

Economic Feasibility of Certified Seed Business Performance for Supporting a Sustainable Clove Production: An Analysis of High-Production Block of Zanzibar Variety

Sujianto¹, Ermiami², and Agus Wahyudi²

¹Research Group of Agricultural Innovation and Policy System, Research Center for Macroeconomics and Finance, Research Organization for Governance, Economy, and Community Welfare, Research and Innovation Agency of Indonesia (BRIN), Gedung Sasana Widya Sarwono Lantai 5, Jl. Gatot Subroto No. 10 – DKI Jakarta 12710.

²Research Center for Cooperative, Corporation, and People's Economy, National Research and Innovation Agency, Jakarta, Indonesia

Abstract. Sustainability of Indonesian clove depends on the seed availability and seed quality. The percentage of immature and damaged plant area reached 67% from total 580,441 ha of Indonesian plantation. Seed quality is an essential factor for the success of replanting and development. For standing integrity, the certification is one of the key guaranty system providing standard seed quality to maintain yield, quality, and preventing propensity of pest and diseases attack. The objective of this study was to analyze feasibility of some certified seed production models to support certified seed availability for clove development in West Sumatra Province. The study was done at the Bernas Nursery Farmers Group, Solok Regency. Data was calculated based on the Zanzibar Clove High-Production Block (HPB) performance and certified seed production. The obtained data were analyzed quantitatively through economic approach using Benefit/Cost Ratio. The finding results confirmed that the most need of clove seed of West Java Province could be fulfilled by the High Production Block (HPB) from Bernas Farmers Group nursery. Type of clove seed sold in that nursery: 1) unshelled seed of clove, 2) sprouted clove seeds with age of 10 days after sowing, and 3) Clove seed in polybag with age 6-9 months. All seed was harvested originally from mother plant of Zanzibar clove high production. The seedlings clove sprout and the seed in polybags form provide a positive flow of income and those seedling model providing good benefit revenue with an R/C ratio of 1.59 and 2.60, respectively. The certified clove seed in nursery of Bernas Farmers' Group, in West Sumatra has a good economic feasibility and can be implemented in other clove center province.

Keywords: Clove Seed, Certified Seed Production, Sustainability, Economic Feasibility, West Sumatra Province

¹ Corresponding author: sujianto@brin.go.id

1 Introduction

As one of the essential spice, Clove (*Syzygium aromaticum* (L.) Merr & Perr.) is originating from the Maluku Region, which has been known since the 17th century [1], [2], [3]. Cloves are used as spices, herbs, and raw materials for food, beverages, pharmaceuticals, and cosmetics. In particular countries like in Japan, China and India, the clove is demanded spice as ingredients for culinary and used for religious ceremonies. More than ninety percent of Indonesia's total clove production was made for domestic cigarette industry production, which began in 1927 in Kudus, Kediri, Tulungagung, Mojokerto, and surroundings [4], [5], [6], [7]. The presence of the Kretek cigarette factory absorbed the national harvested clove from plantation and depended on the clove domestic production that led to the fluctuation of clove export [3]. Indonesia's Kretek cigarette industry is large and the most significant contributor to state revenue. Indonesian revenue from cigarette excise tax continues to increase, in 2009 amounting to Fifty-five trillion rupiah, and as of December 2018, it reached IDR 120.62 trillion from the state budget target of IDR 152.79 trillion [8], [9]. Until November 2019, it reached IDR 133.08 trillion; in 2020, it grew by 9.74 percent, to IDR 146 trillion. This data indicated that clove has a essential role to the the national economy. Therefore the continuous supply of quality clove raw materials is very important [2].

Indonesia has great potential as one of the world's clove-producing countries. From the east to west part, it can be seen that so many clove plants and farmers depend on this plant for their lives. Cloves not only play an essential role as a contributor to household income for farmers [10] but are also a part of spices that has given impact and contribution to the Indonesian national economy, as well as a means of developing equitable regional development [11]. The total area of Indonesian clove plantations is about 98.74% controlled by People's Plantations with a production of 139,240 tonnes and a productivity of 416.7 kg/hectare/year of the total national production of 140,997 tonnes, the remainder being cultivated by State Owned Plantations and Private Owned Plantations. It turns out that the productivity of Indonesian cloves is still far below the potential production of superior varieties of national cloves, which reach 2,000 kg/hectare/year [12]. Therefore, the Ministry of Agriculture will not add more clove areas because it is sufficient. What will be done is to rehabilitate old cloves and those affected by stem borer pests, especially in North Sulawesi and Central Sulawesi, and increase productivity by distributing quality or certified clove seeds. In line with the government's desire to restore the glory of national spices, 2018 was declared the year of the national seed. However, Indonesian cloves have not been able to become a reliable part of Indonesia's primary commodities, one of the reasons being that clove production is very dependent on climate or weather [13].

