Table 1 The average contribution rate of each industry in Sichuan Province from 1980 to 2008

	Crop farming	Forest	Animal husbandry	Fishery
Average value	0.43	0.04	0.50	0.03
Maximum	0.93	0.29	1.19	0.08
Minimum	-0.19	0.005	0.05	-0.002

3.1.2 The econometric analysis of the impact of the changes in agricultural structure on farmers' net income per capita. The adjustment of agricultural structure is the actual requirement of increasing farmers' income. Since the reform and opening up, Sichuan Province has conducted continual adjustment and its dominant industry has shifted from crop farming to animal husbandry. With the continual optimization of agricultural structure and the continual upgrading of agricultural resources allocation, farmers' net income has increased accompanying them. In order to test the impact of agricultural structure changes on farmers' income, the multiple regression and quantitative analysis are conducted on impact of the weight taken by agriculture, forest, animal husbandry and fishery on farmers' net income from 1980 to 2008^[5-6]. Its regression result is:

$$Y = 5.7296 + 0.4899X_1 + 0.2433X_2 + 0.5464X_3 - (18.4121) (3.1948) (1.7950) (4.0299) \\ 0.2334X_4 \\ (-2.1785)$$

In the formula, Y refers to net income per capita; X_1 refers to the weight taken by crop farming in agricultural output; X_2 refers to the weight of forest in agricultural output; X_3 is the weight of animal husbandry in agricultural output; X_4 is the weight of fishery in agricultural output.

The regression result shows that $F^2 = 0.9927$, $D.W. = 1.665$, $F = 826.2087$. From 1980 to 2008, the changes of four variables account for the 99.27% of the changes of farmers' net income in Sichuan Province. Under the significance level of 0.1, the threshold value $t_{0.05}(24)$ of the t statistics with the freedom of motion of 24 equals 1.711, so all the variable parameters do not equals 0 significantly, and the marks before the parameters X_1 , X_2 , X_3 , X_4 are reasonable as well. Coefficient of determination $R^2 = 0.9927$, which shows that the model fits well on the whole. From 1980 to 2008, with the increased weight of animal husbandry (X_3) in agricultural structure, farmers' net income per capita will increase more rapid, the following is crop farming (X_1) and the forest (X_2) ranks the third. The impact of fishery (X_4) on farmers' net income per capita is lower than 0. In general terms, the addition of gross agricultural value can advance the increase of farmers' income. In influence coefficient term, animal husbandry in Sichuan Province has the greatest impact on people' net income per capita and the elastic co-

efficient is 0.5464, besides, the elastic coefficient of crop farming is 0.4899, slightly lower than that of animal husbandry, and crop farming becomes the second section in affecting farmers' net income per capita. Therefore, in order to increase farmers' income, the development of animal husbandry and crop farming should be laid stress on.

3.2 The internal structure of animal husbandry and crop farming

3.2.1 Analysis of the contribution of various sections of animal husbandry to the gross output value of it. According to the original data and by the use of the formula (2), the average contribution rate of each section of animal husbandry in Sichuan Province to the gross output value of it from 1986 to 2008 can be calculated (Table 2).

Table 2 The average contribution rate of each industry of animal husbandry in Sichuan Province to the gross output of animal husbandry

	Meat	Eggs	Milk
Average value	0.8055	0.1617	0.028
Maximum	1.08	0.3511	0.0961
Minimum	0.6397	-0.054	-0.027

It can be seen from Table 2 that, from 1986 to 2008, the annual average growth rate of the gross output value in Sichuan Province is 5.3%, among which the contribution rate of meat is the biggest, which accounts for 80.55%; the following one is egg with 16.17%, milk of 2.8 and the contribution rate of honey and sheep' wool is 0.48%. The contribution rate of meat and eggs to the gross output value of animal husbandry is relatively stable, while the contribution of milk fluctuates greatly. However, the output of milk is fairly stable, so it has positive effects on increasing the output of animal husbandry. In 2005 and 2007, the gross output of animal husbandry appeared negative growth, which led to the negative contribution rate to eggs and milk; it further indicated that the slide of animal husbandry output in 2005 and 2007 was mainly caused by the decrease of the output of meat.

3.2.2 Analysis of the internal structure of crop farming and farmers' net income. In the paper the logarithmic demand model^[7] is used to conduct multiple regressions between the weight of the output of food, cotton-flax, oil, fruits, cane and tobacco in crop and farmers' net income per capita. The regression result is:

$$\ln Y = 14.2264 + 9.5843 \ln X_1 + 0.0807 \ln X_2 + 1.0945 \ln X_3 + 1.1061 \ln X_4 - 0.8402 \ln X_5 + 0.1394 \ln X_6$$

(5.7134) (2.9914) (1.7554)
(2.1440) (12.981) (-3.903)
(1.7932)

In the formula, Y is farmers' net income per capita; $X_1, X_2, X_3, X_4, X_5, X_6$ are the weight of the output of food, cotton-flax, oil, fruits, cane, and tobacco in crop farming.

