Current Situation and Development Recommendations for Betel Nut Processing in Hainan Province

Huide HUANG, Haolun HUANG, Haiqing LIU*

Institute of Scientific and Technical Information, Chinese Academy of Tropical Agriculture, Danzhou 571737, China

Abstract Hainan's betel nut processing industry continues to develop, and the yield has reached 231000 t. There are some problems in betel nut industry such as unreasonable initial processing layout, processing capacity surplus, and deep processing industry lag. It is suggested that we should guide the initial processing layout of betel nut according to local conditions, and carry out overall deep processing planning of betel nut; support betel nut deep processing plant in the main producing areas, establish betel nut initial processing and deep processing serial production line, and develop new betel nut product; build betel nut production, processing, transport and marketing information database and market information early warning mechanism, and improve betel nut processing information service platform to timely provide information services and continuously develop betel nut industry.

Key words Betel nut, Processing, Current situation, Development, Recommendations

1 Current situation of betel nut processing in Hainan Province

1.1 Initial processing Betel nut is a leisure food with a variety of forms, and it is mainly fresh betel nut and edible betel nut in China[1]. Betel nut has developed into the second largest tropical cash crop in Hainan Province, second only to natural rubber. Betel nut planting and processing industry provides income for more than 400000 farmers in the province, and it has become one of the pillar industries in Hainan Province. The processing of fresh betel nut is initial processing mainly in Wanning City, Qionghai City, Tunchang County, Ding'an County, Qiongzhong County, Lingshui County, and Baoting County. Hainan now has 38 initial processing enterprises (12 in Ding'an; 7 in Qionghai; 6 in Lingshui; 5 in Wanning; 4 in Qiongzhong; 2 in Ledong; 1 in Chengmai; 1 in Baoting). In addition, there are many farmers using the traditional method of flue curing to process betel nut, and they mostly use simple old stove for production. Firstly, the drying technology is backward. The processing scale of farmers is small, and the majority of farmers use simple shed, cooking stoves and other traditional facilities to dry betel nut, and the sanitation conditions are poor, making it difficult to guarantee the product quality and safety. Secondly, the processing energy consumption and costs are high. 80% of traditional facilities use wood as fuel to process betel nut, and 1 t of fresh fruits need to consume 1.7 t of wood, costs up to 1400 yuan, resulting in high processing costs of betel nut. Thirdly, the environmental pollution is serious. The design of traditional earth stove is unreasonable, and it will produce smoke and dust during processing to seriously pollute air. To improve the backward initial processing conditions for betel nut and raise quality and safety levels of betel nuts, Hainan Provincial Department of Agriculture introduced *Implementation Plan for Betel Nut Drying Transformation Green Project in Hainan Province*, and shut down some traditional betel nut stove (Table 1). The green stove processing of betel nut has greatly improved fruit quality, perfected processing environment, reduced labor intensity, and alleviated "smoke" pollution from the traditional betel nut curing stove. According to the survey results by Hainan Provincial Department of Agriculture at the end of 2014, Qionghai still had 16461 traditional curing stoves, but most of them were not put to use; Wanning still had 38813 traditional curing stoves, but less than 2000 were in the use. At the end of 2014, the number of traditional curing stoves decreased from 168342 to 86562. Hainan has built 2759 environment-friendly betel nut drying equipments and 222 large and medium-sized production lines, and the annual processing capacity reaches 678000 t (Table 2).

1.2 Deep processing Although betel nut is a commonly used traditional Chinese medicine, it seldom enters the medicinal herb market, and it is only as fresh food or simply processed into dried betel nut for chewing. The dried betel nut processing is deep processing, and now there are 7 betel nut deep processing enterprises in Hainan Province, 4 in Wanning, 2 in Ding'an and 1 in Chengmai. The 7 enterprises are engaged in betel nut deep processing, and the processing raw materials account for about 10% of yield. Hainan now has 3 large and medium-sized edible betel nut processing plants, with the designed annual processing capacity of 22000 t, but the actual processing capacity is less than 8000 t. Kouweiwang Technology Development Co., Ltd., as a betel nut deep processing enterprise in Wanning City, has a total investment of 480 million yuan, and 17.2 million kg of betel nut raw materials are processed annually. Kouweiwang is engaged in betel nut deep processing, and the products are sold to Guangdong and

Received: August 28, 2016 Accepted: October 16, 2016
Supported by Special Project for Research, Development, Demonstration and Extension of Applied Technology in Hainan Province (ZDXM2014101).
* Corresponding author. E-mail: hyy336@163.com

Hainan, greatly favored by consumers, with the market share of over 80%. Kouweiwang betel nut is the industry's first high-end brand, and reputed as "China's First Brand Green Betel Nut".

