

Sustainable Development of Agricultural Product Processing Industry in Jilin Province of China

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Abstract

Jilin is a big agricultural province in northeast China. Development of agricultural product processing industry and improvement of agro-food additional value play a vital role in improvement of living standard of farmer and increase of local government financial revenue. Therefore, agricultural product processing industry is regarded as the third pillar industry after automotive industry and petrochemical industry in Jilin Province, China. Considering the characteristics of agricultural product processing industry, such as water-consuming, over-dependent on water and agricultural products and so forth, its sustainable development seems more necessary than other industries. Sustainable development is not to limit development of agricultural product processing industry, but to further development. The investigation results demonstrated that development of agricultural product processing industry in Jilin Province is still at stage of extensive growth and the sustainable development faces big challenges. In this study, the factors that affect sustainable development of agricultural product processing industry in Jilin Province were discussed and the practicable strategies for sustainable development of agricultural product processing industry of Jilin Province were proposed.

Keywords: Agricultural product processing industry, Sustainable development, Investigation, Factors, Strategy

1. Introduction

Based on statistics research, there are 12 industries that related with agricultural product processing industry, e.g. food processing industry, food manufacturing, beverage manufacturing, tobacco processing industry, textile, costume and other fibers manufacturing, leather/velvet manufacturing, woodworking and straw manufacturing, furniture manufacturing, paper making and manufacturing, printing industry and rubber manufacturing in China. Some small and medium industries, which can seriously pollute the environment, such as corn processing industry, wine industry, beverage manufacturing, paper making and manufacturing, wood manufacturing, leather manufacturing, furniture manufacturing and so on, widely distribute in Jilin Province. For the environmental pollution problems, governments at all levels have drawn up and implemented control measures. However, environmental pollution could not be controlled effectively, even some places showed phenomenon of pollution transfer, for a variety of reasons including imperfect control measures. If the environmental pollutions caused by agricultural product processing industry were regarded as costs of local economic development, many of the economic benefits from enterprise development may not be able to cover environmental costs. Therefore, agricultural product processing industry can really play its role in local economic development and maintain its sustainable development, only if the environmental costs were controlled.

2. Factors affect sustainable development of agricultural product processing industry in Jilin Province

To study strategies of agricultural product processing industry sustainable development, more than 100 agricultural products processing enterprises were investigated and found that there were amounts of factors affect sustainable development of agricultural product processing industry. The most important is as following:

2.1 Agricultural product processing industry is polluting industries

Pollution data analysis of agricultural product processing industry in recent three years was as follows. The Emissions of pollutants in agricultural product processing industry from 2006-2007 were demonstrated in Table 1 and Table 2.

According to the figures given in the tables, agricultural product processing industry is one of the most serious polluting industries in China, especially for water pollution. In order to find if the local government of Jilin Province has been adware of the environmental challenges, considered the sustainable development and controlled the pollutions, more than 100 agricultural product processing industries were investigated.

2.2 Survey of agricultural product processing industry sustainable development in Jilin Province

For the reason of spaces limitation and enterprise privacy, the investigation results were only summarized briefly and the typical examples were taken for demonstration in this study. According to the investigation, agricultural product processing industries, especially the small industries sprang up everywhere. However, the environmental costs did not control effectively. In the view of pollution degree, for lack of supervision, environmental pollutions caused by agricultural product processing industry were more serious in remote areas, where the potentials for environmental costs control and pollution managements were smaller. Although many intensive industrial zones were established in past several years in Jilin Province, the emissions of pollutant was still random for the intensive industrial zones were not run with the cyclic economy management mode. In addition, a large amount of intensive industrial zones are at stage of beginning and most of agricultural product processing industries are not sited in intensive industrial zones; In the view of enterprise scale, pollutions caused by large-scale agricultural product processing industries were less than that caused by small-scale industries; In the view of investment original of the industries, state-owned or holdings industries emitted less pollutant than private industries; In the view of the type of agricultural product processing industry, the most serious polluting industries in Jilin Province were corn processing industry, paper making and manufacturing and starch industry; In the view of type of pollutant, the most serious pollution from agricultural product processing industry was water pollution, especially groundwater pollution; In the view of technological process, agricultural product processing industry was water-consuming. However, the groundwater level of the main location of agricultural product processing industry such as Wukeshu district, Yitong County, Siping city and Dehui County, dropped off seriously and affected the sustainable development of agricultural product processing industry; In the view of different district, the environmental pollution caused by agricultural product processing industry in Nongan, Dehui, Yitong and Dongfeng was more serious than that in Wukeshu district. Environmental Protection department have improved management of high-polluting enterprise and many industries transferred from city to countryside or remote areas. This was just the pollution transfer—from big city to small city or from small city to countryside, and the problems cannot be solved fundamentally.

