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Revitalization of cloves cultivation in Central Java, Indonesia

E W Riptanti^{1,2,*}, A Qonita¹ and R Uchyani^{1,2}

¹ Department of Agribusiness, Faculty of Agriculture, Universitas Sebelas Maret, Jl. Ir. Sutami 36 A Surakarta, Indonesia

² Study Center and Mentoring of Cooperation and Micro, Small and Medium Enterprises (CMSMEs), Universitas Sebelas Maret, Jl. Ir. Sutami 36 A Surakarta, Indonesia

*erlynawida@staff.uns.ac.id

Abstract. Clove (*Syzygium aromaticum*) is an Indonesian indigenous plant, which belongs to the most valuable spices in the world. Central Java has been one of the clove production centers in Indonesia, but in the last six years, the area and production tend to decline due to poor management. In order to revive the glorious existence of the clove, the act of revitalization in the clove cultivation becomes crucial, given the role of clove as one of the world's important commodities. This research uses purposive sampling in some regions, namely Wonogiri Regency and Pemalang Regency. The respondents selected as subjects of this research are 30 clove farmers chosen from each regency in purposively using snowball-sampling technique. Apart from the clove farmers, the information is gained from the Field Extension Officer, farmer groups, clove traders, and any representatives from the related agencies. Revitalization is carried out by increasing the capacity building, the institution, and the cultivation activity of the clove farmers. The key of success in this effort is the good collaboration between the farmers, farmer groups, and the stakeholder involved.

1. Introduction

Clove (*Syzygium aromaticum*) is one of the most valuable spices that has been used for centuries as food preservative and for many medicinal purposes. Clove is native of Indonesia [1] but nowadays is cultured in several parts of the world including Brazil in the state of Bahia [2]. Clove tree is cultivated in the islands of Tanzania (Pemba and Zanzibar), Madagascar, Comoros Islands, and Sri Lanka, but the major producer is Indonesia [3,4]. This plant represents one of the richest sources of phenolic compounds such as eugenol, eugenol acetate and Gallic acid and possess great potential for pharmaceutical, cosmetic, food and agricultural applications [2].

Clove is a unique and strategic commodity for national economy. It is unique because Indonesia plays role as both the producer and the consumer. It is strategic because this commodity plays the essential role in absorbing the labors, both directly and indirectly. In direct way, it absorbs the labors in the whole cultivation activities. In indirect way, it absorbs labors in other activities related to cigarette industries and other clove processing industries [5].

Central Java has been one of the clove production centers in Indonesia, but in the last six years, the area of production tends to decline, as shown in the figure 1 [6,7]. Clove commodity becomes an interesting topic of research, given the fact that it has been the competitive commodity of farmers in the mountainous area and becomes the export mainstay in Indonesia. The volume of clove export in Central



Java in the recent years can be seen in the figure 2 [8]. This commodity has also experienced price downturn, forcing most farmers to cut down the clove trees and replace them with other plants, while the others abandoned the plants.

