Study of "Indo Jarwo Transplanter 2:1" Machine Performance on the Paddy Field Planting in North District Bengkulu

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ABSTRACT

Simultaneous paddy planting launched by local governments constraints by limited manpower to plant paddy so that efforts to increase paddy paddy IP and application of PTT component Legowo 2:1 becomes very slow. One way to overcome these problems is through the mechanization of agriculture in the form of Jarwo transplanter machine. This study was conducted to determine the technical and economic performance of paddy planting machine Indojarwo transplanter 2:1 on irrigated land in the province of Bengkulu. Parameters observed were machine performance, planting costandman power eficiency. As comparison were the treatment of farmers using "caplak roda" 2: 1. The use of planting machines Indojarwo transplanter 2:1 was able to accelerate the time of planting from 16 HOK to2 HOK and transplanting costs up to 72.02%.

Key words: performance, mechanization, "Indo Jarwo Transplanter 2:1"

INTRODUCTION

Paddy is the main commodity of food crops and is vital to the achievement of food security. Paddy given a major contribution to gross domestic product (GDP) (Damardjati 2006; Director General of Food Crops, 2008; Sembiring and Abdulrahman, 2008). In order to achieve sustainable rice self-sufficiency, in 2011 the government has established the National Paddy Production Enhancement Program (P2BN). Instruments used in the production increase were: (1). Expansion (new paddy fields, optimization of land, and increase Farming Index (IP); (2). Increased productivity (use of new varieties, fertilization, Legowo row, the pest control: approach to crop management and resource Integrated (PTT); (3). Modification of technology and social (Demplot, Demfarm and SL-PTT).

Paddy productivity in Bengkulu province reached 4.3 tons GKG/ha (BPS Bengkulu Province, 2012). There is a gap results are quite high (21.82%) between the productivity of paddy in the province of Bengkulu and paddy productivity nationally. Gap can be minimized by the application of the results of PTT. There are 11 components of PTT that can be applied in the system of paddy cultivation, namely: (1). Modern varieties (VUB, PTB, PH); (2). Quality seeds and healthy; (3). Setting planting method (Legowo row); (4). Balanced fertilization and efficient use of LCC and PUTS / Permentan No. 40/2007; (5). IPM appropriate target pests; (6). Organic matter / manure / ameliorant; (7). Age young seedlings; (8). Processing good soil; (9). Optimal water management (irrigation intermittent); (10). Liquid fertilizer (PPC, KDP organic, bio-biological fertilizers, plant growth regulator, fertilizer micro); (11). Harvest and post-harvest handling (Directorate General of Food Crops, 2013).

The survey results show that the new 3-4 PTT paddy component applied by farmers in the province of Bengkulu. There is a positive correlation between the number of components PTT applied to crop productivity. To a certain extent, the more the number of components PTT applied, the higher the productivity that can be achieved (Authority et al., 2011).

In the province of Bengkulu, the number of tractors is sufficient to cultivate paddy fields quickly, but have not been able to ensure the implementation of planting simultaneously in an overlay. This relates to the cropping limited manpower. Prompts planted simultaneously in a single stretch is also a problem in the application of Jajar Legowo in Bengkulu, because it requires more labor.

Legowo row, in particular 2: 1, has been recognized to increase productivity up to 18.12% (Suhendra and Kushartanti, 2013). The main problem in the application of Jarwo include requiring labor for planting more, high costs and difficult soil conditions managed (small plot, water is difficult to control, and solum soil too deep / marsh).

One way to overcome problems in implementing Jarwo is through the mechanization of agriculture in the form Jarwo transplanter machine. Jarwo transplanter with 2-3 operators have a working capacity of 6-7 hours / ha. Suhendrata (2013) reported that under plot of paddy fields, mud flat with a depth of less than 40 cm, transplanter machine can help solve the problems of shortage of planting paddy. Unadi and Suparlan (2011) states that the function of agricultural tools and machines are to: (1). Fill the labor shortages of human and livestock are increasingly rare; (2). Increase labor productivity; (3). Improve farming efficiency through saving energy, time and cost of production; (4). Save results and improve the quality of agricultural products. Adult agricultural development can not be separated from the development of technology tools and agricultural machinery (Tambunan and Sembiring, 2007).

