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PLANTING PATTERNS ON RAINFALL PAID LAND FOR INCREASING IP 100 TO IP200 IN POSO REGENCY, CENTRAL

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ABSTRACT

Determination of cropping patterns in rainfed paddy fields is very necessary so that crop failure can be avoided and to maximize profits for farmers. The study aims to obtain Replace aimed with aims cropping patterns in rainfed lowland areas that can produce high yields and increase farmer incomes. The research was carried out in Tonusu Village, Pamona Puselemba District, Poso Regency, Central Sulawesi Province. The research was conducted from January 2018 to December 2018, the research consisted of cropping patterns and variety rotation during two growing seasons, namely the rainy season (RS) and the dry season (DS). Planting pattern of paddy farmers - bero (IP.100) and rice cropping pattern - paddy (IP.200. Introduction pattern). The results showed that: Farming analysis of IP 100 and IP 200 Tonusu Village, Pamona Puselemba District, Poso Regency scale per hectare At Palnting Season (PS) I and (PS) II can provide a profit of Rp. 15,130,000, - with an R/C: Ratio of 3.01 to farmers (IP 200) per (PS). The value of farming on the farmer's pattern (IP 100) provides a profit of IDR 10,170,000 with an R/C: Ratio of 1.77.

Keywords: Planting, Pattern, Index, Rainfed Rice Field, Rice.

INTRODUCTION

Referring to government policies in the field of agricultural development, the development of cropping patterns and the diversification of farming on dry land have a strong justification. To optimize rainfed lowland rice fields, it is necessary to determine cropping patterns so that crop failures can be avoided and to maximize farmers' profits. The avaibility national food, most of which is still supplied from optimally irrigated paddy fields. Suboptimal rainfed paddy fields also have the potential to support national food availability. However, rainfed rice fields are very vulnerable to the impacts of climate change, especially drought stress and attacks by plant-disturbing organisms. Anticipating the impact of climate change on rainfed paddy fields is carried out by applying adaptive technology. The potential area of Central Sulawesi's rainfed dry land and is around 12,630 ha which can only be planted with rice one Apart from rice, corn and peanut commodities are also of concern planting to the regional government of Central Sulawesi Province.

Dry land is a resource that has the potential to support the increase of the national food self-sufficiency target, considering that this dry land is still very wide and its productivity is still low with a cropping index (IP) at 100%. The management of agricultural land, especially rainfed dry rice fields, requires professional handling and must follow environmental principles because the management of dry land agro-ecosystems is seen as a large part of the management of natural resource ecosystems by the farming communities who in their areas. Haryono (2013) argues that in the future chievement of self-sufficiency in food must optimize sub-optimal lands including dry land such as rain-fed paddy fields through intensification, increasing the cropping index, and applying superior and specific technological innovations. Various kinds of technologies are commonly applied to dry land management such as improvement of cultivation techniques including the use of superior varieties, variety rotation, integrated crop management and cropping patterns which by agro-climate patterns are fundamental factors in achieving optimal productivity in rainfed lowland farming. Sidqi et al, (2010) concluded that to optimize dry land in rainfed rice fields, it is necessary to improve cropping patterns and the selection of plant species. The results of the study by Sirappa and Wahid, (2013), concluded that the introduction of varieties and the application of farming innovations in rainfed lowland areas can increase land production and productivity.

Dryland such as rainfed rice fields is a land resource where water source relies on rainfall. Water is a determining factor for the success of farming on dry land. Uncertainty in distribution patterns and rainfall intensity needs to be anticipated and exploited through improved cultivation and garden patterns and is expected to increase the production and productivity of rainfed paddy fields. Improvement of cultivation techniques ncludes: fertilization, use of superior varieties and integrated pest control, variety rotation, and integrated crop management (Pirganti and Makarim, 2006; Pirganti and Pane, 2005; Prihasto *et al*, 1997)

