

# Strategy in Controlling Rice-Field Conversion in Pangkep Regency, South Sulawesi, Indonesia

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**Abstract**—The national rice consumption keeps increasing along with raising income of the households and the rapid growth of population. However, food availability, particularly rice, is limited. Impacts of rice-field conversion have run cumulatively, as we can see on potential losses of rice and crops production, as well as work opportunity that keeps increasing year-by-year. Therefore, it requires policy recommendation to control rice-field conversion through economic, social, and ecological approaches. The research was a survey method intended to: (1) Identify internal factors; quality and productivity of the land as the cause of land conversion, (2) Identify external factors of land conversion, value of the rice-field and the competitor's land, workforce absorption, and regulation, as well as (3) Formulate strategies in controlling rice-field conversion. Population of the research was farmers who applied land conversion at Pangkep Regency, South Sulawesi. Samples were determined using the incidental sampling method. Data analysis used productivity analysis, land quality analysis, total economic value analysis, and SWOT analysis. Results of the research showed that the quality of rice-field was low as well as productivity of the grains (unhulled-rice). So that, average productivity of the grains and quality of rice-field were low as well. Total economic value of rice-field was lower than the economic value of the embankment. Workforce absorption value on rice-field was higher than on the embankment. Strategies in controlling such rice-field conversion can be done by increasing rice-field productivity, improving land quality, applying cultivation technique of specific location, improving the irrigation lines, and socializing regulation and sanction about the transfer of land use.

**Keywords**—Land conversion, quality of rice-field, land economic value, strategy in controlling.

## I. PREFACE

**T**RANSFER of land use on rice-field was caused by the increasing rate of economic development, reducing quality of farming land and land rent of rice-field, which is always below other economic sectors. Due to economic growth, the demand of land for developing infrastructures, such as roads, buildings, settlements, and other non-agricultural sectors have increased. As a result, more rice-fields have transferred into non-farming uses [18]. However, among the agricultural sectors, less intensive rice-field [4] has transferred its land use into other crops. Such transfer of land use has also triggered the farmer to be inconsequential farmer by land ownership is less than 0.5 hectare on average [5], [9].

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The transfer of rice-field conversion into non-agricultural uses, such as for industrial area, settlements, trading centers, and public facilities, have created negative impacts on economy, social, and environment [10]. Rice-field conversion has become a serious threat on food security. It means that potential losses of production for rice and crops, work opportunity, and environmental damages may increase year-by-year, and the transfer of land use of rice-field could not be returned into rice-field anymore [11]. Besides that, farmer societies at the village may lose their work opportunities both on-farm and off-farm sectors, so that its contribution may affect, directly and indirectly, on PDRB [19]. Therefore, it requires policy recommendation in controlling rice-field conversion by developing economic and social approaches.

## II. RESEARCH METHODS

### A. Location and Time of the Research

This research identified and analyzed the internal factors (strength and weakness), external factors (opportunity and threat) as causes of rice-field conversion, which was done at Pangkep Regency, South Sulawesi. Location of the research was determined purposively by considering that majority of the farmers have conversed their rice-fields into embankments. The research was conducted from March 2015 to March 2016.

### B. Population and Sample

Populations of the research comprised of farmer owner, cultivators, and fishery breeders. Samples were determined using incidental sampling method, in which the samples were directed to individuals who have held rice-field conversion because no data existed about population of farmers who conversed their rice-fields.

### C. Data Collecting Method

Data were collected using survey method through observation and deep-interview with the respondents using questionnaires. The collected data in this research included primary and secondary data. The primary data were derived from results of the deep-interview using questionnaires, while the secondary data was derived from the related institutions, such as: *Pemda* (local government), *Bappeda* (Agency for Regional Development), Department of Agriculture, Irrigation Service, Agency for Land Affairs, and Literature Study.

### D. Data Analysis

Data analysis used descriptive analysis and inferential statistics analysis. The descriptive analysis was applied to

describe both internal and external factors, which cause such rice-field conversion, land quality analysis [7], [8], [16], and [17], productivity analysis [10], total economic value analysis [3], and SWOT analysis [6], [14].

### III. RESEARCH RESULT

#### A. Characteristics of the Respondents

Based on household characteristics of the respondents, data were obtained concerning with varying ages of the respondents, 49 years old on average. The education levels also varied from uneducated to educated ones.

