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Readiness of Soybean in Tidal Land Facing The Agriculture Industry 4.0

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Abstract.

The potential of sub-optimal land is tidal land that estimated at 20.13 million ha, spread in Sumatra, Kalimantan, Papua and Sulawesi, 9.53 million ha suitable for agriculture. The tidal land is very important resource in order to meet national food needs in line with an increase population and land conversion of paddy fields, especially in Java. This paper presents the contribution of tidal land use to support food sustainability and its strategy from the aspect for the national soybean commodity. If mapped, the position of soybean agro-industry strength in tidal land is in quadrant I, which is the growth phase area. In this quadrant the strength factor dealing with the opportunity factor with a higher chance factor value. That is, the development of soybean agro-industry for tidal land is easier if properly managed. There are four strategies, namely: (1) Provision of permanent soybean planting areas; (2) Soil amelioration actions; (3) Increasing national soybean competitiveness; and (4) technology dissemination and promotion of domestic soybean use. Implementation of the strategy is to apply a model of corporate-based soybean agro-industry area. By using this agro-industry model the opportunities for modern agricultural technology use can be implemented.

Keywords: Readiness, Soybean, tidal land, industry 4.0

1. Introduction

The potential of tidal swamps is very wide, estimated at 20.13 million ha, spread on the Sumatra, Kalimantan, Papua and Sulawesi, including 9.53 million ha suitable for agriculture (BBSDLP 2006). This tidal land is a very important resource in order to meet national food needs in line with an increase in population and land conversion of paddy fields, especially in Java. According to Suwanda and Muhammad Noor (2014) in the use of tidal swamp land to support national food sovereignty, several strategic steps need to be taken including strengthening technological innovation through research and development activities; strengthening cooperation in harmony, synergistically and in participatory way between the parties concerned; regulation of tidal swamp development; zoning of development areas and commodity zoning; development of supporting infrastructure; strengthening the distribution and marketing of agricultural products.

Indonesia's obsession is not only food self-sufficiency but but also sustainability

and sovereignty in food procurement. F food sovereignty is the right of every country and the right of every people to have the ability to produce and market basic needs independently (Bobjen, 2014). Ffor example sovereign soybeans, a country is able to determine its policies by producing local (domestic) soybeans for its own needs, guarantee the availability of land, water, seeds, including to finance farming and prohibit trade by dumping. The policy means that the independent farmers in the business, starting from producing, distribution and others so that food sovereignty is in the farmers not by entrepreneurs (importers).

Agriculture cannot possibly meet the needs of a growing population without technology. The Ministry of Agriculture (2019) took the initiative to accelerate agricultural productivity by launching the Industrial 4.0 in agriculture to answer the challenges. Through the implementation of Industry 4.0 in the agriculture sector, it is expected that farming processes will become more efficient, productive, and competitivenesscompetitive. How is the readiness of our national soybean commodity facing the era of the industrial revolution 4.0. The Ministry of Agriculture continues to make breakthrough policies and programs to transform traditional agriculture into modern and improve the quality of human resources. The spirit of agriculture 4.0 must be accompanied with the readiness of human resources and the paradigm shift of thinking to move forward to develop the agricultural sector as driving of the people's economy and the economic backbone of Indonesian society.

The Ministry of Agriculture (2019) has prepared many programs. One of them is the optimization of swamps which are quite extensive in Indonesia. Furthermore, the agriculture ministry described the potential of swamps in Indonesia reaching 33.4 million ha consisting of tidal land covering 20.1 million ha and swamps land covering 13.3 million ha. This is a great potential that cannot be maximized yet.

With some of the above considerations, efforts to utilize and optimize in this case tidal land as an area for developing soybean production are expected to support the sustainability of national food. This paper presents the contribution of tidal swamp land use to support food sustainability and its strategy for meeting the needs of national soybean.

