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IMPACT ON RIAM KANAN IRRIGATION TO TECHNICAL EFFICIENCY IN RICE FARMING SYSTEM

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Abstract

This was research conducted in four villages (irrigated and non-irrigated) was designed to identify the impact of Riam Kanan Irrigation to efficiency in rice farming system. For each villages, sample was selected by random sampling of farmers.

To analyze of efficiency, use regression model according to Cobb Douglas. Next, to get frontier production use Tobit model from software SHAZAM.

Results of the research showed that on the function of production findness value of Technical Efficiency Rating (TER) first plant session (0.9958) higher than second plant session (0.9829). It means that for usefullness of production factors in irrigated still higher than non-irrigated. Following should be implemented, that for growing up rice production in farmer , it must be controll about irrigate and drainage system.

Keywords : impact, efficiency, rice farming system

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INTRODUCTION

Irrigation since the 1st five years development plan (Repelita) has been developed along with government's program to achieve food sovereignty, especially rice. Guarantee of water for irrigation has an important role in the production of rice because hybrid seeds, fertilizers, pesticide, and a good planting system, will results good production if the irrigation is sufficient and water supply as adjusted with needs of plants, besides, it has the advantage to enlarge plantation area, adds the sum of planting per year, also escalates the productivity of the field per hectare (Suparmoko, 1980)

In South Kalimantan, there is an irrigation project financed by Japanese Government, The Sumitomo Foundation. The project is irrigation of Riam Kanan was done in four steps since 1988. Step first was finished and started operating in 1992, which covered sub area B with potential area with about 6202.5 hectare (Dinas Pengairan , 1990). The purpose of the project was to fulfill the need of all plants according to planting pattern that was scheduled, technically through system and drainage on 25,900-hectare area. Physical target of project development partially achieved by sub B farming area, about ± 600 hectare. Although from project enabling point of view at is not optimally obtained because from 600 ha of the irrigated field, only 4237 hectare used. But the use of Riam Kanan irrigation is not only sub area B, also sub area A those the production of RiamKanan irrigation shown inTable1

Table 1. Production Data Sub area B and A in South Kalimantan Irrigation1990

Season	Width (ha)	Production (ton)	Result (ton/ha)
Rain	3594	12579	3,5
Drought	6508	26032	4,0
Prod Quantity		38611	

Source : Siagian ; 1991

Planting pattern done by farmer is local/ year, unggul-local/year and unggul-unggul/year that forwards 2 times planting intensity a year with results 2, 02 tons/ha (local), and 2,36 tons/ha (unggul) (Helwiyan ,1986). Last production is 2,8 tons/ha and unggul 3,2 tons/ha (Anggraeni , 1991 and Heny , 1991). Local rice that produce one time a year (IP 100) then unggul, produce twice a year (IP 200). The kind of local rice in sub area B is Siam, Unus, and Adil and the unggul rice are IR 64 and IR 66.

Purposively by Riam Kanan irrigation project, rice production will increase to 4-4,5 tons/ha shown Table 2.

Table 2.Production Data Expected in Riam Kanan Irrigation 1990

Season	Width (ha)	Production (ton)	Result (ton/ha)
By project		1 104000	
Rain	25400	83000	4,0
Drought	18550	187000	4,5
Without Project	22870	141000	2,0
Increase			

Source : Siagian ; 1991

Water usage system, which used optimally in this particular rice planting, causing irrigation functioning system to decrease. Many fields still cannot be obtain in sub area B about ± 22%, and most of the bushy field/ sleeping field (Dinas Pengairan; 1998). The impact is that rice production decrease with low crop and it caused farmers income to decrease also. Besides that, planting pattern causing unoptimum and inefficient user of production factors.

The research has objective of to recognize Riam Kanan irrigation establishment's impact on efficiency of production factor on rice farming system.

METHODS OF RESEARCH

Technical object of research are sub area A,B,C,D and E for width 25,900 hectare. By purposive sampling, we choice sub area B for irrigated and non-irrigated area is four area (Penggalaman, Sei Rengas, Sei Batang and Gudanghirang). By random sampling , the respondent or research objects are about 80 of irrigated and 80 non-irrigated sub area farmer by a random data shortene.

