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Feasibility of Swamp Paddy Farming with New Superior Varieties and Different Planting System

Kelayakan Usahatani Padi Rawa dengan Varietas Unggul Baru dan Sistem Tanam yang Berbeda

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ABSTRAK

Upaya untuk pemenuhan kebutuhan pangan masyarakat dapat dilakukan dengan mengoptimalkan pemanfaatan lahan rawa. Salah satu teknologi yang dapat dikembangkan pada lahan rawa adalah varietas dan sistem tanam. Kelayakan secara ekonomi menjadi salah satu pertimbangan petani untuk mengadopsi suatu inovasi teknologi. Penelitian bertujuan untuk menentukan kombinasi varietas dan sistem tanam yang paling menguntungkan dan layak secara ekonomi untuk dikembangkan pada usahatani padi rawa. Penelitian dilakukan dari bulan Mei-Agustus 2016 di Desa Karang Anyar Kecamatan Semidang Alas Maras Kabupaten Seluma. Terdapat 7 Varietas Unggul Baru (VUB) padi rawa yang dibudidayakan antara lain Inpara 1, 2, 3, 6, 7, 8, dan Dendang serta 1 varietas eksisting sebagai pembanding yaitu varietas Cigeulis. Sistem tanam yang diterapkan adalah sistem tanam jajar legowo 2:1 dengan sisip dan tanpa sisip. Data yang digunakan untuk mencapai tujuan penelitian adalah data primer berupa data usahatani untuk menghitung keuntungan dan kelayakan ekonomi. Keuntungan usahatani dihitung menggunakan analisis parsial sedangkan sedangkan kelayakan ekonomi dihitung dengan melihat nilai titik impas (*Break Even Point*) dan R/C ratio. Hasil penelitian menunjukkan bahwa varietas Inpara 6 dengan sistem tanam sisip memberian keuntungan yang terbesar yaitu Rp 15.096.600,-/ha dengan R/C rasio sebesar 2,92.

Kata kunci: kelayakan, rawa, sistem tanam, usahatani, varietas

ABSTRACT

Efforts to fulfil the community food demands could be achieved by swamp land optimization. One technology that can be developed on swamp land is utilization of new superior variety and planting system. Economic feasibility is one of considerations for farmers to adopt a technology innovation. The study aimed to determine the combination of the most economically viable new superior variety and planting system to be developed in swamp rice farming. The study was conducted from May-August 2016 in Karang Anyar Village Semidang Alas Maras district, Seluma Regency. There are 7 New Superior Varieties of swamp paddy cultivated; Inpara 1, 2, 3, 6, 7, 8, and Dendang and 1 existing variety as benchmark variety, Cigeulis. The planting system applied were legowo planting system (2:1) with insertion and without insertion. The data used to achieve the research

objectives is primary data in the form of farming data to calculate economic benefits and feasibility. Farm profit is calculated using partial analysis whereas economic feasibility is calculated by evaluating the break even point and R/C ratio. The results showed that Inpara 6 with legowo planting system with insertion yield the largest profit Rp 15.096.600,-/ha with R/C ratio of 2.92.

Keywords: feasibility, swamp, planting systems, farming, varieties

INTRODUCTION

Rice is staple food in Indonesia. Rice demands fulfilled from paddy field from regional production centre. In harmony of population increase, rice demands also increase. This condition is not followed by an increase of paddy field and production. Contrary, paddy fields tend to decline due to land conversion into non agriculture land. To overcome this reality, it is required to utilize other land besides irrigated and rain-fed paddy fields which is swamp utilization.

According to Centre For Agriculture Land Resources (CALR) in 2015, tide swamp and lebak swamp that could utilize into paddy field were 5.12 million ha. This opportunity to fulfil people foods demand. Some obstacles were occurred to utilize the swamp into paddy field. Iron poisoning and lack of technology utilization contribute to low swamp paddy productivity (Saidah *et al*., 2015; Firison *et al*., 2013).

