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"Fostering Agropreneurship for Food Sovereignty"

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Universiti Putra Malaysia (UPM)

in collaboration with

Universitas Brawijaya (UB)
Universitas Jember (UNEJ)
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20.	AST09P	Aris Slamet Widodo	The Influence of Irrigation System and Windbarier toward Farming Production Risk of Red Chili on Coastal Land in Indonesia	Universitas Muhammadiyah Yogyakarta

The Influence of Irrigation System and Windbarier towards Risk Production of Red Chili Farming on Coastal Land in Indonesia

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Abstract

Coastal land is so vulnerable to erosion caused either by water or wind leading to raising sea water, coastal abrasion, sedimentation, and excessive erosion. These problems caused the high risk in farm production on coastal lands. Previous study indicated that risk in coastal land farming could be minimized by farming windbarrier and providing irrigation system (joint-well). This aims of this study is to determine the impacts of windbarrier and joint-well (irrigation system) towards risk production of chili farming on coastal lands.This research study used survey method on coastal land in Sanden District, Bantul Regency. The analysis technique used was analysis risk using software program of EVIEWS to regress production function similarity by the method of maximum likelihood estimation. The analysis was used in two stages namely production analysis using double regression to know the big influence of windbarrier and joint-well on production. Both risk analyses were to know the big influence of windbarrier and joint-well on risk farming. In the production function of coast-land conservation farming, there were four independent variables. They were labors, capital, joint-well, and windbarrier. The main thing required attention in this analysis was the amount of coefficient and the level of significance on conservation variable namely windbarrier and joint-well. Research findings explained that coastal land chili production was influenced by production input (seed, fertilizer NPK, dung, labor) and conservation variable namely windbarrier and joint-well. Observation findings showed that windbarrier variable consisting of evergreen shrimp (CasuarinasEquisetifolia) and irrigation system by joint-well were variables that must be available before cultivating red chilies. On red chili commodity in the dry season 1, in analyzing production windbarrier variable was significant with the trust level of 95%, while the joint-well variable was not significant. The result showed that if the input (windbarier) had been added by 1% with ceteris paribus assumption, it would have caused increased chili production as much 0.238% of the total production. While adding 1% of joint-well, it did not make production increase. Risk production analysis of red chili in the dry season 1 showed that windbarier variable in dry season 1 was significant on the trust level of 99% with coefficient value (-) 14,051%, thus increased windbarrier number as much 1% could minimize risk as much as 14,051%. Red chili production in the dry season 2 was influenced by the presence of joint-well or windbarrier being significant on the trust level of 95%. The high influence of windbarrier and joint-well variables was as much 0,148% dan 0,290% of the total production for each 1% adding windbarrier and joint-well. Risk production analysis of red chili in the dry season 2 was only influenced by windbarrier variable being significant on the trust level of 95% with coefficient value (-) 28.21 %, thus increased windbarrier number as much 1% could minimize risk as much 28.21 %. Chili plants, apparently, could be cultivated on coastal land. To grow it well, however, conservation farming on coastal land was needed by cultivating windbarrier, joint-well, and dung to lessen damage risk due to sea water and wind erosion as well as the lack of soil nutrient.The research findings showed that windbarrier was significantly influential toward production and risk in chili farming on coastal land. Thus, it is suggested that the chilli farmers on coastal land to pay more attention to windbarrier readiness before cultivating chili plants.

Keywords: Risk, Farming, Chili

THE INFLUENCE OF IRRIGATION SYSTEM AND WINDBARIER TOWARD FARMING PRODUCTION RISK OF RED CHILI ON COASTAL LAND IN INDONESIA

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Introduction

Coastal land is so vulnerable to erosion caused either by water or wind leading to raising sea water, coastal abrasion, sedimentation, and excessive erosion. This causing the high risk production in farming coastal lands. According to Sukresno (2000) that farming coastal land risk could be minimized by farming *wind barrier* and providing irrigation system (*joint-well*).

Based on the resolution of Minister of Marine Affairs and Fisheries about general guideline of integrated coastal management planning and Act No.5 year 1990 about conservation of biological natural resources and the ecosystem; as well as the importance of coast being rich of natural resources and environmental services, the use of coastline has to do with good and right and able to double function. The double function means that the coastal land management not only functions as wind barrier but also functions to raise income by farming suitable crops and economic value (Triatmojo, 1999).

One of superior horticulture crops many done by the farmers on coastal lands in Bantul Regency were chillies *(Capsicum annum L)*. Based on the data of *Central Agency on Statistics* of D.I.Yogyakarta year 2014 that chilies production year 2013 worth 17,13 thousand tons and thus the production increased as many as 677 tons (4.11%) compared to that of year 2012. The increase was caused by the rising of extent harvest as much as 5.03 % despite decreasing productivity as many 0.05 ton per ha (0.82%) compared to that of year 2012.

