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Agribusiness System and Development Strategy of Lampung Black Pepper

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Abstract. Indonesia is ranked third in terms of the world's exporters of black pepper and white pepper in 2019. Black pepper from Indonesia is known as Lampung Black Pepper which is planted in several areas in Lampung province with a planting area of 45.848 Ha and is able to produce 14.730 tons of pepper in 2019. However, the planting area and production of pepper decreased because the number of constraints on the system agribusiness pepper. The purpose of this research to identify the strengths, weaknesses, opportunities, and threats and strategize the development of black pepper in Lampung Province. The method in this research is literature study. The result of the study that the system of agribusiness pepper start from the upstream subsystem, on farm, and downstream subsystem has the strength factor in the development of Lampung Province as the center of Indonesia's black pepper producers, weakness factor is the development of technology in the process of pepper production has not been done much, the opportunity factor is the most potential export market of Lampung Black Pepper, and the threat factor of development Lampung Black Pepper is decrease the planting area and climate change. Development strategy of Lampung Black Pepper is with the development and mentoring of technology, increased value added, making demonstration plots, corporate-based regional development, and digital marketing.

INTRODUCTION

Export of pepper Indonesia in 2018-2019 was ranked third in the world, with the number of the highest Vietnam 235.889 - 264.800 tons, Brazil 72.580 - 109.400 tons, and Indonesia 47.630 - 47.100 tons [1], [2][10,14,15]. On the world stage in 2019, the main export share of Indonesian pepper was 29.600 tons of white pepper and 17.400 tons of black pepper which were destined for Vietnam, India, USA, Germany, and Taiwan. Pepper (*Piper nigrum* L.) is widely grown by farmers in Bangka Belitung and Lampung. Black pepper is known in the world market under the name "Lampung black pepper" which are produced in the province of Lampung with a planting area 45.848 ha in 2019, while white pepper is known by "Munthok white pepper" which comes largely from Bangka Belitung islands with an planting area 52.688 ha [3]. However, black pepper produced in Lampung Province experienced a decrease in production. In 2014 pepper farmers in Lampung were able to produce 23.450 tons of pepper, decrease to 14.730 tons in 2019. The decline in pepper production is inseparable from the risks of pepper farming, including: (a) drought; (b) attack by pests and diseases, especially stem rot and yellow disease; (c) conversion of land to land for other plantation commodities [4].

Pepper agribusiness system consists of several subsystems which include upstream subsystem, on-farm, and downstream subsystem [5]. The upstream pepper agribusiness subsystem includes several activities, including the procurement of seeds, fertilizers, pesticides, growth regulators, and agricultural machinery. The on-farm subsystem is a cultivation technique starting from land processing to harvesting, while the post-harvest downstream agribusiness sub-system includes storage, processing, diversification, distribution or marketing. In each of these agribusiness subsystems there are various problems, among others, the majority of small-scale plantation management and limited capital capacity by farmers. This has an impact on the lack of application of technological recommendations including the use of superior seeds, cultivation techniques and post-harvest handling [6]. In the

pepper agribusiness system, a strategy is needed to overcome these various obstacles. The purpose of this study is to analyze agribusiness system and development strategy of Lampung black pepper through of Strengths, Weaknesses, Opportunities, and Threats (SWOT).

METHODS

This research was conducted in Lampung Province using purposive sampling with the consideration that Lampung is the main producer of black pepper in Indonesia. The method used by literature study from agencies or institution related to research sourced from the internet that is Directorate general of plantation the Ministry of agriculture website, articles, journals, and e-books. The data obtained were then analyzed qualitatively and explained descriptively.

RESULT AND DISCUSSIONS

Current Conditions of Agribusiness System Lampung Black Pepper

Upstream Subsystem

Traders who sell production facilities in the form of seeds, fertilizers, pesticides plant disease, growth regulators, and other equipment used to carry out agricultural production generally do not have an agricultural background, so they cannot provide information on the proper use of production facilities, nor can they recommend the types of commodities that farmer need. In general, the institutions involved in procuring production facilities in rural areas, such as farmer groups (joined in the Indonesian Pepper Farmers Association), Village Unit Cooperatives, Village Social Institutions and others, are still less involved. Limited capital, information, guidance, and access are the main obstacles in procuring production facilities [7].