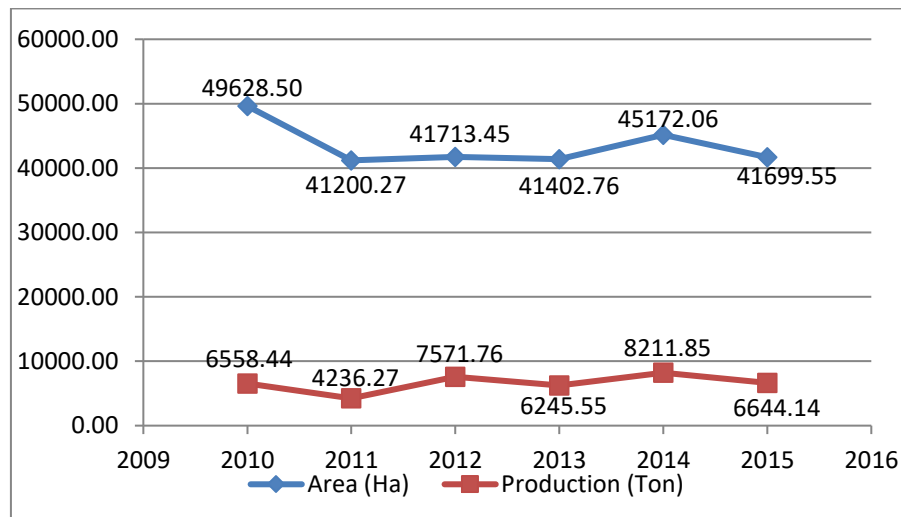


Figure 1. Area and production in 2010-2015

Note: Data for 2016 and 2017 are not found

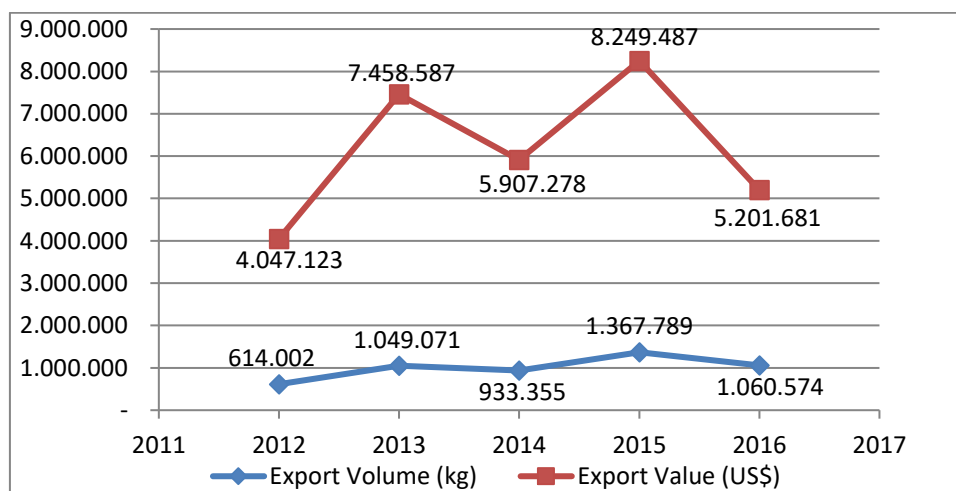


Figure 2. Volume of clove export in Central Java

The clove cultivation areas in Central Java amounted to 42,348 in 2015 and increased to 42,468 ha in 2016 (estimated number). Approximately 97 percent of the areas were people's plantations. The total production was only around 58.9 percent of the total clove cultivation areas. The productivity of cloves in Central Java was only 265 kg/ha in 2015, far lower than the productivity of cloves in the clove production centres in Indonesia. This indicates that the potential of clove has not been optimized, and therefore, there is an opportunity to improve the productivity of cloves in Central Java.

The main problem faced by clove farmers in Indonesia especially in Central Java is the remarkable triennial and quadrennial fluctuation depending on the total year rainfall, the exposure to low and high temperatures, the length of the dry season and other ecological and physiological parameters [9,10]. Problems, the worst of which are tree diseases, ageing tree populations and occasional neglect of trees [11,12]. Besides, the high-quality standard is applied in both domestic industry and the global market [13]. Some cloves are not cultivated but are still wild collected. The need for renewable sources of

industrial products as well as the need to protect plant biodiversity creates an opportunity for farmers to produce such crops [14].

The change of strategic environment in the forms of economic globalization-trade liberalization, urbanization and market segmentation phenomena, consumers preference change, and disruptive innovation phenomena insist the change of mindset on the operation of the business organization of agricultural and food industry [15]. In macro sense, the disastrous spiral of price stress syndrome will lead to the collapse of national clove plantations. The national production plummets, trade deficit widens and Indonesia will again depend on imported cloves [16]. In recent years, clove price shows significant increase, but it has not gained proper respond from the farmers, and leads to a decline instead.

