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Editorial Preface

Developing sustainable and competitive agro-industries is very crucial for improving human welfare. It has enormous potential to provide employment in on-farm as well as off-farm areas. Such agro-industrial activities as producing, processing, handling, packaging, transporting, marketing and distribution of food and agricultural products provide opportunities for the involved people in generating incomes. Therefore, it cannot be denied that agro-industrial activities contribute to economic development and poverty reduction. However, as the growth of world's population is much higher than that of food and agricultural product availability, problem of food and agricultural product scarcity may arise in the future. Such scarcity might be related to lack of its quantity, quality and uneven distribution or supply chain problems.

Lack of quantity of food and agricultural products can be attributable to climate change that brings about drought risk, shifting crop cycle, productivity loss, and degradation of water resources as well as soil fertility. Lack of good quality of food and agricultural products might result from poor quality control and management, inappropriate processing technology or handling methods. Uneven distribution or supply chain problems might be connected with geographical obstacles among regions or countries, but providing global trade opportunities. In relevant to such issues, sustainable and competitive agro-industries should be able to cope with food security and food safety problems without exacerbating environmental destruction that already exists today. Sustainable agro-industries ought to be environmentally friendly, safely and be conducted efficiently and effectively for the sake of human welfare. This can be achieved by innovating technology and better management on food, energy and environment.

In this Second International Conference on Agro-industry (2nd ICoA), we invited researchers, academicians, scientists, students, and practitioners from all over the universities and research institutions to participate and share their latest research findings, developments and applications related to the various aspects of agro-industry. Taking venue at Faculty of Agriculture, Ehime University Matsuyama Japan, on 7-9 November 2015, the conference has successfully arranged a fruitful discussion based on all of the presented papers. Following up the conference, the committee has reviewed and selected potential papers in making contribution to the development of sustainable and competitive agroindustry, all of which are compiled in this proceedings.

The participation in this seminar will not only build and develop research in agroindustry fields but also give benefits to many institutions and universities in assisting designing, negotiating and implementing many aspects of research progress, making them go further in research cooperation or collaboration. This seminar will also assist us in sharing experience, learn from each other and at some point create good network in the future.

At last, we would like to extend our sincere gratitude to our colleagues from Faculty of Agriculture, Ehime University Japan, especially to Prof. Nishina Hiroshige (the Vice President of Ehime University), who were willing to spend their valuable times hosting this international conference in such a way that it ran smoothly and successfully. The significant supports from the Department of Agro-industrial Technology Universitas Gadjah Mada, Department of Agro Industrial and Technology Kasetsart University, Association of Agro-industrial Technologist Profession (APTA) Indonesia are also indispensable resources for sustaining this annual conference. We believe that ICoA 2015 is able to bring out benefits to all participants in particular and to the development of agro-industry in general.

Yogyakarta, December 15, 2015

General Chair of ICoA 2015

Dr. Adi Djoko Guritno

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The Influence of Risk Production Level toward Optimization Conservation Farming at Coastal Land in Yogyakarta Special Province, Indonesia

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Abstract

This research study aimed to analyse the influence of joint-well irrigation technology and wind-barrier vegetation to the risk-production as well as to analyse the optimum resource allocation of conservation farming at coastal land influenced by risk-production.

The research method applied in this study was a survey method. The location of study was along Samas coastal line in Yogyakarta Special Province, Indonesia. The risk-analysis technique used was maximum likelihood estimation method. The analysis of optimizing done by linier programming method by concluding variable of risk-production (windbarrier and joint-well irrigation technology).

The research findings concluded that conservation farming at coastal land was that farming done at coastal land aiming to get farming profit and conserve coastal land by cultivating windbarrier plants and providing joint-well irrigation system as well.

The analysis of risk-production concluded that variable of windbarrier on rainy season could significantly decrease risk-production against cultivating shallots worth 29.92%, eggplants worth 14.99%, and sweet potatoes worth 6.96% for every adding 1% of windbarier unit, while variable of joint-well only influenced toward risk-production on farming eggplants worth 2.61%. On rainy season 1, variable of joint-well influenced risk-production toward farming shallots worth 18,67% and sweet potatoes worth 20.07%, while variable of wind-barrier influenced significantly toward the farming shallots worth 21.63%, red chillies with 14.05% and sweet potatoes with 4.16%. On dry season 2, variable of joint-well only influenced risk-production on farming sweet potatoes with 13.69%, while variable of wind-barrier only infuenced farming shallots worth 28.21%.

Allocation of conservation farming resources at coastal lands by concluding variable of risk-production (wind-barier and joint-well irrigation technology) has been optimal. Maximum income earned by farmers was Rp 11,647,110.-/year.

