Analysis of China's Agricultural input-output structure from 1997 to 2002

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Abstract

Based on China I-O table of 1997 and 2002, we quantitatively analyzed Chinese Agricultural input-output structure in 1997 and 2002, and give some advices for the development strategy of China's Agriculture. Following are main conclusions of our analysis:

Firstly, the ratio between intermediate input and Agricultural output increased between 1997 and 2002, but still the lowest of all the industries. Secondly, the value-added ratio was 57.3%. And Agricultural technical service is the only sector which VAR is in increase. However, the average profit margin of Agriculture had increased sharply. Thirdly, labor cost is the most important part of added values, indicating that Agriculture still belongs to the labor-intensive industry. Fourthly, the technology of Agriculture is behind other industries, the same happened in Agriculture's mechanization and value-added ratio.

Judged from the input aspect, fertilizer manufacturing is most important to Plant. And the importance increased by years, though the marginal benefit and is decreasing. The same happened to pesticide and other factors sector. The Plant is the case, the cumulative input coefficient of fertilizer and pesticide in 2002 had decreased by 16.2% and 38.6% in respective. It is surprised that the coefficient for agricultural machinery was low as 0.023.

As the output effect is concerned, Agriculture is the basic industry, and it is highly correlated with the manufactures of Sawmills, Furniture and Food Products. The cumulative input coefficients are still very high. But the data of 2002 had shown clearly that the correlations are decreasing. In one hand, the benefit from Agriculture decreased, it has only added the quantities without add-values. On the other hand, intensities of processing in other manufactures have increased. The marginal benefit of product has increased.

Key Words: Input-Output table Agriculture China

As we known, Agriculture is the basis of national economy, and it means more for China because of large scale of population. To learn the changing situation of the relationships between Agriculture and other industries, it's necessary and meaningful to analyze China's Agricultural input-output structure from 1997 to 2002. Input-Output (I-O) table can explain the direct and indirect relationships between every two industries in detail. Based on China I-O table of 1997 and 2002, we quantitatively analyzed Chinese Agricultural input-output structure between 1997 and 2002, and give some advices for the development strategy of China's Agriculture.

1. Background of Chinese Agriculture

China has modern Agriculture, and poor national Agriculture, too. In order to get a total impression, we watch it from different views. We find that though the ratio of Agricultural intermediate input of 2002 got 42.7 percent, higher by 2.5 percent than 1997, it is still the lowest of all the industries. So we use four economic indexes to show the development of Chinese Agriculture, they are Value-added Ratio (VAR), average profit rate, labor cost and technical ratio.

Firstly, the VAR was 57.3%. And that of technical services had increased by 19.1 percent, which is the only positive increasing industry of Agriculture. Secondly, the average profit rate of Agriculture had increased sharply. Thirdly, labor cost is still the most important part of new-added values, indicating that Agriculture still belongs to the labor-intensive industry. Fourthly, the technical ratio of Plant, Forestry, Animal Husbandry and Fishery was low in 2002, it got even lower than 1997. It showed the technology of Agriculture is behind other industries, and the mechanization and add-value of Agriculture are still low.

Table 1 Agriculture economic condition in general

		Plant	Forestry	Animal Husbandry	Fishery	Service
Value-added Ratio	1997	185.4	274.6	98.4	153.9	102.3
	2002	188.8	189.8	84.3	122.4	121.2
Average profit rate	1997	4.1	3.9	0.6	5.1	4.1
	2002	8.1	9.5	6.9	7.4	10.9
Labor cost	1997	87.4	88.3	91.8	83.9	19.2
	2002	81.2	77.4	78.5	80.2	67.6
Technical ratio	1997	58.7	66.7	47.0	52.4	11.7
	2002	55.2	53.0	37.2	45.7	40.1

Note: Add-value ratio is equal to add-value dividing intermediate input. Average profit margin is equal to surplus divide the difference between total input and surplus. Labor profit margin is equal to Labor payment dividing add-value. Technical ratio is equal to the sum of labor payment and tax dividing total output.

Sources: All the data came from the calculation of author based on the Input-Output table of China in 1997 and 2002.

2. Views of Input industry

Agriculture can not develop without other industry's input. The cumulative input coefficient in I-O table can show the correlation between Agriculture and other industry in details. We choose fertilizer, pesticide, plastic, machine of manufacturing of Agriculture and service of Agriculture as

the input industries.

