QUALITY, QUANTITY AND AVAILABILITY (QQA) PARAMETER OFWATER IRRIGATION UTILIZATION AT UPSTREAM MUSI RIVERBASIN, KAPAHIANG DISTRICT, BENGKULU PROVINCE,INDONESIA

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Quality, quantity and availability (QQA) parameter of water irrigation utilization at Upstream Musi river basin, Kapahiang District, Bengkulu Province, Indonesia

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ABSTRACT

Conflict and competition in the utilization of water resources had caused a lack of synchronization of water management in upstream, middle and downstream areas. The Program for Payment of Irrigation Water Resources Services (PIWRS) is a policy for watershed protection as well asquantity, quality, and availability (QQA) for irrigation improvement. The objective of this study was to examine the causal relationship between the QQA parameters in the upstream Musi River basin area (16,116.73 hectares or 26.70% of the total Musi River Basin area) towards irrigation water utilization behavior based on the rationality formula for distribution of upstream-middle-downstream irrigation areas. This study followed the Attribute-Based Method (ABM), which is based on farmers' assessment to attributes or characteristics of goods or Services of Irrigation Water Resources (IWRS). The utility values analysis of QQA behavior in the Kepahiang irrigation water utilization area indicated that irrigation O & M fees were the main priority, as followed by availability (Av) and quality (Q_l) of irrigation water.

Key words : *Quantity, Quality and Avaibility (QQA), Irrigation water, Attribute-Based Method (ABM), Willingness to Pay (WTP)*

Introduction

Rapid population and economic growth have generated the high pressure on land use which caused the reduction of ecological function of watershed area (Muradian and Cardenas, 2015). Ecological watershed functions and soil and water conservation management is determinant of water and Quantity, Quality and Availability (QQA) system for sustainability of human and all organism life. Water is one of the essential needs in life, including the agriculture aspect. The scarcity of water resulted in conflict and competition in owning, utilizing and managing water resources. In order to find out the benchmark of QQA behavior in Kepahiang irrigation water use based on the division of irrigation areas of upstream-middle-downstreamor secondary-tertiary- quaternary irrigation plots, the exploration of farmers' desire and need, water utilization mechanisms, rights and obligations, funding and conflict resolution associated with *The Irrigation Water Resources Services* (IWRS) were carried out.

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IWRS valuation is an important part in determining the sustainability of the QQA behavior model in irrigation water utilization area (Hanley *et al.*, 2001; Latinopoulos, 2014^{a}).

The economic value of IWRS is often to be not defined since the market is not available. Therefore, The IWRS that provides intangible benefits and services usually misinterpreted as non-market value products and not traded in the real market. Limited information about economic value of environmental services causes a lack of appreciation to the services provided by these resources.Therefore, the society might be unwilling to pay the additional funds needed for environmental management. Yeo, *et al.* (2013) argue that environmental quality is degraded over time due to the absence of prices (money value). The potential benefits to water users in downstream such as improveming QQA water, reducing the risk of severe flooding, and increasing inheritance value of natural resources for future generations (Lapeyre *et al.*, 2015; McElwee *et al.*, 2014). Payment for environmental service is considered as a tool for managing ecosystems related to its ecologic and economic services (Mombo *et al.*, 2014; Rodríguez-de-Francisco and Budds, 2014). Economically, the payment of environmental services of water resources could be running effectively if the market mechanism works well.

During the implementation, success and failure of the Payment Environmental Services (PES) program relates to the role of local community,the amount of compensation received and the broader dynamics of life (He and Sikor, 2015). The PES emerged as an incentive-based policy instrument to manage and secure the flow of environmental services for human welfare (Caro *et al.*, 2015). PES deals with environmental problems as a consequence of production system failures in internalizing environmental costs and regulating the behavior of institutions to maximize individual utility (Singh, 2015). In the management context, PES scheme considered as a management tool for changing the destructive action of the people in charge by compensating their loss and improving their conservation manner (Mombo *et al.*, 2014 ; Hayes *et al.*, 2015). PES is generally arranged voluntarily. Conditional agreement between at least one 'seller' and one 'buyer' during environmental services is well defined or the used resources will be able to produce environmental services (Caro *et al.*, 2015). The success of PES depends on the changes of involved people behavior. In further stage, it will be connected to the change of compensation structure of PES. Thus, local heterogeneity as a livelihood strategy plays a strong role in achieving the ultimate goal of PES program (Newton *et al.*, 2012).

