Tobacco Agricultural Development in Information Asymmetry——A Case Study of Baise City of Guangxi Province

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Abstract We adopt sampling method combined with questionnaire to research tobacco agricultural development in Baise City of Guangxi Province. Survey results show that there are problems of inadequate propaganda; guidance and training effort; unreasonable rotation system; backward tobacco baking technologies; low specialized service level; constant increase of costs for means of production and labor employment; low information management level; and frequent occurrence of production accidents. Therefore, it is required to strengthen propaganda and training; enhance technical support; scientifically develop tobacco farmers' cooperative organizations; improve service quality; save labor and reduce cost; improve information management level; reduce institutional operation cost; reinforce guidance of safe production, to promote healthy and orderly development of tobacco agriculture in Guangxi and even in the whole country in the environment of information asymmetry.

Key words Information asymmetry, Tobacco agriculture, Crop Rotation, Informationization, China

China is a large country of tobacco production. Both planting area and total output rank the first in the world. In China, tobacco agriculture is a kind of make-to-order production. In other words, tobacco will be purchased by local tobacco companies, so sales channel is fixed and selling market is stable. However, due to long production cycle, highly seasonal, high demand of labor force, great difference in ecological conditions of tobacco production areas, as well as vulnerable to natural disasters and plant diseases and insect pests, especially formal implementation of *Regulations on Banning Smoking in Indoor Public Places* on May 1st, 2011, a deep shadow is cast on development of tobacco agriculture. In line with these actual problems, we conducted careful survey and analysis for tobacco agricultural development in Baise City of Guangxi Province. Major reasons have been found. These will play a realistic role in promoting development of tobacco agriculture in Guangxi and even in the whole country, implementation of policies concerning agriculture, countryside and farmers, as well as socialist new countryside construction.

1 Tobacco agriculture and its development in Baise City

Baise City is in western part of Guangxi Province (106°07′ to 106°56′E and 23°33′to 24°18′N). Its western area joins with Yunnan Province, northern part is contiguous to Guizhou, eastern region neighbors on capital Nanjing, and southern part borders upon Vietnam. The border line is up to 365 km. It covers an area of 36 300 km^2 with total mountainous area up to 95.4%, in which stone mountain takes up 30% and soil mountain accounts for 65.4%. Baise has sub-tropical monsoon climate, abundant rain and sunshine, and average annual rainfall up to 1 115 mm. It is temperate in climate with mean annual temperature 22.1 ℃. So it is very suitable for planting quality tobacco. In 2008, tobacco planting area reached 9 400 hm^2, and about 19 million kilograms of tobacco were sold; in 2009, the planting area was 7 900 hm^2, and 15.9 million kilograms of tobacco were sold; and in 2010, the planting area was 6 300 hm^2, and only 12.8 million kilograms of tobacco were sold[1].

Using method of sampling and questionnaire survey, we distributed 900 copies of questionnaire among 30 villages of 13 towns in 4 large tobacco production counties (Jingxi, Debao, Napo and Longlin). Finally, 784 copies (87.11%) were received and 752 ones were effective. Results show that in these 752 effective samples, 701 households have planted tobacco in recent three years, and the planting rate is up to 93.22%. Among these, 216 households (30.81%) adopt culture without rotation, 278 households (39.66%) adopt current year crop rotation, and 207 households (29.53%) adopt rotation over year. 211 households (30.10%) decide to plant tobacco because of fixed sales channel and stable sales market, while 60.63% households follow the trend, and the rest 9.27% are encouraged by township cadres. Survey samples indicate that 184 households (24.47%) believe tobacco farmers' professional cooperative organizations play a great role; 219 households (29.12%) think tobacco farmers' professional cooperative organizations only play a moderate role; and 349 households (46.41%) are unsatisfied with or do not know tobacco farmers' professional cooperative organizations. 40.66 tobacco farmers express greatest concern about the state policy of banning smoking. Other concerns include planting technology (22.25%), professional service (15.98%), natural disaster (14.41%) and safety for people and livestock (6.70%). Among the surveyed farmers, 29.82% agree that planting tobacco has stable income and high benefit, 48.13% show that

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the income from tobacco is low, and 22.05% farmers say that tobacco planting has high cost and risk. Finally, 452 households (64.34%) are willing to continue planting tobacco; 189 households (26.96%) say that they are unclear about whether to continue planting tobacco or not; and 61 households (8.70%) definitely say that they will not plant tobacco any more.