Viewed from the input industries, the fertilizer manufacturing is the most useful to Plant, was 0.1356 in 1997 and 0.1137 in 2002. The latter decreased 16.2% than the former. From the statistical data of agricultural production, we knew China added 717.4 hundred tons fertilizer per year, and the input quantity of fertilizer increased by years. So we can conduct that the marginal benefit of fertilizer is decreasing, and the yield has decreased. It is the same to pesticide and other production factors. The Plant is the case, the cumulative input coefficient of fertilizer and pesticide in 2002 had decreased by 16.2% and 38.6% in respective. It is surprised that the effect of agricultural machinery was little, and the highest was only 0.023 under the Fishery.

Table 2 Cumulative input coefficients between Agriculture and input industry

output / input	year	Plant	Forestry	Animal Husbandry	Fishery	Service [a]
Fertilizer	1997	0.13563	0.04407	0.04644	0.01848	0.03600
	2002	0.11368	0.05192	0.03442	0.01083	0.01810
	%	(-16.2)	(17.8)	(-25.9)	(-41.4)	(-49.7)
Pesticide	1997	0.02562	0.01388	0.00915	0.00387	0.01177
	2002	0.01574	0.01978	0.00516	0.00194	0.00643
	%	(-38.6)	(42.5)	(-43.6)	(-49.8)	(-45.3)
Plastic	1997	0.03594	0.01452	0.01621	0.01598	0.01962
	2002	0.04093	0.02250	0.01994	0.02112	0.01852
	%	(13.9)	(55.0)	(23.0)	(32.2)	(-5.6)
Machine [b]	1997	0.01361	0.00822	0.00753	0.01992	0.00567
	2002	0.01010	0.01024	0.00567	0.02306	0.00460
	%	(-25.8)	(24.6)	(-24.7)	(15.7)	(-18.8)
Service [a]	1997	0.01476	0.02870	0.01261	0.01491	0.02784
	2002	0.01323	0.02951	0.01190	0.01454	0.02198
	%	(-10.4)	(2.7)	(-5.6)	(-2.5)	(-21.0)

[a] The Service of Agriculture is called Service.

[b] The Machine manufacturing of Agriculture is called Machine.

Sources: The data came from Input-Output table of China in 1997 and 2002.

Compared the I-O table in 1997 and 2002, we found Agriculture's production utility is decreasing, and most input factors' margin is decrease, too. But the Plastic is more effective with the Agriculture, because the usage of new production technique accelerates the demand for plastic products. About the Agriculture department, Forestry is different from others. Its coefficient values are only lower than Plant, but it appears direct rise.

Table3 Change orientation of cumulative input coefficients between Agriculture and Input Industry

	Plant	Forestry	Animal Husbandry	Fishery	Service
Fertilizer	↓	↑	⇊	⇊	⇊
Pesticide	⇊	⇈	⇊	⇊	⇊
Plastic	↑	⇈	↑	⇈	↓
Machine	⇊	⇈	⇊	↑	↓
Service	↓	↑	↓	↓	↓

Note: ↑↑↑or↓↓↓ indicates the change ratio over 50%, ↑↑or↓↓ indicates the change ratio in 25<R<50%, ↑or↓ indicates the change ratio is R<25%.

3. Views of Output industry

In view of the output industries, Agriculture is the basic industry, and it is highly correlated with the manufactures of Sawmills and Furniture and Food Products (such as vegetable oil refining & forage, Sugar, Slaughtering and meat processing, Fish, Wines, spirits and liquors, Soft drink, Tobacco products). The cumulative input coefficients are still very high. We still take Plant for a example, Vegetable oil refining & forage, Sugar, other Food Processing, Wines, spirits and liquors, Soft drink, Tobacco products are based on Plant. The biggest coefficient in 2002 is 0.5695 between Plant and vegetable oil refining & forage. What's more, Animal Husbandry and Slaughtering & meat processing are correlated at 0.7202, Fishery and Fish Processing at 0.5961. These tell us Agriculture is the basis of some industries, it provides the raw materials for them. In other word, the development of Agriculture is limited by that of Output industries.

The cumulative input coefficient is still high, but the data of 2002 has shown clearly that the correlations are decreasing. For example, the coefficients between Plant and these correlative five output industries -- vegetable oil refining & forage, Sugar, Wines, spirits and liquors, Soft drink, Tobacco products -- decreased sharply, had decreased by 22.6%, 30.7%, 29.8%, 59.6% and 75.3%. It means that in one hand, the benefit from Plant decreased, it has only added the quantities without add-values. On the other hand, other manufactures have increased intensities of processing. The marginal benefit of product has increased. Corresponding with the development of society, the more manufacturing techniques have been inputted, the less of cumulative input coefficients between Agriculture and manufactures are.