TABLE I  
VARYING CHARACTERISTICS OF RESPONDENT, 2016

Variable	Range	Mean
Age (year)	28 - 63	49.00
Education (year)	0 - 17	5.21
Dependent of Family (person)	1 - 6	3.82
Experience in rice farming (year)	1 - 40	34.00
Experience in fishery (year)	1 - 44	14.00
Width of rice-field ownership (hectare)	0.1 - 1.5	0.73
Width of embankment ownership (hectare)	0.2 - 6.0	1.91

The respondents are categorized as productive age, 49 years on average, and of course, it affects physical ability and way of thinking of the farmers. Numbers of the family's dependent are 3.82 persons on average (4 persons/Head of Household). Potency of workforces in family is available but unproductive, therefore, it requires additional workforces from outside; particularly for certain activity.

Experience in rice farming is 34 years, on average, longer than experience in fishery because the transfer of land use from rice-field into embankment began in 2005. Width of the rice-field ownership is less than 1 hectare, on average, while width of embankment ownership is 1.91 hectare, on average.

#### B. Rice-Field Quality

Characteristics of the observed land in this research relate to growth requirements of rice, which include: Capacity of cation exchange, base saturation, pH of the soil, and organic carbon of the soil [15]. Index value of land may be obtained by providing weight on land characteristic in accordance with requirements of rice growth based on criteria of [16] and [17]. Results of weighting and index value of land are presented in Table II.

TABLE II  
INDEX VALUE AND LIMITING FACTOR OF RICE-FIELD, 2016

Location	Interval Index of Land	Land Suitability Grade	Limiting Factor
Bontomanai	40.06 - 50.00	S3	N & K
Pundatabaji	34.05 - 46.58	S3	N & K
Manakku	40.25 - 46.68	S3	N & K

Rice-field at location of the research has land suitability grade of S3 (conforms to marginal) with index values of land that ranges 34 - 50. Land suitability grade S3 has moderate limiting factor (2 types) characteristic of soil fertility [1], [13]. However, land productivity may reduce [12] and profit of

farming may be lower as a result of high input of production, which is required for improvement purpose. According to [7], land that has suitability level S3 (conforms to marginal) has more limiting factors and requires additional input/higher capital to improve land quality. Results of analysis for land suitability showed that land quality was lower (less fertile) for rice growth.

#### C. Production and Productivity of Rice

Production and productivity of rice resulted by farmers from rice-field management at three sampled villages at La'bakkang Subdistrict are presented in Table III.

TABLE III  
AVERAGE PRODUCTION AND PRODUCTIVITY OF RICE IN THE RICE-FIELD, 2016

No	Planting Season	Average Land Area (Ha)	Average Production (kg/farmer)	Average Production (kg/hectare)
1.	<i>Rendengan</i>	0.73	2,135	2,933
2.	<i>Gadu</i>	0.73	2,425	3,330
	Mean	0.58		3,131
	Productivity of the Village			5,250
	Productivity of the Regency			6,000

Table III showed that average productivities of rice at location of the research are very low in comparison with productivities at village and subdistrict level. Average value of rice productivity is 3,131 kg/ha, while at the village and subdistrict levels are 5,255 kg/ha and 6,000 kg/ha, respectively [2]. Such condition is one of causes of the farmers to transfer rice-field into embankment by considering that rice-field has no longer profitable in comparison with the embankment based on the economic aspect. Furthermore, farmers did not converse their rice-fields by a reason that the grains production was for household consumption.

#### D. Economic Values of Rice-Field and Embankment

Besides quality of land and grains (unhulled-rice) productivity, other reason that motivates the farmers to transfer the land use is economic value of the competitor's land (embankment is higher than rice farming on the rice-field. Land rent values were counted in accordance with earning and managing cost of rice farming for a year [3]. The farmers have cultivated rice twice in a year by planting pattern of *rendengan-gadu*. Meanwhile, twice spreads in a year have also done in the embankment. Comparison of economic values between rice-field and embankment is given in Table IV.

TABLE IV  
COMPARISON OF LAND RENT BETWEEN RICE-FIELD AND EMBANKMENT, 2016

No	Description	Rice-Field	Embankment
1.	Earning (Rp/ha/year)	25,051,186	31,045,666
2.	Cost of Production (Rp/ha/year)	7,459,226	9,152,918
3.	Land rent (Rp/ha/year)	17,591,960	21,892,748

Based on Table IV, value of land rent for rice is Rp 17,591,960 and value of land rent for embankment is Rp 21,892,748. Economically, farmers who apply the transfer of land use from rice-field into embankment gain more profits 1.24 times than without any transfer of land use. However,

shrimps production from embankment is very lower at present due to high mortality. During dry season, the fishery breeders have used to lay fallow their lands or produce salts.