Development of an introduced cropping pattern on dry land with 200 mm rainfall combined with a cropping pattern at the beginning of the rainy season planting rice followed by intercropping of corn and peanuts yielded 4.7 tonnes of rice/ha, 0.26 tonnes/ha of corn, 0 .9 tons of peanuts and 0.19 tons of green beans. The introduced cropping pattern provides twice as much higher profit as the traditional cropping pattern (Wayan Rusastra *et al* 2004). Improving cultivation techniques using integrated crop and resource management (PTT) technology in cropping patterns accompanied by variety rotation and site-specific fertilization can increase the productivity and efficiency of rice farming in rainfed lowland areas and can reduce the use of chemical fertilizers and their impacts. (Prihasto et al, 1997; Suriadiakarta et al, 2010; Wahid and Sirappa 2013). Various research results on dry land, especially rainfed rice fields, improved cultivation techniques can increase production by 11.9% and income by 21.20% compared to the farmers' method. Widyantoro and Toha, (2010). The same results have also been reported hat technology with improved cropping systems and cropping patterns on rainfed dry land can increase income significantly, namely, previously the pattern of farmers was Rp.1,608,600, - to Rp.3,416,750, - the introduction pattern, so that provide opportunities to increase production, productivity and income of rainfed lowland farming by improving cultivation systems, rotation of varieties and cropping patterns. (Syamsul, *et al*, 2003)

The constrains of limited water on dry land, the farming cannot be carried out throughout the year, of course, it an impact on the cropping index to climate factors.. Rainfall distribution is a factor in determining to cropping paatens needs to be assisted with pumping so that the planting pattern designed does not lack water which causes crop failure. In areas in Western Indonesia, such as Sumatra, Kalimantan, and Central Indonesia, such as Sulawesi, rainfall exceeds 2,000 mm/year with the Cultivation Index can be increased to IP 200 – 250. Amien *et al.* (2001) in A. Abdurachman *et al*, (2008)

The research objective is to obtain superior varieties of rice plants to be planted in rainfed lowland rice fields that can produce high yields and increase farmers' income.

RESEARCH METHODS

The research was carried out in rainfed rice fields in Tonusu Village, Pamona Puselemba District, Poso Regency, Central Sulawesi Province. The research was carried out for 1 (one) year, from January 2018 to December 2018. The research consists of two stages of activity, namely: 1. Identification of locations and 2. Assessment of cropping patterns and rotation of varieties during two growing seasons, namely the rainy season (MH) and the dry season (MK). The treatment study of 2 :

1. Rice Planting Pattern - bero (IP.100. Farmer's Pattern)
2. Paddy Planting Pattern (IP.200. Introduction Pattern)

The activity methodology includes materials and tools and observations, namely: The planting technology to used system is: For each commodity using the PTT Paddy component, before planting the land is perfectly processed. The amount of fertilizer used is based on the results of the soil test or PUTK. Plant maintenance includes controlling weeds as well as pests and diseases according to cropping conditions in the field. Other materials used are pesticides, hand sprayers, scales, and other supporting materials, while the tools used in this activity include hand tractors, harvesting machines, hoes, scythes, blowers, and threshers. Perfect tillage, fertilization based on soil testing and superior quality seeds, and the use of agricultural tools and machinery, decomposers, and biological fertilizers as well as integrated pest and disease management (IPM). The components of observation in this activity are as follows, plant growth includes vegetative components and per plot rice yields converted to tonnes/ha and labor outpouring. Data analysis was carried out based on the data obtained which consisted of data on plant growth and yields with an average analysis, while the feasibility of farming with an income analysis approach with a B/C ratio

$$\text{B/C = Ratio} \; \frac{\text{Total income}}{\text{Total cost}}$$

If the B/C ratio is > 1 then farming is feasible. To see the feasibility of farming when there is a change in intake (input) and output (output), a sensitivity analysis is carried out to changes in these prices.

RESULTS AND DISCUSSION

Management of dry land agroecosystems to Increase Planting Index (IP 100) to (IP 200) in rain-fed paddy fields.

Table 1. Description of Rice Cultivation Technology Improvement Assembly Jarwo 2:1 IP 200 Tonusu Village, Pamona Puselemba District, Poso Regency 2018.

Component technology	Treatment	
	Pattern A (Introduction Pattern, IP 200)	Pattern B (Farmer Pattern, IP 100)
- Land processing	-OTS	-OTS
- Variety	-Inpari 30	-Lokal Super Win
- Number of seeds	- 30 kgs	-40-50 kg
- How to plant	- Jarwo 2 : 1	-Jarwo 2 : 1
- Plant spacing	40 x 20 cm x 10 cm	-40 x 20 cm x 10 cm
- Urea	-	200 kg/ha
- Z.A	25 kg/ha	
- SP 36	-	-
-NPK	200 kg/ha	100 kg/ha
- Weeding	2 times (4 MST)	-
-Pest and disease management	Observation	2 kali
-Harvest	Combine	Preventive, chemical insecticide, Sickle / Slam