Key words: *optimising, risk-production, conservation farming, coastal land.*

1. INTRODUCTION

Farming means activities of business in terms of agriculture susceptible with risks. Source of uncertainty of farming commonly comes from variables of price and productivity. Both variables have high risk because if price and production change, thus income earned also change. Considering risk becomes very important in evaluating various farming, especially farming at marginal land.

Coastal land belongs to marginal land, namely land having limitation to the allocation. Coastal land farming has risk-production due to erosion caused by wind or sea water. One of the problems at coast in terms of climate is the rise of sea water able to make coastal abrasion, sedimentation and erosion excessive (Dahuri R, Rais Y, Putra S, G, Sitepu, M.J, 2001).

Impacts of sand erosion are : 1) The land at coastal land rough textured and wreak off so susceptible that against wind erosion., 2) erosion resulting sand dune able to cover agricultural cultivation area and settlement on the back, 3) granular sand salt brought in wind erosion process can damage and lower cultivation productivity. This makes sandy coastal land be critical and thus need immediate treatment (Triatmodjo, 1999; Tim UGM, 1992, Haryadi B., 2009; Suryanto, 1996 dalam Budiyanto, dkk., 2005).

Sukresno (2000) has made technical guideline of coastal land usage in conservation farming context. The technical guideline is by

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cultivating plants of wind barrier, providing irrigation system as well as manure. The conservation is pre-requisite in minimizing farming risk.

Every farming activity, rational farmers will always think how to allocate input resource as efficient as possible to pursue maximum output (Debertin, 1986; Beneke, R.R. and R. Winterboer., 1973; Soekartawi, 1990). Such mindset with maximization profit approach. This condition explains that farming problems at coastal land susceptible with risks, however, farmers keep striving to maximize profit be real condition in the field.

Based on that condition, the aim of this research study was to analyze allocation of optimum resources by including the risk variable of conservation farming at coastal lands.

2. METHODOLOGY

The research method applied in this study was a survey method. The site of this study was purposively determined covering the areas along Samas coastal line at Bantul Regency of Yogyakarta Special Province, Indonesia.

This research used linier programming method to find optimization of Coastal land conservation farming focusing on activity role of conservation factors, specifically plants of *windbarier (Casuarina equisetifolia)* and irrigation system (wells severally) approached with farming risk-value on attempt to maximize net income of farming. The value was achieved from analysis of farming risk using MLE (*maximum likelihood estimation*) method.

$\ln Q = \alpha_o + \alpha_1 \ln K + \alpha_2 \ln L + \alpha_3 \ln SR + \alpha_4 \ln WB + e$ (1)

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

$$\frac{\partial e2}{\partial SR} = \beta 3.\frac{1}{SR} \quad (3) \qquad \frac{\partial e2}{\partial WB} = \beta 4.\frac{1}{WB} \quad (4)$$

Annotation:

Q = production
SR = joint-wells (unit)
K = capital (IDR)
WB = *windbarier* (unit)
L = labor (HOK)

3. RESULTS AND DISCUSSION

3.1. Cropping Pattern

Farming Pattern done by farmers of coastal lands was a combination among horticultural and food-crops (onions, red chilies, eggplant**s**, and sweet potatoes) with business of cattle, such as cows goats, and poultry as supplier of organic fertilizer and attempting conservation plants, especially cypress crayfish and provision of irrigation system of joint-well to minimize farming risk.

Farming crops do not only function as farmers' income source, but also function as supplier of animal feeding by using crop waste either forage or dry and some others as mixture of organic fertilizer that will be mixed with manure. Animal feed instead of crop waste, also from grass or forage many grow on embankment or empty land. Business of cattle functions not only as family saving or income source of farmers', but also functions as supplier of animal feeding for crops cultivation. Livestock business of cows, goats, and chickens is the most common kinds of cattle by Coastal lands farmers. Based on respondents' data, there were 71 cows ($\bar{X} = 0.65$), 107 goats ($\bar{X} = 0.97$) and 262 chickens ($\bar{X} = 2.38$) among 110 samples.

Fir shrimp *(Casuarinas Equisetifolia)* refers to main plant in terms of Coastal lands conservation. The *Casuarinas Equisetifolia* completely slows down air speed which frequently destroys plants behind them. The *Casuarinas Equisetifolia* is planted along the Coastal near Coastal line. The *Casuarinas Equisetifolia* functions as *wind barrier* plants, whose existence must be useful for sustainable either farming-plants or livestock. The relation between *Casuarinas Equisetifolia* and horticulture farming and or food is as an attempt to minimize risk for damage possibilities happened to plants cultivation due to the wind. Sea breeze potentially increases transpiration, physical damage, entrainment sandy particles, and salt water vapor**.**

Water is needed by plants in the process of photosynthesis or plant physiology in adequate amount. High porosity due to sandy-land characteristics and the height of wind speed causing high transpiration of plants as well as salt water vapor from sea water attached on crops force element of water should always be available. Salt adhering on leaves enables plasmolysis. Irrigation system of joint-well is one of irrigation systems many done by farmers.