Furfural plant of Nongan County was in the south of Nongan city, covered an area of about 60000 m² and 200 metres far away from Nongan granary. Furfural plant of Nongan County has been fertilizer plant before 1986. In 1988, it was changed to furfural plant, which mainly process corn cob. The investigation result demonstrated that the location of furfural plant was very unreasonable. Resident from more than 400 families in Nanguan Village of Nongan County were adjacent with furfural plant. The sewage and waste gases emitted from the furfural plant affected the health and living of resident. For example, suffocating smell diffused, black particles dropped on the researcher's face, deafening boom came occasionally during the investigation process.

Here has ever been a small village with beautiful nature and resident here drink well water. However, the air was no longer clear and the well water became brown color and tasted bitter, since establishment of furfural plant. Many people died of liver, stomach and lung cancer which was thought to be caused by the water pollution. For repeated complains of resident, Nongan County government installed tap water and resolved the problem of drinking water. But the noise and air pollutions were still remained to be resolve.

In addition, Nanguan village is main vegetable production base of Nongan County. Some farmer irrigated with tap water, whereas some farmer irrigated with the polluted groundwater. This means the health of vegetable consumer could not be ensured.

2.3 Analyses of water resources in Jilin Province

Agricultural product processing industry mainly results in water pollution and Jilin Province is lack of water resources. According to "China statistical yearbook" of 2008, the total amount of water resources in Jilin Province was 34 600 000 000 m³, the amount of earth's surface water was 30 150 000 000 m³, the amount of groundwater was 8 630 000 000 m³ and the repeated measure of earth's surface water and groundwater was 4

780 000 000 m³. However, the water resources per capita in Jilin Province was 1269 m³, which was 66.22% of water resources per capita in China (1916.3 m³). Therefore Jilin is a water-lacking province.

2.4 Analyses of climatic condition in Jilin Province

Jilin Province (121°38'-131°19'N 40°52'-46°18') is located in the central part of Northeast China, in the North Temperate Zone. Jilin Province is low temperature area of continental monsoon climate which characteristic with obvious four season's alternation, rain and hot at the same time, dry and windy in spring, hot and rainy in summer, cold in winter. It is about 4-5 months of period for river covered by ice. The runoff during this period is 5%-10% of annual runoff. The maximum thickness and the minimum runoff usually occurred from the end of January to February. This period was called "dry season". Period from May to the first ten days of June every year was called "average water-level season", as cold high pressure move to north and the rainy season have not approached. The ability of environment self-purification is very poor during the period of both "dry season" and "average water-level season".

Therefore, decrease environmental costs of agricultural product processing industry in Jilin Province seems to make more sense than in south part of China. This is also a necessary condition for sustainable development.

2.5 Analyses of raw materials for agricultural product processing industry

According to the investigation result, the widespread problem for agricultural product processing industry in Jilin Province is poverty of raw materials. Many small enterprises only worked 3 months a year. Large enterprises assume more responsibilities and have to raise prices to purchase raw materials from farmers. Vicious competition for raw material purchase and over-investment for pollution management depressed to control pollution caused by agricultural product processing industry.