The level of quality and productivity of plants depends on the seeds used because seeds are one of the keys to the successful cultivation of plants, which have a very decisive role in efforts to increase production and quality, which will increase farmers' income and welfare. Therefore, the plant seed system must guarantee the availability of quality seeds adequately and sustainably and have been certified. Seed quality is an important key [14], therefore for planting to have a high level of productivity and before the clove seeds are distributed, the seeds must be certified in advance by an authorized institution body, namely the Centre for Seeding and Plantation Plant Protection (BBPPTP) or the Regional Technical Service Seed Unit located in the local province [15]. Using original or non-certified seeds will produce crops with varying productivity [16]. The overall clove productivity will be low if the dominant productivity is low. Additionally the number of damaged plant caused by pest and

disease attack in several region reached about 67% of total area of clove in Indonesia [12], [17].

For this reason, it is necessary to rehabilitate clove plantations by replacing them with superior varieties that have high yield potentials, such as Zanzibar Karo, Clove Afo, Zanzibar Gorontalo, and Tuni Bursel cloves varieties, which are local-specific superior varieties. In areas without local-specific superior varieties, the seeds can be supplied from High-Production Blocks (HPB) with the Selected Mother Trees that have been assessed and determined by the competent authority. For example, in 2015, West Sumatra Province already had BPT Zanzibar Cloves managed by Bernas Farmers Group and located in Jorong Pasar Nagari Village, Lembang Jaya District, Solok Regency West Sumatra Province [1].

This research had objective to analyze the economic feasibility and performance of a clove seed nursery with a certified High Producing Block (BPT) Zanzibar Clove Farmer Group in Kenagarian Koto Anau, Lembang Jaya District, Solok Regency, West Sumatra. It is do hoped that the results of this research can become the basis for strategic initiatives to increase the production, distribution, and use of quality clove seeds, especially in West Sumatra and generally in clove development centers in Indonesia. This certified seed is expected providing good quality of clove seed in West Sumatra province and supporting the sustainable production. Finally it will have impact on the clove farmers prosperity and becoming strategy for poverty alleviation.

2 Methodology

2.1 Time and location study

The research was conducted based on the Zanzibar High-Production Block (HPB) in Solok regency West Sumatra Province, especially at the Bernas Farmer Group, Jorong Pasar Nagari Village, Lembang Jaya District of Cloves in August 2019 to April 2022 covering the collection of seed performance, production, and price data.

2.2 Data sources

Economic performance indicates that the success of a farming business reflects the relative success of a farming business, which is indicated by the profits or losses earned by farmers. Economic performance can be measured in several ways, including by analyzing income and business efficiency. Farming has good economic performance if profits continue to increase and the business is run more efficiently [18], [19], [20]. The income calculation was conducted to determine the amount of farmers' income from selling certified clove seeds through tabulation and described descriptively [21]. The production value is gained from the total quantity of the product per unit area and the price of the product. Production costs are obtained from the sum of the factors of production multiplied by the prices of the factors of production. Mathematically, income is calculated with the following formulation:

$$R=Q .P- \sum_{(i=1)}^n X_i .H_{xi} \tag{1}$$

Note.

- R = Total revenue from seeds selling (IDR);
- Q = Production (kg/ha);
- P = Product price (IDR/kg);
- Xi = The factor of production (i = 1,2,3...n);

Hxi = The each of factor production price (i = 1,2,3...n)

The feasibility and efficiency of the clove seed nursery business were calculated with the Revenue Cost Ratio (R/C Ratio) analysis with the criteria that the harvest of seeds and the production process of certified clove seeds was not enough for one year. Hence, the feasibility analysis was without regard to the time factor. The business is declared feasible or efficient if the R/C value > 1 means that the revenue value is equal to or greater than the total cost. Therefore the more significant the R/C value, the greater the efficiency level a business owns [19]. The R/C ratio uses the following formula [21].

$$E=R/C \tag{2}$$

Note:

E = Efficiency

R = Revenue

C = Cost

The business feasibility analysis describes whether or not a business is feasible from an economic, technical, and financial perspective [22]. The business feasibility analysis results will determine a business's further steps. The financial analysis focuses on the financial aspect, especially cash flow or cash flow during business activities [23]. Cash flows consist of revenue and cost flows, which refer to money flow to or from economic agents (farming) [24]. Receipt flows are cash inflows originating from the sale of clove seeds. At the same time, the cost flow is a cash outflow consisting of maintenance costs for Selected Mother Trees (SMT) per tree per year and costs incurred starting from harvesting or collecting seeds to seed production, both grown seeds and seeds that have been planted. Financial feasibility analysis aims to assess the feasibility level of a business' profit [25]. To determine the level of feasibility of a clove seed nursery business, namely by conducting an investment analysis by looking at the level of return received from the capital that has been invested.

