SOCIETY WILLINGNESS TO PAY TO ENVIRONMENTALLY SOUND AGRICULTURAL DEVELOPMENT PROGRAM

KETUT KARIYASA DAN MADE OKA ADNYANA
Indonesian Center for Agricultural Socio-Economic Research and Development (ICASERD)
Jalan A. Yani No. 70 Bogor.

ABSTRAK

Berbagai program konservasi sumberdaya alam seperti penghijauan, terasering, pembuatan embung (small scale water reservoir) alley cropping dan lainnya dapat ditawarkan kepada masyarakat di sepanjang daerah aliran sungai (DAS) untuk menjaga kelestarian lingkungan. Respon dan keinginan membayar (*willingness to pay*, WTP) penduduk terhadap masing-masing program jika diimplementasikan cukup beragam. Terkait dengan program-program konservasi lingkungan di atas, penelitian ini telah dilaksanakan di Jawa Barat dengan mengambil kasus DAS Citarum yang meliputi daerah hulu di Kabupaten Bandung, tengahan di Kabupaten Cianjur, dan daerah hilir di Kabupaten Karawang. Contingent Valuation Method (CVM) telah digunakan untuk menganalisis WTP penduduk di sepanjang DAS Citarum terhadap berbagai program yang ditawarkan, faktor-faktor yang mempengaruhi WTP, dan rekomendasi dan implikasi kebijakan yang diperlukan untuk implementasi program. Hasil penelitian menunjukkan, bahwa keinginan masyarakat untuk turut menanggung biaya implementasi program konservasi cukup besar, bahkan masyarakat di bagian hilir pun bersedia untuk turut berpartisipasi dalam penanggulangan kerusakan lingkungan yang terjadi pada daerah hulu Citarum sehingga dampak negatif yang ditimbulkan pada daerah hilir dapat ditekan.

Kata Kunci: Konservasi, Lingkungan, Keinginan untuk Membayar.

INTRODUCTION

Back Ground

Agricultural development in any country is believe to have indented and unintended by product or externalities that can effect the sustainability of environment quality. Community activities fact is one of the factors that determine quality of environment. Government along a watershed to secure the environment could introduce various natural resource conservation programs. Community along this area may reacts in different ways either positive or negative perception. The economic value of any resource, whether marketed or non-marketed, is defined as the user's willingness to pay (WTP) to receive benefit from resource (Sass one and Schaffer, 1978; Just, et al., 1982).

WTP is a measure of the economic scarifies in terms of income or other goods a person is willing and able to forgo gain or maintain a resource, good, or service. Net WTP,

which is the difference between WTP and actual expenditures for the good or service, is usually used for cost-benefit analysis. Whether WTP is actually collected as cash is largely irrelevant from the standpoint of economic efficiency. While it may be important for political reasons to transfer portion of the user's WTP to actual cash flow, any financial returns are just a transfer of benefits from user to recipient. The total economic value received by society does not change, only the distribution of the economic value among members of society (Willing, 1976).

In order to find more realistic WTP of respondents given an introduced environmentally sound agricultural program, face to face interviewing is carried out during the survey. Individuals are asked to state their maximum WTP. This approach is derived in several ways (Hanley et.al, 1997). *First*, higher and higher amounts are suggested to the respondents until their maximum WTP is reached. *Second*, a range of values then informed to respondents that may also indicate their typical expenditure. This is expected helps respondent to calibrate their replies. *Third*, individuals are then asked for their maximum WTP with no value being suggested to them. Respondents found it relatively difficult to answer such question, especially where they have no prior experience of trading with the program in question. *Forth*, as a closed question, the most realistic payment is suggested, to which respondents should bid until both side come up with the deal payment. This technique may be difficult and need more time to be exercised but the WTP of respondents will be more realistic. This technique is also applied by Selan (2003) to analyze the individual's willingness to pay at nearby Soekarno-Hatta International Airport to the noise, which is produced by the airplane.

Objective

The research objective is to analyze society willingness to pay with respect to various conservation programs, factors affecting WTP, provide policy-makers with specific insights, tools and information with which to analyze the various role of agriculture within their societies and from which to make informal policy decisions in pursuit of sustainable agriculture and rural development.

