Models of Circular Economy on Agriculture in Yunnan Province

Huang Xi*

Vocational and technical college, Yunnan University of Finance and Economics, No. 8 Xuefu Road, Kunming, Yunnan, 650032, China

Abstract

In this thesis, the author analyses the agricultural comprehensive ability and the agricultural environmental pollution in Yunnan province. Then, the author put forward models of circular economy on agriculture in Yunnan province.

© 2011 Published by Elsevier Ltd. Open access under CC BY-NC-ND license.
Selection and peer-review under responsibility of RIUDS
Keywords: Circular economy; Agriculture; Models; Yunnan

1. Introduction

Yunnan locates in the south-west of China. There are 39.4 million square kilometers, which is 4.1 percent of the nation’s total. At the east, there are Guangxi zhuang autonomous region and Guizhou province. At the north, there is a river called Jingsha shared with Sichuan province. At the northwest corner, the Tibet autonomous region is linked together. At the western, Burma intricately interrelates. At the south and south-east, there are respectively Laos and Vietnam.

2. Agricultural comprehensive ability

2.1. Agricultural infrastructures are still weak.

Weakness in agricultural infrastructure is the weakest part in Yunnan economic development. The

* Corresponding author. Tel.:+86-0-15288101362; fax:+86-871-5371771.
E-mail address:huangxi1975@yahoo.com.cn.
situation that agriculture relies on nature has not been changed fundamentally. Even now, agricultural water conservancy degree is only 34 percent.

2.2. Agricultural product processing is underdeveloped

The quantity of agricultural product is ample, but the quality is not so good. The agricultural products processing is still in low degree. Most of agricultural outputs are raw material products, fresh products and primary products. The farmers’ incomes largely reduced because of low level of processing value-added.

2.3. Farmer's science and technology level is not high.

Farmers are little of awareness technology consciousness and operational consciousness in their lives. At the same time, transfer of technology in agriculture to the growth of agriculture has relatively low contribution. So, it is emergent to enhance and spread of agricultural technology.

2.4. Agriculture and rural economic structure adjustment remain to be improved.

On the one hand, low quality agricultural products largely backlog. On the other hand, high quality agricultural products largely are in demand. Structural supply has exceeded structural demand in agricultural products markets. There is agricultural structural surplus and sale difficult phenomenon in Yunnan province.

3. Agricultural environment pollution

3.1. Agricultural production factors are in heavy pollution.

Pesticide on the environmental pollution cannot be ignored. Now, there is pesticide using one fold, using excessive and using incorrectly everywhere in Yunnan province. The toxicity for human and livestock from residue of active ingredients with high toxic and high pesticide is severing. And pesticide is also harm to water, soil and agricultural products.

Fertilizer pollution is getting to serious. Nutrition loses because of long-term erupting and slanting fertilizer. Then, it leads to soil acidification and hardening. After that, it appears to water pollution and eutrophication because nutrient supply is not harmonious in soil.

According to concerned investigation data, nitrogen and phosphorus causing to the water-body eutrophication in most of lakes in Yunnan province is about 50% coming from fertilizer applied in farmland.

Plastic film is largely used in order to increase output of crops. Now, plastic films recycle not completely because of all sorts of reasons. In Yunnan province, average plastic film retention rate is 20% in soil. Residual films reduce soil infiltration function, and also reduce water in soil. Then, drought resistance capability of farmland is reduced. So, it wills bock crop growth. At last, it will bring adverse impact to the agricultural production and the ecological environment.

3.2. The rate of agricultural wastes utilization is low, and pollution by agricultural wastes is severe.

In the past, wastes of farmland are generally used as feed of livestock or fertilizer by decomposed for farmland. With the spreading of chemical agriculture and the sale of various convenient feed, and lack of
more convenient or applicable technology for decomposed manure, most of peasants give up the habit of using farmland wastes. So, farmland wastes are discarded by farmers. Pollution by farmland wastes is heavier.

The use rate of livestock waste is still low. Most of livestock wastes are use as fertilizer in farmland by peasants in Yunnan province. But, the methods of using livestock wastes are simple. Livestock wastes can’t be full used. The rest of livestock wastes become a major source of environmental pollution.

4. Models of circular economy on agriculture

According to the experience of the ecological agriculture demonstration and regional characteristics, and with circulation concept of technology and measures in traditional agriculture, the following patterns of circular economy on agriculture have been piloted in different areas in Yunnan province.

4.1. Recycle economy mode in family

In this mode, rural family is the subject of circular implementing. The incomes mostly come from agricultural products and livestock for rural family. So, this pattern of recycle economy primarily circulates between planting and breeding, in order to recycle and reduce solid wastes and sewage. In this recycle system, biogas is the centre. The whole system includes four subsystems which are planting, biogas, breeding, and farmers’ living. The whole system is helpful to reduce investment in planting and breeding, to increase output, to improve resources and energy efficiency, to reduce wastes, to improve the efficiency of the economy, and to improve the health status of family environment. The typical logistics relationship in this mode can be seen in the figure 1.