2 Existing problems in tobacco agricultural development of Baise City

2.1 Inadequate propaganda and training effort Many farmers have low educational level. They are unclear about or do not know relevant technologies and policies. 60.63% surveyed households follow the trend. Therefore, farmers badly need related advisory service. Unfortunately, we found that as major propagandist of relevant policy, village cadres are not familiar with policies and technologies related to tobacco agriculture. Besides, the propaganda method is simple, and propaganda content is not scientific and not easy to understand. When some farmers get into difficulties or badly need policy support in the course of whole planting, if they fail to get timely help from village cadres because village cadres are also unclear about related policies or technologies, farmers will feel being deceived. In addition to concern about implementation of state policy of banning smoking and development of tobacco agriculture, the propaganda function of tobacco planting will be greatly reduced and the overall effect will be softened.

2.2 Lack of perfect technical support measures

2.2.1 Unreasonable rotation system. Firstly, for most tobacco fields in Baise City, land circulation is difficult. It is hard to adjust rotation system. As a result, overall implementation of rotation will be affected. Many places still use double cropping system and alternative crop is simple. Such cropping system may bring into play its effect, but due to simple alternative crop and short period, tobacco fields will gradually show defects of cropping after several years (generally five years). Defects include delayed growth of tobacco plant, frequent occurrence of disease and pests (such as black shank, virosis, *etc.*), degradation of soil fertility, lower fertilizer utilization rate, tobacco failure to become ripe, little oil in flue-cured tobacco, weak gloss and fragrance, and reduction of tobacco quality and unit production. Secondly, in mountainous regions of tobacco planting, only 50% area adopts rotation over year, leading to unreasonable continuous cropping and rotation and excessive consumption of soil nutrients. Consequently, there are serious deficiency of total potassium, fast acting boron and exchangeable magnesium in tobacco fields, which will influence growth and development of tobacco plant and lead to slow growth. What's more, propagation of diseases and pests aggravates the situation. Occurrence of diseases and insect pests is rising, such as virosis, black shank, root-knot disease and brown spot disease, *etc.* At last, tobacco output and quality decrease, ripeness falls down, tissue becomes compact after baking, color gets grey, oil becomes less, and usability declines.

2.2.2 Backward tobacco baking technologies. At present, there are many types of tobacco baking rooms, while most of them are not standard. For example, unreasonable application of temperature and humidity meter, small size of baking rooms, low utilization rate of heat energy, and backward baking technologies. If floods happen, tobacco may contain much water and many leaves fall in fields. If tobacco farmers do not have technology of baking such tobacco and fail to properly control time of yellowing stage, it may result in various problems due to excessive consumption of leaf dry matter. Besides, tobacco farmers are not good at extending time at 40 to 42 ℃, as a result, tobacco leaves after baking becomes smooth and stiff, and main and branch leaves may contain green part, consequently influencing level and economic benefits of tobacco.

2.3 Low professional service level Tobacco production belongs to labor-intensive and technology-intensive industry. It requires high level of specialization. However, most existing tobacco farmers' professional cooperative organizations in Baise City are small cooperatives. Our survey indicates that 46.41% farmers are unsatisfied with or unclear about these matters. Reasons for these include: First, organization is not properly established. For example, some cooperatives just have border of directors, but no border of supervisors. Some directors are also supervisors. Border of directors and border of supervisors become nominal. So the self-supervision of cooperatives just exists in name. Routine operation and major matters are decided by only few initiators. There are big loopholes in fund management. Representative assembly of community members seldom or never holds meeting. Second, actual service range is limited. Professional service level of cooperatives still remains at lower level and cannot satisfy demands of tobacco farmers for multiple link services. For instance, they just help tobacco farmers to purchase fertilizers, plastic film, pesticide, and other means of production, or provide guidance of low technologies. Third, quality of professional service is not high. For example, the tractor-ploughing depth of cooperatives and transplantation density of tobacco plant fail to satisfy tobacco farmers. Besides, petty-farmer consciousness of tobacco farmers is high, but the cooperative awareness is weak. Such problem as "we will do unless it is good thing" occurs frequently. Some tobacco farmers only pursue scale benefit but lack ability of dealing with natural disasters or emergencies. Cooperatives also fail to foresee difficulties or establish effective measures for prevention and management of risks, so it is not favorable to its healthy development[2].