Legowo row is one component of the basic PTT / PTT compulsory in irrigated lowland paddy (Directorate General of Food Crops, 2013). Jarwo transplanter machine usage, along with other PTT component, is expected to be the tipping point in increasing the productivity and production of paddy in the province of Bengkulu. Farmers will receive and adopt the technological innovations introduced with the requisite technology is economically profitable and technically practicable and not conflict with the social culture of the local community.

Limited manpower for power plant in Bengkulu Province can be triggered by overcrowding in Bengkulu province were still low at only 91 inhabitants per km2. It is necessary for the performance assessment mengenaik paddy planting machine indojarwo tranplanter 2: 1 in the province of Bengkulu.

This assessment activities carried out to determine the technical performance machine planting paddy "Indo Jarwo Transplanter 2:1" on irrigated land in the provinces of Bengkulu and assess the effectiveness of the use of the paddy planting machine "Indo Jarwo Transplanter 2:1" on irrigated land in the province of Bengkulu.

MATERIALS AND METHODS

The assessment was conducted from March to June 2015 in the paddy field belonging to Mr. Sudaryatno, Sukidi, Wayan and Nyoman Page Astawe farmer groups Sukasari 1 Village Rama Agung subdistrict Argamakmur North Bengkulu. Planting is done by using a planting machine "Indo Jarwo Transplanter 2:1". For comparison planting using ticks wheel 2:1. Legowo row planting system 2: 1 Rice varieties used are new varieties of rice irrigated fields Inpari 15. Dose of fertilizer used throughout the same treatment in accordance with the recommendations derived from the analysis of soil and planting calendar (Katam) Balitbangtan.

Materials used in this study include rice seed, fertilizer (Urea, Ponska), pesticides (herbicides, fungicides and pesticides), fuel, plastics, sacks, and ATK. The equipment used is Indojarwo Transplanter, ticks wheel 2: 1, scales, calculators, hand counter and a questionnaire.

Assessment Design

a. Technical performance testing planting machines "Indo Jarwo Transplater 2:1".

The experiment was conducted by comparing the performance of the engine plant "Indo Jarwo Transplater 2:1" by planting using wheel ticks. Treatment arranged in a randomized block design (RAK) with 6 replications. Plot measuring 1.000 m2.

The data collected are rice planting machine performance data "Indo Jarwo Transplanter 2:1" covers; planting time using machine planting "Indo Jarwo Transplanter 2:1" per unit area, measured using a stop watch since engine start planting until the machine finishes planted in a plot and repeated 6 times, failure of plant calculated the number of plants that empty every 100 lines of planting and repeated 6 times. The percentage of failures is calculated using the formula crop planting blank / 400 x 100% and time of insertion as well as the effective use of planting machines "Indo Jarwo Transplater 2:1". Data was analyzed by descriptive to know the difference between treatments.

b. Effectiveness of Indojarwo transplanter planting machine 2: 1

Effectiveness measured performance include the input costs incurred and the time of planting.

Planting costs (US $ / ha) $\Delta TC = \{(TC1 / TC0) -1\} * 100\%$

TC0 = Cost of cultivation using tick Wheels 2: 1

TC1 = Cost of cultivation using "Indo Jarwo Transplanter 2:1"

TK Planting (HOK / ha) $\Delta TK = \{(TK1 / TK0) -1\} * 100\%$

TK0 = Labour planting using tick Wheels 2: 1

TK1 = Labour Indojarwo Transplanter planting using 2: 1

Feasibility of technological change mechanization of rice on irrigated land use analysis and gains or losses, sacrifices and acquisition (Swastika 2004).

RESULTS AND DISCUSSION

Agricultural mechanization is defined as the introduction and use of any mechanical assistance to establish agricultural operations. Mechanical assistance included all kinds of tools or equipment that is powered by human, animal, combustion engine, electric motor, wind, water, and other sources of energy. In general, agricultural mechanization can also be interpreted as the application of engineering sciences to develop, organize, and control the operation in agricultural production (Rubio et al, 2005).