Balai Pengkajian Teknologi Pertanian Yogyakarta (Study Center of Agricultural Technology of Yogyakarta) (2006) explains that joint-well means water sumps and usually made of concrete bus, functioning to juxtapose and ease farming irrigation. The needs of joint-well on the lands of $1000m^2$ average needed 10 - 15 concrete bus units. Working mechanism of joint-well is that concrete bus put in a row within 8 - 10 m and then embedded in the farming lands. Underneath of the concrete bus is casted with concrete bus cover and made impermeable**,** and then among concrete bus joined with pipes. 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 joint-wells fully filled. The farmers do water the cropping by taking water from joint-well by using buckets.

3.2. Analysis of Farming Income

The farmers' income earned from horticulture activities. In the rainy season farmers plant onions, eggplants, and sweet potatoes, while those on dry season 1 are onions, red chili, and sweet potatoes. Especially on dry season 2, the farmers only plant red chili, and sweet potatoes. Average land area ranging from 0.3 - 0.5 ha.

Table 1. Analysis of Farming Income in the Coastal Land, Yogyakarta, Indonesia, 2012.

	Variables	Total Revenue (IDR)	Total Cost (IDR)	Income (IDR)
Rainy Season	Onion	**5,265,118.30**	**3,038,462.86**	**2,226,655.44**
	Eggplant	**2,034,875.92**	**1,813,423.70**	**221,452.22**
	Sweet Potato	**3,561,056.60**	**2,285,048.20**	**1,276,008.40**
Dry Season 1	Onion	**5,189,622.00**	**3,450,832.44**	**1,738,789.56**
	Red Chili	**6,034,930.00**	**1,966,328.55**	**4,068,601.45**
	Sweet Potato	**2,755,991.40**	**2,049,069.49**	**706,921.91**
Dry Season 2	Red Chili	**5,467,700.00**	**2,870,406.41**	**2,597,293.59**
	Sweet Potato	**4,409,392.00**	**1,995,870.06**	**2,413,521.94**

Source: the primary data processed

3.3. Analysis of Farming Risk

Risk analysis with risk function in this study is needed to know marginal effect from joint-wells and *windbarier* existence namely how many activities of conservation variables (*windbarier* and joint-wells) needed to neutralize loss/farming risk**.**

Table 2. Magnitude of influence value of Joint-wells variable against production (α) and risk value of Coastal land farming (β).

	Production	Joint-wells			
		$\propto$	β	$\frac{\partial e2}{\partial SR}$	$\frac{\partial Q}{\partial SR}$
Rainy Season					
Onion	8,589.11	-	-	-	-
Eggplant	9,438.23	0.167	-2.613	**-0.29**	**175.13**
Sweet Potato	12,855.80	-	-	-	-
Dry Season 1					
Onion	9,104.60	0.501	-18.6	**-2.08**	**507.47**
Red Chili	10,972.63	-	-	-	-
Sweet Potato	14,391.62	0.144	-20.0	**-2.23**	**230.38**
Dry Season 2					
Red Chili	10,935.40	-	-	-	-
Sweet Potato	15,204.75	0.313	-13.6	**-1.52**	**530.10**

Source: the primary data processed

Table 3. Magnitude of influence value of Windbarier variable against production (α) and risk value of Coastal land farming (β).

	Production	*Windbarier*			
		$\propto$	β	$\frac{\partial e2}{\partial WB}$	$\frac{\partial Q}{\partial WB}$
Rainy Season					
Onion	8,589.11	0.392	-29.92	**-3.74**	**420.86**
Eggplant	9,438.23	0.294	-14.99	**-1.87**	**346.85**
Sweet Potato	12,855.80	0.199	-6.96	**-0.87**	**319.78**
Dry Season 1					
Onion	9,104.60	0.646	-21.63	**-2.70**	**735.43**
Red Chili	10,972.63	0.346	-14.05	**-1.76**	**475.13**
Sweet Potato	14,391.62	-	-	-	-
Dry Season 2					
Red Chili	10,935.40	0.244	-28.21	**-3.53**	**334.67**
Sweet Potato	15,204.75	-	-	-	-

Source: the primary data processed

Magnitude of influence value of conservation variables against production (α) and risk value of Coastal land farming in this optimization study assumes that farming risk that can be handled or minimized by conservation factors is only 50%. Related to the assumption so that all risk values that will be used in the optimization analysis also using *linear programming* within 50% from the real risk value.