2.4 Constant increase of costs for means of production and labor employment At present, most tobacco fields have realized mechanized or semi-mechanized operation of tractor-ploughing, ridging and film mulching, but no special machinery is designed for transplantation, harvesting and classification, all of which depend on manual operation and require great labor force. However, most rural young labor forces go out to work, so labor employment has certain difficulty, and it is also hard to supervise employment work and difficult to effectively guarantee quality of labor[3]. In addition, the period of high labor demand of tobacco production is relatively concentrated, for example transplanting in April and harvesting and classification in Au-

gust, while in other periods, it requires less labor, resulting in those skilled workers of transplanting, harvesting and classification choosing to other long and stable jobs. Consequently, there is huge loss of skilled workers. When it needs many labor forces in the next year, there are problems of rising of salaries and organizing technical training again. Therefore, there is great loss of human power, financial resources and materials. Also, it delays the progress and procedure of whole tobacco production. To some extent, it reduces quality of some links of tobacco production, affects economic benefits of tobacco plantation and enthusiasm of farmers for tobacco production.

2.5 Low information management level Major technical support of implementation of "digital tobacco agriculture" is 3S technology, namely, geographic information system (GIS), remote sensing (RS) and global positioning system (GPS). Other supports include computer simulation technology, computer network technology and modern communication technology. 3S technology provides new approach for dynamic monitoring and prediction of tobacco growth, diseases and insect pests, natural disaster and production environment. Nevertheless, the digital, precise and intelligent process of tobacco agricultural production management in Baise City still remains at starting stage from sowing, seedling raising, transplantation, irrigation, fertilizing, field management, plant protection, output prediction, to harvesting, storage and management. The overall level of information management is not high. Digital and visual expression, design, control and management of all tobacco agricultural objects and the whole process are still not realized. Thus, it will not only influence adjustment and optimization of management measures of soil and crops, but also affect investment in tobacco agriculture.

2.6 Frequent occurrence of production accidents Tobacco planting belongs to labor-intensive industry. In current situation of low mechanization level, all works in the course of tobacco planting are completed by hand. However, due to lack of appropriate safe production measures, various accidents frequently occur and bring severe damage to tobacco farmers and employees. For example, there are problems of moderate, acute or chronic poisoning during mixing and spraying pesticides; accidental injury in utilization of agricultural machinery and tools; excessive dust in the course of tobacco bundling; and accidental falling during packing or discharging tobacco. These problems result in frequent occurrence of tobacco farmers' poverty or return to poverty and have become major problems that tobacco farmers concern about.

3 Countermeasures and suggestions for tobacco agricultural development in Guangxi Province

3.1 Enhance propaganda and training to ensure working efficiency Firstly, it is proposed to take full advantage of local TV station, radio station and other news media to propagate support policies of tobacco planting and importance of safe production in such forms as holding tobacco farmer forum, broadcasting propaganda film, hanging scrolls, distributing propaganda materials. These will play a great role in summoning up enthusiasm of tobacco farmers and alleviating their worry about implementation of state policy of banning smoking and development of tobacco agriculture. Secondly, it is proposed to provide training service. Through training, we can make all levels of persons grasp relevant policies, working procedure, working methods and relevant technologies, improve their abilities and professional level, enhance their sense of duty and urgency, finally to lay a solid foundation for normal operation of works. Particularly, since cadres of village committee, able persons or leaders are in direct contact with villages, it is better to provide training for those cadres, to let them clearly know latest policies. Then, they may tell or implement relevant policies well.

3.2 Enhance technical support

3.2.1 Crop rotation system. We should look both backward and forward, make overall arrangement, well link the production season of tobacco and rotation crop, to realize increase of output and revenue in both tobacco and other rotation crops. First is the rice field-upland field rotation. It is proposed to promote such triple cropping system as tobacco + rice + green manure crop, and plant alternative crop between two tobacco production seasons, to improve soil aggregate structure and improve fertility and fertilizer efficiency. Second is mountain tobacco rotation system. Continuous cropping is forbidden for mountain tobacco. Rotation over year can be adopted. It is recommended to adopt one of following ways: firstly, one time of harvest per year: plant corn or soybean in the first year and plant tobacco in the second year; secondly, four times of harvest in two years: plant tobacco in the first year, then sow wheat or rape, plant corn in the second year, and then plant broad bean; thirdly, six times of harvest in three years: plant tobacco in the first year, then plant rape or green manure crop, plant corn in the second year, then sow wheat or broad bean, plant corn or sweet potato in the third year, then sow beans or coarse grain.