#### E. Social Aspect of Workforce Absorption

Rice-field and embankment do not only produce food materials, such as rice, crops, fishes, and shrimps, but also absorb more workforces. The economic values of workforce absorption on rice-field and embankment are presented below.

TABLE V  
COMPARISON OF ECONOMIC VALUES ON WORKFORCES ABSORPTION BETWEEN RICE-FIELD AND EMBANKMENT, 2016

Description	Rice-Field	Embankment
Mean of use (HOK/ha/MT)	419	368
Wage (Rp/day)	65,000	65,000
Absorption value (Rp/ha/MT)	1,470,886	572,857

TABLE VI  
DESCRIPTION OF INTERNAL AND EXTERNAL FACTORS ON TRANSFER OF LAND USE IN RICE-FIELD, 2016

Code	Strength (S)	Code	Weakness (W)
S1	Rice farming is the main source of staple for family	W1	Quality of land/soil fertility is low
S2	Rice farmers are more experienced	W2	Rice productivity is very low
S3	Existed farmer group institution	W3	Implementation of culturing technology is low
	Opportunity (O)		Threat (T)
O1	The grains (unhulled-rice) price is stable and tends to increase	T1	Knowledge and socialization of regulation about transfer of land use, are still lower
O2	High mortality of shrimp	T2	Law enforcement is still weak
O3	Land rent of embankment is not significantly different with rice-field	T3	More damaged irrigation lines
O4	Higher absorption of workforce		

Based on Table V, the economic value of workforce absorption for rice-field is 2.56 times higher than for the embankment, which means that rice-field offers greater opportunities to absorb workforce in comparison with the embankment.

#### F. Strategy in Controlling Transfer of Land Use on Rice-Field

Transfer of land use from rice-field into embankment at location of the research has affected the public; therefore, further analysis is required to identify both internal and external factors of such transfer of land use using SWOT analysis in order to formulate the control strategy. SWOT analysis creates two things; internal and external factors. The internal factors comprise of two basic components, strength (S) and weakness (W). The strength factor is condition of the farmer that can be utilized to prevent such transfer of land use, while the weakness is factor that must be improved to prevent the farmers from transfer of land use. The external factor comprises of opportunity (O) and threat (T). The opportunity factor is condition out of rice farming that may be gained if such transfer of land use was not applied, while threat is

condition that threatens rice-field existence or condition that motivates the transfer of land use.

#### G. Analysis on Strategic Factor in Controlling Transfer of Land Use in Rice-Field

Following the identification of internal and external factors, it was continued with analysis on internal and external strategic factors. Then they are presented in Table VII. Table VII shows score difference for internal factors (total S minus total W) as 0.25 and score difference for external factors (total O – total T) as 0.15. Combination of both internal and external factors can be illustrated in quadrant diagram of strategy on transfer of land use, which refers to quadrant II.

Anticipation of land use transferring from rice-field into embankment may face great threat and challenge from the outside even though the farmers still have strength to transfer the land use. Therefore, some efforts are required to prevent the rice-field through various strategies in order to overcome the threatening factors and make them into opportunities. The main threat is no local regulation, which refers to the transfer of land use of rice-field, so that the public interest in transferring the land use of rice-field is getting more difficult to be controlled.

Based on analysis result of internal factors (strength and weakness), the strength aspect has higher scores than the weakness aspect by score difference 0.25, which means that internally, the farmers are still able to control the transfer of land use on rice-field, so that the weaknesses could be overcome immediately. Soil fertility could be improved by applying specific location technology in order to increase productivity of rice farming.

#### H. Arrangement of SWOT Matrix

SWOT analysis has resulted four possibilities of strategy in order to anticipate the transfer of land use from rice-field into embankment as presented in Table VIII. Based on SWOT matrix in Table VIII, 4 (four) alternatives of strategy concerning with policy to control the transfer of land use are given as:

1. Increasing rice productivity by improving land quality, applying rice cultivation technology, and improving the means, especially the irrigation lines.
2. Increasing motivation and eating rice as culture to encourage the farmers to defend their rice-fields as food source of their households.
3. Increasing socialization of regulation and imposing sanction to anyone who has the transfer of land use from rice-field.
4. Increasing roles of the farmer group as socio-economic coordinating institution for the farmers.

