Introduction of Dryland Soybean Technology in Pandeglang Regency, Banten

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Abstract. One of the strategic food crop commodities in Indonesia is soybeans. Domestic soybean production is still low so that it can fill the gap in the domestic fever that is possible through imports. Farmers are less interested in planting soybeans because it is less profitable. Technological innovation and increasing farmer motivation to plant soybeans need to be done, one of which is through demonstration plots and farmer training. The research was carried out in Mekar Sari Village, Panimbang District, Pandeglang Regency, Banten. The study was conducted in the demonstration plot including the introduction of new high yielding varieties. Farmer responses were explored through farmer field day using a questionnaire. The aims of a research is to introduce the technology of dryland soybean cultivation and explore the interest of farmers in developing this technology. the majority of farmers were males with there were 65% of farmers had narrow land area that is ≤ 0,4 ha. Dena 1 variety produced the highest productivity of 1,820.1 kg/h compared to other varieties. The motivation to develop dryland soybean technology is based on the desire to develop more advanced and modern (72.5%), gain insight and knowledge (67.5%) and to develop the regional economy (66.25%).

1 Introduction

In terms of land use, a quarter of Banten's area is wetland (22.55%) which is used for rice farming and vegetable/secondary crops commodities. Meanwhile, for dryland (77.45%) in the Banten region, more than half of the land area is cultivated for upland rice farming, secondary crops, vegetables, fruits and forestry crops as well as livestock and fisheries. Soybean is one of the main food crops in Indonesia, but its production is still low so that the availability of soybeans must be imported. The low production of Indonesian soybeans is due to the use of technology and low seeds quality, harvested area and price factors [1, 2].

Expansion of the soybean planting area will have a positive effect on increasing soybean production. Dryland has the potential to be developed as a soybean development area[3], Banten Province has a large area of potential land, reaching 510,654 ha. The distribution of dryland covers four districts and 2 cities with an area respectively of Lebak Regency 209,003 ha (40.93%), Pandeglang 203,601 ha (39.87%), Serang 56,000 (10,985%), Tangerang 19,804

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(3.87%), Kota Serang 7,939 (1.55%) ha, Kota Tangerang 463 (0.09%) and Cilegon 1,503 (0.35%)[4], so that the expansion of soybean cultivation in the dryland of Banten Province is very prospective.

However, the level of soil fertility and dryland characteristics vary widely, resulting in low dryland soybean production. The soybean productivity of dryland farmers in Pandeglang Regency ranges from 0.8-1.2 t / ha while the research results can reach 1.5-2.5 t / ha [5]. This has resulted in low farmers' interest in cultivating soybeans on dryland.

Increasing soybean production can be done through the use of new superior varieties of soybeans, which have high production potential. Efforts to encourage farmers' interest can be carried out through demonstration plots and training on the introduction of new high yielding varieties. Several studies state that varieties play an important role in increasing production related to genetic and environmental potential [6,7].

The success of an agricultural program is largely determined by the desire or motivation of the farmers in developing it. Measuring farmer motivation towards a program will assist the government in determining agricultural policy in an area. In this study, two measurements were carried out, namely the measurement of crop performance and also the measurement of farmers' motivation in developing soybean farming on dry land. Measuring plant performance will be very useful in determining specific-location an agricultural technology, and the other hand that it will make it easier to provide the recommendation of cultivation technology for farmers and extention workers. This research aims to introduce dryland soybean cultivation technology and to explore the interest of farmers in developing it.

2 Research Methodology

Determination of the location based on the purposive method, in the Tunas Harapan I Village Farmers Group, Lame Village, Mekar Sari Village, Panimbang District, Pandeglang Regency. The activity was carried out in August-October 2019. The implementation of the activity consisted of two activities, namely demonstration plots and interviews to explore farmers' motivation in cultivating soybeans on dryland.