3.2.2 Technology of fertilizer application. One of reasons for faint fragrance of Chinese tobacco is inadequate nutrition supply and uncoordinated nutrients in the course of tobacco growth. Tobacco fields in America and Brazil contain over 3% organic matter and the soil is loose and has good aggregate structure. However, in China, aggressive planting is common in recent years. Soil aggregate structure is damaged and becomes more and more hardened. Excessive application of inorganic fertilizers not only results in environmental pollution, but also leads to serious imbalance of adequate supply of nutrients. Organic matter content is just at a level of 1%. In this situation, it is hard to satisfy demand of producing high quality tobacco with delicate fragrance. Therefore, we should change field management mode from the point of multi-form agriculture and sustainable development. Also, it is proposed to improve soil aggregate structure and soil fertility through applying organic fertilizers, returning crop stalks to fields, or planting green manure crops. Besides, we can combine organic fertilizers with inorganic fertilizers, underground application of fertilizers with foliage top dressing, and major elements with trace elements. It is

expected to form standardized three-dimensional fertilizer application technology, to provide complete, balanced and coordinated nutrients for tobacco growth, finally to produce high quality tobacco.

3.2.3 Tobacco baking technologies. Harvesting and baking are key processes of tobacco production. It is proposed to focus on tobacco fragrance on the basis of "three-stage" baking technology. In the event of floods, we should establish flexible harvesting and baking scheme to ensure timely harvesting and baking. During baking, it is required to properly control the yellowing time. The overall principle is as follows: firstly dehumidify then obtain expected color; shorten low temperature yellowing time using high temperature rapid yellowing method; extend the period of 40 to 42 ℃, to fully degrade protein and chlorophyll in tobacco leaves; extend the period of 46 ℃ to reduce problems of smooth and stiff leaves, main and branch leaves containing green part, *etc.*

3.2.4 Water-saving irrigation technology. Water conservancy is the lifeblood of agriculture and also key condition for normal growth and development of tobacco. Generally speaking, tobacco growth depends on fertilizer, but its harvest relies on water. Therefore, it is required to find out proper irrigation mode according to specific characteristics of ecological regions, in the hope of meeting requirement of high quality tobacco growth and achieving the goal of saving water. For example, we can concentrate on basic tobacco fields; speed up construction of auxiliary facilities for large irrigation areas and transformation of water-saving works; and strengthen construction of small water conservancy works and field irrigation and drainage facilities. On the basis of overall planning, we should renovate tobacco fields as per standard of "connecting fields, roads, channels to network for purpose of irrigation and drainage in case of drought or floods", to improve output benefits and ability of resisting natural disasters of tobacco fields.

3.2.5 Plastic film cultivation technology. Plastic film cultivation features such advantages as keeping warm and moist, raising survival rate of tobacco plantation, and promoting early growth and rapid development of tobacco plant, so it is favorable to arranging crop rotation.

3.3 Scientifically develop tobacco farmers' cooperative organizations to improve service quality Established in accordance with law, tobacco farmers' professional cooperative organizations are cooperative economic organizations that take tobacco industry as support and tobacco farmers as subject, and provide service for labor production. They show basic feature of modern tobacco agriculture. Besides, they represent socialization process of tobacco production organization, and they are fundamental approach to liberating tobacco farmers from high labor intensity and high technical requirement. The greatest difference between these organizations and farmers' cooperative organizations lies in that they do not directly purchase or sell products. Tobacco farmers' professional cooperative organizations mainly provide professional production services, such as seedling raising, tractor-ploughing, plant protection, classification and baking, *etc.* Their objectives are as follows. Firstly, it is to promote land circulation, realize large-scale operation, define regions as per order plan of tobacco companies, and help tobacco farmers to circulate land in tobacco zones, finally to improve level of large-scale plantation[4]. It is expected to achieve change "from small households to large households" and "from scattered to concentrated". Secondly, it is expected to promote agricultural standardization and build modern tobacco agriculture. Tobacco farmers' professional cooperative organizations often invite relevant experts to pass on knowledge and skills of standardized production, provide technical guidance for their members in seedling raising, plant protection and baking, provide high quality tobacco plants and order such means of production as fertilizers and plastic films for tobacco farmers, to improve standardization of tobacco production[5]. Thirdly, tobacco farmers' professional cooperative organizations carry out unified and standard management, guidance and supervision of tobacco production, bring into full play motivation of able persons. For example, scientific and technological experts among tobacco farmers have a good command of tobacco production technologies, so tobacco produced by them has high quality and great benefit. They can bring into play their exemplary role and radiating function, promote standardized production of the whole tobacco zone, and speed up construction of modern tobacco agriculture[6].

