Joint-Well Technology and the Effect on the Risk Production of Sweet Potatoes in Coastal Land Farming

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ABSTRACT

Marginal land including coastal land is expected as an alternative to be used as agricultural productive land. One obstacle of the coastal land is that the sandy soil porosity is high and limited water resources. Technology of joint-well has been applied to supply water in coastal land farming. The purpose of this study was to analyze the technology of joint-well and determine the influence of the joint-well technology to the risk production of sweet potatoes in Bantul regency. This study used survey method in which the location is Sanden Beach, Bantul. This research used risk analysis by using the software program package Eviews for regressing equation production function with maximum likelihood estimation method to determine the influence of joint-well on production and that of joint-well to the risk production. The study concluded that the technology of joint-well is as alternative watering system that can be applied on coastal land. Joint-well means water sumps and usually made of concrete bus functioning to juxtapose and ease farming irrigation. The need of joint-well on the lands of 1000m^2 is about 8 - 10 concrete bus units. Working mechanism of joint-well is that concrete busput in a row within 8 - 10 mand then embedded in the farming lands. Underneath of the concrete bus is casted with concrete buscover and madeimpermeable, and thenamong concrete busis joined withpipes (paralon). The irrigation system i.e. the farmers take water from its source (ground wells, river) by using machine (diesel) and then insert it into one of joint-wells until all the join-wells fully filled. The farmers do water the cropping by taking water from joint-well using "*gembor*". Joint-well affects to the risk of sweet potatoes farming production only in the dry season 1 and dry season 2, which amount to 20.07% and 13.69%. While in the rainy season, the joint-well does not affect significantly.

Keywords: Joint-well, Risk production, Coastal land

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Introduction

Marginal land including coastal land is expected as an alternative to be used as agricultural productive land. In terms of this, considering the so-width coastal land in Indonesia, covering 95.181 kmwith broad area of the sea 5,4 million km square (*WorldResources Institute* (1998)*cit* the policy of Minister of Marine and Fisheries of Indonesian Republic, Number Per.06/MEN/2010).

Potential of coastal land as alternative of farming production is constrained by the wind erosion so continuously that the condition of land be marginal. Impacts of sand erosion are 1) The soil on coastal land being rough textured and so wreak off that sensitive to wind erosion, 2) Erosion resulting sand dune could cover cultivation and settlement areas backwards, and 3) Granular salt sand brought from the wind erosion could damage and decrease productivity of crops.

Support from the government in terms of coastal land usage as productive land, has been issued in the policy of Ministry of Marine and Fisheries Number 10/Men/2002about general guide of integrated coastal management planning; and Act No. 5 Year 1990regarding Biodiversity Conservation and the ecosystems; and the coastal significance full of biodiversity resources and environmental services; that is, the usage of sandy coastal land should be done right and properly and double-functioning as well. Sandy coastal land could function to control erosion (the wind) and to increase people's income by cultivating seasonly-crops properly and economically. By such model of management, it is expected that the results could change abandoned land to potential farming land (Harjadi B, danOctavia., 2008; Dahuri*et, al*., 2001).

Farming development at coastal land has once studied in Bantul Regency.

Research by Harjadi B, and Octavia (2008) explained that sandy coastal land conservation at Samas Coast, Bantul Regency, done by the method of cultivating windbreaker plants, soil improvement with manure and irrigation development facilities with joint-well technique.

Water is the most vital element in the agricultural process. It is needed by plants in the process of photosynthesis or plant physiology in adequate number. High porosity as sandy soil nature and the high wind speed causing high transpiration plants as well as steam salt water attached on the plant made water element should always be available. Salt attached on the leaves allow for plasmolisis. Plasmolisis means the mass flow process of fluid cells from within plants to the outside through stomata leaves. This happens as the blinding difference on the leaf surface due to the salt accumulation and thus it lacks of liquid then dries. The following negative impact is the emergence of fungus around the leaf crown due to the inceased humidity. Joint-well system is one of irrigation systems many used by farmers to overcome those things.

Objective of the study

The purpose of this study was to analize the joint-well technology and to know the major influence toward production risk of sweet potatoes farming at coastal land, Bantul Regency.

Methods

This research used a survey method situated in Bantul Regency, Special Province of Yogyakarta. The samples of village and sub-district purposively determined were Sanden sub-district, along the Samas Beach by village-sampling in Srigading and Gadingsari. The area was conservation and farming activities at coastal land existing long time since 1996 as well as conservation monitoring from the Office of Forestry, Agriculture, Coastal and Livestock, Fisheries in Bantul Regency.