1.1. Development of the Soybean Tidal Land Area

Profile of Soybean Farmers in Tidal Land

Historically, soybean farming in tidal land was brought by migrants from Java. These migrants are pioneer in the use of tidal land for agricultural cultivation. They open the land with simple technology independently, namely making drainage related to the river. The tidal land that was cleared at decades ago is now diverse, from it has been remains a bush, swamp to what has arranged into rice fields. Technically, tidal land is feasible and suitable to be developed for agriculture with an integrated farming system based on food crops, industrial crops (coconut) and livestock. For the natural conditions, water is always available both from rainfall and from tidal currents. It can be said, water from tides and rivers that already natural and it become an important resource to agro-industrial systems sustainable on tidal land.

The community who has already live in tidal land are workers as a human resources, although at the beginning it is necessary to been improved the quality of their human resources from unskilled to skilled workers who have expertise in agriculture. Focus attention is land management must be carried out properly and carefully before the land is used for an agricultural business system. Tidal land farming system seen from the typology aspect of land overflowing type and wide land and available

technology is quite promising. (Sianturi, 2011).

Agricultural Research and Development Agency in the last 15 years has conducted a series of research activities in the tidal land and has found various tidal land agricultural technologies. Various alternative technologies have been produced including: land management and water management, cropping patterns, superior varieties of tidal rice, soil amelioration, fertilization, pest and disease control, farming tools and machinery and farming systems. The alternative technology has been studied and developed in various tidal farmers' fields called FSTA (Farming System Technology Adaptation) in South Sumatra, Jambi, Riau and West Kalimantan.

Farmer's Response to Soybean Technology

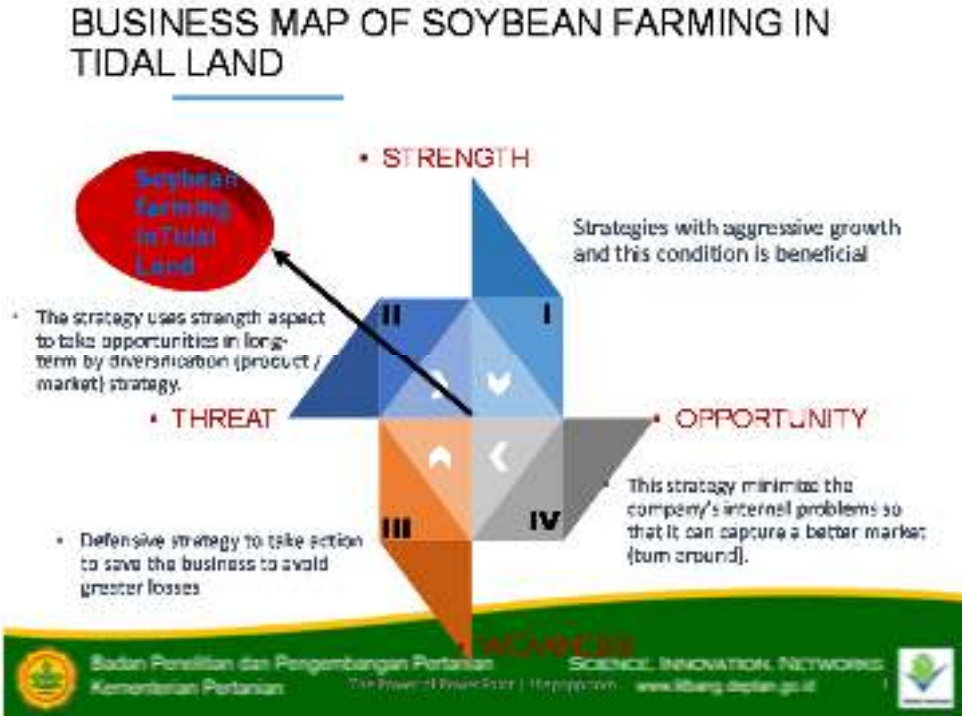
The Indonesian Agency for Agricultural Research and Development, in this case the Indonesian Legumes and Tuber Crops Institutes (ILETRI), has conducted a series of soybean Integrated Crop Management (ICM) activities in the Tanjung Jabung Jambi sub-district in the past year. One of the studies of these activities is the problem of farmers' behavior in cultivating soybean ICM technology that has been introduced in the field. Behavioral patterns are social aspects seen from the response of cooperator farmers (farmers who are directly involved in research activity) and non-cooperators (not directly involved limited in knowing the existency of research) on ICM technology. It is suspected that there are some characteristics of a person who influences a lot of behavior to make choices. In this case the choice of accepting, rejecting or partially accepting from soybean technology. The main characteristics were (1) the status of a farmer he is a cooperator or non-cooperator in carrying out testing / experimental activities, (2) The level of formal education they have, (3) the long experience in soybean farming which is also a lot related to the age and (4) total area of cultivation in producing soybeans.