Leimona (2015) identified that PES of irrigation water resource payments is in accordance with the capabilities and expectations of the community which are very favored and feasible. This type of payment is well known as the social economic (socioeconomic) investment like mutual cooperation and the role in institutions which is one of the important aspects of the PES and anti-poverty approach. Furthermore, the farming acceptance factor determines the participation in willingness to pay the PES of irrigation water resource payments. The WTP can be increased through several efforts which increase the acceptance of lowland rice farming. The higher level of acceptance of perennial planting rice farming generates the higher level of farmer participation in the willingness to pay PES (1.641 times). This approach happens as the farmers who have a high level of farm acceptance tend to have a higher awareness and willingness to pay for PES of irrigation water resource (Bremer *et al.*, 2014; Meyer *et al.*, 2015).

The objective of this study was to examine the causal relationship between the QQA parameters in the upstream Musi River basin area (16,116.73 hectares or 26.70% of the total Musi River Basin area) towards irrigation water utilization behavior based on the rationality formula for distribution of upstream-middle-downstream irrigation areas.

Methodology

Method

This research was conducted in the upstream region of the Musi River Basin, Kepahiang Regency, Bengkulu Province, Indonesia. This study utilized the Attribute-Based Method (ABM) method, *which is based on farmers' assessment to attributes or characteristics of goods or (IWRS).* This approach departs from the premise that farmers use IWRS because of its characteristics, not solely on irrigation water items. When farmers use irrigation water, what they "buy" is actually the irrigation water characteristics, namely $Q_{t,}$ Q_{l}, A_{V} and the price of the Irrigation water. One of the ABM methods is conjoint-choice method (CCM). The CCM method is a choice experiment that offers various choices to the respondent during the survey. They are asked to make their choices. This process is repeated several times and the attributes changed each time. In the final stage, one respondent will produce a set of choice patterns which then become the basis for calculating the Value of Water Availability or Willingness (WTP) obtained by each group of water user and user farmers (upstream-middle-downstream or secondary-tertiary- quaternary) in paying the IWRS fee for changes to one attribute (Yacob *et al.*, 2009).

To estimate the standard of behavior of QQA in the Kepahiang irrigation water use area based on the division of upstream-middle-downstream or secondary-tertiary- quaternary) irrigation areas, it involves the following steps

Selection of Attributes and Levels

The initial survey was conducted to identify attributes related to QQA behavior involving 100 respondents in the study area. This survey identifies irrigated rice farmers' opinions on up to date issues and problems related to QQA behavior in irrigation water utilization areas. Furthermore, a separate pilot survey in the area of irrigation water utilization is based on the division of upstream-middle-downstream or secondary-tertiary- quaternary irrigation areas, which aims to improve the selected attributes (Latinopoulos, 2014[b]). Following this procedure, four attributes were chosen to describe the behavior of QQA in the area of irrigation water utilization: (1) quantity or water demand "Q_t", (2) water quality "Q_l", (3) water availability for agriculture "A_v" and (4) costs per planting season for service improvements (the value of water availability services obtained by each group of water users). The next step is determining the level of attribute. The level chosen must be realistic and relevant to farmers preferences for IWRS. Understanding farmers' preferences is very important to implement the efficient and effective irrigation water management policy instruments (Latinopoulos, 2014[a]).