RESEARCH METHODOLOGY

Theoretical Framework

Contingent Valuation Method (CVM) has been widely used in recent years. In this method, questionnaires are sent to the general public who benefit from the environment, asking people directly how much they would be willing to pay for the improvements of the environment which agriculture brings (Yoshida et al., 1997 and Yoshida 1999). CVM uses surveys in which people are asked how much they are willing to pay (WTP) for a change in the level or condition of some non-marketed goods. The basic notion underlying CVM is that a realistic but hypothetical market for buying or selling use or preservation of non-marketed good can be described to an individual. Key features of the hypothetical market include: (1) description of the resource being valued; (2) means of payment (payment vehicle), such as an increase in taxes or in a utility bill; and (3) the value of elicitation. The means of payment must be realistic and emotionally neutral for the respondents. In order to improve realism, the means of payment must be appropriate for the good and the constructed market.

In principal, application of CVM based on potential behavior, which is not based on actual behavior (Munasinghe, 1992). The application of CVM is basically assessing the consumer preferences with respect to the observable benefit through investigation of consumer's willingness to pay (WTP) or spend amount of money to obtain that benefit. Sufficient numbers of impact assessment methodologies have developed by environmentalist; various methods are often used when evaluating multifunctional roles. CVM has been widely used in recent years. In this method, questionnaires are sent to the general public who benefit from the environment, asking people directly how much they would be willing to pay for the improvements of the environment which agriculture brings (Yoshida et al., 1997 and Yoshida 1999).

CVM has been shown to be reliable, especially for estimating user values. For example, Looming (1989) found that CVM is reliable in retesting, such as when respondents were asked the same CVM questions approximately 9 months after first survey. Meanwhile, Adamivicz and Graham-Tomasi (1991) found that CVM is generally consistent with axioms of revealed choice. At least for familiar goods and services, CVM

typically has been shown to compare very favorably with other non-market resource valuation techniques (Mitchell and Carson, 1989; Cummings, et al., 1986). Therefore, among available techniques mentioned above.

CVM is a market simulation approach that uses direct consumer surveys. CVM is the most widely exercised approach for determining the value of non-market goods. CVM has been shown to produce benefits estimates close to the true benefit and has also been shown to be reliable in re-testing at least for user values (Bishop and Hebertein, 1979; Loomis, 1989). Agriculture development produces both costs and benefits that may not be valued in the market place. In addition, some government agricultural programs not yet initiated may have unknown cost that cannot be summarized from market activity. For example, CVM can be used to determine the optimal payment to farmers to induce them to put in filter strips or other long-term set-side acreage.

Location and Number of Respondents

Direct and face-to-face individual survey was conducted at three area of Citarum river basin, which representing upstream area, middle stream, and down stream area. Survey at upstream was carried out in South Bandung District or at Wayang Mountain, while Jangari village in Cianjur District representing middle stream and Karawang District representing down stream area. A total of 180 respondents were drawn from three areas that consist of 60 respondents for each area such as upstream, middle stream and down stream respectively. Stratified random sampling was exercised to draw the respondents with stratum such as: (1) area (upstream, middle stream and down stream, (2) respondents' status (farm households and professional), and (3) land holding.

Contingent Valuation Model

Following Cameron's (1988, 1991) approach in which assumes that unobserved WTP could be expressed as

$$WTP_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \ldots. \beta_k X_{ki} + \varepsilon_I \qquad (1)$$

Were ε_I is independently and identically distributed $(0,\delta^2)$, and where the X_i's are the explanatory variables. In this study the WTP for each area of Citarum river basin is regressed with various explanatory variables for each environmentally sound program such as (1) reforestation, (2) alley cropping, (3) terracing system, (4) small scale water reservoir, (5) irrigation and drainage system, (6) household's well, and (7) agro forestry.

$$WTP_{up} = \beta_0 + \beta_1 AGE_{1i} + \beta_2 EDUC_{2i} + \beta_3 FEXP_{3i} + \beta_4 PRAG_{4i} + \beta_5 INC_{5i} + \beta_6 LHLD_{6i} + \beta_7 D_{7i} + \varepsilon_i \quad (2)$$

$$WTP_{md} = \alpha_0 + \alpha_1 AGE_{1i} + \alpha_2 EDUC_{2i} + \alpha_3 FEXP_{3i} + \alpha_4 PRAG_{4i} + \alpha_5 INC_{5i} + \alpha_6 LHLD_{6i} + \alpha_7 D_{7i} + \varepsilon_i \quad (3)$$

$$WTP_{dw} = \lambda_0 + \lambda_1 AGE_{1i} + \lambda_2 EDUC_{2i} + \lambda_3 FEXP_{3i} + \lambda_4 PRAG_{4i} + \lambda_5 INC_{5i} + \lambda_6 LHLD_{6i} + \lambda_7 D_{7i} + \varepsilon_i \quad (4)$$