Technology improvement were required to utilize swamp as food source. Application of new superior variety and planting system could be alternative technology in swamp paddy utilization. According to Saidah *et al* (2015), application of suitable and adaptive new superior variety is technology component that has significant contribution to paddy productivity improvement. As production component, variety has largest contribution for an increase in paddy production 56,1% (Balitpa, 2007 *in* Rohaeni *et al*., 2012). Application new superior variety believed could produce good seedling that has uniform growth rate with strong roots, faster plant growth, pest resistance, has high crop yields, and better crop production (Dirjen Tanaman Pangan, 2013). Some new superior variety that has been released by Indonesian Agency for Agricultural Research and Development (IAARD) Ministry of Agriculture. Each variety has its own land suitability. Those variety were Tapus that appropriate for swamp with highest water body 150 cm. Banyuasin, Batanghari, Dendang, Indragiri and Punggur variety that suitable for swamp, peatland and acid sulphate land while Martapura and Margasari each well adopted to tide swamp land. Since 2008 to 2012, 7 swamp paddy variety has been released with name Inpara 1 to Inpara 7 that mostly grown in lebak swamp or tide swamp.

Arrangement of planting system affecting the space between plant and plant population. This arrangement contributes to quantity and quality of paddy plant clumps, together with population/ total number of plant/unit area contribute to crop yields (Ikhwani et al., 2013). One planting system regarded as breakthrough to increase paddy productivity were Legowo planting system. Legowo planting system is a technology hoped to increase plant production and profit for farmers. Application of this planting system will contribute to optimum plant growth, high yield and improved grain quality due to manipulation on denser border plant (Firdaus, 2015; Ariwibawa, 2012). According to Ikhwani *et al*., (2013) legowo planting system principally increase plant population by arranging plant distance. Legowo 2:1 planting system described as two plant row interspersed by a blank row with width two time row range, but plant spacing in-row were halved. Plant that in the halved spacing were called inserted plant.

Utilization of both cultivation technique assumed that would affecting crop yields.

Although, it is still unknown which combination could contribute to optimum yields. The different in production, in the ends will affect farming profit. Cultivation technique applied, price level, crop yields and input efficiency will contribute to revenue and profit farming system (Rachman and Saryoko, 2008; Makarim and Suhartatik, 2006).

This study objectives were: 1) Determine combination of variety and planting system that has highest profit in swamp farming, and 2) Determine combination of variety and planting system that most feasible in swamp farming. This study could provide information for farmer as consideration to adopt new innovation technology.

MATERIALS AND METHODS

The study was done on May- August 2016 at Karang Anyar village, Semidang Alas district, Seluma Regency, Bengkulu Province. This study was done in 3 ha lebak swamp with 6 farmer co-operators. Data collection were done using farm record keeping methods to collect primary data to calculate farming profit and feasibility.

Technology component applied based on swamp paddy integrated farming management such as; 1) Utilization of new superior variety, 2) healthy and good quality seed, 3) N, P and K fertilization based on soil evalution analysis in Soil Laboratory of Assessment Institute of Agriculture Technology (AIAT) Bengkulu which is 92 N (200 kg Urea), 36 P_2O_5 (100 kg SP 36) and 60 K_2O (100 KCl), 4) Integrated pest control based on targeted plant pest. New Superior paddy variety used were Inpara 1, 2, 3, 6, 7, 8, and Dendang with existing variety as benchmark, Cigeulis. Planting system applied were Legowo 2:1, 20 x 40 cm with and without insertion. Farming system profit calculate by deducting total revenue with total cost. Cost consist of variable cost (VC) such as seed cost, fertilizer, pesticide, and labour; fixed cost (FC) such as land rent and tools value shrinkage. Some of this cost were paid directly (seed, fertilizer and labour come from outside farmer`s family) and some cost were counted (such as labour come from inside farmer`s family). Amount of variable cost and fixed cost become Total Cost (TC). Total Revenue (TR) calculated by multiplying total product (Q) with price (P). Profit is total revenue reduced with total cost that directly paid, meanwhile benefit is subtraction of total revenue with total cost. Mathematically, profit formulated using equation;