Water quantity "Q_t" is defined as the quantity of water in one year for three growing seasons of paddy rice, consists of: water deficiency (using a thermen / rotating system), means that farmers are unable to cultivate rice 3 times (quo situation), as found in the preliminary survey. Next level: excess water (cultiavte 3 times per year). " Q_l" water quality is considered a qualitative attribute and two levels are chosen: uncertain water quality (status quo situation) and good water quality. This simple classification was conducted as the difficulty for farmers to see the quality of irrigation water based on physicochemical parameters. Water availability for agriculture " A_v" farming is considered as an availability attribute with two levels of choice: uncertain water quantity (status quo situation) and good water quantity.

Coding was used instead of dummy variables to represent quantitative attributes. The coding of X variables consists of 0 and 1 for each attribute of level X. The coding of variables for one qualitative level is equal to 1 when there is influence at this level, and 0 when the level of status quo (reference) (Latinopoulos, 2014[a]).

Determination of Alternative Attributes (Number of Attribute Levels and Actual Attribute Values) Presented to Farmers Respondents

After knowing the attributes and its levels, the next scenario is designing the combination of attribute levels. The combination of attributes levels called stimuli has a role on the preferences of respondents. This stimulus will influence the farmers decision to consider the best combination of attribute levels from a set of choices. The complexity of choice sets stimuli design relevance to IWRS (Hensher, 2006). The attribute levels used in research design had two levels that can be distinguished intuitively.

Selection of the research design form

The study design used the $\frac{1}{2}$ fractional factorial design. The number of attributes used is 4 (four), each of which has 2 (two) levels. The number of stimuli in this experiment was 2^{4-1}= 8 treatments. For this purpose, the attribute level is allocated to each choice according to orthogonal design (Latinopoulos, 2014a). The main step in designing the study is to illustrate the profiles and choice sets with simple conjunctions of four attributes, namely Q_t Q_l A_v and Irrigation water prices, which is explained in 2 (two) levels. SPSS v.20 software for Windows utilized for the formation of stimuli with orthogonal planning, so that all attributes and levels can be represented.

Making Choices Set of The Irrigation Water Resources Services (IWRS)

In the conjoined-choice (choice-conjoint) method, farmers are offered a number of choice sets of IWRS in the form of 2 (two) choices. Respondent farmers were asked to choose which profile to choose. Number 1 (one) is an additional stimuli as the best comparison, and the number 0 (zero) is the choice of the current condition (status quo). The set of Irrigation water environment services that are displayed are chosen randomly using random generators provided by Microsoft Excel. In designing a selection of Water environmental services, the zone of distribution of irrigation areas is based on the distance between the location of rice fields and rivers as irrigation water sources. There are three levels of distance identified into the chosen study area, namely Upstream-Middle-Downstream, or based on the distribution of irrigation network plots, namely Secondary-tertiary- quaternary. All of these areas are located in the Upper Musi River Basin, Kepahiang Regency, Bengkulu–Indonesia.

The distance ratio between the zones of the irrigation utilization area is based on the interval between the location of rice fields and the river as a source of irrigation, the maximum distance (3,500 meters) and the minimum distance (10 meters) divided into three classes: Upstream-Middle-Downstream. Upstream consumption or secondary plots are areas identified as excess irrigation water, Central or tertiary plots are areas of adequacy of irrigation and downstream water or quaternary plots are areas lacking irrigation water. Farmers respondents in each division of the region were asked to choose a set of IWRS. Examples of sets of environmental services are shown as follows:

Calculating Service Value Availability of Water Obtained by Each Farmer Group Users of IWRS