3 Result and discussion

3.1 Overview of plantation in West Sumatra

Based on the area and the number of farmers involved, Solok Regency is the main clove planting area in West Sumatra, with a total area of 2,616 ha and 10,743 farmers involved. Meanwhile, the Mentawai Islands and Pasaman Regency cover 2,138 ha and 1,049 ha, respectively, with 2,123 and 1,027 farmer families involved. However, in terms of total production and productivity levels, the Mentawai Islands and Pasaman District are higher, respectively, 673 and 380 tons, with 442 and 772 kg/ha productivity. Meanwhile, Solok Regency is even lower, only 373 tonnes with a productivity of 342 kg/ha. This data is due to the large area of Immature Plantations (TBM), which is 1,524 ha, and the cultivation techniques used have not followed recommended technology; farmers still use their seeds, known as random or uncertified seeds [12]. They do not do intensive farming, especially when prices are low, their crops are neglected, and many plants are old and die. It affects production, productivity, quality, price, and of course, also on farmers' income. The productivity of cloves in West Sumatra is still below the optimal productivity of national superior varieties, which reach 2,000 kg/ha [12]. For this reason, it is necessary to rehabilitate clove plantations, namely, replace them with superior varieties with high yield

potential. West Sumatra already had a source of local superior variety seeds, namely High-Production Blocks (HPB) as Selected Mother Trees (PIT) Zanzibar Cloves Variety Bernas Farmers Group in Kanagarian Koto Anau, Lembang Jaya District, Solok Regency [12].

Bernas Farmers Group Profile. Bernas Farmers Group Jorong Pasar Nagari Koto Gadang Koto Anau, Lembang Jaya District, Solok Regency, West Sumatra Province, was formed in 2010 based on the Decree of the Wali Nagari Koto Anau No. 140/Kpts.3/NKA.2010, which consists of 20 farmers with a total land area of 66.75 hectares, consisting of 55 hectares of member land area, 10.25 ha of group land and 1.5 hectares of High-Production Block (HPB) of clove with 10 Selected Mother Plants (SMPs). The Bernas Farmers Group is not only engaged in clove plantations (farming and production of clove seeds) but also in the field of food crops, such as rice, animal husbandry (ducks, chickens, cattle), and fisheries (breeding and cultivating Jumbo raya fish and fast water fish). The acknowledged farmer group as supporting institution was one of the success factor of seed clove development [26].

3.2 Seed certification

Specifically, a clove plantation of 1.5 ha has existed since 1972 and is owned by a local community leader named Ahmad Rivai. The cultivated cloves and the seeds came from Bogor, which Ir. Thoyib brought. However, over time this clove garden was not maintained. In the end, many plants were damaged and died from being attacked by Clove Wood Bacterial Disease (BPKC); in the end, there were only 53 trees left. Then by the owner, the clove garden is handed over to the Bernas Farmers Group to be appropriately managed by sharing; 75% of the share goes to the garden owner and 25% to the manager or farmer group since there is still a lot of vacant lands, the farmer group replants with clove plants (planting spacing 8 x 8 m) with a 50% production sharing agreement for the garden owner and 50% for the manager or farmer group. The superior seeds is one of the determinants of the development success. The utilization of quality seeds is crucial to increase seed production and productivity, because it is necessary to hold certification to ensure that the seeds on the market are of high quality [27].

In line with government programs, using superior seeds is an absolute requirement for distribution to farmers and prospective seed producers. Before distribution, The seed must meet quality standards and be certified and labeled [28]. Seed certification is a series of activities to issue certificates for seeds carried out by certification bodies through field inspections, laboratory tests (including testing for variety and physical purity, moisture content, and germination power), carrying out supervision until the seeds meet the requirements for distribution by the aim is to provide guarantees to seed users about the certainty of the quality of the seeds and varieties to be used, to provide legality to seed producers, that the purity and quality of the seeds produced are guaranteed [29].

The legal basis for certification of plantation crops is Law No. 39 of 2014 concerning plantations which play an essential role and have great potential in the development of the national economy in order to realize prosperity and welfare of the people equitably and Minister of Agriculture Regulation No. 50 of 2015 concerning production, certification, distribution, and supervision of plantation seeds.

Certification of plantation crops to maintain variety purity, maintain seed quality, and provide guarantees to seed users (consumers). While the certificate guarantees seed users (consumers) that the seeds they buy have passed certification, it is clear that the quality and variety come from a predetermined clove seed garden [30]. Certification also has the

benefits of continuing conservation and increasing the level of welfare of farmers [31]. Although the experience of the process of certifying plantation seeds is relatively minimal in literature, clove seed certification is expected to provide quality seeds, high productivity, and minimize attacks by plant-disturbing organisms (OPT). An example of the success of other commodities was namely potato seed certification, which is carried out to provide virus- and other pathogen-free potato seeds in an integrated manner [32], [33].