In analyzing the optimal benefits of farming in Poso Regency through setting IP 100 to IP 200 cropping patterns by incorporating improvements to rice cultivation technology assemblies which have not been carried out by farmers before such as the introduction of superior varieties, how to plant the jajar legowo system, fertilization, weeding, integrated pest management, post-harvest and some and technology using other agricultural machine tools. Every application of technology is taught in field schools based on plant growth in the field. Because this technological innovation has not fully spread to farmers, it is necessary to innovate agricultural technology which it expected will be useful for farmers, therefore it is necessary to disseminate introduction technology to farmers. (Alwi *et al.*, 2019)

Table 2. Average Production at Harvest IP 200 Tonusu Village, Pamona Puselemba District, Poso Regency 2018

No. Sample	Tile Size	Varieties	Seed yield (t/ha)
1.	3 rows x 5 meters	Inpari 30	6,3
2.	3 rows x 5 meters	Super Win	5,3

Source: Processed primary data, 2018

Table 2 shows the average yield of tiles at harvest by taking tiles based on the 2:1 row legowo planting system, namely 3 rows x 5 meters converted to 6.3 tons/ha of GKP production. the results shows the yield has increased the introduced variety Inpari30 compared to local varieties super win around 5.3 ton/ha GKP. This riseach that the IP 200 introduction pattern has the addition of a higher production component, due to the pattern of fertilization treatment is based on soil testing, while the IP 100 farmer pattern only uses urea fertilizer, or according to farmers' habits. Likewise, if rice plants are planted with balanced fertilizer application based on plant needs, it seems that rice plants tend to have a higher number of productive tillers based on plant descriptions than rice crop farmers' patterns because farmers are only based on technological habits. Santoso *et al.*, (2021) in the same way that in Tanimbar Islands Regency (West Southeast Maluku), Upland Rice Cultivation Pattern 1 (Gogo Rice + Corn-Peanuts) and Introduction Planting Pattern 2 (Upland Rice + Corn/Cassava-Green Beans-Peanuts) Land) can increase the productivity of land, and farmer income. With a cropping pattern, food crops can be combined with horticultural crops and vegetables, (Suditayasa *et al.*, 2021) with a rice-rice, tomato-rice, and chili-rice cropping pattern in Palu City. Lowland rice production in the Tomato-Rice cropping pattern reached an average of 6.8290 tons/Ha, the GKP was higher than the Chili-Rice cropping pattern, which reached an average of 4.4738 Tons/Ha. The GKP was higher than the Paddy-Rice cropping pattern, which reached 2.6679 Tons/ Ha GKP. Likewise the corn-based on double cropping pattern for the production of strip cropping corn and monoculture corn, as well as the Land Equity Ratio value of the monoculture pattern and the strip cropping pattern (Amir *et al.*, 2021). The development of cropping patterns to increase the Planting Index uses several calculations, including calculations of effective rainfall, evapotranspiration, and mainstay discharge, then calculating water needs for optimal cropping patterns such as the first paddy-rice-rice crops and the second alternative for rice-rice-rice crops. (Riduan & Hadisaputro, 2021)

Table. 3. Rice Farming Analysis of 200 Tonusu Village,Pamona Puselemba Disgtrict, Poso Regency 2018

	Description			Saprotan Cost			
		ha		Price (Rp/Units)		Cost (Rp. 000/ha)	
		IP.200	Farmers **(IP.100)**	**IP.200**	Farmers **(IP.100)**	**IP.200**	Farmers (IP.100)
1.	A.Variable Cost (kg)						
	1. Seeds	30 kg	50 kg	9.000	9.000	270.000	450.000
	2. NPK fertilizer	200 kg	-	2.300	-	460.000	-
	3. ZA fertilizer	25 kg	-	1.000	-	25.000	-
	4. Urea	-	200 kg	-	1.300	-	260.000
	5. Ponska	-	100kg	-	2.300	-	230.000
	6. Pesticides						
	Gramaxon	2 liter	2 liter	60.000	60.000	120.000	120.000
	Tigold	100 gram	100 gram	15.000	15.000	15.000	15.000
	ally	3 wrap	3 wraps	10.000	10.000	30.000	30.000
	Reagent		1 bottle		60.000		60.000
	Virtaco		1 bottle		220.000		220.000
	Amount. 1					920.000	1.385.000
	B. Labor (HOK)						
	1. Land Processing.	package	package	1.000.000	1.000.000	1.000.000	1.000.000
	OTS				50.000		500.000
	2. Planting			50.000	50.000	500.000	250.000
	3. Fertilization			50.000	50.000	250.000	500.000
	4. Weeding 1			50.000	50.000	250.000	100.000
	5. Spraying			50.000	50.000	100.000	500.000
	7. Weeding 2.			50.000	50.000	250.000	1.000.000
	8. Harvesting and Processing			50.000		1.000.000	
	Amount 2					3.350.000	3.850.000
	Amount of cost 1+ 2					4.270.000	5.230.000