TABLE VII  
ANALYSIS ON INTERNAL AND EXTERNAL STRATEGIC FACTORS IN TRANSFER OF LAND USE ON RICE-FIELD, 2016

No	Description	Weight	Rating	Score
1.	Internal Factor			
	Strength (S):			
S1	Rice farming is the main source of staple for family	0.50	4	2.00
S2	Rice farmers are more experienced	0.15	2	0.30
S3	Existed farmer group institution	0.35	3	1.05
	Total S	1.00		3.35
	Weakness (W):			
W1	Low quality of land/soil fertility	0.30	3	0.90
W2	Rice productivity is very low	0.40	4	1.60
W3	Implementation of culturing technology is low	0.30	2	0.60
	Total W	1.00		3.10
	Score difference (total S – total W)			<b>0.25</b>
2	External Factor			
	Opportunity (O):			
O1	The grains (unhulled-rice) price is stable and tends to increase	0.20	3	0.60
O2	High mortality of shrimp	0.40	4	1.60
O3	Land rent of embankment is not significantly different with rice-field	0.20	3	0.60
O4	Higher absorption of workforce	0.20	2	0.40
	Total O	1.00		3.20
	Threat (T):			
T1	Knowledge and socialization of regulation about transfer of land use, are still lower	0.45	4	1.80
T2	Law enforcement is still weak	0.35	4	1.40
T3	More damaged irrigation lines	0.20	3	0.60
	Total T			3.80
	Score difference (total O – total T)			<b>- 0.60</b>

TABLE VIII  
SWOT MATRIX OF STRATEGY IN CONTROLLING THE TRANSFER OF LAND USE ON RICE-FIELD, 2016

	INTERNAL FACTOR	Strength	Weakness
EXTERNAL FACTOR		1. Rice farming is the main source of staple for family	1. Quality of land/soil fertility is low
		2. Rice farmers are more experienced	2. Rice productivity is very low
		3. Existed farmer group institution	3. Implementation of culturing technology is low
	<b>Opportunity</b>	<b>Strategy S-O</b>	<b>Strategy W-O</b>
	1. The grains (unhulled-rice) price is stable and tends to increase	Providing extension and assistance through farmer group institution about a program to increase farming productivity, market security, and high opportunity of workforce absorption	The government offers a program to increase rice productivity by improving land quality, technology application, means and infrastructures improvement, and market security
	2. High mortality of shrimp		
	3. Land rent of embankment is not significantly different with rice-field		
	4. Higher absorption of workforce		
	<b>Threat</b>	<b>Strategy S-T</b>	<b>Strategy W-T</b>
	1. Knowledge and socialization of regulation about transfer of land use, are still lower	The government activates socialization of regulation about prevention on transfer of land use as well as the sanction.	Increasing frequency of farm extension and action program about:
	2. Law enforcement is still weak	Through farmer group, it is expected that the farmers will be motivated to participate in improving means and infrastructures on rice-field	Socialization of regulation about the transfer of land use
	3. More damaged irrigation lines		Improving land quality and culture technology

#### IV. CONCLUSION

Results of the research showed that quality of rice-field was low as well as productivity of the yielded grains (unhulled-rice). Average productivity of grains (unhulled-rice) was 3,131 kg/ha lower than average productivity at the village level for about 5,525 kg/ha, 2) total economic value of rice-field is Rp 17,591,960/year lower than the economic value of the competitor (embankment) Rp 21,892,748/year. Workforce absorption value on rice-field is higher than on the embankment. The regulation, which concerning with transfer

of land use of rice-field, has not been applied so that land conversion keeps to be occurred. Strategies in controlling such rice-field conversion can be done by (1) increasing rice-field productivity by improving land quality, applying cultivation technique of specific location, and improving the irrigation lines, (2) increasing motivation to consume rice, and (3) socializing regulation and imposing sanction about the transfer of land use.

## ACKNOWLEDGMENT

Author would like to thank to *Ditlitabmas* and General Director of Higher Education Research and Technology, Indonesian Ministry of National Education on funding competitive research grants Hibah Competitive Fiscal year 2016.

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