3.3 Production of certified clove seeds

The average productivity of the 10 PITs in the BPT Bernas Farmers Group was 96.54 wet kg/tree/year, see Table 1 [1]. If the seeds that come from these 10 PITs are cultivated for 1 ha of land with a population of 100 trees (planting distance of 10 x 10 m), then harvesting clove plants at the age of 40 - 46 years produces an average clove flower of 9,654 kg wet/hectare or equivalent to 2,423.50 kg of dry clove flowers/ha/year, with a correction factor of 25%, the net yield obtained is 1,810 kg/ha/year, almost reaching the optimal productivity of national superior varieties (2,000 kg dry/ha/year).

Table 1. Productivity of Ten Zanzibar Clove Selected Mother Tree (SMT) of High-Production Block in Bernas Farmers Group in Jorong Village Pasar Nagari Koto Gadang Kato Anau Lembang Jaya District, Solok Regency, West Sumatra

No of SMT	Production of wet flowers per tree (kg)				Average of Production (kg)
	2011	2012	2013	2014	
1	82.6	130.3	98.5	178.1	122.4
2	105.5	137.3	109.5	171.1	130.8
3	52.7	124.4	43.8	142.3	90.8
4	52.7	75.6	59.7	156.2	86.1
5	48.8	102.5	24.9	150.2	81.6
6	73.6	75.6	63.7	173.1	96.5
7	52.7	86.6	96.5	127.4	90.8
8	40.8	95.5	65.7	124.4	81.6
9	77.6	108.5	48.8	128.4	90.8
10	64.7	104.5	76.6	130.3	94.0
Rata-rata dan strandar deviasi					96.54 ± 16.677

Source: Bermawie *et al* (2015)

Bernas Farmers Group produces and sells certified seeds in two forms; 1) the sprouted seeds (starting ten days after sowing), 2) the sprouted seeds that have been planted in

polybags aged 6-9 months, which are sold to various areas around West Sumatra. The seeds used are seeds that fall from the Selected Mother Plants (SMPs), provided that the seeds are ripe (dark brown), sound, healthy, smooth, without defects, without scars or black spots, and are not contaminated. If the seeds have scars or black spots, they are attacked by fungus; if there are lumps, they are infected with clove leafpox [34]. According to the statement from the Head and marketing division of the Bernas Farmers Group, from the 10 SMPs evaluated, only six SMPs have been certified, namely numbers 1, 2, 5, 6, 7, and 9. In contrast, the other 4 SMPs (numbers 3, 4, 8, and 10) are only used if the requests are not fulfilled from the 6 SMPs [1]. Although the production of certified seeds per SMPs per year is not recorded, there is a total production of six SMPs seeds per year for five years; for details, see Table 2.

Table 2. Certified clove seed production and sales of Bernas Farmers Group, Lembah Anau District, Solok District, 2015-2019

Year	Total seed from six Selected Mother Plants/year	Mean/SMP/year	Unit
2015	200000	33333	seed
2016	97000	16,167	Seed
2017	98000	16,333	Seed
2018	150000	25000	Seed
2019	65000	10833	Seed
Total	610000	101,667	Seed
Average	122000	20,333	Seed

Note. 1 kg = 800 nut seed
 20 333 nut seed = 25,42 kg seed/selected mother plant/year

3.4 Seed handling

After harvesting, to make it easier to peel, the seeds are first soaked for 24 hours, after which the shells are opened so that they germinate quickly and prevent fermentation which can damage the viability of the seeds. Next, the seeds are soaked for one night to increase the moisture content and then cleaned of the mucus adhering to the seeds, after which they are sown immediately because clove seeds are recalcitrant; they cannot be stored for too long [35]. Peeling is done carefully, either by hand or knife but not too sharp so that the seeds are not injured. While washing aims to remove the mucus attached to the seeds. Washing the seeds must be stirred and rubbed in water carefully to accelerate the loss of mucus attached to the surface of the seeds; the washing water is replaced 2-3 times and after cleaning the seeds immediately in sowing. For growing well, the clove plants need sufficient water, soil moisture and nutrition [36][37].

There are two ways to sow the seeds by the Bernas Farmers Group: 1) The seeds are placed on a used cloth, watered, and then wrapped, but what is usually done is wrapped first

and then tied tightly, then dipped in water until it is approximately evenly wet, then hung in a container. Shade for 7–10 hours. Moisture is maintained by water, after which the seeds grow and are ready to be sold or planted in polybags; 2) The seeds are sown indoors on moist media. The media can be burlap, used sheets, gauze, and others. The humidity is maintained by watering it with water when needed because the media is exposed every time the watering process is sorted to maintain quality. After ten days of sowing, the seeds start to grow and can be sold or planted in polybags [38]. Seeding without special treatment was done by sowing seeds using coconut water to increase clove seeds' viability and healthy growth [39]..