TR = Q x P
B = TR – (VC+FC)
B = TR - TC

Farming feasibility were calculated using R/C ratio with equation :

$$R/C = \frac{\text{Revenue}}{\text{Total cost}} = \frac{Q \times P}{VC+FC}$$

With criteria;
if R/C > 1, therefore farming system were feasible,
if R/C < 1, therefore farming system were not feasible .
Break Even Point (BEP) also calculated where farming system in state with no gain and no lost using equation:
BEP_{price} (Rp/kg) = Total Cost (Rp)/production (kg)
$BEP_{produktion}$ (kg) = Fixed Cost/(Sell price/unit – Variabel cost/unit)

RESULTS

Variety and Planting System Combination Yield Highest Profit

Combination of Inpara 6 variety and Legowo 2: 1 with insertion yielded highest farming profit compared with other combination. This is because total production was higher compared to other combination (Table 1).

On average, all variety this season were not optimal and lower than yield potency. Based on variety description, yield potency variety of Inpara 1, 2,3 6,7,8, dendang and cigeulis subsequently 6,67 t/ha; 6,08 t/ha; 5,6 t/ha; 6,0 t/ha; 5,1 t/ha; 6,0 t/ha; 5,0 t/ha and 8,0 t/ha. Reduced crop yields due to

some problems during plant growth such as climate condition and pest attack.

The Most Feasible Combination of Variety and Planting System

Generally, all combination of variety and planting system were feasible economically due to R/C > 1 except for combination of Inpara 1 and Legowo 2: 1 without insertion. R/C ratio indicate most of the combination of variety and planting system were feasible to develop (Table 2). Price BEP for each combination were at range Rp 1.301,00 – Rp. 3.821,00 with production BEP 57,87-2.377 kg. Grain price at the study location was Rp. 3.800,0/kg. Price BEP and Production BEP most of the combination indicate that farming system were profitable. Only in combination of Inpara 6 and Legowo 2:1 without insertion showed higher production BEP compared with grain price in the study site and other combination.

Table 1. Profit of swamp paddy farming combination of 8 swamp paddy variety and 2 planting system at Seluma regency in 2016

Paddy Variety	Planting System	Production (kg/ha)	Revenue (Rp/PS*/ha)	Cost (Rp/ha)	Profit (Rp/ha)
Inpara 1	Insertion	2.917	11.084.600	7.683.000	3.401.600
	Without Insertion	1.771	6.729.200	6.767.000	(37.200)
Inpara 2	Insertion	5.833	22.165.400	7.651.000	14.514.400
	Without Insertion	4.583	17.415.400	6.829.000	10.586.400
Inpara 3	Insertion	4.583	17.415.400	7.729.000	9.686.400
	Without Insertion	4.167	15.834.600	7.005.000	8.829.600
Inpara 6	Insertion	6.042	22.959.600	7.863.000	15.096.600
	Without Insertion	5.417	20.584.600	7.127.000	13.457.600
Inpara 7	Insertion	3.958	15.050.400	7.693.000	7.347.400
	Without Insertion	4.292	16.309.600	7.017.000	9.292.600
Inpara 8	Insertion	5.417	20.584.600	7.827.000	12.757.600
	Without Insertion	4.583	17.415.400	7.029.000	10.386.400
Dendang	Insertion	3.750	14.250.000	7.631.000	6.619.000
	Without Insertion	3.958	15.040.000	6.993.000	8.047.400
Cigeulis	Insertion	3.125	11.875.000	7.595.000	4.280.000
	Without Insertion	3.917	14.884.600	6.982.500	7.902.100

*PS (Planting Season), Source: Processed primary data, 2016

Table 2. R/C ratio and BEP swamp paddy farming combination of 8 swamp paddy variety and 2 planting system at Seluma regency in 2016