From the regression result, it can be seen that F^2 equals 0.9847, which indicates that the model fits well, and the t distribution has passed the test. The indices D and W are around number 2, which illustrates that there is no first order au-

tocorrelation among indices. It can be seen from related coefficient that among the crop farming, food, oil and fruits have fairly greater impact on farmers' net income per capita. Every one percent increase of food output, farmers' net income per capita will increase 9.58 yuan relatively; every one percent increase of oil and food output, farmers' net income per capita will increase about 1.1 yuan relatively. It can be seen from regression equation that cane has negative impact on farmers' income, and farmers' net income per capita increase mainly depends on the farming of the main cash crops, hence, scientifically and reasonably adjusting the agricultural structure, appropriately and increasing the farming area of cash crops and improving their yield are effective ways of increasing farmers' income.

4 Conclusion and suggestions

4.1 Conclusion It can be seen from the above analysis that the agricultural structure has changed from the crop farming dominance to the all-around development trend, which is dominated by animal husbandry and combined by forest and fishery. The output of animal husbandry has the greatest impact on farmers' net income per capita and slightly surpassing crop farming. During the fairly rapid development of crop farming and animal husbandry, both of them have great impact on farmers' income. In the animal husbandry, meat and eggs have relatively larger impact on farmers' income, while in crop farming; food still has dominant impact on farmers' income, followed by cash crops.

4.2 Suggestions

4.2.1 Optimizing the internal structure of agriculture. From the regression result, it can be seen that animal husbandry has the greatest impact on farmers' net income per capita, so the government should accelerate the development of animal husbandry, promote the increase of livestock products and their added value, as well as ensure the safety and quality of livestock products. In addition, the government should develop agricultural products according to standard and scale development to accelerate the process of rural industrialization^[8-9].

4.2.2 Adjusting the internal structure of crop farming. In the internal structure of crop farming, cash crops have bigger impact on farmers' net income per capita, so the farming area of cash crops in Sichuan Province should be increased. Although food has the biggest impact on farmers' income, the large area of mountains in Sichuan squeezes the farmlands, so the mountain areas should be fully made use of to plant cash crops such as, fruits and the like. Besides, the added value of these products produced by crop farming, in order to fully display the functions of the mountain areas and then increase farmers' income.

4.2.3 Adjusting the internal structure of animal husbandry. Sichuan is an animal husbandry province and the animal husbandry has relatively larger impact on farmers' net income per capita. While in the internal structure of animal husbandry, meat contributes much more than others to animal husbandry, followed by eggs and milk, and the impact of honey and sheep' wool are relatively smaller. Thus the government should encourage farmers to develop animal husbandry in scale and

(To page 28)

op agricultural and grazing industry, cultivate new industry growth point, play their own unique strengths and potential, and form industries and regional brands with local characteristics^[9].

(4) Jixi, Shuangyashan, Heihe, Yichun, Qitaihe, Hegang and Daxinganling. These areas are in a disadvantageous position in comprehensive evaluation, indicating that they are backward in economic development in Heilongjiang commodity grain base. Among them, Jixi, Shuangyashan, Qitaihe, and Hegang are coal cities, which are also important energy bases of China. Industrial structure of these cities is relatively single, and non-resource-based industry is relatively weak. Therefore, these cities should accelerate the system reform, pay attention to environmental protection and reasonable use of resources, increase investment and attract talents, vigorously develop the industry silicon, silicon carbide, magnesium alloy and so on, transform coal energy resources into economic advantage, and realize economic coordinated and sustainable development. However, Yichun, Heihe and Daxinganling are forestry cities with huge employment pressure and slow social economic development. Besides, these areas have immense woodland, broad snowland, and cold climate. Therefore, Yichun, Heihe and Daxinganling should fully use their superior resources, establish ice-snow tourism area and primeval forest park, vigorously develop sustainable industry, establish eco-tourism cities, accelerate the transfer of labor force, increase investment, broaden employment channels, and increase farmers' income^[10].

References

- [1] HUO XX, WANG ZB. Research review of China commodity grain base[J]. Rural Economy, 1995(11):1–3. (in Chinese).
- [2] BAI SJ. Systems engineering[M]. Beijing: Electronic Industry Press, 2009:118–122. (in Chinese).
- [3] WANG XY, WANG FL, QIAO JY. The research of the indexes system about evaluating strong provinces of agriculture[J]. Journal of

Agricultural Mechanization Research, 2003(3):59–61. (in Chinese).