Farmers' response to the soybean technology component as the main consideration of farmers for technical aspects are variety and lime application to the land (amelioration). So, supporting factors of adoption technology for social aspects are education and direct involvement in technology assembly activities or farmer participation. The higher the formal education, the higher the farmer will adopt soybean new technology. The opportunities for adoption of this educational factor was range from 38-50% and farmers' participation was 21-35%. (Rozi et al 2013)

Position of Soybean Business in Tidal Land

The development of agro-industry at the agricultural industrialization is right strategy, because it being able to create conditions of mutual support between advanced industrial and agriculture. (Hanani et.al , 2003), Likewise, how the ability of soybean agroindustry in tidal land in the era of agricultural industrialization 4.0 needs to know the condition of its strength map. Based on SWOT analysis (Rangkuti 2005). the development of soybean agro-industry in tidal land is currently in quadrant II area. Where, this wasbusiness area by facing various threats, although the condition of this business still has strength from an internal factor. The threat from external factors (environmental) of the soybean commodity development is the over supply of imported soybeans which are always a competitor to local (domestic) soybeans, so that comparative advantage of local soybeans is low and other threats are limited soil fertility in tidal land (Heriyanto and Fachrur Rozi, 2011).

Figure ,1: Business Map of Soybean Farming in Tidal Land (Heriyanto and Fachrur Rozi 2011).



The strategy that must be applied is use strength factor to take advantage opportunity factor in long-term for facing of threats, namely by diversifying strategies (products / markets). In the short term the strategy to be carried out of this diversification strategy is the permanent soybean planting areas with new technologies application. The implementation of the strategies are (1) Opening of new soybean land areas with the development of soybean plantations by a plasma-core pattern of at least 2000-2500 hectares, and (2) Establishing policies to increase productivity of Imperata grassland by using new technology, namely cultivation techniques and seeds of soybean new superior varieties (Taufiq A, Marwoto, F. Rozi, and M. Jana Mejaya, 2009).

Readiness of Soybean New Technology Support

Efforts to manage tidal swamps need to be supported by suitable cultivation technology because generally tidal swamps have several obstacles in the fertility of the land. Effort to increase productivity in tidal land by technology support is very important. The success of soybean development in tidal land is largely determined by the regulation of water management, land amelioration, and fertilization (Balitkabi, 2013; Taufiq et al 2009). One of the limitations of labor and human resources can be overcome by using agricultural equipment and machinery, including land processing machinery, soybean thresher and dryer (Umar et al 2002), planting equipment, as well as harvesting and postharvest equipment (Sawiyo et al., 2000).

The good condition of soybean farming in the tidal land is also strengthened by the results of research of the using of feasibility of new technology and economically (Jumakir, and Abdullah Taufiq. 2010). The technological innovations to support increased soybean productivity have been available by using technology packages such new superior varieties with a potential yield of more than 2 ton / ha. Fertilizing 50 kg / ha Urea, 75 kg / ha SP36 and 50 kg / ha KCl, dolomite 300 kg / ha and 1000 kg / ha manure.

Increasing of soybean productivity needs to be supported by other technological

components such as micro water management, pest / disease control, harvest and post-harvest (Jumakir and Endrizal, 2015). Some new superior varieties (VUB) of soybeans that accordance with the agroecological conditions of tidal land have high yield potential and large seed with same as imported soybeans was Dega 1, as reported by Balitkabi (2018). The others variety in the tidal land Barito Kuala Regency, South Kalimantan were Anjasmoro, Panderman, Dega 1, and Demas that can grow well at the 30% Al saturation, and give same results with plants that grow at 20% Al saturation. Furthermore, the results of the four varieties were Anjasmoro has 2.35−2.52 ton / ha, Panderman has 2.01−2.29 ton/ha, Dega-1 has 2.53−2.72 ton / ha, and Demas has 1.78−1.95 ton / ha of yields farming.