To seeking production efficiency rice farming system in irrigated area and non-irrigated area as technical , allocative and economical efficiency.

a. Technical Efficiency

Technical efficiency can be represented by a stochastic frontier production function with maximum likelihood estimation as :

a. Production Function of estimation per hectare in first and second session

$$\text{Ln } Y(I) = ß_o + ß1 \ln UREA + ß2 \ln TSP + ß3 \ln KCl + ß4 \ln PST + ß5 \ln BNH + ß6 \ln TK + \varepsilon$$

$$\text{Ln } Y(NI) = ß_o + ß1 \ln UREA + ß2 \ln TSP + ß3 \ln KCl + ß4 \ln PST + ß5 \ln BNH + ß6 \ln TK + \varepsilon$$

ε = u+v with $u \leq 0$ (normal distribution)

b. Production Function of estimation per hectare , differences irrigated and non-irrigated area) in first session

$$\text{Ln } Y = ß_o + ß1 \ln UREA + ß2 \ln TSP + ß3 \ln KCl + ß4 \ln PST + ß5 \ln BNH + ß6 \ln TK + Dir + \varepsilon$$

Where :

Y(I) = rice production in irrigated area per hectare (kilogram per hectare)

Y(NI) = rice production in un irrigated area per hectare (kilogram per hectare)

UREA = vast of fertile UREA per hectare (kilogram per hectare)

TSP = vast of fertile TSP per hectare (kilogram per hectare)

KCl = vast of fertile KCl per hectare (kilogram per hectare)

PST = vast of pesticide per hectare (kilogram per hectare)

BNH = vast of feed per hectare (kilogram per hectare)

TK = vast of man power per hectare

Dir = dummy variable (D=1 irrigated and D=0 non-irrigated)

Technical efficiency is the ratio of annual output (Y) to potential output (Y). if maximum value of TER is absolutely 1, means annual output equal to potential output.

To hypothesis testing about technical efficiency in Riam Kanan irrigation use Maximum Likelihood Estimation follow as :

$\mathbf{-2\ [L(\beta R)-L(\beta\mu R)] \approx \chi^2 m}$ with m = restriction (Green,1990)

RESULTS AND DISCUSSION

Rice Plant System

Riam Kanan is an irrigation, which built from Riam Kanan dam, have potential farm 25,900 ha, done in 5 stage cover 5 sub areas (A, B, C, D and E). In dry season, farmers need irrigation water for their rice plant system, but wrong design and construction ‘caused water supply interrupted. In another side, during rain season, farmer doesn’t need irrigation water. Martapura river and rain flood their farm, and soil be come more acid.

In this irrigation area, including floated farm have 2- plant season in on year, local rice and hybrid rice. Rice citification started by fermentation in molded farm called “ Meneradak” (Banjar language), first movement to “ampak”, second movement to “ Lacak”, than cultivate in water farm. In farm level, soil treatment and citification still traditional, rare tractor found. After rice plant in watered farm, usually farmer doesn’t do citification activity unless pest and disease control. Farmers use Urea, TSP, KCL, and salt for fertilize. Local rice plant in rain season, with life cycle 8 month with production mean 2-3 ton/ha. In second plant system, farmer plant hybrid rice, but still less than 60 % ‘caused rat pest, and the productivity less than local rice. In non-irrigation farm, citification only can do in first plant season. In second plant season, they can’t cultivate ‘cause their farm are floated, basically this area need dryness. Some farmer uses it to aqua culture activity in order to rice their income.

Production Factor Usefullness Efficiency amps thus Rice Plant System

Technical efficiency level is equal of actual farmer production and production potential, which can be reach (estimation production of frontier function). To estimate frontier function production, maximum likelihood method are used, with to bit software help on Shazam.

Table 3. Frontier estimated production function for first plant session

Variable	Coefficient	t-count
Seed	-0.13752	-0.7644
Pesticide	-0.00507	-0.26976
Urea	0.0508	0.9579
TSP	-0.0576 *	-1.4476
Kill	0.0392	0.89349
Work force	0.4052 **	2.2037
Constanta	6.7453	4.6661
χ^2	23.4935 ***	
TER	0.9958	

Source : Result of analysis data,1999
*** = significance for level 99%
** = significance for level 95%
* = significance for level 90%

To know about useful of model MLE, shown from value of goodness of fit chi-square 23.4935. it means significance for level 99% with dread free 6 that model is feasible. Base of frontier coefficient function, t-test result (individual test), have two independent variable work forces. In another hard, seed variety, pesticide, urea and KCl fertilize are not significant determinate.

TSP fertilize variable is significant determinate a standard error 0,1 with regression coefficient 0,4052. This mean, 1% more of work force will increase rice productivity for 0,4052 %. Much or rice plant system of research area are manual. There's only a few tractor can be found. In another hard this area only have limited worker.

Base in t-test conclusion of every regression coefficient, fertilize variable (Urea and KCl), pesticide and seed had significant determinate at rice productivity more assessment area variable have regression coefficient score 0,0588, this means every 1% extra urea will increase productivity score by 0,0508 %. In practice rice doesn't have response in fertilize used. Much fertilize will give negative effect to farm and decrease KCl fertilizer have regression coefficient score 0,0392.

Seed has regression variable score – 0,13752. This means every 1% more seed will decrease seed productivity 0,13752 %. This could be hopped because farmer have difference seed standard. They don't by seed, but used seed from last harvest.

Pesticides has regression variable score 0,00507 which shown negative effect. This means every 1 % more pesticide will decrease rice productivity 0.0507 %. Local variety resist with rat pest, they don't need pesticide.