Method of withdrawal sample farmers used in this study was proportional random sampling i.e a technique of collecting sample randomly with proportional number for each sub-population (farmer group) in accordance with the size of the population (Sekaran, 2003). Furthermore, the technique of data collection used three ways. They were interview, observation, and note-taking.

The technique of analysis used risk analysis approach and *software* program EVIEWS package for regression equation of production function with MLE (*maximum likelihood estimation*) method. The analysis done in two stages; they are, production analysis using double regression to know major influence of joint-well toward production. Secondly, risk analysis to know major influence of joint-well toward farming risk.

$$\ln Q(uj) = \alpha_o + \alpha_1 \ln K + \alpha_2 \ln L + \alpha_3 \ln SR + \alpha_4 \ln WB + e$$

$$\ln e^2 = \beta_o + \beta_1 \ln K + \beta_2 \ln L + \beta_3 \ln SR + \beta_4 \ln WB + \eta$$

$$\frac{\partial e2}{\partial SR} = \beta 3.\frac{1}{SR} = sruj$$

$$\frac{\partial e2}{\partial WB} = \beta 4.\frac{1}{WB} = wbuj$$

Explanations:

Q = production (Kg)

SR = joint-well (unit)

K = capital (Rp)

WB = windbarier (unit)

L = manpower (HOK)

UJ = sweetpotatoes

Results and Discussion

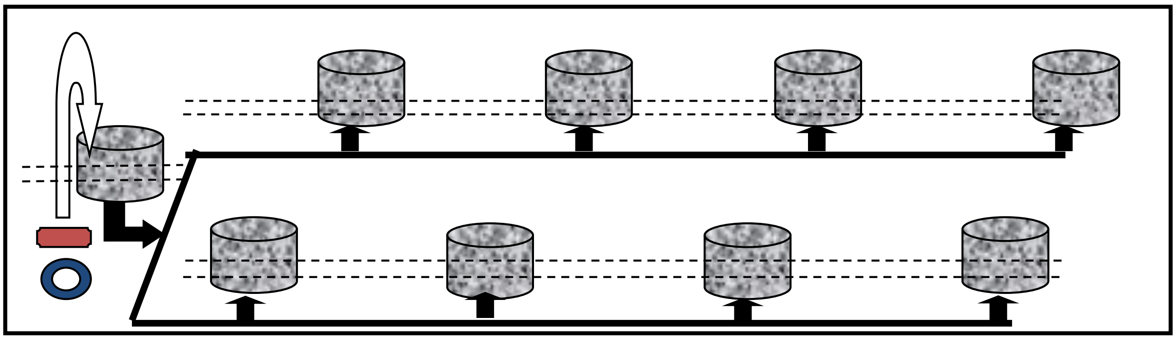
Technology of Joint-well

The system of coastal land irrigation in the location of study (Sanden District) used joint-well system. The joint-well irrigation system means engineering application of energy efficiency and water usage fif with the condition of plant and the location. Practically, joint-well consists of reservoirs made of concrete bus to come close and ease plants irrigation.

The working mechanism of joint-well is that concrete bus set lined with distance 8 - 10 man embedded at the farming land. Underneath the concrete bus is casted with a cover of concrete bus and made impermeable as well, then connected with pipes among the concrete. Pipes should be casted underground in order not to expose to the sunshine so that it is more durable. The system of refilling means that farmers from the water source (artesian well, river, tower) using machine and fill it into one of joint-well until all of them fully filled. They water the crops using *gembor* and take it from the joint-well. The joint-well is capable of enduring for about 15 years, but still needs maintenance especially changing pipes which can maximally last for 5 years. Based on the field observation and the field test, the setting of joint-well should be considering things as follow:

1. Ground water stock around farming location.
2. Sufficiency ground water for sucked into reservoirs next distributed into joint-well.
3. Sufficiency diesel for sucking water as well as the irrigation installation made of pipes and plastic hoses.

Based on primary data, system of joint-well needs initial capital which is quite expensive. The following table shows the amount of initial capital for constructing joint-well as well as cost of depreciation over coastal land farming in Bantul Regency. take water



Explanation of images:

: Artesian well

: Pipe toward joint-well

: Concrete Bus

: Hose from Diesel toward reservoirs

: Water Pump / Diesel

: Land surface

Table 1 Initial Capital, Cost and Depreciation Cost per 0.1 ha on Sandy Coastal Land in Bantul Regency in 2014.