Because rural family is a relative economic unit or a production unit, this mode is more suitable for vast household in rural. It has the important practical significance to save energy expenditure and to achieve efficiently utilization of the wastes for rural families. In Yunnan province, agriculture is still with small-scale decentralization family business as the main body. It becomes a major agricultural non-point pollution source because of extensively production mode and strongly option. So, it is a long-term mechanism to advocate circulating agricultural in family for improving operational efficiency of the family economy and reducing agricultural non-point source pollution.

This mode is suit for farmers with the household contract responsibility system. It has been piloted in Yuxi and Erhai areas.

4.2. Recycle economy mode in villages

Now, in part of rural areas with planting as the main economic income within Dianchi areas, farmers apply a mode with a double-chamber heap decomposed manure system (DCHDS) and a healthy dry latrine. In this mode, village sewage is disposed by a vertical-oxygen system. This mode basically realizes agricultural recycle with families and village as the main body. This mode can dispose a large number of wastes from foreign breeding, and produce efficient organic fertilizer. It is proved by practice that using these efficient organic fertilizers can obviously reduce pesticide and chemical fertilizer input. Furthermore, pesticide residuals decline obviously in agricultural products used these efficient organic fertilizers compared to those used routine fertilizer and pesticide. The typical logistics relationship in this mode can be seen in the figure 2.
Figure 1: The logistics relationship of recycle economy mode in family

Figure 2: The logistics relationship of recycle economy mode in village
This mode is based on recycle economy mode in family. Furthermore, this mode harness rural environment with a village as a unit. In this mode, the village concentrates and collects a little life rubbish which can’t be used for decomposed manure at this moment. Then, these are putted to sanitary landfill and treated harmlessly. At the same time, sewage produced by farmer’s daily life is concentrated and collected by the sewage treatment plant in the village. After the treatment, these water run into the agricultural irrigation system. This mode is the upgrade of the recycle economy mode in family. It is good to control of wastes which can’t be good used by rural families.

4.3. Recycle economy mode in ecological agriculture parks

Recycle economy mode in ecological agriculture parks emphasize large-scale production. It realizes energy and materials recycle by using the link in the agricultural industry module relationship. This mode may have longer industrial links. And it characters as presenting multi-level recourse. Especially, the primary products in planting and breeding were processed many times by agricultural product processing enterprises. So, it increases agricultural ecological and economic benefits by products appreciation many times. In this mode, the main body may be a company, a few companies, or companies plus farmers. Because the main body is different, it is easy to conduct cleaner production and product standardization accreditation in process, to get completely to recycle use the energy and materials.

In this mode, with the agricultural products processing enterprise as the leading role, the main bodies are companies or companies plus farmers. The industrial chain includes processing, planting and breeding. There are two examples of this mode. One is about organic sugar production. Another one is about the processing of pollution-free milk and meat.

Example one: Enterprises produced sugar will put forward quality request for raw materials, and provide preferential measures, in order to prompt farmers planted sugarcane to plant according to the standard of the green agricultural products or the organic agricultural production. Enterprises produced sugar will monitor the whole process including varieties, soil, irrigation water, fertilizer, pest control, atmospheric environment, etc. It also produces and certifies sugar according to the standard of organic sugar production in enterprises produced sugar. The figure 3 illustrates the classical logistics.

![Figure 3: the classical logistics of organic sugar production](image)

Example two: There are rich pasture resources in Yunnan province. So, the three-dimensional planting and breeding between grass and livestock has greatly developed in mid-levels in Yunnan province. Based on the recovery and protection of vegetation, by using two corn-straw in a year, combining silage and ammoniation processing technology, it has been changed from single forage to inexpensive high-quality green herbage hybrid and further to producing series composite forage grass for cattle and sheep. In this
mode, animal products processing enterprise is the center. It uses the way of scale facilities breeding by feeding cattle indoor, establishing high producing dairy demonstration area. Then, enterprises which process animal products produce green animal products. It uses cleaner produce inside enterprises. The products are implied pollution-free authentication. In the whole process, it is monitored from forage planting, heap decomposed manure, to disease prevention and cure, in order to ensure the quality of products. The figure 4 illustrates the classical logistics.

![Diagram](image)

Figure 4: the classical logistics of pollution-free milk and meat.

### 5. Conclusion

Although all these modes above are developed in Yunnan province, there is still lack of some patterns which are suitable for regional economic cycle in the whole areas. In other words, it will need to be researched to how to establish and improve the regional ecological integrated and symbiosis mechanism, and how to realize the balance between economical growth and ecological protection in the whole areas, according to principles of regional layout optimization.

### References