TER score can be calculating by equalization of actual production and potential production. TER score maximum is one. Technical Efficiency Score (TER), which can be reached farmer in irrigated farm, is 0,9958. This shown that farmer uses their production factor inefficiently.

Productivity estimation function in 2 the plant season, frontier estimation of productivity is shown in Table 4.

Table 4. Frontier estimated production function for second plant session

Variable	Coefficient	t-count
Seed	0.37204 **	1.7735
Pesticide	0.00495	0.3124
Urea	0.0345	0.6139
TSP	0.0349	0.9134
KCl	-0.0341	-1.0675
Work force	-0.3024 **	-2.1034
Constant	15.043	9.775
χ^2	19.1462 ***	
TER	0.9873	

Source : Result of analysis data,1999

To know about useful of model MLE, shown from value of goodness of fit chi-square 19.1462. it means significance for level 99% with derajad free 6 that model is feasible.Base on frontier production coefficient function from t-test (individual test), there were two variable independent each have significant determinate regression coefficient are 0,37204 as a positive influence every 1% more hybrid seed will increase 0,37204 % rice productivity.

Work force variable have significant determine in treatment level 95% with regression coefficient -0,30242. This mean every 1%, more work force will decrease 0,30242 % rice production as a negative difference. In fact, hybrid rice needs more work force to plant because they have more complicate.

Base on t test for every regression coefficient, fertilize variable (Urea, TSP and KCl), and pesticide doesn't have significant determinant with incensement rice productivity. Acid farm doesn't responsive with any fertilize although hybrid variety responsive with fertilize. Pesticide variably only have regression coefficient score 0,00495 which have positive effect. This mean every 1% more pesticide will increase 0,0507 % rice productivity hybrid variety need more pesticide in order to eliminate rat test.

TER analyst shown that TER average score inn regretted farm is 0,9873, this mean farmers don't use their production factor efficiently yet. Farmers who have TER score more than one is 45 % and TER score less than one are 55 %.

For Productivity Function Differences Between Plant Season Estimation Non-irrigated by frontier production function estimation shown in Table 5.

To know about useful of model MLE, shown from value of goodness of fit chi-square 42.8812 it means significance for level 99% with derajad free 6 that model is feasible.Base on production function coefficient, from t-test (individual test), work force variable is significant determinate to independent variable. Others independent variable (seed, pesticide and fertilize aren't significant determinate).

Table 5. Frontier estimated production function for first plant session

Variable	Coefficient	t-count
Seed	-0.1946	-0.8519
Pesticide	0.0181	0.9894
Urea	0.0313	0.3318
TSP	-0.0415	-1.1986
Kill	0.0352	0.9970
Work man	0.5965 ***	3.3032
Constanta	13.344	9.6581
χ^2	42.8812 ***	
TER	0.9829	

Source : Result of analysis data,1999
*** = significance for level 99%
** = significance for level 95%
* = significance for level 90%

Work force variable significant determinate at trustiest level 99% with regression coefficient 0,5965. This mean every 1% more work force will increase rice production by method, only a few tractor could be found in this area, in others side work force is a limited resource.

Urea variable doesn't have significant determinant to increase rice production. It have regression coefficient score 0,0313 which mean every 0,0313 % more urea will increase rice productivity by 0,0313 %. In fact, local variety isn't responsive to fertilize KCl and TSP have coefficient score 0,0352 and 0,0415. This score shown that incensement or decreasement of those factor won't give any effect to rice productivity. Pesticide variable doesn't have significant determinant with regression coefficient score 0,0181 which shown positive influence. This mean every 0,0181% more pesticide will increase rice productivity by 0,0181%. Seed is other variable, which doesn't have significant determinant with regression coefficient score -0,1946 %. This happen because farmer use seed from last harvest to plant.

TER analyzed shown that technical efficiency level (TER) average, which could reach by farmer non-irrigated farm is 0,9829. This shown that farmer didn't use their production factor efficiently yet.

Farmers who have TER score more than one are 40% and TER less that one is 60%.

For Productivity Function Estimation of 2nd Plant Season, non-irrigated farm couldn't be planted second plant season. They are floated by Martapura River. There's no plant activity in this season.

Base on analyst result both of irrigated and unirigated farm in 1st and 2nd plant season technically and allocate not efficient. This make those farm economically is not efficient. This probably 'caused farm condition. Which acid, frequently floated and have pest and diseases.

CONCLUSIONS AND RECOMMENDATION

Conclusion

Production factor (input) use in Riamkanan system by technically, not efficient for irrigated and non-irrigated.

Recommendation

1. For increase rice production in irrigated and non-irrigated area must be wing area by maximal, with decrease absentee area, control of using urea/ pesticide.
2. Before 2nd stage mild irrigation system, must be feedback control about irrigation drain in 1st job so that useful for ember rice farming system in irrigation area.

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