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Land Scale, Input-Output and Income

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Abstract Based on the investigation of production, inputs and income of tobacco farmers in 337 families in 10 counties of which the specialty is tobacco in Henan Province in 2010, the differences in the production, inputs and income were discussed. Results suggested that in terms of land yield rate and tobacco growers' income, the suitable proportion of land for tobacco production in Henan Province is from 0.33 to 0.67 hm^2 .

Key words Tobacco growers, Scale, Production, Investment and output, Income

The household contract responsibility system, as the primary reason of the sustaining fast development of agriculture in the 1980s in China^[1–3], plays an essential role in rural economic development and farmers' life. However, with the gradual loose control over this policy, such diverse management has showed increasingly prominent drawbacks, such as the disadvantage and limitation of land operation. The scale management of the land has become the trend of agricultural development in China, which also realizes agricultural modernization in China. As for tobacco production, proper scale is conducive to the change of traditional production mode, the reasonable combination and dominant regrouping of land, technology, personnel and fund, *etc.*, realization of the basic aim of increasing efficiency, and capacity to strengthen the tobacco agriculture's resistance to risks^[4–5]. Therefore, the study on the tobacco production and land management has great significances.

Through the investigation of tobacco growers from 337 families in ten counties that grow tobacco (Dengzhou, Linyi, Lushi, Luyi, Luoning, Miyang, Ruyang, Duqi, Xiangcheng, and Jiaxian), the status quo of tobacco production was studied, and based on which the suitable proportion was determined. The data which was used in the study came from one of the investigation that Henan Tobacco Corporation entrusted the Tobacco Study Bureau of Agricultural Science Academy of Henan Province. 356 farmers in 10 counties of Henan Province were investigated for the study, among which the answer of 337 families was valid. According to the arable land for tobacco plantation, there was the small scale ($0-0.33 \text{ hm}^2$), average scale ($0.33-0.67 \text{ hm}^2$), and large scale ($>0.67 \text{ hm}^2$). Besides, there were 115 families growing small scale of tobacco (34.1%), 122 families growing average scale of tobacco (39.5%) and 71 families growing large scale of tobacco (21.1%).

1 Production by tobacco growers of different scales

The scale of tobacco growers' land is an essential factor that influ-

ences the land yield rate and production of tobacco growers. As shown in Table 1, there are certain differences in tobacco yields and tobacco quality among tobacco growers of different scales. Tobacco growers of small scales plant only 0.5 hm^2 of tobacco and the yield level and quality is relatively low. The output of tobacco per capita is 2 214 kg and the output value is 32 849 Yuan. The ratio of good tobacco in all ones is 87.4%. With the gradual expansion of tobacco business, the indicator of each output increases. Moderate scales of tobacco growers plant only 1 hm^2 of tobacco. The turnout per hectare is close to 2 310 kg, while the output value is up to 35 255 Yuan and 89.6% of tobacco is good ones. These three indicators are 4%, 7% and 2% higher than that of small scale tobacco growers. When the tobacco land increases to 2.5 hm^2 per family, the turnout of tobacco per hectare decreases to 2 166 kg and the output reduces to 33 035 Yuan. However, the ratio of good tobaccos increases to 90.4%. Therefore, speaking of land production rate, the appropriate area for tobacco production should be between 0.33 and 0.67 hm^2 .

Different tobacco growers have different plantation methods. As shown in Table 1, the percentage of small scale tobacco growers who grow both tobacco and other plants is quite high, about 22.8%. However, with the addition of tobacco area, the percentage of tobacco growers decreased. The ratio of moderate scale of tobacco growers who grow both tobacco and other plants is 19% and the ratio of large scale of tobacco growers is 16.9%. The reason why small scale tobacco growers tend to use interplant method is that given the small scale business, interplant can enhance the utilization intensity of land and the crop output per unit. Considering the large scale plantation, it is impossible to conduct interplant with machine plantation. One direct drawback of interplant is the reduction of tobacco quality and decrease of the ratio of good tobacco.

Advanced barbecue equipment is one condition to produce high quality tobacco. Investigation suggests that farmers who use compressed barbecue house for barbecue tend to increase with the expansion of plantation scale (Table 1). Only 77.5% small scale of tobacco growers use compressed barbecue house, 93.4% middle scale of tobacco growers and 95.8% large scale of tobacco growers.

Table 1 Production of tobacco growers of different scales

Scale	Area per family hm ²	Yield per unit kg/hm ²	Output value per unit//Yuan/hm ²	Ratio of good tobacco//%	Interplant ratio//%	Ratio of compressed baking house//%
Small scale	0.5	2 214.0	32 848.5	87.4	22.8	77.5
Middle scale	1.0	2 308.5	35 154.5	89.6	19.0	93.4
Large scale	2.5	2 166.0	33 034.5	90.4	16.9	95.8

Note: The data comes from investigation.