On Farm

a. Land preparation

Land is cleared of weeds, then the farmer digs a planting hole and is given a stake. Field drainage is made with a size of 30x20cm (width and depth) in every 4 rows of pepper and a 40x30 cm circumference (wide and deep) trench is made.

b. Stake planting

In cultivating pepper plants, a stake edge is needed, both in the form of live and dead. The ideal stake life expectancy should have the following characteristics: (1) growing upright, (2) initial stem diameter >7.5 cm and having a strong stem with a rough surface, (3) resistant to periodic heavy pruning and long life, (4) allow the roots attached can be attached to both, and (5) not a parasite place for pest. Stake or climbing poles used by pepper farmers in Lampung in general are the types of dadap cangkring (*Erythrina variegata*), gamal (*Glyricidia maculata*), and kapok (*Ceiba petandra* L.) plants [8]. Stake is planted 1 year before the pepper seeds are planted in the field.

Stake > 5m can increase pepper yields because the high crown of pepper plants and contains branches or massive (dense) fruit tendrils allows the pepper plants to produce higher amounts of pepper. The use of high pitch in pepper cultivation has been practiced by pepper farmers in Lampung. In Vietnam farmers earned an average production of pepper ranged from 2,6 until 3,8 tons, even more so because it uses the high life and accompanied stake intensive crop maintenance, including the use of fertilizers (chemical and organic).

c. Planting hole

Before planting pepper seeds, farmers first make planting holes with a size of 60x60x60 cm with a spacing of 2,5x2,5 m per plant. Each hole was given 5 kg of compost. During this land preparation, the vacant area between the planting holes is usually planted with seasonal intercropping plants, such us corn, beans, kencur, curcuma, turmeric, and others.

d. Preparation materials

The planting material used comes from the farmers' own fields, other farmers' fields, or the nursery fields. There are two techniques used in pepper seedling, such us through cuttings and planting material derived

from climbing vines which are characterized in the book as having attached roots. Climbing vines come from pepper plants aged >7 months to <3 years, have not flowered and bear fruit and are free from pests and diseases.

- 1) Through cuttings: long cuttings (7-10 segments) are cut into single leaf cuttings and then cut in an upright position. The cuttings are rammed and covered with transparent plastic for 20-25 days. The lid is opened gradually and maintained until the seedlings have at least 5 segments.
 - 2) Planting material derived from climbing vines is then planted on previously prepared land, then after 1 year of planting, pepper plants are lowered back around 10 cm by digging a planting hole, this is done so that the root system is strong [9].
- e. Pepper planting
Seedlings are planted towards the stake, propped up and tied to the stake then given shade from banana leaves or coconut leaves midrip so that the plants do not wither.
- f. Cultivation plant
- 1) Pruning of hanging vines and worms is often done because every farmer goes to the field almost every day, pruning is because these two tendrils are not productive. Pepper cutting are pruned after 1 year of planting.
 - 2) Pruning stake is done so that the penetration light of sun through the canopy of pepper. Stake pruning 3 times/year was able to reduce plant mortality by 2,3% due to stem rot disease compared to pruning 2 times per year [10]. This is thought to be closely related to the condition of lower air humidity or better air circulation due to the sharpness being trimmed more often. Sharp pruning 3 times a year at the beginning, middle and end of the rainy season allows light that reaches the canopy surface to reach 70-75% which is optimal for pepper plant growth and fruiting [11].
 - 3) The first fertilization using compost as much as 5 kg given at the beginning before the crop is planted and 5 kg in mid-year, while inorganic given 1 times a year.
 - 4) Control pest, pest often attack the pepper plants in Lampung are yellow disease and stem rot, to control pests that have attacked crops, farmers are already growing pepper repeal and replace with a new plant. Meanwhile, to prevent pest attacks, pepper farmers use seeds that are resistant to pests and make drainage.

Downstream Subsystem

The method of processing black pepper by pepper farmers in Lampung already has a thresher machine, but it is still quite a bit. Most of the farmers process pepper by bringing bunches of fresh peppers into sacks and then to the threshing ground. Threshing is done by way of overlaying bunches of pepper on top of woven bamboo with holes and placed rather high, and then crushed so that the grain of pepper regardless of the shaft. Next, the pepper grains are dried on a drying floor made of cement or on the side of a paved road with mats, burlap sacks or tarpaulins. The peppers are dried in the sun for 3-4 days to dry, then put in burlap sacks and ready to be sell. Pepper is stored in the warehouse for a while and sell to collectors in each farmer's village. With such treatment, the quality of the product is not guaranteed. The quality of the product is still low and it is feared that it will be contaminated with microorganisms.