The service value of water availability in each group of water-using farmers is analyzed by The Choice-Conjoint Method (CCM), which uses a conditional logit (CL) regression model consisting of 2 (two) models. The first model is a basic specification that shows the importance of attributes in explaining the choice of respondent farmers for two different choice options. The second model is expanded to include socio-economic and environmental attitude variables. The inclusion of these variables helps to correct heterogeneity in preferences and provides an estimate of the effect of changes in attributes on the probability that an increase or base option will be chosen. The CCM is the preference method stated in the assessment of water availability services which is generally used to estimate non-market values from IWRS (Adamowicz *et al.*, 1998; Latinopoulos, 2014a). The preference choice experiment data or data collected in the conjoined study were analyzed using multiple regression methods (usually OLS regression dummy variables) to estimate utility functions for each respondent (or for subgroups of water-using farmers) (Rao and Pillai, 2014). Choice experiment assumes that farmer *k* will choose alternative *i*, from a number of alternatives *j* based on the desire to maximize the utility function $U(U_{ik}>U_{jk}; i \neq j)$. Alternative *i* is composed of a series of X attributes, so that the choice of alternative *i* versus alternative *j* is the result of comparing X_{ik} to X_{jk}.. Thus, $U_{ik} = f(X_{ik} + \varepsilon_{ik})$. Alternative opportunities *i* (P_{ik}) are calculated by number of chosen alternative *i*appearances compared to other alternatives. The opportunity is represented in the general form as:

$$P_{ik} = f(U_{ik}, U_{jk}; i \neq j, \beta) \qquad \text{... (1)}$$

Where: P_{ik}: Opportunities for respondents to choose alternatives i; $\boldsymbol{U}_{ik}$: alternative utility i selected by respondent k; $\boldsymbol{U}_{jk}$: alternative utility j chosen by respondent k; and β,: function parameter obtained from estimating the marginal value of the attribute in the choice set.

$$P_{ik} = \frac{\exp(\mu Xik)}{\sum_1^j \exp(Xjk)} \qquad \text{... (2)}$$

assuming that it has linear parameters, X_{ik} can be written in the equation:

$$X_{ik} = \boldsymbol{\beta}_1 X_{1ik} + \boldsymbol{\beta} 2 X_{2ik} + \ldots + \boldsymbol{\beta} n X_{nik} \qquad \text{.. (3)}$$

WTP estimation

The coefficient *â* can be used to estimate the marginal willingness to pay ((MWTP) for each non-monetary attribute, thus providing a measurement for increasing benefits in attributes from one level to another. These values are obtained as the ratio of the corresponding attribute coefficients and monetary attributes.

MWTP estimation can be calculated using the ratio of attribute coefficients to monetary costs or coefficients. This ratio is also known as marginal implicit price (Latinopoulos, 2014[a]). The implicit price of MWTP from an attribute reflects the willingness of respondent farmers to pay for additional units of existing attributes, ceteris paribus, taking into account the coding attributes (Yacob *et al.*, 2009):

$MWTP = -m_k \frac{\beta_{k,}}{\beta cost}$ (*k*= non monetary attributes*)* .... (4)

where, m_k is a constant depending on the encoding of the attribute k (m = 1, for continuous and dummy variables, and m = 2 for variables with effect codes).

Results and Discussion

Determination of Benchmarks for QQA Behavior in Irrigation Water Utilization Areas in the Upstream Musi River Basin, Kepahiang Regency Based on Distribution of Irrigation Areas (Upstream-Middle-Downstream and Secondary-tertiary- quaternary)

Validity and ReliabilityTest

Tests for accuracy with the Pearson's correlation test, were carried out on 100 respondent farmers in the upstream Musi River basin, Kepahiang (Table 1).

The results of the correlation values of each attribute were compared with r-table with alpha 0.05 and N = 100, which is 0.197. All variables are greater than $r_{(0,05;100-2)} = 0.197$. Table 1 showed that all stimuli of QQA behavior attributes in the irrigation water utilization area in upstream Musi river basin were valid, and can be accounted with high accuracy in conjoining process. It showed the relationship between estimation and fact were very strong.

After all attribute stimuli declared valid, the reliability test was carried out. Statistical test indicated that the *Alpha Cronbach* coefficient value (rcount = 0.692> $r_{table} = 0.197$ with $\alpha = 0.05$), it couldbe concluded that all attributes timuli of QQA behavior questionnaire in of irrigation water utilization area in the upstream Musi river basin were reliable.