2 Investment of tobacco growers of different scales

For tobacco growers, the investment includes two parts. First, material investment, such as seedling, fertilizer, membrane, fuels, electricity, land and other investment. Table 2 reflects the basic composition and change trend of material fees to different scales of tobacco growers. In general, with the expansion of scale, the material cost first increases and then decreases. The cost of materials to small scale tobacco growers is the lowest, 13 746 Yuan/hm², while that of middle scale is 15 899 Yuan/hm² and of large scale is 14 604 Yuan/hm². The investment in fertiliz-

er by different scales of tobacco growers on per hectare is quite similar, around 2 350 hm². The investment in other materials differs, especially the rent. The rent of land costs the tobacco growers of small scales only 2 643 Yuan/hm², which accounts for 60% of the middle scale and large scale. In terms of the constitution of material fees, the ratio of coal, rent and fertilizer is relatively large. The cost of coal, land rent and fertilizer takes account of 70.8% , 72. 8% and 74% of the total amount of investment of three kinds of tobacco growers.

Table 2 Constitution of material costs of different scales of tobacco growers

Scale	Seedling	Fertilizer	Membrane	Coal	Electricity	Rent	Other fees	Total
Small scale(<0.33 hm ²)	484.5	2 350.5	328.5	4 737.0	1 378.5	2 643	1 824.0	13 746.0
Constitution//%	3.5	17.1	2.4	34.5	10.0	19.2	13.3	100.0
Middle scale(0.33 -0.67 hm ²)	483.0	2 361.0	442.5	4 975.6	1 663.5	4 243.5	1729.5	15 898.5
Constitution//%	3.0	14.9	2.8	31.3	10.5	26.7	10.9	100.0
Large scale(>0.67hm ²)	45.0	2 335.5	400.5	4 320.0	1 482.0	4 158.0	1 458.0	14 604.0
Constitution//%	3.1	16.0	2.7	29.6	10.1	28.5	10.0	100.0

One characteristic of tobacco production is that it's a work of many people. The cost of employees for tobacco production is an essential part in the tobacco production. As shown in Table 3, with the expansion of tobacco industry, the worker per unit reduces gradually while the employee's amount increases. Small scale tobacco growers work 522 days in general, and the hired farmers work 175.5 days, which accounts for 33.6%. The work days of middle scale tobacco growers decrease to 510 days, while the work days of hired farmers increase to 241.5 days, which accounts for 47.4%. The work days of large scale tobacco growers reduce to 472.5 days, while the work days of hired farmers increase to 249 days, which accounts for 52.7%.

With the expansion of tobacco farmers, the money spend on hiring farmer increases dramatically, so is its ratio in general cost. The hired workers cost small scale growers 5 616.0 Yuan per hectare, which is the lowest in general fee, 30.5%. The cost of mid-

dle scale tobacco grower is 8 452. 5 Yuan, which increases by 50%, and its ratio in general cost rise to 36. 1%. The hired workers cost large scale tobacco growers 8 939. 1 Yuan, which accounts for 38.3%. The increasing cost comes from the employee amount and cost for hiring employees. The small scale tobacco growers cost 32 Yuan/day, which is lower from the middle scale and large scale of tobacco growers by 35 to 36 Yuan/day.

Therefore, with the rapid changes of rural social economy and labor force structure, tobacco growers of different scales adopt different production styles. Small scale tobacco growers usually apply intensive growing method and invest much more efforts in each link in tobacco production. The large scale tobacco grower use the extensive method by replacing labor force with machine and try to reduce employee costs. However, modern technology is far from replacing machine with labor force and leads to high cost on employees.

Table 3 Employees of different scales farmers

Scale	Total fees//Yuan	Work days	Employee's work day	Percentage %	Salary Yuan per day	Worker's salary//Yuan	Percentage %
Small scale(<0.33 hm ²)	18 387	522	175.5	33.6	32	5 616.0	30.5
Middle scale(0.33 -0.67 hm ²)	23 386.5	510	241.5	47.4	47.4	8 452.5	36.1
Large scale(>0.67 hm ²)	23 322	472.5	249.0	52.7	52.7	8 939.1	38.3

Note: Total fee = cost of hired employees + material fees

3 Income of different scales of tobacco growers

The interest of tobacco growers is the primary conflict that the sus-

tainable development of tobacco production faces^[6]. After all, what tobacco grower cares is their income, which has certain rela-

tion with the production of tobacco grower. As shown in Table 4, because the yield per unit and tobacco quality of middle scale is relatively high, the gross income per unit is 35 255 Yuan/hm². The gross income of small scale tobacco grower is the lowest, 32 849 Yuan/hm². Through comparing the net income of different scales tobacco growers, if we don't consider the cost of tobacco growers and deduct material cost, the net income of small scale tobacco growers is the highest, 27 958.5 Yuan/hm², while the net income of large scale tobacco growers is only 24 451.5 Yuan/hm², which is lower than 3 507 Yuan/hm². The net income of middle scale tobacco grower and small scale tobacco grower differ by only 192 Yuan/hm². If the material cost and employee cost were deducted, the net income of middle scale tobacco grower was the highest, 18 400.5 Yuan/hm². To the second place comes the small scale tobacco grower, 16 879.5 Yuan/hm². The net income of the large scale tobacco grower is the lowest, 16 413.0 Yuan/hm².