3.5 Economic feasibility

Seed collection uses labor within the farmer group whose value is the same as labor wages outside the farmer group. The wage for collecting clove seeds is still in the IDR 70,000/kg shell. Wages from collecting seeds to sowing until the seeds grow, starting ten days after sowing, amount to IDR 130,000 per kg (1 kg of about 800 seeds).

There are three models of selling seeds at BPT Berbas Farmers Group, namely: 1) Seeds that are still in the shell (IDR 300,-/seed), 2) Seeds that grow from 10 days age (IDR 400,-/seed), and 3) Polybag seeds with age 6-9 months are sold at IDR 7,000/polybag. Seeds with shells, buyers are usually students, researchers, and some farmers in small parties (limited to 10-50 kg only); therefore, the analysis is carried out in 2 (two) forms of sales, namely 1) in the form of growing seeds and 2), in the form of seeds growing which has been planted in polybags aged 6-9 months. Consumers are farmers, farmer groups, breeders (privately and through government projects), and the private sector.

Table 3. Average expenditure, revenue, income, and feasibility of certified clove seed nurseries in the form of growing seeds/selected mother plant/year at Hight-Production Block of Zanzibar Clove at Bernas Farmers Group, Solok Regency, West Sumatra

Economic parameters	Volume	Unit	Price (IDR)	Total (IDR)
1. Labor costs for maintenance				
▪ Preparation and cultivation	4	Labor day	65,000	260,000
▪ Fertilization (1 x 6 month)	2	Labor day	65,000	130,000
▪ Plant protection (pest control)	12	Labor day	65,000	780,000
Total labor cost (1)				1,170,000
2. – Labor cost from seed picking to growth seed per selected mother plant/year	25.42	Kg	130,000	3,304,113
Total labor cost (2)				3,304,113
3. Materials cost				
- Organic fertilizer 1 x 6 month @ 2 sack	4	sack	40,000	160,000
- Pesticide	6	Carton	26,000	156,000
- harvesting equipment	1	Package	75,000	75,000
- Seedling place	1	Package	300000	300,000
- Bucket	5	Unit	45000	225,000
- tray	5	Unit	30000	150,000

- Plastic size 5 kg	10	Kg	8000	80,000
Materials cost (3)				1,146,000
4. Equipment depreciation costs per selected mother plant/year				88,236
Total depreciation cost (4)				88,236
Total cost 1+ 2+3+4				5,708,349
Average seed production grown/PIT/year	20,333	Seed		
Average seed production grown/PIT/year	2,033	Seed		
Income	18,300	Seed	400	9,083,200
Revenue				3,374,851
R/C Ratio				1.59

Table 3 shows that the flow of seed nursery revenue grows larger than the flow of financing so that the seed hatchery business grows (starting ten days after sowing) in the Bernas Farmers Group provides an income of IDR 3,374,851, - /PIT / year with R/C Ratio of 1.59. It shows that the hatchery business until the seeds grow (10 days after sowing) is financially profitable and feasible because it provides adequate income. Seeding in polybags, seeds that have grown are planted in polybags until 6-9 months (in the analysis carried out until the age of 1 year). Planting seeds into polybags is usually carried out by the Bernas Farmers Group per 10,000 seeds (12.5 kg) with a hatchery area of 10 x 20 m² with a land lease of IDR 1,000,000/year.

Table 4. Expenses, revenue, and income from certified clove seed nurseries in polybags (1-year-old) at BPT Clove Zanzibar Bernas Farmers Group, Solok Regency, West Sumatra

No.	Economic Parameters	Volume	Unit	Price (IDR)/Unit	Total (IDR)
I	Cost of Labor dan Rent				
1	Rent Cost of Land	1	Plot 10 x 20 m	1.000.000	1.000.000
2	Land clearing	3	Labor day	65.000	195.000
3	Creating seed beds	6	Labor day	65.000	390.000
4	Campur tanah + pukan dan pengisian polybag	10.000	Unit	250	2.500.000
5	Installing paranet	4	Labor day	65.000	260.000
6	Planting into polybags	10.000	Polybag	250	2.500.000
7	Replanting for embroidery	2	Labor day	65.000	130.000
8	Weeding (1 x 1 bulan)	12	Labor day	65.000	780.000
9	Organic fertilization (1 x 3 bulan @ 2 sack)	8	Labor day	65.000	520.000
10	Watering	24	Labor day	65.000	1.560.000