Table 1 Traditional betel nut curing stove

Regions	Number of the original betel nut curing stoves	Number of the betel nut curing stoves shut down	Number of the existing betel nut curing stoves
Wanning City	56032	17219	38813
Qionghai City	43261	26800	16461
Tunchang County	24000	10000	14000
Ding'an County	20794	3651	17143
Qiongzhong County	255	110	145
Lingshui County	24000	24000	
Total	168342	81780	86562

Table 2 Number of betel nut green drying equipment and production capacity

Regions	Standard equipment number	Large and medium-sized equipment production lines		Single production capacity//t	Annual processing capacity//t
		Number	Number of curing stoves		
Wanning City	2225	85	2550	14325	343800
Qionghai City	153	94	2820	8919	214056
Tunchang County	20	25	750	2310	55440
Ding'an County	138	13	390	1584	38016
Qiongzhong County	212	0	0	636	15264
Lingshui County	5	5	150	465	11160
Baoting County	6	0	0	18	432
Total	2759	222	6660	28257	678168

2 Problems in betel nut processing

2.1 Lagging of processing For a long time, the dried betel nut deep processing has been mainly in Hunan Province. In Hainan Province, the betel nut is planted by farmers in a dispersed state, and most of the fresh fruits are initially processed into dried fruits in local areas, and then sold to Hunan for deep processing. Hunan's enterprises control the price trend of betel nut, and the specialized processors in Hainan Province bear a lot of price risks. Thus, Hainan is the origin of betel nut fruit, but the dried fruit prices are determined by Hunan's deep processing enterprises, and the dried fruit prices affect the fresh fruit prices, easily making the growers difficult to avoid market risks in Hainan Province. The development of betel nut planting industry is rapid in Hainan Province, and the initial betel nut processing industry forms a large scale, while the deep betel nut processing industry lags behind[2]. Due to small deep processing capacity, single processing product and lack of new products, the betel nut products with medicinal and health function are not fully utilized and developed.

2.2 Surplus initial processing capacity Betel nut is planted in various cities and counties of Hainan, and during 2013 – 2014, the annual betel nut yield was more than 20000 t in Qionghai, Wanning, Sanya and Qiongzhong, and the annual betel nut yield was more than 10000 t in Tunchang, Ding'an, Baoting, Chengmai, Ledong and Lingshui. The betel nut yield in different regions during 2010 – 2014 is shown in Table 3. From Table 3, it is found that the betel nut yield was 33800 t, 40700 t, 18600 t, 16200 t, 25000 t, 9600 t and 15200 t in Wanning, Qionghai, Tunchang, Ding'an, Qiongzhong, Lingshui and Baoting in 2014, respectively. Based on the betel nut yield in 2014, it is found that the production was not in line with annual processing capacity of existing betel nut green drying equipment, and the initial processing capacity was surplus. The betel nut yield in Hainan Province was 35500 t in 2000, 152100 t in 2010, and 231000 t in 2014. Although betel nut production increases year by year, the annual increase is less than 30000 t. At present, the annual processing capacity of standard green betel nut drying equipment built in Hainan reaches 678000 t, and there are also other betel nut initial processing and production lines, indicating that there is surplus betel nut initial processing capacity in Hainan Province.

2.3 Unreasonable initial processing layout In recent years, Hainan has paid special attention to betel nut initial processing capacity building, and there have been 2759 standard green betel nut drying equipments (2 225 in Wanning, accounting for 80.6% in the province; 153 in Qionghai, accounting for 5.5%; 20 in Tunchang, accounting for 0.7%; 138 in Ding'an, accounting for 5.0%; 212 in Qiongzhong, accounting for 7.7%; 5 in Lingshui, accounting for 0.2%; 6 in Baoting, accounting for 0.2%). It has built 6 660 stoves with large and medium-sized production lines (2550 in Wanning, accounting for 38.3%; 2820 in Qionghai, accounting for 42.3%; 750 in Tunchang, accounting for 11.3%; 390 in Ding'an, accounting for 5.9%; 150 in Lingshui, accounting for 2.3%), and there are no stoves with large and medium-sized production lines in Baoting and Qiongzhong. Obviously, the layout of the standard environment-friendly betel nut drying equip-

ments and stoves with large and medium-sized production lines built in Hainan does not match the fresh betel nut yield in various cities and counties, and there is unreasonable initial processing layout. The initial processing layout also does not match the fresh betel nut yield in various cities and counties, which will increase fresh fruit transport costs.