Mechanization of agriculture in the broad sense aims to increase labor productivity, improve land productivity, and lower production costs. The use of tools and machinery in the production process is intended to improve the efficiency, effectiveness, productivity, quality of results, and reduce the workload of farmers (Salokhe and Ramalingam, 1998).

In an effort to overcome labor shortages when the planting and harvesting of rice arrived and accelerate the introduction of Legowo row planting 2: 1 or 4: 1, mechanization is a solution in order to pursue the Index of Production (IP). (Ahmad and Haryono, 2007). Transplanter Indojarwo planting machines use 2: 1 is able to accelerate the time of planting and growing labor shortages Legowo row planting system with 2: 1. Results of research conducted in farmer groups Sukasari village of Rama I the Great North Bengkulu District of Argamakmur shows that with mechanization, Watu planted in one hectare which usually takes two to three days with the growing number of workers ranged between 8-12 people. While Indojarwo transplanter planting machine in one hectare can be completed within 1 day with a workforce of 2-3 operators.

Tabel 1. Time Average that needed in paddy planting at manual and planting machine "Indojarwo Transplanter 2:1" In North Bengkulu District

No.	Repetition	Manual (hour/ha)		Machine (hour/ha)	
		Caplak (1 OH)	Planting (4 OH)	Planting (1 OH)	Embroideries (2 OH)
1	1	4.81	30.89	6.67	3.12
2	2	4.18	31.95	6.21	3.43
3	3	4.18	23.59	6.64	3.38
4	4	4.03	27.97	5.11	2.98
5	5	4.32	28.15	6.02	3.02
6	6	4.21	30.24	5.86	2.76
Sum		25.73	172.79	36.51	18.69
Average		4.29	28.80	6.09	3.12

The test results of the time required to manually planting and planting machines indojarwo transplanter using 2: 1 can be seen in Table 1 above. Time ticks by labor 1 average OH can be completed within 4.29 hours / ha while planting time with the amount of labor per hectare 4 OH takes on average for 28.80 hours / ha. Meanwhile, if the planting is done using planting machines "Indo Jarwo Transplanter 2:1" with a workforce of 2-3 OH planting only takes 6.09 hours / ha and replanting of 3.12 hours / ha.

Meanwhile, if dikonfersikan overall workforce rice planting 1 OH, manually (ticks + planting) on average takes 49 minutes for 119 hours or approximately 16 days and if using a planting machine "Indo Jarwo Transplanter 2:1" only takes mean The average for 12 hours 46 minutes or less 2 days.

The test results on the performance of the planting machine indojarwo tranplanter 2: 1 in the village of Rama Agung subdistrict Argamakmur North Bengkulu in accordance with the opinion of Suhendrata (2013), which states that the planting machine Indojarwo transplanter can help solve the problems of shortage of planting paddy only with 2-3 operators has the capacity to work 6-7 hours / ha on the condition plot of paddy fields, mud flat with a depth of less than 40 cm.

Table 2. Average total time dubutuhkan manually in rice cultivation and planting machines "Indo Jarwo Transplanter 2:1" in North Bengkulu

No.	Repetition	Caplak + Planting		Machine planting + Embroideries	
		(hour/ha)	(day/ha)	(Hour/ha)	(day/ha)
1	1	128.37	18.34	12.91	1.84
2	2	131.98	18.85	13.07	1.87
3	3	98.54	14.08	13.40	1.91
4	4	115.91	16.56	11.98	1.71
5	5	116.92	16.70	12.06	1.72
6	6	125.17	17.88	11.38	1.60
Sum		716.89	96.69	74.8	10.65
Average		119.49	16.12	12.46	1.78

Thus, the use of meisn planting Indojarwo tranplanter 2: 1 is able to accelerate the planting of 16 days to 2 days if the assumed use of manpower 1 OH, so that future agricultural development today can not be separated from the development of technology tools and agricultural machinery (Tambunan and Sembiring, 2007).

Table 3. Data Results planting machine performance "Indo Jarwo Transplanter 2:1" in North Bengkulu.