Utility value on Each Attribute Level Based on Respondents' Farmers Preferences

The conjoined analysis was carried out in groups and overall respondents, by ranking the existing stimuli. It obtained the utility value for the attribute of irrigation water QQA benchmark. Each Irrigation water QQA behavior consisted of 2 (two) attribute levels. Number 1 and 0 which formed the basis for conjoint analysis (Wisanggeni and Putro, 2017). Number 1 showed the attributes that farmers preference, and 0 was not farmers' preference (Table 2).

The total utility function model for determining the benchmark QQA behavior of water of all respondents in irrigation water utilization area in the Upstream Musi River basin, Kepahiang, as follow:

$$U(x) = 6.438 - 0.625\ X_1 - 1.625X_2 - 0.125X_3 + 1.125X_4$$

Conjoin analysis of QQA behavior bench marking in of irrigation water utilization area in the upstream-middlestream-downstream region Musi river basin, Kepahiang, farmers in the upstream-middlestream-downstream farmers region in the produced model, as follows:

Upstream : $U(x) = 6.000 - 0.500X_1 - 1.000X_2 + 0.000X_3 + 2.000X_4$
Middlestream : $U(x) = 4.625 - 0.250\ X_1 - 0.750X_2 + 0,000X_3 - 0,250X_4$
Downstream : $U(x) = 4.375 - 0.500X_1 + 0.00X_2 - 0.250X_3 - 0.750X_4$

Conjoined analysis of the determination of QQA behavior standards in the area of irrigation water utilization in the Upper Musi River Basin, Kepahiang Regency based on the distribution of irrigation areas (Secondary-Tertiary-Quaternary) resulted in the utility model, as follows:

Secondary : $U(x) = 4.938 - 0.125X_1 - 0.875X_2 + 0.375X_3 + 1.125X_4$

Table 1. Pearson and Kendall coefficients as Test Validity of Research

Attribute	Correlation			
	Person's R	Description	Kendall's tau	Description
Water Quantity (Q_t)	0,664	Valid	0,779	Valid
Water Quality (Q_l)	0,248	Valid	0,432	Valid
Availability of Water (Av)	0,931	Valid	0,955	Valid
Water Fee	0,430	Valid	0,575	Valid

Source: Research Processed Results, 2017

Table 2. Attribute Utility Estimate for for all respondent, farmers in the upstream-middlestream-downstream region, and in the secondary-tertiary- quaternary irrigation plot

Attribute	Utility Estimate					
	All Respondent Farmers	Upstream	Middlestream	Downstream	Secondary	Tertiary	Quaternary
(Constant)	6.438	6.000	4.625	4.375	4.938	6.938	3.188
(Std. Error)	(1.644)	(1.410)	(0.777)	(0.912)	(0.949)	(1.447)	(0.846)
Water Quantity (Q_t)	-0.625	-0.500	-0.250	-0.500	-0,125	-1,125	-0,375
(Std. Error)	(1.471)	(1.261)	(0.695)	(0.815)	(0,849)	(1,294)	(0,757)
Water Quality (Q_l)	-1.625	-1.000	-0.750	0.500	-0,875	-1,375	-0,125
(Std. Error)	(1.471)	(1.261)	(0.695)	(0.815)	(0,849)	(1,294)	(0,757)
Water Availability (Av)	-0.125	0.000	0.000	-0.250	-0.375	0.375	-0.375
(Std. Error)	(1.471)	(1.261)	(0.695)	(0.815)	(0.849)	(1.294)	(0.757)
Water Fee contribution	(1.125)	2.000	-0.250	-0.750	1.125	0.625	0.125
(Std. Error)	(1.471)	(1.261)	(0.695)	(0.815)	(0.849)	(1.294)	(0.757)