Table 3 The betel nut yield in different regions during 2010 – 2014

Unit: 10^4 t

	2010	2011	2012	2013	2014
Qionghai	2.5300	3.1100	3.5400	3.8900	4.0700
Wanning	1.2200	2.2400	2.9000	3.2500	3.3800
Sanya	2.0400	2.4600	2.5500	2.7100	2.9800
Qiongzhong	1.0900	1.4400	1.8800	2.2900	2.5000
Tunchang	0.8400	1.3500	1.5300	1.7600	1.8600
Ding'an	0.8700	1.3100	1.7200	1.8800	1.6200
Baoting	0.9100	1.1900	1.3400	1.5500	1.5200
Chengmai	0.4800	0.6900	1.1000	1.2700	1.3900
Ledong	1.0100	1.1500	1.2100	1.2400	1.3500
Lingshui	0.7100	0.9700	0.9300	1.0900	0.9600
Wenchang	0.4000	0.4700	0.4900	0.5300	0.5700
Haikou	0.1600	0.1800	0.1700	0.3200	0.3000
Wuzhishan	0.1300	0.2000	0.2200	0.2300	0.2700
Baisha	0.1100	0.1300	0.1600	0.1800	0.1900
Danzhou	0.0200	0.0400	0.0400	0.0400	0.0400
Dongfang	0.0080	0.0100	0.0200	0.0100	0.0400
Lin'gao	0.0048	0.0049	0.0052	0.0050	0.0052
Changjiang	0.0007	0.0002	0.0002	0.0002	0.0003
Total	12.5300	16.9200	19.8100	22.3300	23.1000

3 Conclusions and recommendations

3.1 Conclusions In this paper, we give an overview about the current situation of betel nut processing in Hainan Province and analyze some problems in betel nut industry such as unreasonable initial processing layout, processing capacity surplus, and deep processing industry lag. Relying on the local betel nut resource advantages in Hainan Province, adjusting the initial processing layout of betel nut, moderately developing deep processing, and developing new deeply-processed betel nut products, can help to increase the type of betel nut product. Based on Hainan's tourism industry needs, it is necessary to develop health food and new tourism products, and build a new pattern featured by rich varieties and good flavor, so as to make betel nut industry become an industry with characteristics from planting to processing, and achieve sustainable development of betel nut industry.

3.2 Recommendations

3.2.1 Guiding the initial processing layout of betel nut based on local conditions. In 2014, the betel nut harvest area was 65000 ha in Hainan Province, and the dried fruit yield reached 230000 t. With the increase in production of betel nut, the processing industry also continues to develop. It is estimated that the province's betel nut initial and deep processing enterprises can give jobs for at least 15000 people, and increase farmers' wage income by nearly 300 million yuan. According to the actual betel nut production in various cities and counties, it is necessary to guide betel nut initial processing layout in Hainan Province based on local conditions, make full of support funds for green betel nut drying equipments and curing stoves to reasonably support betel nut initial processing, enhance the quality of betel nut, improve the processing environment, and avoid waste of betel nut processing equipments and resources. The green betel nut drying equipment and curing stove support funds are mainly for the cities and counties with betel nut yield of more than about 1 t, and the funds can be allocated based on the ratio of 1∶1.5 in accordance with betel nut yield to production capacity.

3.2.2 Supporting betel nut deep processing industry. The betel nut deep processing industry in Hainan Province is still in its infancy, with limited degree of market development and low added value of products. A good overall plan should be made for betel nut deep processing in Hainan Province. In the main producing areas, it is necessary to support betel nut deep processing plants, construct betel nut initial processing and deep processing serial production line, and conduct initial processing of fresh fruit and then deep processing, in order to reduce marketing and transport costs during the betel nut processing. The continuous processing line of betel nut deep processing plant is used to process betel nut, so as to closely combine cultivation and production with initial processing and deep processing, and gradually reduce the fruit initial processing implemented by a great number of betel nut workshops in the main producing areas of betel nut to improve betel nut processing quality.

3.2.3 Developing new betel nut products. The betel nut deep processing in Hainan Province is still in its infancy, and the betel nut product is developed only as food, with low added value. Based on the actual situation, the government should make good processing plan, change the traditional processing mode, achieve

integrated model innovation of betel nut initial and deep processing, support the development of betel nut processing industry and new product development, purposefully support the relevant enterprises and research institutes to accelerate research and development for new betel nut products, establish and improve the industrial chain of betel nut production, processing, research and development and marketing. It is also necessary to open up new areas of betel nut deep processing, and strive to achieve balanced development of upstream and downstream industries and enhance the comprehensive production capacity of industry[3].