$$\beta_i, \alpha_i, \lambda_i > 0; i = 1, 2, 3,\ldots 7.$$

where

WTP_{up}	=	WTP of respondents at upstream area of Citarum
WTPmd	=	WTP of respondents at middle stream area of arum
WTP_{up}	=	WTP of respondents at downstream area of Citarum
AGE	=	Age of respondent (year)
EDUC	=	Education level (year)
FEXP	=	Farming Experience (year)
PRAG	=	Number of household's member in productive age > 15 (person)
INC	=	Total household's Income (Rp 000)
LHLD	=	Total of land holding (ha)
D	=	Dummy variable; D=1 for farmer and D = 0 for professional

Data Analysis

Ordinary least square (OLS) was used to estimate the parameters for each respondent's WTP. Since OLS has given quite efficient parameter estimate in term of coefficient determination and magnitude of the estimates so that no other technique was exercised. Responsiveness of respondents to the change of explanatory variables was also computed in term of elasticity value.

Therefore, at least 21 WTP equations were estimated with pre-condition all sign of parameter estimates are positive. In other words, all explanatory variables included in the model are positively influence the variability of respondents WTP to various programs introduced at each area of Citarum river basin in West Java.

RESULTS AND DISCUSSION

Willingness To Pay (WTP)

Readiness of respondents at the up-stream area of Citarum to participate in a few programs to lessen floods, which is measured in the form of Willingness To Pay (WTP) like presented at Table 1. Aggregately, the level of regional WTP of respondents at up-stream to seven program raised is equal to USD122.24 per household per year, with detail about USD115.33 for professional and USD127.62 farmer respondents. This phenomenon indicates that WTP at farmer respondents is 10.66% higher than professional.

Furthermore, evaluation of respondents' WTP to each program indicates that the highest WTP of professional and farmer is addressed to program of re-forestation that is about 24.53% and 17.90% at professional farmer respondents respectively. Meanwhile the lowest WTP respondents either professional or farmer is at household's Well program that is about 9.15% and 7.1% respectively. The next biggest WTP of respondents is shown with respect to program of agro-forestry, followed by terracing and alley cropping.

Meanwhile, regional WTP of respondents with respect to flood prevention program at middle stream area showed that level of professional's WTP is about 16.96% higher than farmer that is USD56.28 compared to USD48.12. If compared to WTP of respondents at upstream area then the WTP of respondents at middle stream only about 41.66% of WTP at upstream that is USD 50.93 and USD122.24 consecutively. This significant different of two WTP is mainly due to household's income gap between these two areas.

Table 1. Willingness to Pay (WTP) by Programs of Respondent at Up-Stream and Middle Stream area of Citarum River Basin, 2003.

Programs	WTP at Up-stream			WTP at Middle-stream		
	Professional	Farmer	Aggregate	Professional	Farmer	Aggregate
1. Re-forestation	28.29 (24.53)	35.6 (17.90)	32.35 (26.46)	9.49 (16.88)	8.77 (18.23)	9.02 (17.71)
2. Alley Cropping	16.4 (14.22)	16.41 (12.86)	16.4 (13.42)	8.89 (15.80)	9.06 (18.83)	9.00 (17.67)
3. Terracing	16.41 (14.23)	16.78 (13.15)	16.7 (13.66)	8.95 (15.90)	6.89 (14.32)	7.6 (14.92)
4. Dam (Water reservoir)	14.6 (12.66)	15.01 (11.76)	14.83 (12.13)	8.00 (14.21)	6.34 (13.18)	6.91 (13.57)
5. Irrigation and drainage system	15.36 (13.32)	16.06 (12.58)	15.75 (12.88)	7.6 (13.50)	6.46 (13.42)	6.85 (13.45)
6. Household's Well	10.55 (9.15)	9.07 (7.11)	9.73 (7.96)	6.18 (10.98)	5.4 (11.22)	5.67 (11.13)
7. Agro-forestry	13.72 (11.90)	18.69 (14.65)	16.48 (13.48)	7.17 (12.74)	5.2 (10.81)	5.88 (11.55)
Total WTP per household	115.33 (100.00)	127.62 (100.00)	122.24 (100.00)	56.28 (100.00)	48.12 (100.00)	50.93 (100.00)

Note: ( ) percentage to total WTP

If evaluated according to programs raised at this area, professional with respect to program re-forestation shows the highest respondents' WTP. It is counted about 16.88% from total WTP of professional is allocated at program of re-forestation followed by terracing and alley cropping at about 15.90% and 15.80% consecutively. From seven existing alternative programs, the lowest professional's WTP is to household's Well

program that is only 10.98%. Meanwhile, the biggest farmers' WTP is addressed to program of alley cropping and come next program of re-forestation that is about 18.83% and 18.23% from the total WTP respectively. While the smallest farmers' WTP relative to other WTP is addressed to agro-forestry that is equal to 10.81%.