Source: Research Processed Results, 2017

Tertiary : $U(x) = 6.938 - 1.125 X_1 - 1.375X_2 + 0.375X_3 - 0.625X_4$

Quaternary : $U(x) = 3.188 - 0.375X_1 + 0.125X_2 - 0.375X_3 + 0.125X_4$

Viewed from Table 2, the results of conjoint analysis show that the utility value of attributes has positive and negative values. Positive signs of usability values indicate that these attributes are more desirable. Conversely, the negative sign indicates that the attribute is less desirable. The more positive the value of the use of an attribute, then these attributes are increasingly in demand.The utility value in Table 2 is a numerical representation of respondents' farmer preferences. The higher the utility, the higher the preference. Therefore, we can conclude that irrigation O & M Fee is the attribute most considered by the respondent's farmer, followed by water availability (Av) and water quality (Al). Water quantity (Qt) is the least considered attribute. The Utility value of respondent farmers in secondary plots is higher compared to tertiary and quarterly plots. Likewise, farmer groups in the upstream are higher in Utility Value than farmers in the middle and downstream. The results of this conjoint analysis can be considered to calculate the value of water availability services in each group of users and users of farmers IWRS.

Irrigation Water Quantity Attribute (Qt)

The first attribute, namely the quantity of Irrigation water (Qt). This attribute gets a negative utility value for all respondent farmers, farmers in the upstream-middlestream-downstream region, and farmers in the secondary-tertiary- quaternary irrigation plot. The negative sign of utility value in conjoined analysis shows, that these attributes are increasingly not considered. The quantity of Irrigation water (Qt) shows water requirements for one year. This attribute consists of two levels, namely lack of water (status quo situation), with numbers (0), and excess water (1). An interesting result is the negative utility value of the quantity of water (Qt) Irrigation attribute. This, shows that the negative attitude of farmers to the quantity of water for irrigation use can be minimized. The possible explanation for this, is that there is an influence of survey time and interviews with farmers. Because at the time of the survey and interview, it coincided with the rainy season, so the quantity of irrigation water (Qt) for lowland rice was not so worrying. Therefore, it is not too surprising, that the alternative 'water requirements' will reduce utility and reduce the possibility of being chosen.

Irrigation Water Quality Attributes, (Q_l)

The second attribute, namely the quality of irrigation water (Q_l). This attribute has a positive utility value in the downstream irrigation area, which is (0.500). The rest, this attribute gets negative utiliy values for all respondent farmers, farmers in the upstream and middlestream region, and farmers in secondary-tertiary-quaternary irrigation plots. Farmers in the downstream region expect water quality (Q_l), that is free from pollution. Negative signs of utiliy values in this attribute, indicate farmers in the upstream-middlestream region, and farmers in secondary-tertiary- quaternary irrigation plots do not consider the quality of irrigation water. Irrigation water quality (Q_l) in this study consists of two levels, namely: water quality is still within the threshold to be allowed as irrigation water, or there is a good improvement in water quality (1), and uncertainty or no change in irrigation water quality (status quo situation) (0). Thus, all the selected attributes appear to influence the choice of the respondent's farmers. Regarding the sign of the utility value, showing some interesting results found. That is, a positive sign of irrigation water quality (Q_l), shows that respondents have a positive preference for improving water quality, (namely, farmers are more likely to choose alternatives with good water quality).

Irrigation Water Availability Attribute, (Av)

The third attribute, namely water availability (Av), this attribute consists of two levels, namely: the level of availability of water for agriculture per land of good quantity of water, namely the comparison of the amount of water available for irrigated rice fields in the Musi River Basin area Upstream with numbers (1). And the level of uncertainty in water quantity (status quo situation) number (0). From conjoint analysis, this attribute has a positive utility value in the upstream and middle irrigation areas of (0,000), and tertiary plot of (0,375). This attribute also gets negative usability values for all respondents (-0.125), farmers in the downstream region (-0.250), in the secondary irrigation plot (-0.375), and quaternary plots (-0.375).