3.4 Save labor and reduce cost to increase tobacco farmers' income It is proposed to properly utilize support policies and self-owned agricultural machinery and tools, implement proper preferential policy to large tobacco production households and specialized households, and reduce their labor and plantation risk. Firstly, on the basis of service mode of "raising seedling at factory, baking at factory and providing specialized production service", in reliance on "seedling raising factory, baking factory and agricultural machinery", we should energetically improve organization level of tobacco production. For instance, compared with tobacco farmers' employment cost, specialized service of tractor-ploughing service team can save cost for 40% and save time for 70%[7], thus it is favorable to solving problems of shortage of labor forces and technical barriers. Secondly, we should gradually realize large-scale plantation, mechanical operation, specialized division of labor, as well as information management, to provide tobacco farmers with low cost and high quality means of production and high standard specialized service. In this way, we can save transaction costs, increase output of better-than-average quality tobacco, and reduce overall cost of tobacco production, to achieve the goal of receiving comparative benefit of tobacco production and increasing tobacco farmers' income.

3.5 Improve information management level and reduce institutional operation cost Tobacco planting system is an integrated technical system used by tobacco production zone or unit in certain natural condition or social economic condition, to realize proper distribution of tobacco and local grain crops and economic crops, and achieve overall promotion of quality and output of tobacco and other crops, as well as sustainable development. However, this integrated technical system is still

completed by hand, so the institutional operation cost is very high. Therefore, it is required to strengthen infrastructure construction of tobacco information system and establish three-level (city, county and village) information network system. In other words, we should establish an integrated information network system through Internet, Local Area Network and wireless communication technology. This integrated information network system should be able to visually and vividly reflect frontline information of tobacco production in real time, such as topography, landform, traffic, towns and villages, distribution of tobacco fields, soil types, condition of water and fertility, growth and development, climatic condition, diseases and insect pests, *etc*. In addition, we should also formulate applicable standards and codes for development and application of digital tobacco agriculture, to realize information resource sharing, and intercommunication and interconnection of information, put an end to low level repeated construction and waste of resources, and reduce institutional operation cost.

3.6 Reinforce guidance of safe production It is proposed to provide guidance in prevention of chlorosis, injury from pesticides or mechanical operation, falling in the course of packing or discharging tobacco, as well as in dust prevention. Tobacco chlorosis is a kind of nicotine poisoning accident resulted from contact with wet tobacco leaves. Since nicotine is soluble in water, it may penetrate to surfaces of tobacco leaves through rainfall, dew and sweat. If absorbed by human body, it will go into blood, leading to dizziness, nausea or vomiting, which will be shown generally several hours after exposure. Therefore, it is required to guide tobacco farmers to wear clothes with long sleeves, wear gloves, or raincoat to reduce exposure of skin. Once in contact with fresh tobacco leaves, timely wash hands with hot soapy water, so as to prevent chlorosis as much as possible. Besides, improper use of pesticides or incorrect operation may also be harmful to human body. In this situation, we should enhance training and warning for tobacco farmers, to make them safely store and correctly use pesticides. Besides, pesticides should be kept away from children, animals and foods. Furthermore, personal protection equipment must be used when applying pesticides. In the course of tobacco production, mechanical operation may generate splashes and cause accident of personal injury. Therefore, it is required to provide training and authorization for tobacco farmers who carry out mechanical operation. There shall be safe seat and protective clothes. Besides, it is proposed not to stand behind the vehicle or too close, and it is strictly prohibited for teenagers or old, weak, sick and disabled persons to carry out the operation. Baking rooms are basically five to six meters high, so it is required to prevent falling when accidental falling during packing or discharging tobacco, and strictly carry out safe procedure, ensure equipment safety, and relevant persons should wear safety belt and safety net. Finally, in the course of classification and tobacco bundling, it is required to wear mouth mask and keep well ventilation of operation fields, to prevent farmers from absorbing excessive dust.

4 Conclusions

In the environment of information asymmetry, local government and tobacco companies should take effective measures, guarantee sustainable development of tobacco zones, and actively promote transformation of traditional tobacco production to modern tobacco agriculture, to promote healthy and orderly development of tobacco agriculture in Guangxi and even in the whole country.

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