Red chili pepper many done on coastal lands particularly in Sanden District, Bantul Regency. However, the coast condition being vulnerable with erosion due to the water and wind speed, salt vapor, sandy land with low organic element would impact on production. Based on the background knowledge, this research study aimed to know the impacts of windbarrier and joint-well (irrigation system) toward risk production as well as farming chili production on coastal lands in Bantul Regency.

Methodology

This research study used survey method on coastal land in Sanden District, Bantul Regency. The analysis technique used was analysis risk using software program of EVIEWS to regress production function similarity by the method of *maximum likelihood estimation*. The analysis was used in two stages namely production analysis using double regression to know the big influence of windbarrier and joint-well on production. Both risk analyses were to know the big influence of windbarrier and joint-well on risk farming.

The equation for estimating the value as follows:

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

$$\ln \mathbf{e}^2 = \beta_o + \beta_1 \ln K + \beta_2 \ln L + \beta_3 \ln SR + \beta_4 \ln WB + ŋ$$

Annotation:

Q = production K = capital (Rp) L= labour (HOK)

SR = joint-well (unit) WB = windbarrier (unit)

Results & Findings

Research findings explained that farming technology of coastal land cultivation had apparently been able to give good results, however, the condition of wind speed and salt vapor frequently destroyed farming crops (Chalifah A., 2006).

This could be understood considering that coastal land had shortage namely soil texture that porous, poor nutrient, and organic substance as well as high soil temperature because of open condition besides the presence of strong wind carrying salt particles being not good for the growth of plants and livestocks. The high destruction of coastal land area, the government and farming society attempted to conserve by cultivating windbarriers. Some windbarriers were evergreen shrimp, terecede, *kolonjono,* and corn.

Other conservation farming was by using joint-well functioning as water receptable arranged lined up and connected with paralon or pipe. Water needed by the plants in the photosynthesis process and plant physiology in adequate amount. The high porosity due to sandy soil nature and the strong wind causing the high plants transpiration as well as the salt vapor from the sea water attached to the plants mad water element must always be available. Salt attached leaves enabling plasmolysis. It was a process of liquid mass flow inside the plant getting out through leaves stomata.

Assessment Institute for Agriculture Technology of Yogyakarta (2006) informed that joint-well referred to water tubs and usually made of concrete bus functioned to ease and juxtapose irrigation in farming. The working mechanism of the joint-well was the concrete bus put lined up with range of 8 – 10 m and immersed in the farming land.

Underneath concrete bus was casted with concrete cover and made impermeable, then among concrete buses were connected with paralons. The paralons should be immersed underground in order not to be exposed with sunlight so that more durable. The filling system was the farmer to take water from the water sources (ground-well, river) using diesel/machine and to insert it into one of the wells until all filled. The farmers watered the plants using *gembor* and taking water from the joint-well. The joint-well were durable ranging from 20 - 30 years, by regular maintenance particularly changing paralons in every 5 years.

Red chili *(Capsicum annum L.)* was main crop cultivated by the coastal land farmers in Bantul Regency. Data from *Central Agency on Statistics* of D.I.Yogyakarta by the year 2012 informed that red chili production in Bantul Regency in 2013 gained 17.13 thousand tons and mostly cultivated on coastal land in Sanden, Kretek, and Srandakan Districts.

Coastal land farming, especially on sandy areas, had average productivity more than that in general in Bantul Regency, namely 10.9 tons/ha. The condition inferred that coastal land had physical condition suitable to chilies growth. Field information gained from the head of coast-land farmers group of Sanden District, Mr.Subandi, that on good weather coast-land red chili could produce 20 – 25 tons per hectare. The average productivity difference was likely influenced by the high risk farming value.

Farming red chili on coastal land cultivated in dry season 1 and dry season 2. In the rainy season, the farmers did not cultivate red chili due to the high risk of weather or natural factors. Farming cost of red chili in the dry season 1 was commonly lower than that in the dry season 2. Procurement seeds cost in the dry season 2 was as much Rp 140.814,23 (10,63 USD). The high cost of procurement seeds in the dry season 1 was caused by high cost of seeds due to the high demand and the increased number of seeds per area because some seeds were used to tatting caused by the damaged seeds by the weather (wind and heat). Seeds variety frequently used were variety of TM 999. The high usage of fertilizer Nitrogen (N), Fosfat (P), Kalium (K) could be seen on the following table.

The fertilizer N usage either in the dry season 1 or that in dry season 2 was still under Standard Procedure Operating (SPO) of cultivating red chili on coastal land having arranged by the Agriculture Agency of Kulonprogo Regency by the year 2009. The dry season 2 was noted as the mostly using fertilizer, when element N gained 37,99 kg and K gained 37,61 kg, and remained under SPO while in the dry season 1 as much 16,22 while that in the dry season 2 as much 37,61 kg. Field observation found that in the dry season 2, the farmers fertilized repeatedly even up to 6 times. This was caused the fear of nutrient element shortage and competing plants physical growth among the farmers as well as expectation in order the plants to be capable of bearing fruit longer. Such expectation became important, because in the dry season 2, many farmers, even in other areas, cultivated red chili so that the price frequently decreased. The price would increase again when the chili harvest and the chili amount in the market started to reduce. This became the farmers' expectation to gain better pricing.