During production, small scale tobacco growers would ask their family members to be the main labor force and use the inten-

sive production style. So if the opportunity cost of this labor force, the small scale tobacco growers' income is the highest one. However, if the opportunity cost of such labor force is considered, their income reduced greatly. Because of incomplete replace of machine to labor, large scale of tobacco growers have to hire lots of employees from other places. With the magnificent changes of labor force structure and rural social economic development, the labor cost is increasing and the net income of large scale tobacco grower is the lowest. In terms of the interest of tobacco growers, the appropriate production scale should be above moderate scale, namely 0.33–0.67 hm² per family.

Besides, the dependence of different scales of tobacco growers on tobacco income varies (Table 4). With the expansion of scale, the ratio of tobacco income in different scales of tobacco family increase incessantly. In small scale tobacco growers' family, tobacco income only accounts for about 60% (59.4% to be specific), while 75% income in middle scale tobacco growers come from tobacco industry. For large scale tobacco growers, tobacco nearly becomes the only source of family income.

Table 4 Income of tobacco growers of different scales

Scale	Gross income Yuan//hm ²	Net income Yuan//hm ²	Net income Yuan//hm ²	Percentage of tobacco income in family total income
Small scale(<0.33hm ²)	32 848.5	27 958.5	16 879.5	59.4
Middle scale (0.33 – 0.67 hm ²)	35 254.5	27 766.5	18 400.5	74.6
Large scale (>0.67 hm ²)	33 034.5	24 451.5	16 413.0	83.2

Note: Net income1 = Total income – material fee – workers' salary; Net income2 = Net income1 – salary of family workers.

4 Conclusions and Suggestions

Scale management of land is the inevitable trend of the modernization and sustainable development of tobacco industry. However, such formation and development isn't built in one day. Through the analysis of production, investment and income of 337 tobacco families in ten provinces in Henan Province, following suggestions are concluded.

(1) Appropriate scale of cultivation area. The scale management of land takes the comprehensive interest as inherent motive, featuring incessant changes and multi-forms. Appropriate scale management can improve land yield rate and bring high economic benefit for tobacco growers. If the tobacco growers' business is too small, its income would be lower than those who work in other industry, even those who grow other kinds of crops, which would lead to reduce of enthusiasm of tobacco growers. On contrary, if the scale is too large, over the current operation capacity, it would lead to rough business or high production cost. According to the situation in Henan Province, whether from the angle of land yield rate or income of tobacco growers, the appropriate scale of land operation should be between 0.33 and 0.67 hm².

(2) Enlarging subsidy to purchase machine and enhancing the operation of machine. Among various elements of production force, laborer is the decisive factor, a very prominent question in tobacco production^[6]. One essential way to reduce planting tobacco time and labor intensity to make farmers feel easy to grow tobacco is to promote the application of machine in tobacco opera-

tion. Therefore, it is necessary to enlarge subsidy to tobacco growers and to enhance the application of machine.

(3) The sound social service system for tobacco production. Social service is an necessity to realize scale and professional production. To families who run standard business, the socialization service has directly related to the healthy and stable development of scale management. In reference to tobacco company, it is necessary to depend on government to create opportunities for the promotion of social service and shoulder some social service function. Considering scale business as key service target, it is necessary to strengthen services in agricultural machine and management, and to pay attention to technology training, so as to improve the technological performance of tobacco in large scale tobacco growers.

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4.2.6 Adopting advanced agricultural operation management method to provide efficiency guarantee for developing modern agriculture. For developing modern agriculture, the key is to improve integrated allocation ability of agricultural and social resource elements. In other words, it is required to transform traditional agricultural operation and management model. Scientific management is the most distinct feature of modern agriculture. In my opinion, this feature is more important than technical characteristic of modern agriculture. Intensive production, specialized labor division, organized operation, socialized service and market-oriented circulation are specific indications of scientific management idea of modern agriculture. It is also specific practice connotation of agriculture under the guidance of industrial idea: (1) comprehensively train new farmers to improve their quality and provide forces for implementing management measures of modern agriculture; (2) energetically develop farmers' professional cooperatives and enhance farmers' organization, to resist agricultural risks and improve agricultural specialization; (3) establish effective agricultural product market system. On the one hand, it should ensure regional grain security. On the other hand, it should improve commercialization level of agricultural products, extend agricultural industrial chain, provide more jobs for farmers, and increase added value of agricultural products.

The *Report to Seventeenth National Congress of the CPC* takes "ecological civilization" as new requirement for the objective of building a well-off society in an all-round way. The ecological civilization is the sum of material and spiritual achievements obtained by human beings through following the principle of harmonious development of human and nature, and promoting social, economic

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and cultural development. It contains the value concept of harmonious development of human and nature, production value concept of sustainable development of ecosystem, and consumption value concept of satisfying self development without harming nature. CEDAs should not only become forerunners of material civilization development, but also become pioneers of ecological civilization. Building modern agriculture and developing modern agriculture are the most realistic measures for practicing ecological civilization.

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