Paddy Variety	Planting system	R/C	BEP of Price (Rp)	BEP of Production (kg)
Inpara 1	Insertion	1.44	2.634	120
	Without Insertion	0.99	3.821	2.377
Inpara 2	Insertion	2.90	1.312	58,89
	Without Insertion	2.55	1.490	63,53
Inpara 3	Insertion	2.25	1.686	68,05
	Without Insertion	2.26	1.681	67,78
Inpara 6	Insertion	**2.92**	1.301	57,87
	Without Insertion	2.89	1.316	58,13
Inpara 7	Insertion	1.96	1.944	77,11
	Without Insertion	2.32	1.635	66,39
Inpara 8	Insertion	2.63	1.445	61,29
	Without Insertion	2.48	1.534	63,52
Dendang	Insertion	1.87	2.035	80,93
	Without Insertion	2.15	1.767	70,52
Cigeulis	Insertion	1.56	2.430	103,08
	Without Insertion	2.13	1.783	71,05

Source: Processed primary data, 2016

DISCUSSION

Average productivity all variety were below optimum productivity and yield potency as described in variety description. This problem because some problem in the fields. In vegetative stage, plant didn't have sufficient water due to low rain occurrence. The Rice Black Bug attack 20 % plant population and turn them into yellow leaves. During generative stage, rat attack level reached 40%. The most dominant pest were rat and The Rice Black Bug. If the plant has more favourable climate condition then the productivity might have improved. Empirically, plant growth can be stated as function of genotype with environment where both of them influenced by internal and external growth factor (Gardner, *et al.*, 1991).

Profit as indicator of successful farming system influenced by many factor such as cost, revenue, benefit, etc (Saihani, 2012). On this study, farming system cost based on its nature divided into 2, variable cost and fixed cost. Cost grouping into these groups intended to simplify the equation and temporary (Budiono, 1982). Cost component of variable cost and fixed cost on Legowo planting system with and without insertion were not much different.The difference only occurred in planting system labour cost. Labour cost is important production component that need to evaluate in production process. Labour cost is more important compared to other production component such as seed, soil and water because human that drive those factors to produce a product (Bukit and Bakir (1998) *in* Mariyah (2004).

Legowo with insertion planting system took longer time for planting process compared with Legowo without insertion. Inserted plant in the Legowo 2:1 plant system with insertion with plant spaces (20x40) x 10 cm produce highest plant population 333.333 plant/ha. Meanwhile without insertion only has 166.666 plant/ha. Abundance of plant population required higher person working days (PWD), Legowo with insertion required 43 PWD while Legowo without insertion required 16 PWD. Higher plant population that should be planted in Legowo planting system with insertion took longer time compared with Legowo without insertion. Appropriate labour cost in paady farming system will have positive impact on production improvement (Mahananto dkk, 2009). Not only in planting system, cost differentiation also occurred on threshing and transportation. This cost depends on the crop yields. Higher crop yields also means higher cost. On the study location, transportation cost based on number of sack with average weight 50 kg with transportation cost from paddy field to farmers home were Rp.3.000/sack.

Besides cost, total production also influence profit that farmer would have. Farming profit depends on revenue from crop yields and cost incurred (Fitria and Ali, 2014). According to Fauzi and Andani (2010) farming profit occurred from difference of total revenue and total production cost, while farming revenue is multiplication of production and price of the product, in this case the product in form of harvested dry grain. Legowo planting system, especially 2:1 acknowledged could increase productivity up to 18,12% (Suhendra and Kushartanti, 2013). Misran (2014) reported that application of Legowo planting system has significant effect on harvested dry grain and could increase harvest dry grain up to 19,90-22%. Mayunar (2014) study in Serang Regency, Banten Province showed that Legowo planting system increase productivity 17,7% compared to common planting system. R/C ratio analysis showed that each new superior variety economically feasible. Calculation result showed that swamp farming has more revenue in Lebak swamp using Inpara 6 and Legowo with insertion planting system compared with other variety. R/C ratio Inpara 6 and Legowo with insertion planting was 2,92 indicate that each addition of production cost Rp 100,- would yield Rp 292,- higher revenue.

Price and production BEP were done to determine the lowest price and production that should fulfilled to achieve profitable farming system (Rachman and Saryoko, 2008). It also determine how sensitive farming system to price and production fluctuations (Fitria and Ali, 2014).

CONCLUSION

Combination of new superior variety Inpara 6 and legowo planting system with insertion yielded the largest benefit (Rp. 15.096.600,-/planting season/ha) and highest R/C ratio 2,92.

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