Comparative Analysis of Eco-Friendly Agriculture and Marketing Innovation on Shallot Farming

Case Study: Lestari Mulyo Farmer Group, Selopamioro Village, Imogiri Subdistrict, Bantul, Yogyakarta Special Region

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Abstract. The habit of farmers selling crops with a slash system is a practice of buying and selling carried out by wholesalers by buying agricultural products before entering the harvest period. The practice of buying and selling without perfect use sometimes causes the unclear amount of the goods sold, to cause losses to one of the parties. Semi-organic farming is a form of soil processing and crop cultivation by utilizing fertilizers derived from organic materials and chemical fertilizers in minimal quantities to increase the nutrient content of the soil. Semi-organic farming can be said to be environmentally friendly agriculture because it can reduce the use of chemical fertilizers to above 50%. In addition, the application of semi-organic agriculture is sustainable with government programs in sustainable agricultural development. Semi-organic agriculture is also considered to have economic differences such as production costs, revenues, incomes, and profits and feasibility when compared to inorganic agriculture that has been first applied. Based on this concept, the purpose of this study is 1). Know the difference in production, receiving, and income costs from semi-organic and inorganic, 2). Know the difference in profits and business feasibility of a corporate-based slash and weigh marketing system. The determination of samples using the *Non-Propositional Stratified Random Sampling* method with the number of samples for semi-organic farmers is as many as 20 samples or respondents and inorganic as well as 20 respondents. Quantitative descriptive data analysis as well as a statistical test (independent *sample t-test).* Analysis of shallot farming with environmentally friendly technology applied by farmers in Nawungan Bantul showed the profit obtained by farmers per hectare of Rp. 129,720,000 within ±50 days (1 shallot growing season) compared to inorganic systems of Rp. 58,430,000. Production reached 15 tons/ha with an average price of Rp 17,000/kg (how to sell weight) with a total receipt of Rp 125,280,000. The average B/C ratio in shallot farmers harvested in a weighted manner of 1.03, greater than the slash of 0.952. The feasibility of semi-organic (environmentally friendly) shallot farming with marketing using corporate institutional innovation (weigh instead of slash) showed the highest figure of 2.03.

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1 Introduction

Shallot centers in Yogyakarta Special Region (DIY) are in Bantul Regency with production in 2019 of 90,432 quintals with a harvest area of 894 ha [6]. Shallot production in Bantul Regency is highest compared to four other districts in DIY. Furthermore, the three sub-districts that produced the highest shallot production in Bantul Regency in 2017 were in Imogiri District which contributed 51.26%, followed by Kretek District as much as 27.90%, and Sanden District as much as 19.38% [5]. The Selopamioro area has fertile soil conditions and abundant water availability. This is a factor supporting the abundance of shallot production in the area [1].

Eco-friendly agriculture is an agricultural system used by local governments to manage all agricultural resources and agricultural inputs wisely, based on technological innovation to achieve sustainable productivity improvements and economically profitable and socio-culturally acceptable and low risk or not damaging/reducing environmental functions. Recognizing the importance of environmental issues, in 2013 the Agricultural R&D Agency has compiled an m-AP2RL2 model (Sustainable Environmentally Friendly Agricultural Development Acceleration model), which includes 9 elements, namely increased productivity, low greenhouse gas emissions, adaptive to climate change, the application of integrated pest control, low polluting of heavy metals, zero waste, utilization of local resources, maintained biodiversity, and integration of crops. The concept of PRL is still very feasible to be developed because it combines and integrates the production sector, environment, and socio-economy. Indicators for production in the form of increased productivity (quality and quantity) in a sustainable manner and diversification of production. The environmental indicator unit consists of low greenhouse gas emissions, adaptive to climate change; disease pest control wisely; low pollutant heavy metals and agrochemical residues (*on-site* and *off-site*); zero waste; maintaining the quality of the land from physical, chemical, and biological degradation; and the maintenance of biodiversity. As for economic and socio-cultural indicators consisting of increased income and efficiency (B/C ratio, IRR, NPV); easy to implement; socially acceptable and maintained local wisdom and technology (*local wisdom and local technical knowhow*). Strategies are generally in the form of synergy and integration between technologies; integration of livestock crops; location specifics; based on superior commodities; and optimization of resources and production inputs. m-AP2RL2 is not a concept but is immediately implemented in the field.