11	Spraying paste (ant-poison)	24	Labor day	65.000	1.560.000
	Total I				11.395.000
II	MATERIALS				
1	Seeds	10.000	Unit	400	4.000.000
2	Net	1	Roll	1.250.000	1.250.000
3	Bamboo	10	Unit	5.000	50.000
4	Polybags	37	Kg	30.000	1.110.000
5	Paddy straw	20	50kg	5000	100.000
6	Organic fertilizers (first)	5.500	kg	500	2.750.000
7	Organic fertlizer (second)	8	karung @ 25kg	40.000	320.000
8	Pesticide	6	liter	25.000	150.000
	TOTAL II				9.730.000
III	Depreciation cost /year				529.417
IV	Total Expenditures I + II + III				21.654.417
V	Seedling production in polybags - 25% correction or risk factor	7.500	Polybag		
Income		7.500	polybag	7500	56.250.000
Revenue					34.595.583
R/C ratio					2.60

Before the growing seeds are transferred to a polybag, a seedbed is prepared in advance, around which a ditch is made so that if it rains, the water does not flood the seedbed. The beds' width in the nursery is 120 cm, and the length is as needed. The distance between the beds is about 30 cm, so it is easy to do weeding while also functioning as a ditch. After making the beds, nets are given to the seedbeds by tying them to bamboo installed in every corner and on each side of the beds. In the middle of the beds, a bamboo or wooden pole is given 2-2.5 m high (the important thing is that it is easy to do during weeding and accessible for walking). The nets are installed in the shape of a house's roof, after which polybags are finished and filled with soil mixed with manure (1:1) in the prepared beds. After that, the seeds grow ready to be planted or transferred to a polybag by making a planting hole with a diameter of 1 cm. The seeds are planted vertically with the prospective roots down until the surface of the seed is as flat as the media. The seeds can also be planted horizontally, and watering is arranged in such a way as to maintain humidity [34].

The analysis of costs, revenues, income and financial feasibility of a nursery of 10,000 certified clove seeds in polybags for up to one year shows that the structure of revenue flows is also greater than financing, so the farming business provides income of IDR 34,595,583, - with an R/ C Ratio of 2.60. It shows that certified clove seed nurseries in polybags are

profitable and feasible because they provide sufficient income, $R/C > 1$, which is 2.6 (Table 4).

The total costs that must be incurred to produce certified clove seed production are 7,500 polybags (after deducting the 25% correlation factor). The selling price is IDR 7,500, which means a profit of IDR 4,613/polybag or 61.15% of the selling price. The other results of research stated that the total cost of producing certified clove seeds of 60,000 polybags is IDR 82,120,334 [40], so it is known that the cost of seeds is IDR 1,369/polybag. Therefore, with a selling price of IDR 4,000, the profit per polybag is IDR 2,631, or around 66% of the selling price. This analysis aligns with other farming research by considering aspects of technical efficiency, where breeder farmers see minimal resources, available cultivation technology, and the operation of the seed supply chain being cultivated [41], [20]. Sales of certified clove seeds in polybags at BPT Bernas Farmers Group, usually for government projects, for the 2015-2019 period around 6,000 – 7,000 polybags per year.

4 Conclusions

4.1 Conclusion

West Sumatra Agricultural Government already has a Zanzibar Clove High-Production Block (HPB) with 10 Selected Mother Plants (SMPs) since 2015 based on the Decree of the Head of the West Sumatra Provincial Plantation Service Number: 800/529/SK/KD/V-2015. However, only 6 PITs have been certified, namely: SMPs number 1, 2, 3, 6, 7, and 9, with a note that if the demand for seeds is not fulfilled, only four other SMPs will be certified. During five years, the Bernas Farmers Group produced 122,000 certified clove seeds or an average of 20,333 seeds or 25.42 kg/SMPs/year (1kg of clove seeds = 800 seeds). Sales of certified clove seeds at HPB Bernas Farmers Group are in three models: 1) in shell form, 2) in the form of sprouted seeds (10 days after sowing), and 3) in the form of seeds that have been planted in polybags (aged 6–9 month). The Bernas Farmers Group's income from selling certified clove seeds, sold as sprouted seeds, is IDR 3,374,851 /SMPs/year, with an R/C ratio of 1.59. Meanwhile, from seeds planted in the form of polybags, IDR 34,595,583 / year with an R/C ratio of 2.60.

The clove seed industry need to be continued of production so the seed can be utilized not only within province but also can be commercialized into other clove center province for replanting program and rejuvenation. One thing must be highlighted is do not set a too high profit for selling seed. The subsidy might be needed for providing seed. If this business running well, the sustainability of clove production in the future will be.

4.2 Recommendation and impication

From the research results, the success of clove seed germination with Bernas Farmers Group certification can be replicated in other regions. However, to maintain product quality and prevent losses to farmers, clove seed growers should use seeds whose origins are clear and come from gardens that already have certificates or business licenses from related parties. So that certified clove seeds are available in a sustainable manner. For sustainable development of clove in West Sumatra, clove farmers can select the type of seed that going to be planted depends on their preferences.