3. Strategies for sustainable development of agricultural product processing industry in Jilin Province

3.1 Prerequisites of the study

According to the analyses of above, factors affecting sustainable development of agricultural product processing industry in Jilin Province were versatile. Climatic condition is one of the factors and uncontrollable, that could not be changed. In addition, China is in the process of urbanization and a great amount of farmer become industrial labor. Therefore, the output problems of agricultural product could not be resolved fundamentally in a very long time. This study concentrated on strategies for sustainable development of agricultural product processing industry under the available production conditions, not how to expand sources of raw materials. Therefore, the prerequisite of the study is to maximize the efficient use of water resources, while the yield of agricultural product processing industry is not affected.

3.2 Draw up sustainable development programs of agricultural product processing industry in Jilin Province

According to the investigation, there were no special programs about agricultural product processing industry in Jilin Province. Even there are some programs; they were only included in "Productivity Programs", which did not consider the characteristic of agricultural product processing industry. In addition, high-polluting agricultural product processing industry almost distributed randomly in all the city and county of Jilin Province. For example, there are various agricultural product processing industries, such as Houshi Starch Industry, Bizhou Beer Company, Shunchi Beer Company, Hengxin Chemical Industry, Pengxiang Livestock, Zaisheng Paper Group, Dongfeng Artificial Board Plant and Yangming Chemical Industry, in Dongfeng County of Jilin Province. The industries scattered in this county, some industries even located in remote mountain area. Dongfeng County geographically located in the upstream of Huifa River, which through the whole county. Therefore, if the upstream water was polluted, it would affect areas downstream the river and increase environmental cost. Additionally, Dongfeng County was in Changbai Mountain area, where distributed many rare plant species. Water pollution will result in biodiversity losses. Therefore it is not suitable to develop agricultural product processing industry in Dongfeng County. If have to develop, it should be managed intensively. However, there is no overall planning for agricultural product processing industry in Jilin Province at present time to result in the arbitrary status.

3.3 Support and incubate large-scale enterprise of agricultural product processing industry

According to the investigation result, the large- and medium-scale enterprises of agricultural product processing industry, such as Dacheng corn industry, Jiliang group and Hongbaolai LTD, could control pollution properly. Hongbaolai LTD received researchers warmly and helped researchers to get related data. According to the introduction of production department, Hongbaolai LTD purchased one sewage treatment instrument valued of RMB 3 million Yuan, which took advanced sewage treatment technology from Germany. This instrument can

deal with 2000-4000 tons sewage produced in the company. The quality of treated sewage was close to first-class water and could be used as irrigation. The cost for treatment was only 0.3 RMB/ton. The leaders of sewage cleared that it is impossible to emit sewage without any treatment. Now this company is striving for the title of "Environment friendly enterprise". They think that environment protection is a necessary tendency. They will confirm the development of their company to this tendency, hold the development opportunity and establish environment protection brand to amplify market. In addition, they cannot afford the heavy losses caused by production disruption, even the fine was not considered, for the environmental problems. According to estimation, the losses is nearly RMB 0.2 million Yuan for one-day production disruption. However, the cost of sewage treatment is only RMB 3000 Yuan per day and less than RMB 1 million Yuan annually.

According to the statement of businesses management department of Hongbaolai LTD, the company lost some medium- and low-level market for the price of products was higher than that of small-scale company. For example, one small-scale company, which does not have environment protection cost, produces the same products with Hongbaolai LTD. The products from this small-scale company will be more competitive than that of Hongbaolai LTD as its lower price. In this review, Hongbaolai LTD will loss medium- and low-level market. The incentives and constraints of government to enterprises that carry out different environmental policy is not enough. Therefore, the costs of products from different company will be different. It is this difference to make companies, that protect environment positively, loss markets. However, they believe that they are right in long terms and will be appreciated. They hope government could draw up some strategies for water reuse, which will stimulate further positive action for environment protection.

Therefore, one suggestion is that government should support and incubate large-scale enterprise of agricultural product processing industry. Considering, Jilin Province is an inland province, the small-scale enterprise should be guided to be medium- or large-scale enterprise and improve their ability of pollution control, not be forced to close.