While the institutional assistance of farmers in farmers groups becomes one way of introducing corporate-based farming. The farmer's corporation is one form of the economic institution of farmers that has a strategic dimension in the development of agricultural areas because it is formed from, by, and for farmers. The growth and development of farmers' corporations is the empowerment of farmers who are believed to be able to realize the economic institutions of farmers who are corporate (business entities) in agricultural areas. The growth and development of farmers' corporations have been outlined in the National Medium Term Development Plan and the Strategic Plan of the Ministry of Agriculture 2020–2024 [2, 3].

As a follow-up to the implementation of the strategic program, the Ministry of Agriculture issued a *Grand Design* that emphasized the importance of The Development of Farmers' Corporations as Economic Drivers of Agricultural Areas for Farmers' Welfare. The Ministry of Agriculture has also issued Regulation of the Minister of Agriculture of the Republic of Indonesia Number: 18/Permentan/Rc.040/4/2018 which describes guidelines for the development of agricultural areas based on farmers' corporations as new management in the management of agricultural systems [3]. Article 31 of the Regulation of the Minister of Agriculture of the Republic of Indonesia Number 18/Permentan/Rc.040/4/2018 concerning Guidelines for the Development of Agricultural Areas Based on Farmers Corporations mentions that to accelerate the development of Agricultural Areas Based on Farmers Corporations implemented with fully activities. It has become a habit of farmers to sell crops with a slash system is a practice of buying and selling done by wholesalers by buying agricultural products before entering the harvest period. The practice of buying and selling without perfect use sometimes causes the unclear amount of the goods sold, to cause losses to one of the parties. Semi-organic farming is a form of soil processing and crop cultivation by utilizing fertilizers derived from organic materials and chemical fertilizers in minimal quantities to increase the nutrient content of the soil. Semi-organic farming can be said to be environmentally friendly agriculture because it can reduce the use of chemical fertilizers to above 50% [4]. In addition, the application of semi-organic agriculture is sustainable with government programs in sustainable agricultural development. Semi-organic agriculture is also considered to have economic differences such as production costs, revenues, incomes, and profits and feasibility when compared to inorganic agriculture that has been first applied. Based on this concept, the purpose of this study is 1). Know the difference in production, receiving, and income costs from semi-organic and inorganic, 2). Know the difference in profits and business feasibility of a corporate-based slash and weigh marketing system.

2 Materials and Methods

2.1 Materials

Research activities were carried out from April to September 2021 in the shallot production center area in Nawungan Hamlet, Selopamioro Village, Imogiri Subdistrict, Bantul Regency, Yogyakarta Special Region. Farmers belonging to the Lestari Mulyo farming group were the subjects of the study. The area of the expanse used in the shallot farming business covers an area of 140 hectares.

2.2 Methods

The determination of samples using *the Non-Propositional Stratified Random Sampling* method with the number of samples for semi-organic farmers is as many as 20 samples or respondents and inorganic as well as 20 respondents. Quantitative descriptive data analysis as well as a statistical test (independent *sample t-test).*

3 Results and Discussion

Yogyakarta Special Region is one of the large shallot-producing centers in Indonesia. Kulon Progo, Bantul, Sleman, and Gunung Kidul are shallot producers in Yogyakarta Special Region. Shallot commodities in DIY have increased the area of production harvest in the last five years (2014–2019). The area of the shallot harvest increased by 443 ha or 35.20%. The increase in the area of shallot commodity harvest is directly proportional to the increase in the value of its production. Shallot production increased by 46,390 quintals or 37.53%. The increase occurred due to government assistance in the form of financing and training in the framework of the development of the leading horticultural commodity production center area [5, 6]. This could be one of the potential boosting national economies after the Covid-19 pandemic. This can be seen from the export of shallot horticultural commodities which reached 7,750 tons or up by 93.5% in 2017 [2].

The government through the banking world, especially Bank Indonesia (BI) has a strong commitment to supporting efforts to place the agricultural sector as a mainstay in poverty and unemployment reduction during the Covid-19 pandemic through the Agricultural, Fisheries, and Forestry Revitalization (RPPK) program launched in June 2020. RPPK is one of the "*triple track strategies*" in the framework of reducing poverty and unemployment, as well as improving national economic competitiveness. One of the policy instruments in supporting the success of RPPK is in the aspect of investment and financing. The investment needs of the agricultural sector to achieve the revitalization target for the period 2005–2010 are estimated at Rp 183.1 trillion or an average of Rp 30.5 trillion per year which is expected to be met by the government, private, and the community.