Farmers in the upstream and middle irrigation areas, and in secondary and quaternary plots were more considerate of water availability (Av). Farmers expecting an enhancement water availability (Av) and reliability of irrigation water in the future. In the enhancement of water availability would reduce the risk of declining agricultural production (due to water deficiency), and could expand the total irrigation area. In this condition, the water availability "A_V" for agriculture is indirectly used as a quantitative attribute.

Conversely, the negative marks of usability values in this attribute indicated that farmers in the downstream and quaternary plot areas did not respond to water availability (Av). It was because of the crops cultivated by farmers did not require large amounts of water during dry season. While farmers in secondary irrigation plots were no longer worried about the water availability since it did not decrease over a period of time.

Cost of Contribution Attribute for Irrigation O and M

The fourth attribute is the fee for irrigation O & M. This attribute obtained the most positive utiliy value on conjoint analysis of all respondent farmers, in the upstream area, secondary, tertiary and quaternary irrigation plots, which were 1,125 (all respondents), 2,000 (upstream), 1,125 (secondary), 0.625 (Tertiary), and 0.125 (Quaternary). These results indicated that irrigation contribution cost was more considered by the respondent farmers. The irrigation contribution

Table 3. Marginal Willingness to Pay (MWTP) for all respondent farmers based on distribution of irrigation in the upstream-middlestream-downstream region, and secondary-tertiary-quaternary irrigation plot

Attribute	The Marginal Willingness To Pay (MWTP)						
Non Monetary	All Respondents	Up-Stream	Middle-Stream	Down-Stream	Secondary	Tertiary	Quaternary
Water Quality (Qt)	-0,556	0,250	-1	-0,667	**0,111**	**1,8**	**3**
Water Quality (Ql)	-1,444	0,500	-3	0,667	**0,778**	**2,2**	**1**
Availability of Water (Av)	-0,111	0	0	-0,333	0,333	-0,6	3

Source: Processed Research Results (2017) cost was indeed a problem for some farmers and also very sensitive. The irrigation contribution cost has become a burden of farmers. In order not to impose the farmers, the amount of irrigation contribution cost must be considered first. Farmers must also take into account the benefits of IWRS in farming process. When costs are incurred, farmers will expect benefits from irrigation water. By considering the hopes and desires of farmers, the right pricing strategy will be able to attract farmers 'sympathy, and in the end it can bring farmers' awareness to pay of IWRS.

The irrigation contribution cost for O & M consisted of two levels: paying Rp. 150,000 twice per planting season (0), and paying Rp. 200,000 once per planting season (1). Farmers in utilizing IWRS certainly wanted low cost and good quality. It is expected that stakeholders would evaluate the irrigation contribution costfor Irrigation O & M and considering the benefits and sustainable irrigation water and environmental services.

Estimated WTP

The usability value (β coefficient) of each non-monetary attribute used to estimate The Marginal Willingness To Pay (MWTP), (equation 4). MWTP is presented in Table 3.

The water quantity attribute (Q_t) showed an increase in water demand is highly valued by respondents. In particular, farmers in Secondary, Tertiary and Quaternary plots. In accordance with the results of the estimated MWTP calculation, this study reveals, that the water availability f is important for farmers. They are willing to pay higher irrigation O & M contributions for better quality and quantity of irrigation water. MWTP in quaternary irrigation plots was higher compared to secondary and tertiary plots. The farther distance between rice fields and irrigation sources, the more motivation of farmers spend more money to irrigate their fields. This finding was similar with empirical studiy of Mudaca, *et al.* (2015) who concerned household participation in ecosystem services payments for in N'hambita in Sofala province, Mozambique. The distance between houses and centers of economic activity plays an important role in the level of farmer participation and they have the opportunity to gain moreincome through the sale of carbon produced from their farms.

Conclusion

The utility value analysis in QQA behavior in the Kepahiang irrigation water utilization area showed the irrigation contribution cost attribute for irrigation O and M is the main priority, followed by water availability (A_v) and irrigation water quality (Q_l).

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