		IP.200	**Farmer IP.100**
3.	**Seed yield (kg/ha)**	6,3 ton	5,3 ton
	Production Cost (Rp/kg)	4.270.000	5.730.000
	Selling Price (Rp/kg)	3.000	3.000
	Revenue (Rp/ha)	18.900.000	15.900.000
	Profit (Rp/ha)	15.130.000	10.170.000
	R/C ratio	3,01	1,77

Source: Processed primary data, 2018

Price Range at harvest PS. I and PS. II

Price of Grain Consumption Rp. 3000,-/ kg

The labor wage is IDR 50,000 per day

The farming analysis is needed to assess the feasibility of the technology and the added value achieved by the introduction of technology in this study. The results provide information regarding analysis of the output and input of rice farming until the farmers sell the grain to traders. According Table 3 it can be seen that the analysis of rice farming in Tonusu Village, District Pamona Puselemba, Kab. Poso 2018 (per hectare scale) In PS 2018 using introduced technology assemblies can provide a profit of Rp. 15,130,000, - with a B/C ratio of 3.01 for farmers (IP 200). The value of farming on the farmer pattern (IP 100) provides a profit of IDR 10,170,000 with a B/C ratio of 1.77.

The appearance of rice plants for each production component at IP 200 varied shows the yield gap between IP 100 and IP 200 due to farmers being more inclined to prepare pesticides for their farming activities than using complete fertilizers. Moreover, production IP 200 increases savings in the use of pesticides which is quite large compared to IP 100 pattern. This causes differences in farm income.

Fluctuations in rice prices are a factor causing the gap in yields between IP 100 and IP 200. Rice prices at harvest time vary greatly, usually prices decrease.ales of rice harvest transactions between farmers occur almost every day. In sales transactions between farmers, generally, farmers already have good agreements between farmers and farmers in between villages and farmers with mill entrepreneurs. Analyzing the results of farmers' income in several areas that use planting patterns such as rice - rice - only twice a year, which is carried out by farmers in Jembayan Dalam Village, Loa Kulu District, Kutai Kartanegara Regency. With rising production costs, production is also higher than other cropping patterns in terms of hectare conversion and annual average. Ningrum *et al.,* (2022) said Increasing the Cultivation Index can also be carried out on rice and secondary crops to provide optimal benefits for farmers. The economic perspective sees areas that need water as a provider of farmer activities for human welfare (Blomquist & Schlager, 2005). While the socio-economic aspects include access to water for agricultural needs, animal husbandry, and other productive activities, (Calder *et al.,* 2007). It can also regulate Paddy-Rice-Palawija cropping patterns by regulating the distribution of irrigation water to increase the cropping index. (Halil *et al.* , 2021) as well as those who have the existing cropping pattern of Paddy Palawija (Sulistyani & Irianto, 2021), The cropping pattern increases the rice production index in a year if the rainy season and dry season make water availability uneven because it is influenced by natural supporting factors, namely climate and soil, the obstacles that are often faced are global climate change which has an impact on rainfall patterns in various regions (Saputra *et al.,* 2021; Saves *et al.,* 2021)

CONCLUSION

1. Farming analysis of IP 100 to IP 200 for rice in Tonusu Village, Pamona Puselemba District , Poso Regency 2018 (per hectare scale) In PS 2018 using introduced technology assemblies can provide a profit of Rp. 15,130,000, - with B/C ratio of 3.01 for farmers (IP 200). The value of farming on the farmer pattern (IP 100) provides a profit of IDR 10,170,000 with a B/C ratio of 1.77.
2. Introduction of superior varieties of Inpari 30 rice plants to be planted in rainfed rice fields which can produce higher yields compared to farmer patterns and increase farmers income Tonusu Village, Pamona Puselemba District

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