The opportunity of clove commodity for both domestic and international market is very promising, indicated by the development of clove processing industry. On the other hand, the potential of clove cultivation in Central Java has not been optimized. The farmers are reluctant to do an intensive cultivation. For this reason, this research article aims to revitalize the clove cultivation in Central Java.

2. Methods

The design of this study uses explanatory research to gain an overview of clove cultivation in Central Java. Explanatory research aims at finding the explanation of the observed phenomena, problems, or behavior [17]. The methodological approach used in this research belongs to the cross-sectional study, which is a research, conducted only at a certain time without doing a treatment on the object so as to produce a portrait of the situation at a certain time.

Data used in this research include primary and secondary data. Primary data involve the farmers' characteristic condition and the management of clove cultivation. The data were collected by doing in-depth interview using questionnaires with the clove farmers, Field Extension Officer, and the District Forestry and Plantation Services. The secondary data were gained from the Central Bureau of Statistics, Provincial Trade and Industry Service, and other institutions related.

The research was conducted in Central Java Province (Figure 3) and the research locations selected using purposive method were Wonogiri Regency as the largest clove cultivation area and Pemalang Regency as the area with the highest level of productivity. From each regency, the sub-district with the largest production was selected, namely Karang Tengah and Moga Sub-district.

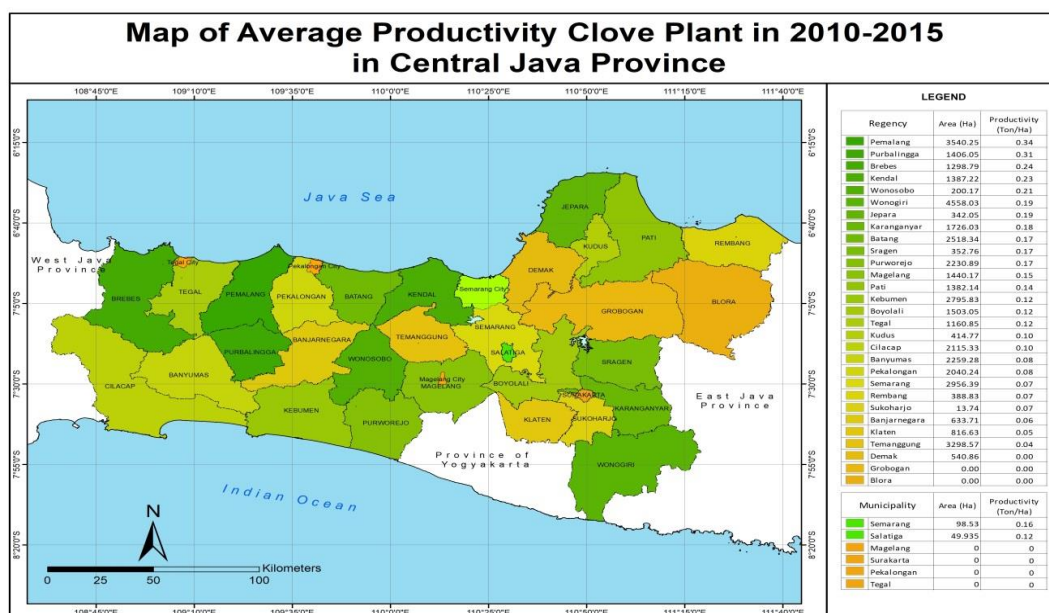


Figure 3. Distribution of clove production areas in Central Java

The sample were selected in purposive way using snowball-sampling technique in which from each sub-district 30 respondents were drawn and the total number of respondents were 60 farmers. The information was also gained from the head of the farmer group, Field Extension Officer, collector trader, and representatives from the District Forestry and Plantation Services.

Data analysis applied in this research is the descriptive analysis, which carries out the research finding as the portrait of the actual situation. The activities included in the qualitative data analysis were conducted interactively and continuously until the adequate data were completed and saturated. Activities in the data analysis include data reduction, data display, and conclusion drawing/verification [18].