Lampung Black Pepper Development Strategy

Analysis of the factors of strengths, weaknesses, opportunities, and threats of Lampung black pepper development

The results of the study show that the factors that are the strengths in the development of black pepper in Lampung are: (1) Lampung as a center for producing Indonesian black pepper [3], (2) the commodity cultivated is a leading commodity, which is ranked third in the world in terms of pepper exporters [10], (3) the main occupation and income as farmers are 63.013 pepper farmers in Lampung in 2018 [6], (4) the experience of farmers in farming is quite long, that the experience of farming can shape the character of farmers to become better people open and compact in the communication network between farmers, (5) pepper farmers prioritize labor in the family to reduce the cost of pepper production, and (6) pepper farming is feasible with NPV>0 ; IRR 23,71% >interest rate 17,50% ; Net B/C ratio 1,5; Gross B/C ratio 1,35 ; and a payback period of 7,78 years [23].

The factors that become the weakness of the development of black pepper in Lampung are: (1) most of the formal education levels are below junior high school [12], (2) the cultivation of pepper plants that have not been

carried out in accordance with the GAP, (3) harvest and postharvest pepper that has not been carried out according to GHP, (4) technological development in the pepper production process has not been widely carried out, and (5) diversification of pepper products is only partially carried out by farmers.

Factors that become opportunities for the development of black pepper in Lampung are: (1) high international market demand for pepper, (2) government support in pepper development through the launching of a program from the Governor of Lampung and Balitbangtan [13], (3) development of appropriate technology [4], (4) the role of farmer groups as a means to create and disseminate new technology and create farmer independence, (5) opportunities to improve farmers' welfare [14].

Factors that threaten the development of black pepper in Lampung are: (1) a decrease in the area of planting of the year 2014-2017 planting area of 60.480 ha to 45.848 ha, (2) the younger generation is less interested in working in agriculture it can be seen from the mean rate of age of pepper farmers > 40 years [12], (3) increase in the price of inputs (inputs and labor), and (4) climate change is affecting the success of farming pepper.

Development strategy of Lampung black pepper

Based on the SWOT analysis above, it can be seen that it is necessary to develop a strategy for developing black pepper in Lampung in an effort to increase productivity to support the success of farmers in their farming. The effort to formulate this strategy refers to the pepper development plan in accordance with the direction of the Head of the Plantation Research and Development Center through the Balitbangtan Innovation to improve the competitiveness of Lampung black pepper which was delivered at an audience with the Governor of Lampung in March 2021 [13].

The Lampung black pepper development strategy is by providing Development and mentoring technologies, increasing value added, making demonstration plots, developing corporate-based areas, and digital marketing.

1) Development and mentoring technologies

Development and mentoring technologies include seed, development of plantation master, and cultivation techniques suitable GAP (Good Agricultural Practices) as an effort to increase the productivity of pepper through plant maintenance such as fertilization, management of pole climbing, fields irrigation and integrated pest management (IPM).

a. Seed development through pepper plant rejuvenation

b. Balanced fertilization is the right time, right type, right dose, right method, and right location. According to Pepper GAP [8] that inorganic fertilizers should be applied 2 times a year at the beginning and end of the rainy season, each with 50% of the dose. Ripe organic fertilizer in the form of manure or compost is given 5-10 kg/tree, with a frequency of 2-3 years. Inorganic fertilizers are evenly distributed in shallow grooves of 5-10 cm around the projection of the outer canopy (canopy) of the plant, then covered again with eroded soil or added soil around the plant.