Dung/manure was gained from livestock waste of cow, goat, and chicken being the main input in need in the dry season 1 as much 6.036,6 kg/ha and 8.564,6 kg/ha in the dry season 2. The amount of dung in the dry season 2 was intended that it was actually not only for use in the dry season 2, but was also for use in the following rainy season. Irrigation cost gained from gasoline in the dry season 1 was just worth Rp 83.221,34,- (6,28 USD) while that in the dry season 2 rised to Rp 270.000,- (20,38 USD). The extremely dry condition and the increased wind speed carrying salt vapor in the dry season 2 made the farmers water the plants repeatedly. Besides, the farmers' expectation to lengthen chili plants production made watering cost higher.

Labors became the highest production cost in farming red chili both in dry season 1 and that in dry season 2 worth 38.7 HKO or Rp 1,161,106.72 (87,63 USD) and 46.42 HKO or Rp 1,392,650.71 (105,11 USD). The farmers mostly employed family-labor, while on certain works employed outsider-labor like building beds and cultivating with wages as much Rp 30.000,-/ HOK (2,26 USD/ working days). A like other farming cost, it was higher in dry season 2 than that in dry season 1. Natural condition getting hard especially the wind speed, the crowd of farmers cultivating red chili and the expectation of mass production longer in dry season 2 led to increased use of labors. Field condition explained that actually the farmers activity in the farming land was not only related to farming red chili but was also related to windbarrier maintenance or looking for animal feed.

The farmers income was the result of times the production with the price. The different income in both seasons was highly determined by pricing difference worth Rp 5,500,- /kg (0,415 USD/ kg) in dry season 1 and that worth Rp 5.000,-/kg (0,377 USD/ kg) in dry season 2. The price was average price during harvest in both seasons. The pricing fluctuation would influence on farming chili income. The low farming access in determining price and the feast of harvest in several other areas made price decreased in dry season 2.

Coast-land chili production was influenced by production input (seed, fertilizer NPK, dung, labor) and conservation variable namely windbarrier and joint-well. Observation findings showed that *windbarrier* variable consisting of evergreen shrimp *(Casuarinas Equisetifolia)* and irrigation system by joint-well were variables must have been before cultivating red chilies.

In the production function of coast-land conservation farming, there were four independent variables. They were labors, capital, joint-well, and windbarrier. The main thing required attention in this analyisis was the amount of coefficient and the level of significance on conservation variable namely windbarrier and joint-well. On red chili commodity in the dry season 1, in analyzing production windbarrier variable was significant with the trust level of 95%, while the joint-well variable was not significant. The result showed that if the input (*windbarier)* had been added by 1% with ceteris paribus assumption, it would have caused increased chili production as much 0.238% of the total production. While adding 1% of joint-well, it did not make production increase.

Table. Results of Risk Analysis of Farming Production on Coastal land

Variable	Season 1		Season 2	
	Koefisien	t-hitung	Koefisien	t-hitung
Production Analysis				
Joint-well	-0,036	-0,228^{ns}	0,148	2,498**
Windbarier	0,238	2,116**	0,290	3,109**
Konstanta	3,832	16,796***	3,204	5,224***
R-square	0,980		0,998	
Risk Analysis				
Joint-well	6,856	1.704^{ns}	27,67	2,426^{ns}
Windbarier	-14,051	-12,065***	-28,21	-2,488**
Konstanta	51,841	7,105	-152,57	-1,668
R-square	0,892		0,840	

Annotation: ns = Not significantly different at the real level of 90%.
* = Significantly different at the real level of 90%
** = Significantly different at the real level of 95%
*** = Significantly different at the real level of 99%

Risk production analysis of red chili in the dry season 1 showed that windbarier variable in dry season 1 was significant on the trust level of 99% with coefficient value (-) 14,051 %, thus increased windbarrier number as much 1% could minimize risk as much 14,051%.

Red chili production in the dry season 2 was influenced by the presence of joint-well or windbarrier being significant on the trust level of 95%. The high influence of windbarrier and joint-well variables was as much 0,148% dan 0,290% of the total production for each 1% adding windbarrier and joint-well. Risk production analysis of red chili in the dry season 2 was only influenced by windbarrier variable being significant on the trust level of 95% with coefficient value (-) 28.21 %, thus increased windbarrier number as much 1% could minimize risk as much 28.21 %.

Originality & Contribution

Chili plants, apparently, could be cultivated on coastal land. To grow it well, however, conservation farming on coastal land was needed by cultivating windbarrier, joint-well, and dung to lessen damage risk due to sea water and wind erosion as well as the lack of soil nutrient.

The research findings showed that windbarrier was significantly influential toward production and risk chili farming on coastal land. Related to this, it is suggested that the farmers of chili on coastal land to pay more attention to windbarrier readiness before cultivating chili plants. This research study was the first and had never been studied by other researchers in terms of coastal land farming in Sanden District, Bantul Regency.

Keywords : risk, farming, chili