3. Result

Cloves in Central Java are planted in the front yards, fields, as well as the forest borders. By doing so, farmers in Southeast Asia have developed a great variety of land use systems to be classified as either home gardens or forest gardens, which are important sources of supplementary subsistence and/or income. In contrast to forest gardens, home gardens are confined to the area immediately surrounding the home [19,20,21]. Cloves in the research location are planted using “*tumpang sari*” (polyculture), technique with the perennial plants such as kinds of fruits and coconuts [22] and with cassava or other food plants if they are planted on fields [23]. Clove plants are cultivated as secondary crops, instead of as main crops. This plant is mostly planted as a land separator.

The result of observation in the farming level shows that the cultivation has not been optimized, due to several reasons: 1) farmers are reluctant to do treatments because they prefer seasonal plants; 2) without any treatments, clove is still able to bloom every year and there are variations in production from year to year [9] ; 3) farmers experience trauma when the plants were properly treated but the price dropped (Clove Marketing Buffer Agency). In general, the characteristics of clove farming can be seen in the Table 1. Variety of cloves planted by farmers are mostly Zanzibar because the production is higher, compared to Siputih.

Table 1. Characteristic of Clove Farming

No	Description	Annotation
1	Area of production (m ²)	3,882
2	Total number of plants (trunk)	38
3	Age of plant (year)	Less than 10 years = 20% 10 to 25 years = 30% Above 25 years = 50%
4	Range of plantation (m)	Irregular Planted on the edge of the land as a barrier
5	Intensification on clove cultivation	No specific treatment
6	Average amount of production (kg) per stalk	7 – 69
7	Price of wet cloves (IDR)/kg	20,000 – 33,000
8	Price of dry cloves (IDR/ kg	75,000 – 120,000

Source of data: primary data analysis (2018)

Table 1 shows that the business of clove plants is relatively wide, but is still in need of known to be fluctuating, characterized by the plenty harvest in a year and then followed by very small harvest in another year. The different amount between the plenty harvest and small harvest can reach up to 60%. Periods of harvesting are varied between 2-4 years, depending on the age, genotype, and plant maintenance in the field. Table 1 displays that the production is relatively low, far from the targeted potential production; the production of Zanzibar and Siputih varieties reached 161.8 kg/tree/year and 93.1 kg/tree/year [24]. The low production was also due to the traditional harvesting method in which

pickers climb the trees, lash branches together and use ropes or hooked sticks to reach the cloves on distant branches. He also indicated the difficulties of controlling branch breaking; in particular, the picking period is very short and if overseers were too strict pickers were likely to leave and the crop could be lost [25]. Low production is also caused by the lack of care on clove plants.

Most clove plants cultivated by farmers are more than 25 years old, and therefore, their productivity begins to decline. In fact, old plants are no longer productive and some of them are dead. However, rejuvenation has not been carried out. Improvement has to be made by setting a good cropping pattern in order to maximize farmers' income.

4. Discussion

Community management of natural resources fosters a greater sense of responsibility and better stewardship of the land. These community-based management approaches also have better integrate indigenous knowledge and traditions in management decisions. Further, indigenous people's efforts to develop their own management plans are important not only in promoting ecological and economic sustainability, but also in promoting cultural sustainability, which is essential for the survival of the indigenous medical knowledge, values and in traditions [26].

The development of agribusiness is a great way to improve the economy and competitiveness of the region. To build and accelerate the development of agribusiness requires determination of agribusiness service centers as well as measures of operational strategies to suit local circumstances. The determination of growth centers through the analysis of comparative advantage plays an important role in the agribusiness development [27]. The suitable area, climate, and human resource in the mountainous land in Central Java [28] contribute as the basic capital of the comparative advancement of the cloves. Therefore, this comparative advancement needs to be managed at optimum level by revitalizing the clove cultivation.