Policy Implementation

Agriculture 4.0 is a certainty that must be faced so that readiness and acceleration of adaptation to users (farmer) is needed. The national soybean problem has not been resolved until now. The great opportunity solve the problem is produce soybeans on tidal land in outside Java. Land use competition in tides is not as heavy as the condition of land in Java. Such as the problem of land conversion and also land use competition for soybean farming. According to Satria (2019) agriculture 4.0 will be characterized by precision farming, starting with producing superior seeds based on bioinformatics, intelligent integrated pest control with artificial intelligence such as identification of plant diseases with smart phones, precision fertilizing, using of smart tractors, seeding seed with robots. Plant factory is now also increasingly popular.

Agricultural objectives 4.0 related to the national soybean problem can be realized with optimizing land in tidal areas by increasing yields (quality and quantity) and efficient use of available resources. Strategy of policy implementation as fallows: (1) Provision of permanent soybean planting areas (soybean estate) based of regional with a corporate model by using new technology. The application of new technology and modernization of agriculture is done easier in one area. Using of Labor is scarce in tidal land, especially outside Java, also by relatively large ownership of land area and will be easier to consolidate for the application of modern agricultural tools. The farmer corporation model is an institutional model of farmer group economic cooperation with an agribusiness orientation through land consolidation into one area, but by guaranteeing the ownership of each farmer's land. By farmer corporations, resource management can be optimized because it is carried out in a more integrated, consistent and sustainable manner so that more efficient, effective and high quality standards are formed that encourage economic growth in rural areas. The area development approach is designed to be able to increase the effectiveness of farming activities, encourage financial efficiency, and support the sustainability of soybean farming in tidal especially in the outside Java regions.

(2) Increase the productivity by using an application of soybean new technology. The use of soybean new technology to reduce yield gaps at the farm level. Using of soybean seeds with new varieties, namely: Dega-1, Devon, Dena. Cultivation techniques by using the soil amelioration and fertilizing recommendations. From many soybean new varieties, the Agency for Agricultural Research and Development produces varieties of soybean is soybean Devon-1. The Devon 1 variety of soybean can support acceleration of soybean production increase due to high yield. Devon 1 of soybean variety was capable of producing 3.09 ton / ha by using new cultivation techniques that are amelioration land and fertilization. The yield is higher than soybean productivity at the farm level, which currently only reaches 1.3 t / ha. This yield jumps in soybean productivity is very likely increase national soybean production in meeting the increasing needs of soybean for community.

(3) Education to community. Education to public in the form of dissemination or socialization the importance of consuming local soybeans or healthy products (non-GMO). The product can counteract free radicals and in a long time formed in our body. Selectivity for soybean commodities needs to be socialized through various media massively so that public opinion can be formed. For example Devon 1 variety of soybeans contain isoflavones (2,220 µg / g) that is higher than Wilis variety (1,854 µg / g) or Anjasmoro variety (1,457 µg / g) which both are widely planted by farmers now, moreover for imported soybean isoflavones far below it. (Adie M.M, 2015). Isoflavones are nutrients contained in soybean. According to health experts isoflavone compounds in soybean beneficial to prevent several diseases such as cardiovascular, osteoporosis, reduce cholesterol levels and can prevent cancer (Křížová L et al , 2019; Wu X C, 2008).

In the international world, soybean commodity is not merely placed as food, but has improved its function by being positioned as a healthy food source and becoming a highly prospective functional food source. The global community faces many and experiences a variety of degenerative diseases due to various negative impacts of development and lifestyle, so food selectivity by the community needs to be done to anticipate free radicals that cause many health problems. The promotion to Increase of Local Soybean will have an impact to growing love of domestic soybean (fanaticism) and market demand increase will cause farmer's good will plant soybean increase also and resulting in a multiplier effect.

Conclusion

- There are some problems must be solved for domestic soybean in facing the agricultural era 4.0 which is still great hope to be solved.
- Development of soybean farming in tidal land is prospective to rebuild domestic soybean in the agricultural 4.0 era
- By using of model soybean farming that based of regional and a corporate.
- By applying a new technology can develop tidal land to support agriculture revolution 4.0.

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