Table 4 Cumulative Input Coefficient between Agriculture and Output Industry

	Year	Sawmills and Furniture	vegetable oil refining & forage	Sugar	Slaughtering and meat processing	Fish	Other Food Processing	Wines, spirits and liquors	Soft drink	Tobacco products
Plant	1997	0.01082	0.73600	0.69150	0.28029	0.10762	0.34211	0.38753	0.36960	0.20097
	2002	0.01362	0.56954	0.47935	0.22873	0.07270	0.24659	0.27214	0.14919	0.04970
	%	(25.9)	(-22.6)	(-30.7)	(-18.4)	(-32.4)	(-27.9)	(-29.8)	(-59.6)	(-75.3)
Forestry	1997	0.14996	0.00432	0.00461	0.00370	0.00351	0.00866	0.00486	0.00688	0.00367
	2002	0.11934	0.00353	0.00368	0.00456	0.00530	0.00612	0.00425	0.00802	0.00123
	%	(-20.4)	(-18.3)	(-20.1)	(23.0)	(51.1)	(-29.3)	(-12.6)	(16.6)	(-66.6)
Husbandry	1997	0.00410	0.02237	0.00957	0.75222	0.00612	0.09629	0.01004	0.01951	0.00535
	2002	0.00294	0.01875	0.00613	0.72021	0.00645	0.10611	0.00541	0.01804	0.00146
	%	(-28.3)	(-16.2)	(-36.0)	(-4.3)	(5.5)	(10.2)	(-46.1)	(-7.6)	(-72.7)
Fishery	1997	0.00201	0.02355	0.00249	0.00473	0.65696	0.02458	0.00427	0.00441	0.00165
	2002	0.00218	0.03956	0.00178	0.00790	0.59610	0.02231	0.00210	0.00339	0.00067
	%	(8.8)	(68.0)	(-28.7)	(67.2)	(-9.3)	(-9.2)	(-50.9)	(-23.1)	(-59.6)
Service	1997	0.00415	0.01011	0.00919	0.00912	0.00944	0.00582	0.00530	0.00524	0.00278
	2002	0.00358	0.00805	0.00609	0.00806	0.00828	0.00431	0.00360	0.00243	0.00071
	%	(-13.7)	(-20.3)	(-33.8)	(-11.6)	(-12.3)	(-26.0)	(-32.1)	(-53.6)	(-74.4)

Sources: The data came from Input-Output table of China in 1997 and 2002.

About the change orientation of cumulative input coefficients between Agriculture and Output Industry, the decrease outweighs than the increase. The industry of Sugar, Wines, spirits and liquors and Tobacco products are decreased significant, they have changed very much on techniques since 1997. But the Slaughtering and meat processing and Fish Industry have little changes. It seems that these two industries still have chance to make great progress in the future.

Table 5 Change Orientation of Cumulative Input Coefficients between Agriculture and Output Industry

	Sawmills and Furniture	vegetable oil refining & forage	Sugar	Slaughtering and meat processing	Fish	Other Food Processing	Wines, spirits and liquors	Soft drink	Tobacco products
Plant	↑↑	↓	↓↓	↓	↓↓	↓↓	↓↓	↓↓↓	↓↓↓
Forestry	↓	↓	↓	↑	↑↑↑	↓↓	↓	↑	↓↓↓
Animal Husbandry	↓↓	↓	↓↓	↓	↑	↑	↓↓	↓	↓↓↓
Fishery	↑	↑↑↑	↓↓	↑↑↑	↓	↓	↓↓↓	↓	↓↓↓
Service	↓	↓	↓↓	↓	↓	↓↓	↓↓	↓↓↓	↓↓↓

Note: ↑↑↑or↓↓↓ indicates the change ratio over 50%, ↑↑or↓↓ indicates the change ratio in 25<R<50%, ↑or↓ indicates the change ratio is R<25%.

4. Conclusions

With Comparison of the I-O data between 1997 and 2002, we analyzed the Chinese Agriculture's structural change, and found some interesting conclusions.

Firstly, agriculture's contribution to national economy has decreased. Though the Agriculture output is still grow, the value change little. The way to develop Agriculture is extending the other output industries' use.

Secondly, farmer still prefer add the use of fertilizer and pesticide, machines' use is not popular in China Agriculture. Data shows the marginal output of the former two factors are decreased, machines maybe one way of Agriculture's development.

Thirdly, Agriculture is the basis of other industry, but its development is still limited by that of other output industry. Development in Agriculture depends on other output industry. With more consumption of Agricultural products as intermediate, there are more chance for Agriculture.

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