Differ from both areas discussed above, at downstream area of Citarum river basin, which is located in Karawang Su-district besides studied the level of WTP at seven applied program at upstream and middle stream is also studied the level of respondents' WTP to three programs to be executed at downstream area. Respondents' WTP to each program is presented at Table 2.

The level of WTP of respondents to all of programs is equal to USD 37.44, with detail USD 34.24 at professional and USD 37.44 at farmer respondents. In this area seems WTP of farmer is about 9.35% higher than professional's WTP. If evaluated according to region or areas then WTP of respondents at upstream of Citarum river basin is the highest then come next middle stream and downstream.

From ten raised programs, either professional or farmer ready to pay the biggest amount at program of making irrigation and drainage system at downstream area. At this program, WTP of professional and farmer is about 23.16% and 24.89% from total WTP respectively. The second biggest WTP found at program of re-forestation that is about 16.38% at professional and 17.18% at farmer respondents. At both groups respondents indicate that program of water pomp not yet got strong support from respondents. This condition is shown by WTP to the program only about 1.20% at professional and 2.12% at farmer out of their total WTP.

Table 2. Willingness To Pay (WTP) by Programs of Respondent at Down-Stream of Citarum River Basin, 2003.

Programs	WTP of Respondent (USD)		
	Professional	Farmer	Aggregate
Program that applied at up/middle stream			
1. Re-forestation	5.61 (16.38)	6.8 (17.18)	6.33 (16.91)
2. Alley Cropping	2.53 (7.39)	2.29 (5.79)	2.39 (6.38)
3. Terracing	2.05 (5.99)	2.33 (5.89)	2.22 (5.93)
4. Dam (water reservoir)	4.49 (13.11)	4.91 (12.41)	4.74 (12.66)
5. Irrigation and drainage system	2.74 (8.00)	2.57 (6.49)	2.64 (7.05)
6. Household's Well	1.46 (4.26)	1.7 (4.30)	1.6 (4.27)
7. Agro-forestry	0.88 (2.57)	1.07 (2.70)	0.99 (2.64)
Sub Total WTP Up/Middle Stream	19.76 (57.71)	21.67 (54.75)	20.91 (55.85)
Program that applied at down stream			
1. Dam (water reservoir)	6.14 (17.93)	7.22 (18.24)	6.78 (18.11)
2. Irrigation and drainage system	7.93 (23.16)	9.85 (24.89)	9.08 (24.25)
3. Water pump	0.41 (1.20)	0.84 2.12)	0.67 (1.79)
Sub Total WTP Down Stream	14.48 (42.29)	17.91 (45.25)	16.53 (44.15)
Total WTP	34.24 (100.00)	39.58 (100.00)	37.44 (100.00)

Note : ( ) percentage to total WTP

Following will be elaborated the total WTP of respondents according to the stream area and alongside of Citarum river basin (Table 3). In the year 2003 number of resident at upstream area estimated not less than 5,713 thousand people or equal to 1,383 thousand households, while at middle stream is about 1,332 thousand people or 311 thousand household) and 1,565 thousand people or equal to 395 thousand households at part of downstream. So that the total number of resident which is live alongside of Citarum is about 6,610 thousand people or counted not less than 2,085 thousand households. Meanwhile the level of WTP per household for all suggested programs is about USD122.24 at upstream, USD50,93 at middle and USD37.44 at part of downstream or in average the WTP of respondents is about USD95.70 per household.

Table 3 also showed that level of total WTP of community at up-stream area for suggested programs is counted about USD169.1 million, at middle stream is counted about USD15,8 million, and down stream is USD 14.6 million. Therefore, WTP of community alongside of Citarum to suggested program is about USD199.5 million. This situation

indicate that in fact there is very big potential of society alongside Citarum river basin to participate in improving the sustainability natural resources through suggested programs. With assumption result of this study come near truth, its implication then is government not necessarily handles all the cost of environmental recovery program.

Table 3. Total WTP According to Stream Citarum River Basin, 2003.