The plot demonstration was carried out on 3,000 m^2 of land owned by the Chairman of the Farmer Group. The technology applied is dryland cultivation technology using several superior varieties of soybeans from the Indonesian Legums and Tuber Crops Research Institute (ILTCRI)[8]. The technology developed consisted of: 1) the use of new high yielding varieties of soybeans, namely Dena 1, Devon, Detap, Anjasmoro, Grobogan and Tanggamus; 2) site-specific nutrient fertilization under the results of the Paddy Field Test Kit (PUTS); 3) the use of liquid organic fertilizer which is applied 3 times during the planting period; 4) Control of Plant Pest Organisms (OPT) under the IPM concept; 5) Irrigation according to plant needs; 6) use of straw as mulch or ground cover. The parameters observed were total pod weight, pithy pod weight, dry seed weight per hectare and 100-grain weight.

Measurement of motivation is carried out through interviews with respondents who are the management and members of the Tunas Harapan I farmer group, with a total of 40 farmers. Data were analyzed using descriptive analysis. To measure the level of motivation used a Likert scale in the form of a score. The Likert scale is used to measure attitudes, opinions, and perceptions of a person or group of people [9]. Positive statements are measured by the following scores: strongly agree (score 4), agree (score 3), disagree (score 2) and strongly disagree (score 1). Negative statements were measured by a score of strongly agree (score 1), agree (score 2), disagree (score 3) and strongly disagree (score 4).

3 Results and Discussion

3.1 Characteristic of Farmer

Characteristic of farmer presented on Table 1, the result show that the majority of farmers were males with the age of 41 to 50 years old (37.5%). The majority of educational level was elementary school (55%) with farming experience of farmer long enough for 6 to 10 years experience.

The number of family member more than 4 members wich included husband, wife and children. In general, each farmer has 3 to 4 children. However, there were 65% of farmers had narrow land area that is ≤ 0.4 ha, this indicated that farmers have low economic capacity. So that to fulfill basic needs must be supported by other work.

Table 1. The Farmer Characteristic

Characteristic	Criterion	Percentage
Sex	Male	40.0
	Female	60.0
Age	≤ 30	15.0
	31-40	27.5
	41-50	37.5
	> 50	20.0
Education	Elementary	55.0
	Yunior high school	37.5
	Senior high school	5.0
	Academi	2.5
Family Member (person)	≤ 4	20.0
	> 4	80.0
Ownership area (ha)	≤ 0.4	65.0
	0.5-1.0	20.0
	1.1-1.5	20.0
	>1.5	5.0
Experience (year)	1-5	5.0
	6-10	70,0
	>10	25,0

3.2 Agronomic Performance of Soybean Plants

Agricultural Research and Development Agency through the Indonesian Legums and Tuber Crops Research Institute has produced various technologies, such as soybean cultivation technology in rain-fed rice fields. however, the use of research technology is still very low at the farm level. One of the functions of the existence of AIAT in each province is to bridge the existing technology in the ILTCRI into Specific-Location technology that is used at the Farmers level. One approach is through the demonstration farm of Specific-Location cultivation technology with a variety of new superior varieties produced on ILTCRI.

The productivity between soybean varieties varies in dryland soybean cultivation. The productivity of some varieties is very low due to the lack of water supply during the production process. Rainfall affects the process of forming productive pod, where high rainfall will result in higher productive results compared to when the rainfall is low [10,11].

Dena 1 (1,820 kg/ha) and Anjasmoro (1,530 kg/ha) varieties produced the highest productivity compared to other varieties. Productivity is influenced by genetic and

environmental factors and their interactions. This difference in results is related to the ability of plants (genetic) to adapt to the environment during the growth phase [12, 13], and reliable to improved through integrated all the knowledge and technology [14].

Table 2. Components of soybean cultivation yield in the Panimbang district, Pandeglang

Variety	Total Pod Weight (gr)	Pithy pod Weight(gr)	1000 Grains Weight (gr)	Productivity Kg/ha
Devon	67.24	63.38	3.70	207.6
Grobogan	6.63	6.36	7.40	417.5
Detap	11.33	10.48	4.93	466
Tanggamus	10.26	9.72	4.93	625.5
Anjasmoro	13.36	14.29	6.44	1,529.8
Dena 1	55.09	52.78	71.28	1,820.1