c. Integrated Pest Control. Another problem that occurs in pepper cultivation in Lampung is the attack of stem rot disease. It is necessary to control with biological agents, as has been tested on pepper plantations that were attacked in Bangka Belitung. The use of these biological agents can reduce disease attacks up to 30%. The application of biological agents such as *Trichoderma* spp., antagonistic bacteria, and mycorrhizae is carried out in conjunction with the application of manure/organic matter, as a preventive measure [8]. Integrated pest management is done with good plant material, cultivation of efficient and environmentally friendly, and integrated crop management include the use of natural enemies and conservation technologies [15]. Implementation of integrated control includes increasing plant vigor by applying recommended cultivation, suppressing the growth of *P. capsici* populations through the application of biological agents, such as *Trichoderma*; while the use of fungicides is only done as a last resort if the development of the disease is getting more serious [16]. Yellow disease due to Nematodes or Fungi attack, this pest can be controlled technically and biologically. Technical culture is using healthy seeds, making an isolation trench 30 cm wide and 40 cm deep. While biological/natural control by application of carbofuran 25 g/plant/6 months suppressed yellow disease up to 46% and reduced the nematode population. In addition, the combination treatment of the nematode parasite rhizobacteria *P. penetrans* with organic matter suppressed the nematode populations of *R. similis* and *M. incognita* [8].

d. The integration pattern needs to be done to increase farmers' income and anticipate fluctuations in pepper prices. Farmers are encouraged to include other activities such as integration with livestock, pepper intercropping with seasonal crops can be done when land preparation and when new pepper plants are planted in the land, or other crops. The integration of pepper with livestock and planting of ground cover such as ornamental bean (*Arachis pintoi*) is highly recommended to support efficient. In addition, the use of

cover crops will reduce the occurrence of pests and diseases. Pepper crop farming goats integration with pepper increases productivity more than 60% and can reduce the cost of production of pepper cultivation by 50,5 % of total production costs [17].

e. In addition, European spice importers often complain about Indonesian pepper products, such as the high levels of dirt and microorganism contamination. So it is necessary to improve harvesting and post-harvest methods at the farmer level. The development of technology by designing a thresher, blanching, drying, and sorting device for pepper is an effort that can be done to control the attack of microorganisms and reduce the level of pepper impurities.

2) Increased value added

Increased value added by harvesting and postharvest management in accordance with GHP (Good Handling Practices) and can be done by product diversification. Diversification of Lampung black pepper products includes the manufacture of ground black pepper, pepper oil, and pepper balsam [18].

3) Making demonstration plots

Demonstration plots according to GAP (Good Agriculture Practices) is carried out by rehabilitating or intensifying existing plantations. Intensification of existing field by developing demonstration plots. Deploying demonstration plots in Bangka Belitung by using high-yielding varieties, determining plant materials, cultivation and maintenance methods. A total of 2000 pepper plants used Petaling 2 and LDK varieties on an area of 2 hectares [19]. Furthermore, the demonstration plot was carried out again in Bangka Belitung using $\frac{3}{4}$ hectares of land, such as carrying out plant rehabilitation, using certified seeds from partner pepper groups, and balanced fertilization.

4) Development of a corporate-based area

Development of a corporate-based area to strengthen the consolidation of farmers in modern economic business institutions, and increase farmers' accessibility to capital, besides that, it can increase partnership connectivity with modern processing and trading industries, as well as encourage agricultural modernization and integration with public facilities or infrastructure.

5) Digital marketing

Marketing optimization is influenced by the marketing mix. Strategy to emphasize how to sell product known as 4P's (Product, Price, Place, Promotion) as effective as possible. To support marketing at this time, it is done with digital marketing. Digital marketing is used because of the speed of deployment, ease of evaluation, wide reach, cheap and effective, building a brand name. The digital marketing design stage is situation analysis, planning strategy, objectives, digital marketing strategy, implementation plan, budget, and evaluation plan [20]. Marketing techniques included in digital marketing are SEO (Search Engine Optimization) to optimize a site to get the top ranking from search results, online advertising such as FB Ads and Google Ads, print media promotions, television and radio advertisements, electronic billboards, email marketing, affiliate marketing, social media marketing, native advertising, and mobile marketing [21].

CONCLUSIONS

System of agribusiness pepper start from the upstream subsystem, on farm, and downstream subsystem. The strength factor in the development of black pepper is Lampung Province as the center of Indonesia's black pepper producers, weakness factor is the development is technology in the process of pepper production has not been done much, the opportunity factor is the most potential export market of Lampung Black Pepper, and the threat factor of development Lampung Black Pepper is decrease the planting area and climate change. Development strategy of Lampung Black Pepper is with the development and mentoring of technology, increased value added, making demonstration plots, corporate-based regional development, and digital marketing.

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