3.2.4 Improving betel nut processing information service platform. It is necessary to establish information database and market information early warning mechanism concerning betel nut production, processing, transport and marketing, and improve betel nut processing information service platform to provide accurate betel nut production, processing, transport, market and price information for the government, enterprises and farmers, so that farmers grasp the situation of betel nut planting and marketing in a timely manner and avoid the market risk of betel nut industry, to continuously develop betel nut industry, promote the steady growth of processing industry value of betel nut, increase farmers' income and promote socio-economic development.

References

[1] KANG XN, JI JB, LI L. Analysis of unsafe factors in baked craft of betel nuts[J]. Food and Machinery,2015,31(1):68 - 70. (in Chinese).

[2] CHEN J, HAN X, LIU LY, *et al*. Developmental strategy of betel nut industry in Hainan Province[J]. Journal of Anhui Agricultural Sciences, 2011,39(2):1210 - 1212. (in Chinese).

[3] LI XY, XIONG HB. Analysis on the current situation of betel nut industry in Hainan Province[J]. China Tropical Agriculture,2007,(6):15 - 16. (in Chinese).

(From page 25)

new variety via the form of commercial insurance. It was conducive to decreasing farmer's risk in adoption process of new variety, and increasing farmer's activity of adopting new variety.

References

[1] GAFSI S, ROE T. Adoption of unlike high-yielding wheat varieties in Tunisia[J]. Economic Development and Cultural Change, 1979(28): 119 - 133.

[2] YUJIRO H. Induced innovation, green revolution and income distribution [J]. Comment Economic Development and Cultural Change,1981(30): 169 - 176.

[3] HERATH HMG, HARDAKER JB, ANDERSON JR. Choice of varieties by Sri Lanka rice farmers: Comparing alternative decision models[J]. American Journal of Agricultural Economics,1982(64):87 - 93.

[4] BARKLEY AP, PORTER LL. The determinants of wheat variety selection in Kansas, 1974 - 1993[J]. American Journal of Agricultural Economics, 1996(78): 202 - 211.

[5] HORNA JD, SMALE M, VON-OPPEN M. Farmer willingness to pay for seed-related information rice varieties in Nigeria and Benin[J]. Environment and Development Economics, 2007(12): 799 - 826.

[6] WANG XD, WANG YC. Analysis on the choice behavior of new wheat varieties of peasant households based on high-class seeds subsidy policy [J]. Chinese Rural Economy, 2008(7): 24 - 31. (in Chinese).

[7] LI DM, LIU Z, TANG S, *et al*. Analysis on the intentions of farmers' selection on new rice varieties and the influencing factors——Based on the investigation of 402 peasant households in primary rice production regions of Sichuan Province[J]. Problems of Agricultural Economy, 2009(11): 44 - 50. (in Chinese).

[8] TANG BW, LUO XF, QIN J. Analysis on the influencing factors of different attribute technologies adopted by farmers[J]. Chinese Rural Economy, 2010(6): 49 - 57. (in Chinese).

[9] QI ZH, LIANG FL, ZHOU H, *et al*. Empirical research on influencing factors of the rice farmers choosing new varieties. Based on the statistics of Hubei Province[J]. Journal of China Agricultural University, 2012 (2):164 - 170. (in Chinese).

[10] HUANG W, HAN XQ, ZHU GM. Analysis on the influencing factors of new varieties' acceptance of peanut farmer households[J]. Journal of Agrotechnical Economics, 2012(12): 12 - 21. (in Chinese).

[11] HOU LK, QIU HG, BAI JF, *et al*. Effect of farmers' risk appetite on the input of agricultural production factors[J]. Journal of Agrotechnical Economics, 2014(5): 21 - 29. (in Chinese).

[12] THEDORE W. SCHULTZ. Reforming traditional agriculture[M]. (LIANG XM) Beijing: The Commercial Press, 1987. (in Chinese).

[13] ATANU S, ALAN LH, ROBEIT S. Adoption of emerging technologies under output uncertainty[J]. American Journal of Agricultural Economics, 1994, 76(11): 836 - 846.

[14] KONG XZ, FANG SH, PANG XP, *et al*. Analysis of the effect of household endowments on the agricultural technology adoption decision in west China[J]. Economic Research Journal, 2014(12): 85 - 95, 122. (in Chinese).