No	Repetition	Planting fail	Percentage (%)	Level of emptiness from the edge of embankment	Level of tidiness plant row
1	1	56	14.00	5 Row	Medium
2	2	59	14.75	7 Row	Medium
3	3	72	18.00	5 Row	Low
4	4	99	24.75	6 Row	Low
5	5	66	16.50	5 Row	Medium
6	6	99	24.75	5 Row	Medium
Sum		451	112.75	33 Row	
Average		75.17	18.79	5.5 Row	

Rice planting machine performance "Indo Jarwo Transplanter 2:1" in North Bengkulu district still having some problems diantarnya quality of the work the machine still needs to be improved further. The failure rate of planting / transplanting empty hole is still high with an average of 75.17 per 400 planting hole planting hole or 18.79% and the number of seeds per planting hole that is uneven and some have reached 7 stems per planting hole should only 1-2 stems per planting hole. This resulted stitching time becomes longer and use of seeds that more than seahrusnya. To overcome this, Indojarwo transplanter planting machines need to be calibrated back.

Table 4. Data estimated costs of planting machine "Indo Jarwo Transplanter 2:1" in North Bengkulu

Treatment/ replications	Caplak Roda 2:1 Labor (HOK/Ha)	Cost (HOK/Ha)	Indojarwo Transplanter 2:1 Labor (HOK/Ha)	Cost (HOK/Ha)
1	18	Rp. 930.000,-	3	Rp. 239.200,-
2	18	Rp. 930.000,-	3	Rp. 239.200,-
3	14	Rp. 780.000,-	3	Rp. 239.200,-
4	16	Rp. 830.000,-	3	Rp. 239.200,-
5	16	Rp. 830.000,-	3	Rp. 239.200,-
6	17	Rp. 830.000,-	3	Rp. 239.200,-
Average	13,67	Rp. 855.000,-	3	Rp. 239.200,-

Data processed, 2015

Note:

1. Indojarwo Transplanter 2: 1 TK Male 2 HOK / ha (Rp.80.000, - / HOK), TK Woman 1 HOK / ha (50.000, - / HOK), petrol 4 liters / ha @ Rp. 7,300, - = Rp. 29,200, -
2. Tick wheel 2: 1 * TK Male 1 HOK / ha (Rp.80.000, - / HOK), TK Women HOK / ha (50.000, - / HOK),

Tidiness result of planting has been done yet so satisfying farmers but it also still are vacant land, especially at the edge of the embankment which is wide enough so that the lead time becomes longer stitching. This is because the machine operators who are new used the machine. While in terms of the growing speed and efficiency of labor and the cost of planting has been very helpful for farmers.

Results of calculating the effectiveness of labor with the use of planting paddy transplanter machine indojarwo planting 2: 1 compared with manual planting using ticks wheel is as follows:

TK Planting (HOK / ha)

$\Delta TK = \{(TK1 / TK0) -1\} * 100\% = \{(3 / 13,67) -1\} * 100\% = 78.05\%$

Agricultural mechanization by rice planting machine indojarwo transplanter 2: 1 is able to save labor to 78.05%. While the costs incurred in planting paddy capable saved reached 72.02%. Planting costs (Rupiah/ha) $\Delta TC = \{(TC1 / TC0) -1\} * 100\% = \{(239,200 / 855,000) -1\} * 100\% = 72.02\%$

CONCLUSION

1. Planting time using Indojarwo Transplanter machine 2:1 with a workforce of rice planting 1 OH, manually (ticks + planting) on average for 119 hours and 49 minutes or less 16 days and if using a planting machine "Indo Jarwo Transplanter 2:1" only takes an average of 12 hours 46 minutes or less 2 days.
2. Performance Indojarwo rice planting machine Transplanter 2: 1 in North Bengkulu district still having some problems among which the quality of the work machine seen from the results of planting neatness and there is still vacant land, especially at the edge of the embankment which is wide enough so that the lead time becomes longer stitching , While in terms of the growing speed and efficiency of labor and the cost of planting has been very helpful for farmers.
3. Agricultural Mechanization with machine planting rice "Indo Jarwo Transplanter 2:1" is able to save labor to 78.05%. While the costs incurred in planting paddy capable saved reached 72.02%.

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