3.3 The Farmer's motivation in developing soybean production

The development of soybeans faces a serious challenge. This is reflected in the target of achieving soybean self-sufficiency which has not been achieved so far. Soybean production both nationally and in the province of Banten tends to slope. The government's challenge in realizing soybean self-sufficiency is quite heavy, with several problems in local soybean development, namely (1) the quality of seeds and fertilizer[3] (2) limited land for soybeans (3) low technology adoption (4) low productivity at farmer level [15]. Farmers are less interested in planting soybeans because this business is seen as less profitable as expected. Soybean productivity is on average below 1.5 tonnes / ha with a business scale of less than 1 ha so that the income received has not been able to provide welfare and family needs. In Indonesia the profit obtained by farmers from soybean farming is less than 1 million ton/ha/season[16]. The government needs to make a breakthrough to increase farmers' motivation in cultivating soybeans by increasing productivity and added value. The soybean technology assembly was able to increase production from 1.42 t/ ha to 2.77 t/ ha (tidal land, Jambi) and increased from 1.71 t/ ha to 2.20 t/ ha (dryland, Grobogan Middle Java) [17].

Farmer motivation is the motivation or desire of farmers in developing their agriculture [18]. Factors that influence motivation are internal factors (from within the farmers themselves) and external factors [19, 20, 21]. Measurement of motivation consists of physiological motivation, sociological motivation and needs or self-actualization. Maslow divides human motivation into motivation for physiological, sociological, security, self-esteem and self-actualization needs [22, 23].

Table 3. The physiological motivation of farmers in developing dryland soybean cultivation

No.	Indicator	Interval Score	Achievement Percentage Score (%)
1	Meet the needs of family life	(1 - 4)	76.25
2	Increase income	(1 - 4)	83.75
3	Owning and increasing savings	(1 - 4)	85
4	A better and prosperous life	(1 - 4)	78.75

Based on table 3, the motivation for the physiological aspects [24] of owning and increasing savings is the highest motivation underlying farmers in developing soybean cultivation. This shows that farmers have the desire to carry out cultivation and development of soybeans properly so that optimal production results can be obtained. Through optimal production results at a reasonable selling price, farmers get an income that is relatively higher than expenses so that the difference between income and expenditure can be saved.

Table 4. The sociological motivation of farmers in developing dryland soybean cultivation

No.	Indicator	Interval Score	Achievement Percentage Score (%)
1	Adding relations	(1 - 4)	73.75
2	Collaborating with others	(1 - 4)	65
3	Strengthening harmony	(1 - 4)	81.25
4	Sharing opinions	(1 - 4)	73.75
5.	Received assistance from other parties	(1 - 4)	67.5

The motivation of the sociological aspect of strengthening harmony is the highest motivation underlying farmers in developing soybean cultivation. This shows that farmers have a desire to live in harmony, exchange opinions and interact well with one another. This can be the basis for the growth and development of farmer groups so that farmer groups can play a role and function optimally and benefit farmers (Table 4).

Table 5. The motivation of farmers' desire to develop in developing Dryland Soybean Cultivation

No.	Indicator	Interval Score	Achievement Percentage Score (%)
1	Obtain insight and knowledge	(1 - 4)	67.5
2	Developing more advanced and modern	(1 - 4)	72.5
3	Developing the regional economy	(1 - 4)	66.25

Based on table 5, the motivation for the desire to develop more advanced and modern is the highest motivation underlying farmers in developing soybean cultivation. This shows that farmers have the enthusiasm and openness to accept and apply technological innovations that can bring soybean development activities towards more advanced and modern agriculture.

(a) (b) (c) (d)

Fig 1. (a) FGD for Motivation Analisys; (b) Learning of dryland soy bean technology; (c) Farmer Disscusion; (d) Assessment of soybean plant performance (vegetative phase).

4 Conclusions

Base on this research have two measurements were carried out, namely the measurement of crop performance and also the measurement of farmers' motivation in developing soybean farming on dry land. Increasing soybean production can be done through the use of new superior varieties of soybeans. The result show that Dena-1 variety produced the highest productivity of 1820.1 kg/h compared to other varieties. The success of an agricultural program is largely determined by the desire or motivation of the farmers in developing it. The motivation to develop dryland soybean technology is based on the desire to develop more advanced and modern (72.5%), gain insight and knowledge (67.5%) and to develop the regional economy (66.25%).

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