References

- [1] N. Bermawie, "Keragaan hasil dan mutu pohon induk terpilih cengkeh di Sumatera Barat," dalam *Prosiding Seminar Teknologi Budidaya Cengkeh, Lada dan Pala*, 2015, hlm. 1-8.
- [2] A. Wahyudi, "Stabilisation Strategy of National Clove Market Performance," *Perspektif*, vol. 15, hlm. 73, 2017.
- [3] V. Rhezamayye, I. T. Amir, dan Z. Abidin, "Faktor-Faktor Yang Mempengaruhi Ekspor Cengkeh Indonesia Tahun 2001-2015," *Berk. Ilm. AGRIDEVINA*, vol. 8, hlm. 115-126, 2020.
- [4] N. Nurdjannah dan N. Bermawie, "Cloves," dalam *Handbook of Herbs and Spices: Second Edition*, vol. 1, Woodhead Publishing Limited, 2012, hlm. 197-215.
- [5] J. Towaha, "Manfaat Eugenol Cengkeh dalam Berbagai Industri Di Indonesia," *Perspektif*, vol. 11, hlm. 79-90, 2012.
- [6] D. F. Cortés-Rojas, C. R. F. de Souza, dan W. P. Oliveira, "Clove (*Syzygium aromaticum*): A precious spice," *Asian Pac. J. Trop. Biomed.*, vol. 4, hlm. 90-96, 2014.
- [7] H. Semangun, "Sejarah cengkeh," dalam buku *Cengkeh: sejarah, budidaya dan industri*, vol. 388, Indesso dan Magister Biologi Universitas Kristen Satya Wacana Salatiga, 2014.
- [8] H. Pambudi, "Cukai Rokok Akhir 2017 Selamatkan Penerimaan Negara," *Viva.Co.Id*, 2017.
- [9] B. P. Statistik, "Statistik harga produsen Pertanian: Subsektor tanaman pangan, hortikultura dan tanaman perkebunan rakyat 2020," Jakarta, 2021.
- [10] G. K. N. Kumaat, T. M. Katiandagho, dan M. L. Sondakh, "Kontribusi Usahatani Cengkeh Terhadap Pendapatan Rumah Tangga Petani Di Desa Raanan Baru 2, Kecamatan Motoling Barat," *Agri-Sosioekonomi*, vol. 11, hlm. 75, 2016.
- [11] Sukalni, "Menuju Kelembagaan Perbenihan Perkebunan yang Modern," Direktorat Jendral Perkebunan Kementerian Pertanian, 2013.
- [12] Direktorat Jendral Perkebunan, "Statistik perkebunan non unggulan nasional 2020-2022," Kementerian Pertanian, 2020.
- [13] H. T. Irawan, I. Pamungkas, dan Muzakir, "Analisis Risiko Rantai Pasok Komoditas Cengkeh di Kecamatan Salang Kabupaten Simeulue," *J. Optim.*, vol. 5, hlm. 72-81, 2019.
- [14] K. G. Broadfoot, "Seed certification," *NZGA: Research and Practice Series*, vol. 5, Elsevier, 1990, hlm. 32-34.
- [15] Menteri Pertanian, "Keputusan Menteri Pertanian Republik Indonesia Nomor: 88/KPTS/KB.020/11/2017," 2017.
- [16] K. G. Broadfoot, "Seed Certification," *NZGA: Research and Practice Series*, vol. 5, Springer, 1990, hlm. 32-34.
- [17] S. Sujianto, Ermianti, dan A. Wahyudi, "Institutional model of sustainable development for controlling clove pest management," *IOP Conference Series: Earth and Environmental Science*, vol. 472, IOP Publishing, hlm. 12064, 2021.
- [18] Rr. Ernawati, "Peneliti Balai Pengkajian Teknologi Pertanian Lampung Jln Hi Pagar Alam," "Analysis Income of Nursery Pepper Natar 1 in Prima Tani, North Lampung," *J. Penelit. Pertan. Terap.*, vol. 10, hlm. 84-89, 2010.
- [19] S. Sujianto dan A. Wahyudi, "Analisis kelayakan dan finansial dalam penyediaan benih bermutu jahe merah (*Zingiber officinale* var. *rubrum*)," vol. 26.
- [20] B. Sudjarmoko dan E. Randriani, "Efisiensi Teknis Usaha Tani Kopi Arabika Garut Kuning (AGK)," *J. Tanam. Ind. dan Penyegar*, vol. 6, hlm. 13-20, 2019.
- [21] Soekartawi, "Ilmu Usaha Tani," Penebar Swadaya Grup, 2001.
- [22] H. Lakamisi dan R. Usman, "Analisis finansial dan strategi pengembangan Usaha Kecil Menengah (UKM) kacang vernis," *Agrikan J. Agribisnis Perikan.*, vol. 9, hlm. 57-65, 2016.