Revitalizing the cloves cultivation aims at raising the consciousness of the cloves farmers to put back the clove as the essential commodity as a source of livelihood which can compete in the global market, by means of refreshing the vitality, utilizing the skill and enhancing the quality of the commodity. Clove plant production and productivity can be potentially optimized through revitalization of clove cultivation. Revitalization is realized through:

- a. Reviving clove farmers' awareness about the importance of cultivating the cloves by referring to the Good Agriculture Practices (GAPs) [29,30,31] and Sustainable Agricultural Intensification (SAI) [32,33]. This effort is fundamental to be taken considering traumatic past experiences when the clove price collapsed below the production operational cost. If the farmers consider this matter, then there will be a desire to work for better production, the product will be accepted by the global market, and the farming business shall continue to exist [34].
- b. Increasing the capacity of human resources, particularly the clove farmers, by training and empowerment. Clove cultivation management comprises the optimization of ecological factor maintenance by upgrading the suitability level of the soil from actual to potential, the maintenance of clove production factors from the genetic aspect by selecting the advanced variety, intensification of clove cultivation in accordance with GAPs and SAI, access to the marketing and financial institutions, and optimization of social factor of local people by strengthening the clove farmers institution [35,36].

The role of the clove seeds suppliers is very crucial in providing certified seeds with the guaranteed quality. The availability of local clove genetic resources is highly fundamental for the utilization through the population and parent trees selection program, which aims to produce qualified parent trees [24].

- c. Strengthening the cloves farmer group institution, including the institutional policy, institutional structure, and personnel and operational skill [37,38]. This will lead to the increase of bargaining position of farmers in both input purchase and output sales, and access to the marketing and financial

institution. Furthermore, strengthening the institution can be realized by improving and enhancing the role of clove association groups, science and new technology adopted by farmers.

d. Replanting the plants

Clove plants aged over 25 years old should be replaced with new plants due to their decreasing level of productivity. Replanting can also be applied to dead plants caused by diseases. Replanting has been crucial to the maintenance of the industry, which has also been strengthened by government assistance [12]. This step is very necessary to be taken when the condition of the plants is terrible. The success of replanting will depend upon the availability of good quality seedlings and the adoption of methods of tree establishment, which are appropriate for the climate and farming systems to grow Zanzibar or Siputih. Zanzibar is less influenced over external factors and present trends, suggesting that increasing Indonesian production will result in a smaller world clove market in which there will be increasing competition between the main producers [12].

The availability of the certified seeds is the key of success of this replanting program. In the research location, sufficient certified seeds must be available, to note that this type of seed is rarely found.

e. Improving the harvesting technique to produce qualified cloves, which meets the standard

This technique improvement is realized by utilizing high triangle ladders to ease the farmers in harvesting and prevent them from breaking the branches or the flowers. This method is considered to be more effective than harvesting by climbing or using long pole. Cutting the top of the last leaves using scissors will increase new shoots. Clove flowers are plucked when they are still buds in the age of six months since the emergence of the flowers from the flower base [39].

Revitalization will succeed when there is a good collaboration among many parties namely the clove farmers, Field Extension Officer, farmer group, and the related institution. Supporting policies by the government are in forms of incentive replanting [40] input subsidy policy, facilitation of capital and marketing access, and the improvement of infrastructures which ease the farmers in revitalizing the cloves.

5. Conclusion

Guarantee upon the sustainability of clove production is precisely vital in providing important commodity for the global market. Revitalizing the cultivation is also necessary to guarantee the availability of cloves as the fulfilment of raw material in both domestic industry and foreign market. Revitalization is implemented by raising the awareness of the farmers about the importance of clove cultivation by referring to GAPs and SAI. Furthermore, the enhancement of capacity building, the strengthening of institution, the clove replanting program, and the improvement of harvesting technique are very necessary to be taken in order to guarantee the quality and the quantity of the production.

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Conflicts of Interest. The authors declare there is no conflict of interest

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