BI's efforts in addressing agricultural sector financing problems (Ratnawati, 2009) [7] include the state budget and non-state budget. With APBN instruments carried out by (a) increasing access to capital through credit (KKP, KUR), (b) providing capital strengthening assistance to farmers/mining through the Rural Agribusiness Business Development Program (PUAP), (c) facilitation for increased business/agricultural production (subsidies). Meanwhile, the non-state budget is to impose financing obligations for banking and the implementation of Corporate Social Responsibility (CSR) for SOEs.

The potential of dry land for shallot development in DIY, especially Bantul Regency attracted the attention of BI, so it felt the need to make investments and synergize to open shallot business opportunities by utilizing technological innovations. Nevertheless, the development of repair technology for the provision of seed sources on shallot farming in DIY is relatively low. Innovation of shallot repair technology as one of the main commodities of vegetables in DIY is needed. Harmonization with technology innovation providers becomes one of the output targets for the success of the achievement of the "*triple track strategy*". Adaptive and input-efficient technology is the key answer to the successful development of vegetable regions, especially shallots and increased productivity to help the government in suppressing inflation. The repair industry in Indonesia has not been able to develop by the large germplasm potential due to limited regulation, business order, and research and development that support this industry. The results of the AIAT Yogyakarta study show that through the application of several technologies, it has succeeded in increasing shallot production, especially related to improving the

physical properties of soil using organic materials and soil destruction (zeolite and clay soil) and coastal land use (sub-optimal) for various agricultural commodities. Data from the DIY Agriculture Office (2014) [8], mentions that shallots are one of the main vegetable products of DIY that have been proven to provide additional income for farmers in the southern coastal region along Bantul to Kulonprogo.

The Bantul Regency Government in the grand design of regional development is also developing the Nawungan area as agrotourism. Among the four functions listed in the grand design of regional development (production, education, tourism, and agro conservation), the production function still plays a major role. The production function in question is that the area is the center of Shallot cultivation production '*Glowing*' (a bit more original environmentally minded) with an area of 120 hectares. Furthermore, the function of education as an environmental education center and agricultural education, especially semi-organic Shallot commodities. As for the function of tourism as a natural tourist area with Bukit Dermo as a gateway for agrotourism and panorama of semi-organic Shallot land. While the function of agro conservation as a conservation area that uses natural media for fertilizers and biological agencies, as well as the existence of convex that aims to prevent erosion on healthy Shallot agricultural land, is environmentally friendly.

The role of the Agricultural Crop Protection Center that accompanies environmentally friendly Shallot cultivation technology has been carried out since 2014, through SLPHT (Integrated Pest Control Field School) activities. Shallot farmers in Nawungan are familiar with environmentally friendly cultivation models. So no wonder the shallot produced by Nawungan farmers has the advantage of the size of the bulbs are larger, the color is more red and the aroma is sharper which was later popularized with *glowing* Shallots. With the total planting area of the April 2021 planting season covering an area of 120 hectares in the growing season, and the need for seeds of 1 ton/ha, it takes at least 120 tons of Shallot seeds. If the price of seeds is 40k/kg, then the cost needed for one planting period amounted to Rp 4.8 billion.

The participants who were respondents as many as 40 people consisted of onion farmers from Gunungkidul, Bantul, Sleman, and Kulon Progo regencies. Farmers as many as 20 respondents, from Gunungkidul, Sleman, and Kulonprogo cultivated conventional systems, on average using chemical fertilization according to the recommendations of local extensionists. While farmers from Bantul as many as 20 farmers are members of the Mulyo Lestari Farmers Group in Nawungan Hamlet, Selopamioro Village, Imogiri Subdistrict, which seeks its land with an environmentally friendly system, without using pesticides and utilizing biological agencies in controlling their crop disrupting organisms. Characteristics of farmers that are considered important to know are age, education level, agricultural cultivation, land ownership status, land area, and planting patterns. The characteristics of each farmer vary, so this can affect the difficulty of farming from the aspect of cultivation techniques. Based on the results of Asih's research (2009) [9] in Sulawesi, showed that the characteristics of age, education, agricultural status, and the number of household dependents affect the skills of farmers in managing onion farming.