3.4. Optimal Resource Allocation of Conservation Farming

Maximum net income on each season earned by the farmer from the use of optimal resource in each activity. The kind of activity on each season is mainly the same, while the difference is only on the kinds of cultivated plants. On rainy season, there are three commodities; they are onion, eggplant, and sweet potato. The resource of farming land on the rainy is 0.1 ha as well as the optimal allocation is farming onion within 0.052 ha, 0.032 ha for eggplant, and 0.016 ha for sweet potato. While the result of another resource allocation is shown on table 4.

Table 4. Optimal Resource Allocation of Coastal Land Conservation Farming

No	Activities	Optimal Resource Allocation		
		Rainy Season	Dry Season 1	Dry Season 2
1	Onion(Ha)	0.052	0.022	
2	Red Chili (Ha)		0.022	0.062
3	Eggplant (Ha)	0.032		
4	Sweet Potato (Ha)	0.016	0.051	0.038
5	Cow	0.650	0.650	0.650
6	Goat	0.970	0.970	0.970
7	Chicken	2.38	2.38	2.38
8	Windbarrier (branch)	2.941	2.941	2.941
9	Joint-well (unit)	9.577	2.635	6.605
10	Buying Feed (kg)	0.000	0.000	0.000
11	Organic Fertilizer (Kg)	267.174	267.174	267.174
12	Buying element N (Kg)	18.769	23.139	22.907
13	Buying element P (Kg)	13.253	15.359	16.082
14	Buying element K (Kg)	11.606	16.679	24.098
15	Paying Labor (HOK)	0.000	0.000	0.000
16	Selling Onion (kg)	449.028	196.644	
17	Selling Red Chili (Kg)		239.117	679.302
18	Selling Eggplant (Kg)	299.343		
19	Selling Sweet Potato (Kg)	205.758	734.083	575.962

Source: the primary data processed

Magnitude of farmer's income is not only from farming plants, but is also from cattles; they are cows, goats, and chickens. Based on the analysis finding of *Linier Programming* of resource optimal allocation for the cow worth 0.65**,** the goat worth 0.97, and the chicken worth 2.38.

Table 4 informs that magnitude of optimal resource allocation for windbarier is within 2.94 plants (*casuarinas*). The number of *windbarier* on each season is the same. Meanwhile, the magnitude of *windbarier* influence against the plants on each season is not always the same depending on the magnitude of risk value from one unit of *windbarier* as well as the magnitude of influence from one unit of *windbarier* against production on each commodity.

The activities are supplying animal feed and producing organic fertilizer. Both activities are related; i.e they become connectors between farming activity and livestock one. Situation in the filed shows that livestock is done independently; however, cage management is done jointly. Animal feed, as an important element in cultivating cattle, is gained from farming waste, such as sweet potato leaves and the branches, straw, and grass well. The optimal value of buying animal feed is 0.00, meaning that the feed amount provided from the farming land (3,500 kg/season) is sufficient to feed-supply, so it needs not to buy.

Important role of cattle in the farming activity on sandy Coastal land means as supplier of dung that will be processed as organic fertilizer. The function of organic fertilizer is as supplier of nutrient for plants, especially macro element namely N, P, and K and also able to fix the land texture by holding or distilling water to be longer, so that humidity is protected. Magnitude of optimal activity value of organic fertilizer is 267.174 kg/season. The value is achieved from the number of cattles maintained by the farmers for 4 months or 1 season. The production number of organic fertilizer will affect the stock number of macro fertilizer element fulfilled by organic fertilizer.

Table 4 shows that the farmers still have to buy fertilizer element of N, P and K with different amount on each season for much dependent on the commodity as well as the land area. Based on the optimal situation, thus it can be concluded that organic fertilizer can minimize the outcome of supplying cost for fertilizer on Coastal land farming.

The labor activity measured by HOK unit (workdays) having allocation value of farming resource within 0.00 HOK. The value informs us that family-labor which is average on 2.7 HOK (324 HOK/season) can fulfill the need of labors on farming, cattle, organic fertilizer production, maintenance of *windbarrier* and joint-wells.

4. CONCLUSION

a. Windbarier and joint-wells have influence production and risk of farming activity. The increase of Windbarier and joint-wells will increase production, however, decrease risk of farming.
b. Farmers have optimal allocation resources of farming and earn about Rp 11,647,11. Maximum income can be achieved when:
    1) On rainy season, there are three main commodities i.e. red onions, eggplants,

and sweet potatoes. Resources of farming lands on rainy season 0.1 ha and optimal allocation is by planting red onions on area of 0.052 ha (52%), eggplants of 0.032 ha (32%), and sweet potatoes of 0.016 ha (16%).

2) On dry season 1, optimal allocation of farming resource is by planting red onions on area of 0.022 ha (22%), eggplants of 0.022 ha (22%), and sweet potatoes of 0.051 ha (51%).
3) On dry season 2, optimal allocation of farming resource is by planting red onions on area of 0.062 ha (62%) and sweet potatoes of 0.038 ha (38%).

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