- [4] Heilongjiang Provincial Bureau of Statistics. 2007 Heilongjiang statistical yearbook[M]. Beijing: China Statistics Press, 2007. (in Chinese).
- [5] Heilongjiang Provincial Bureau of Statistics. 2008 Heilongjiang statistical yearbook[M]. Beijing: China Statistics Press, 2008. (in Chinese).
- [6] Heilongjiang Provincial Bureau of Statistics. 2009 Heilongjiang statistical yearbook[M]. Beijing: China Statistics Press, 2009. (in Chinese).
- [7] CHEN C, ZOU Y. SPSS15.0 common functions and its application[M]. Beijing: Electronic Industry Press, 2009:312–315. (in Chinese).
- [8] ZHANG WT, DONG W. SPSS tutorials for statistical analysis[M]. Beijing: Higher Education Press, 2004:213–227. (in Chinese).
- [9] XU Z. Research on the regional industrial structure development strategies in Heilongjiang Province[D]. Harbin: Harbin University of Science and Technology, 2008:29–34. (in Chinese).
- [10] SUN W, WANG QY. Factor analysis for level of comprehensive development of center cities in Heilongjiang Province[J]. Journal of Harbin Engineering University, 2002, 23(2):130–134. (in Chinese).
- [11] LEI ZB, DU HW. Driving factors and model of change in arable land area in China[J]. Asian Agricultural Research, 2009, 1(5):35–38.
- [12] LI J, MING DT. Driven factors analysis of developing circular agriculture[J]. Journal of Anhui Agricultural Sciences, 2010, 38(9):448–450. (in Chinese).
- [13] YANG LP, GUO HH, YAO HM, *et al.* Regional supply capacity of agricultural products in Shangdong Province based on GIS[J]. Asian Agricultural Research, 2009, 1(5):39–42.
- [14] FAN CK, WU Y. Analysis of regional economic development level in Guangxi Zhuang Aatonomous region[J]. Journal of Anhui Agricultural Sciences, 2010, 38(14):454–456. (in Chinese).
- [15] XIAO M. Discussion on ways of economic development in rural areas of Anhui Province based on cooperatives[J]. Asian Agricultural Research, 2009, 1(6):16–19, 28.

(From page 24)

scientifically feed livestock and fowls.

4.2.4 Strengthening the support from government. The government should strengthen its support on agriculture and enact the policies implemented for benefiting farmers strictly; enforce the publicity; enhance farmers' awareness of scientific and reasonable planting and breeding, elevate farmers' activities in participating scientific farming. Furthermore, the government should increase farmers' income through solving the rural surplus labor.

References

- [1] ZHANG DF, GUAN H. Thinking on strategic adjustment of advancing China's agricultural structure[J]. Agricultural Economy, 2003(2):22–23. (in Chinese).
- [2] The Bureau of Statistic of Sichuan Province. Sichuan statistical yearbook[EB/OL]. <http://www.sc.stats.gov.cn/nj/nj.asp>. (in Chinese).
- [3] LIU Q. The quantitative analysis of the contribution of the regulation

of agricultural structure to the agricultural economic growth[J]. Journal of Henan Agricultural University, 2001(2):169–170. (in Chinese).

- [4] CHEN XW. The key is to grasp strategic adjustment of the agricultural and rural economic structure[J]. Shanghai Rural Economics, 2000(1):12–15. (in Chinese).
- [5] MU WS, ZHANG XS, FU ZT, *et al.* A quantitative analysis on changes of agricultural structure and it's effect on the farmer's income[J]. System Sciences and Comprehensive Studies in Agriculture, 2004, 20(4):251–253. (in Chinese).
- [6] CUI YF, FENG ZC. Correlation analysis on agricultural structure adjustment and agricultural economic growth—a case of Jingmen City, Hubei Province[J]. Problem of Agricultural Economy, 2004(2):63–65. (in Chinese).
- [7] YU MJ. Quantitative analysis on the correlation between agricultural structure and agriculture income of farmers[J]. Journal of Huainan Teachers College, 2007(2):26–29. (in Chinese).
- [8] ZHOU KZ. Optimizing agricultural development based on structural adjustment[J]. Problems of Agricultural Economy, 2000(1):9–11. (in Chinese).
- [9] ZOU FL. Industrialization is essential to adjust agricultural structure[J]. Macroeconomics, 2003(4):51–52. (in Chinese).