Tools	Initial Capital (Rp)	Depreciation Cost (Rp)
Concrete Bus (9 unit)	362.945,00	36.294,50
Pipes (10 stem)	750.000,00	150.000,00
Hose (14 m)	246.535,00	61.633,75
Diesel (1 unit)	2,130,227.00	142.015
Total Cost/year	3.489.707,00	389.943,25
Total Cost/ season (1 year : 3 cultivating season)		129.981.08

The use of concrete bus in the joint-well irrigation system be the main facility as reservoirs. Average number of concrete bus for farming scale are 9 units and initial capital needed is Rp 362,945,- with depreciation cost Rp36.294,50,- per year. Concrete bus has quite long ages of use about 10 years but it is sensitive to leakage whether on the well basis or floor or pipe connector so that maintenance needed.

Pipes used for connecting one concrete bus to the others and for sucking underground water or main well. Pipes used in average are 10 stems. Initial capital for purchasing pipes is Rp 750,000.- with depreciation cost Rp150.000,- per year. The function of plastic hose is almost similar with that of pipes which is as installation facility for flowing water from diesel into the nearest concrete bus. Initial capital for providing plastic hoses is the cheapest one which is Rp 246,535,- with depreciation cost Rp61.633,75,- per year.

Besides those tools, there needs a diesel which is a primary tool in terms of joint-well irrigation system. This functions to suck water from the water source; that is, primary well. Average diesel possess is one unit with initial costRp 2,130,227,- and has depreciation cost as muchRp 142.015,-/year.

Influence of Joint-well toward Production Risk

This research study focuses on production risk of sweet potatoes farming owing to the use of joint-well technology. The risk analysis used in two stages; first, production analysis using double-regression to see the big influence of joint-well toward production. Secondly, the risk analysis to know the big influence of joint-well toward farming production risk.

Sweet potatoes commodity cultivated on rainy season, dry season 1 and dry season 2. How major influence of joint-well as well as the risk value can be seen on table 2.

Table 2 Production Risk of Sweet Potatoes in Rainy Season.

Variables	Rainy Season	
	Coefficient	t-Stat
Production		
Joint-well	0.262	4.508***
Windbarier	0.199	2.938**
C	1.921	2.679**
R-square	0.986	
Risk Analysis		
Joint-well	-0.741	-0.241 ns
Windbarier	-6.961	-1.932*
C	119.045	3.134
R-square	0.634	

Table 3 Production Risk of Sweet Potatoes in Dry Season 1.

Variables	Dry Season 1	
	Coefficient	t-Stat
Production		
Joint-well	0.144	3.781***
Windbarier	0.313	7.453***
C	2.293	6.324***
R-square	0.998	
Risk Analysis		
Joint-well	-20.075	-1.777*
Windbarier	-14.485	-1.196 ns
C	188.983	1.613
R-square	0.734	

Table 4 Production Risk of Sweet Potatoes in Dry Season 2.

Variables	Dry Season 2	
	Coefficient	t-Stat
Production		
Joint-well	0.313	3.423*
Windbarier	0.258	2.924*
C	3.479	4.467*
R-square	0.996	
Risk Analysis		
Joint-well	-13.69	-
Windbarier	1.14	0.215 ns
C	70.84	1.149
R-square	0.855	

Table 2, 3 and 4 shows major coefficient as well as significant level over joint-well variable. Production analysis result, show that on rainy season, dry season 1 and dry season 2 concludes that joint-well significantly influences level of sweet potatoes production with significant level between 95% until 99%. Such situation due perhaps to, on all season, the needs of water for crops has been mostly fulfilled by joint well.

The result of risk analysis shows that, on rainy season, joint-well has non-significant influence. The significant level on dry season 2, it is so significant that trust level be 99%, while on dry season 1 the significant level only 90%. The major influence of joint-well toward sweet potatoes production risk on dry season 1 and dry season 2 are 20.07 % and 13.69% out of the total production.

Conclusion

a. Technology of joint-well is an alternative one in terms of irrigation system applied on marginal lands (coastal) with technique using concrete bus set lined and connected with pipes to fill water from water pump or diesel into the concrete bus.

b. Joint-well influences the production risk of sweet potatoes farming on the dry season 1 and dry season 2 as much as 20.07 % and 13.69%out of the total production.

Remarks

a. Well proven technology of joint well have a good function in water supply, so the technology of joint-wells needs to introduce to the community and developed to optimize the farming of coastal land

b. Joint-well technology is applicable; still, further studies needed in order that its usage be more efficient as the initial capital of procuring tools and operations is quite expensive.

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