- [23] A. Mardiyah dan S. Supriyadi, "Kelayakan Finansial Usaha Pengolahan Ubi Kayu Menjadi Tiwul Instan Di Kabupaten Lampung Timur," *J. Penelit. Pertan. Terap.*, vol. 18, hlm. 1.
- [24] J.-P. Tan, J. R. Anderson, P. Belli, H. N. Barnum, dan J. A. Dixon, "Economic Analysis of Investment Operations," World Bank Publications, Washington DC, 2001.
- [25] A. M. Pasaribu, "Perencanaan dan evaluasi proyek agribisnis (Konsep dan aplikasi)," Andi, 2012, hlm. 182.
- [26] A. Ermiati dan I. K. Ardana, "Model of seedling institution development to improve sustainability of clove farming system in West Java," *IOP Conf. Ser. Earth Environ. Sci.*, vol. 418.
- [27] S. Ilyas, "Ilmu dan teknologi benih: teori dan hasil penelitian," Penerbit IPB Press, 2012.
- [28] A. A. Sulaiman, E. Jamal, B. Wirawan, B. Budhianto, B. Sayaka, et al., "Benih Unggul Jurus Sukses Swasembada Pangan," IAARD Press, 2018.
- [29] V. Darwis, "Implementasi legislasi benih dalam mensukseskan swasembada pangan," *SEPA J. Sos. Ekon. Pertan. dan Agribisnis*, vol. 12, hlm. 133, 2016.
- [30] Kementerian Pertanian, "Peningkatan produksi, produktivitas tanaman rempah dan penyegar: Pedoman teknis pengembangan tanaman kakao berkelanjutan," Direktorat Jenderal Perkebunan Kementerian Pertanian, 2015.
- [31] C. Tayleur, A. Balmford, G. M. Buchanan, S. H. M. Butchart, C. Corlet Walker, et al., "Where are commodity crops certified, and what does it mean for conservation and poverty alleviation?," *Biol. Conserv.*, vol. 217, hlm. 36-46, 2018.
- [32] D. Halterman, A. Charkowski, dan J. Verchot, "Potato, Viruses, and Seed Certification in the USA to Provide Healthy Propagated Tubers," Source.
- [33] K. E. Frost, R. L. Groves, dan A. O. Charkowski, "Integrated control of potato pathogens through seed potato certification and provision of clean seed potatoes," *Plant Dis.*, vol. 97, hlm. 1268-1280, 2013.
- [34] A. Ruhnayat dan A. Wahyudi, "Petunjuk teknis pebenihan tanaman cengkeh (*Eugenia aromaticum*)," Sirkuler. Pedoman Teknis Teknologi Tanaman Rempah dan Obat, Bogor: Badan Litbang Pertanian Press, 2012.
- [35] A. Ruhnayat dan A. Wahyudi, "Petunjuk Teknis Pembenuhan Tanaman Cengkeh (*Euegenia aromaticum*)," vol. 21.
- [36] B. Umasugi, S. Prijono, S. Soemarno, dan R. Ariffin, "Improvement of soil moisture storage in clove plantation land using biopore technology and organic material litters," *J. Degrad. Min. Lands Manag.*, vol. 8, hlm. 2601-2610, 2021.
- [37] B. Umasugi, S. Prijono, S. Soemarno, dan R. Ariffin, "Soil moisture analysis and rainwater management at clove plantation to meet the water requirement of clove plants during dry season," *Int. J. Adv. Sci. Eng. Inf. Technol.*, vol. 11, hlm. 2197-2203, 2021.
- [38] A. Ardiwiansyah, E. Adelina, dan S. Samudin, "Viabilitas benih cengkeh pada pemberian ZPT berbagai konsentrasi setelah penyimpanan," *Agrotekbis*, vol. 6, hlm. 438-443, 2018.
- [39] E. Mayura, N. Yudarfis, H. Idris, dan I. Darwati, "Pengaruh Pemberian Air Kelapa Dan Frekuensi Pemberian Terhadap Pertumbuhan Benih Cengkeh," *Bul. Penelit. Tanam. Rempah dan Obat*, vol. 27, hlm. 123.
- [40] S. Sasmita, "Analisis Pendapatan Usahatani Cengkeh Di Desa Duinggis Kecamatan Dako Pemea Kabupaten Tolitoli (Studi Kasus Pada Kelompok ...," *Biofaal J.*, vol. 3, hlm. 71-79.
- [41] S. C. Wuwung, "Manajemen rantai pasokan produk cengkeh pada desa Wawona Minahasa Selatan," *J. EMBA J. Ris. Ekon. Manajemen, Bisnis dan Akunt.*, vol. 1, hlm. 230-238, 2013.