Respondent, as many as 40 people are in the age range of 26–70 years with an average age of 49 years. Some are in the productive age (96.97%), who usually have a high spirit to develop their business and can do their business better compared to

relatively older farmers. The level of education of farmers varies from Junior School to College. Most farmers have an SLTA education level (54.55%), while farmers have SLTP education (39.38%) and Higher Education (6.06%). With formal education, it is expected that farmers can be a driving force for their group and the environment to continue to develop their farming. The experience of farmers is very diverse, from inexperienced (0 years) to 40 years, on average experienced for 8 years. Some farmers state that they are just about to start an onion farming business, so now they still feel the need for knowledge and skills to try to grow onions. Farmers who have long tried to farm onions certainly already have a lot of experience and are expected to be a place of learning for onion novice farmers. The land is the basis in agricultural activities that act as one of the capitals in agriculture in addition to labor and capital.

The area of land cultivated by onion farmers ranges from 500 m^2 to 3 ha, which is planted an average of 2 times a year. Most of the participating farmers are farmers who used to develop onion farming for consumption (69.69%). While onion farmers who produce onions consume and produce seeds as much as 15.15%, farmers who produce onions consumption and seedlings 12.12%, and farmers who are pure produce seeds only 3.03%. The average grows onions twice a year.

3.1 Economic Analysis

The climate conditions are appropriate and supported by proper maintenance by farmers, allowing shallots to grow optimally. Bima varieties that have genetic traits suitable for the environment in Nawungan can optimize their growth and development, which in turn production is also maximal.

One of the criteria for conformity to be accepted by new technology by farmers is *the economic viability* of that technology (Malian, 2004) [10]. Based on the results of financial farming analysis there is a difference in production achieved between the use of amelioration technology. This shows that both amelioration technologies deserve to be developed because they are more profitable with R/C and B/C ratio levels. In the calculation of B /C, the minimum ratio is calculated variable costs such as labor, seed costs, fertilizer costs, crop production costs, and others related to production ratios, while fixed costs are not taken into account land rent, tool costs, and fertilizers.

Assistance to farmers in the shallot sales system is the main focus in downstream activities in the production center. The habit of farmers selling crops with a slash system is slowly converted into a weighing system, by including resellers initiated through corporate activities. The Cooperative is a private party that is passed by the Bantul Regency Government in accommodating farmers' crops with a weighing system. The weighing is controlled directly by the farmer and the banking sector, which provides non-cash payment facilities through *QR-Code.* The results of the calculation can be seen in the following table of Analysis of Onion Farming with environmentally friendly systems compared to conventional systems.

Table 1 shows the difference in calculations in conventional cultivation (the use of chemical fertilizers and chemical pesticides), cultivation with seed-origin seeds, and the results of financial analysis of shallot farmers in the production center of Nawungan Bantul. Based on the known calculation of shallot cultivation with environmentally friendly technology applied by farmers in Nawungan Bantul shows the profit obtained by

Table 1. Analysis of Onion Farming with environmentally friendly systems compared to conventional systems4

Cost Component	Shallot Farming (Idr/Hectare)		
	Slash System	Weigh System	Inorganic System
FIXED COSTS			
Land Lease/Growing Season	5,000,000	5,000,000	5,000,000
Earth Tax (Conversion per Season)	-	-	-
Watering Dues P3A + Fuel	6,000,000	6,000,000	6,000,000
Depreciation (In 1 Year = Tool Value × 20%)/Season	1,920,000	1,920,000	1,920,000
Other	-	-	-
SUM (A)	12,920,000	12,920,000	12,920,000
VARIABLE (NOT FIXED) COSTS			
Seed	36,000,000	36,000,000	36,000,000
Compound Organic Fertilizer	22,500,000	22,500,000	0
Dolomite	5,000,000	5,000,000	0
Fertilizer SP36 2400	480,000	480,000	0
Fertilizer KCL 9000	1,800,000	1,800,000	0
Fertilizer Mutiara 16-16-16 25000	5,000,000	5,000,000	1,480,000
POC APH (Biological Control Agency)	3,000,000	3,000,000	0
Liquid Trichoderma	1,500,000	1,500,000	0
Pesticide	0	0	5,950,000
SUM (1)	75,280,000	75,280,000	64,270,000
Labor Cost Package, Post-Harvest Costs, and Transportation Per Growing Season Per Hectare			
SUM (2)	40,000,000	50,000,000	50,000,000
SUM (B = 1 + 2)	115,280,000	125,280,000	114,270,000