3.4 Establish intensive industrial zones at suitable locations

Intensive industrial zones has advantages, e.g. good for pollution control, easier be managed and promptly control of pollution accident. At present time, many intensive industrial zones in Jilin Province are at stage of beginning or at unsuitable location. There are not big strategies differences between inside and outside of the intensive industrial zones; even the mature intensive industrial zones could not attract enterprise of agricultural product processing industry.

Therefore, there are two suggestions for the government, one is to establish intensive industrial zones at suitable locations; another one is to implement different strategies for inside and outside of the intensive industrial zones and give more privileges to the enterprise entered intensive industrial zones.

3.5 Agricultural industrialization and decrease raw materials flowing into foreign areas

In Jilin Province, most raw agricultural materials flow into foreign areas because they are dispersively produced and sold dependent on price. Therefore, government should implement agricultural industrialization strategy and establish long-term cooperation between agricultural product and agricultural product processing industry, to remain sustainable development of large-scale agricultural product processing industry.

3.6 Strictly administrate ground water resources

Most of the agricultural product processing industries in Jilin Province located in remote areas, so they have to use ground water for production, which could result in over-use and pollution of water resources. According to this situation, one suggestion is to limit the use of ground water strictly and improve charges of water resources apart from establishment of intensive industrial zones. For some industries which do not require water resources strictly, such as paper making and manufacturing, wood manufacturing, furniture manufacturing and leather manufacturing, should be un-allowed to use ground water.

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Table 1. Emission of sewage and SO₂ in agricultural product processing industry in China from 2005-2007

	Sewage (Million tons)			SO ₂ (Thousand tons)		
	2005	2006	2007	2005	2006	2007
Food processing industry	1189.64	944.14	1485.89	156	168	170.3
Food manufacturing	428.30	431.13	428.24	94	105	117.2
Beverage manufacturing	434.04	560.49	631.56	107	116	123.6
Tobacco processing industry	28.09	28.44	28.73	13	15	13.6
Textile	1722.32	1979.34	2251.69	296	303	275.9
Costume and other fibers manufacturing	91.85	136.85	144.94	15	21	12.4
Leather/velvet manufacturing	183.38	203.40	235.74	21	18	17.5
Woodworking and straw manufacturing	65.69	52.23	48.25	48	47	42.4
Furniture manufacturing	7.97	9.31	18.48	4	3	3.4
Paper making and manufacturing	3674.22	3744.07	4245.97	431	428	491.6
Printing industry	16.18	11.99	19.64	2	2	2.4
Rubber manufacturing	61.18	59.76	64.35	44	46	44.9
Total	7902.86	8161.15	9603.48	1231	1272	1315.2
Total emissions of industrial pollutants in China	24311.21	20804.40	22075.66	21684	22348	21400
Proportions of sewage and SO ₂ emitted from agricultural product processing industry in total emissions in China	32.51%	39.23%	43.50%	5.68%	5.69%	6.15%

Table 2. Emission of industrial smoke and solid waste in agricultural product processing industry in China from 2005-2007

	Smoke (Thousand tons)			Solid waste (Thousand tons)		
	2005	2006	2007	2005	2006	2007
Food processing industry	204	161	127.5	450	68.4	50.2
Food manufacturing	51	50	54.8	30	17.7	22.6
Beverage manufacturing	90	88	81	60	65.9	55.2
Tobacco processing industry	6	7	6.2	110	2.3	2.9
Textile	128	124	127.3	170	28.9	35
Costume and other fibers manufacturing	7	11	4.8	10	9.9	0.6
Leather/velvet manufacturing	11	10	11	0	5.6	4.9
Woodworking and straw manufacturing	55	37	31.7	10	4.1	8.2
Furniture manufacturing	2	4	5.1	0	0.4	0.2
Paper making and manufacturing	241	209	236	80	68.4	96.3
Printing industry	1	2	1.2	0	0.3	0.7
Rubber manufacturing	20	18	16.5	0	4.1	2.9
Total	816	721	7031	920	276	279.7
Total emissions of industrial pollutants in China	8549	8642	7711	14930	11999.3	10756.2
Proportions of smoke and solid waste emitted from agricultural product processing industry in total emissions in China	9.54%	8.34%	9.12%	6.16%	2.30%	2.60%