(*continued*)

Table 1. (*continued*)

Cost Component	Shallot Farming (Idr/Hectare)		
	Slash System	Weigh System	Inorganic System
Amount of Production Cost C = (A + B)	115,280,000	125,280,000	121,570,000
PRODUCTION (D)	15 TON PER HA TEBAS	15 TON PER HA @17,000	10 TON PER HA @ 15,000 =
	225,000,000	255,000,000	150,000,000
ADVANTAGE (D – C)	109,720,000	129,720,000	28,430,000
B/C Ratio (Advantages: Production Costs)	0.952	1.035	0,480
R/C Ratio (Revenue: Production Costs)	1.952	2.035	1,480

farmers per hectare of 129,720,000 within 50 days (1 shallot growing season). Production reached 15 tons/ha with an average price of Rp 17,000/kg (how to sell weight) with a total receipt of Rp 125,280,000.

The feasibility of a farm can be seen based on its B/C ratio. If the B/C ratio is >1 then the farm is worth working on while if the B/C ratio is <1 then the farm is not worth trying. The average B/C ratio in shallot farming is 1.03. Financial viability (R/C ratio) is the balance of receipts and fees. The calculations obtained showed that the average R/C ratio in shallot farming was 2.03. It is expected that in the future farmers can save production inputs in the form of seed purchases, by utilizing shallot seeds and G0 mini bulb seeds that began to be produced at the shallot production center location in Nawungan, Selopamioro, Imogiri, Bantul, DIY.

The farmer's corporation is a business model to improve the welfare of farmers through more optimal management of resources in agricultural areas because they are built in an integrated, consistent, and sustainable manner. The development of farmers' corporations involves various businesses upstream and downstream that support each other in the corporate management system. Upstream businesses include the seed industry, fertilizers, pesticides, agricultural tools, soil processing services, cultivation businesses, financing, and so on. Meanwhile, downstream businesses include product processing and packaging. The involvement of business/industrial farmer's corporations demands the need for synergistic cooperation, mutual strengthening, and profitability. Each business is built simultaneously, resulting in a synergistic resultant, mutual strengthening. If there is one business that does not develop will be a limiting factor for the progress of the corporation.

The development of farmers' corporations is carried out in a planned and programmable manner with a good governance system to improve farmers' access to productive resources, add value and competitiveness to agricultural products, strengthen farmers' institutions, increase the capacity and bargaining position of farmers, which

boils down to increasing farmers' income and welfare. Farmers' corporate development programs include:

- increased production capacity;
- the development of human resources, institutional, and business capacity;
- technological assistance;
- downstream and marketing industry development;
- the development of business diversification; and
- business promotion development and business networking.
- Sustainable: Peasant corporations are built on the principle of being economically viable, socially acceptable, and environmentally friendly.

Shallot farming in Nawungan, Selopamioro Village, Imogiri Subdistrict, Bantul Regency is one of the activities of the environmentally friendly agricultural system. This can be proven by the management system of all agricultural resources and agricultural inputs that are done wisely, based on technology to achieve sustainable and economically profitable productivity improvements and are socially and culturally acceptable. Corporate development at the farmer and institutional levels of farmers' groups in Imogiri is still in the process of socialization aimed at being an economic driver of agricultural areas for the welfare of farmers. The growth of farmers' corporations has a strategic dimension in the development of agricultural areas because it is believed to be able to drive the economy through integrated, consistent, and sustainable resource management. Farmers' corporations are formed from, by, and for farmers through the consolidation of business management from small-scale to large-scale economic oriented.

4 Conclusion

Analysis of shallot farming with environmentally friendly technology applied by farmers in Nawungan Bantul showed the profit obtained by farmers per hectare of Rp. 129,720,000 within ±50 days (1 shallot growing season) compared to inorganic systems of Rp. 58,430,000. Production reached 15 tons/ha with an average price of Rp 17,000/kg (how to sell weight) with a total receipt of Rp 125,280,000. The average B/C ratio in shallot farmers harvested in a weighted manner of 1.03, greater than the slash of 0.952. The feasibility of semi-organic (environmentally friendly) shallot farming with marketing using corporate institutional innovation (weigh instead of slash) showed the highest figure of 2.03 than inorganic system of 1.481.

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