Item	Citarum river basin			Total
	Upstream	Mid- stream	Downstream	
Population (000)	5,713	1,332	1,565	8,610
Number of households (000 unit)	1,383	311	391	2,085
WTP (USD per household)	122,24	50,93	37,44	95,70
Total WTP (USD 000)	169,057.92	15,839.23	14,639.04	199,536.2

Note: Total WTP is calculated base on no. of population live along the Citarum river basin.
Source: West Java Provincial Agency for Environment Conservation, 2001.

Starting year 2003, government of West Java province plan to implement program of Citarum *Bergetar* (Clean, Beautiful, and Sustainable) at about 75,000 hectares of depleted land at upstream area of Citarum representing the core problem that cause the happening of floods, erosion, and landslide. If this plan is related with level of WTP of society alongside Citarum with assumption that all WTP can be transferred to upstream program, hence will be obtained about USD2,660.48 per hectare with the program period, which is estimated for 5 years. As an illustration, in average a reforestation program need cost at least about USD 6,000 per hectare, hence government only require to provide fund equal to USD 3,339.52 or about 55.0% from required fund, because there are significant participation of society that equal to 45.0% in order to finish this program.

Result of Parameter Estimate and Elasticity of WTP of Programs at Up-Stream Area of Citarum, Bandung District

Program of Re-Forestation

Parameters estimate of WTP model for re-forestation, alley cropping, rice terracing consecutively is presented in Table 4. Result of parameter estimate of WTP at program of reforestation indicates that variation of WTP for the program of reforestation empirically can be explained in an suitable model with coefficient of determination (R^2) equal to

0.8053. In other words, about 80.53% of phenomena were able explained by exogenous variable included in the WTM model of reforestation program. The exogenous variables are consisting of age, education, farming experience, number of productive age family member, household's income, and land holding.

In relation to program of re-forestation, empirically age of respondents showed significant negative effect to WTP, its mean that when respondent getting older then level and commitment to participate in this program progressively declining. In contrary, level of education significantly determine respondents' participation in this program, which is transmitted in their WTP. In other words, respondents with higher education have better way of thinking and knowledge about the importance of effort to have more sustainable natural resources through program of reforestation. As a form of his concern to this issue, respondents showed higher level of WTP to this program. Similarly, farming experience, number of productive family member, and household's income has positive influence to WTP at program of reforestation.

However, in term of magnitude of each exogenous variable, number of productive family members has the strongest influence. For example, every one unit of increase this variable can improve WTP equal to 19.93 unit. Meanwhile WTP to this program will increase about 3.1 units for every one-unit increase on farming experience. Although it is not significant, in the reality size of land holding also have positive influence to WTP. This Phenomenon indicate that land holding have positive influence to WTP in general valid for own land, while for other land status its influence varied to WTP.

Furthermore, elasticity value indicates that WTP at program of reforestation less sensitive to all exogenous or explanatory variables, which is expressed by its elasticity value <1.0. If compared based on age of respondents and pursuant to elasticity value, this program have opportunity to success at respondent's relative younger. This can be observe at respondents' WTP of reforestation program relatively respond to the age compared to other variables. And this program is very difficult to be applied if solely only based on size of household's land holding. Other interesting phenomena can be drawn from the parameter estimate of dummy variable. This variable indicates that farmers are more participative compared to professional with respect to program of reforestation.

Table 4. Result of Parameter Estimate and Elasticity of WTP on Program of Re-Forestation, Alley Cropping and Terracing Equation at Up Stream area of Citarum River Basin in Bandung District, 2003

Program/Dependent Variable	Parameter Estimate	Standard Error	Prob > (T)	Elasticity
Re-forestation				
Intercept	226.909526	28.38607852	-	-
Age	-2.803549	0.46140785	0.0001	-0.43261
Education	1.734483	1.33391247	0.2000	0.05800
Farming Experience	3.110883	0.54212924	0.0001	0.20229
Member of Household Age > 15	19.926700	3.53644854	0.0001	0.21925
Total Income	0.000379	0.00015552	0.0187	0.04856
Total Land Holding	3.996009	6.01235630	0.5096	0.01756
Dummy of respondent	46.041225	9.92858324	-	-
R^2 = 0.8053	F_{hit} = 27.172		Prob>F = 0.0001	
Alley Cropping				
Intercept	50.888554	19.04816571	-	-
Age	-1.165936	0.30962266	0.0005	-0.35481
Education	2.994113	0.89510729	0.0016	0.19744
Farming Experience	1.979032	0.36378986	0.0001	0.25379
Age of Household member > 15	4.374060	2.37309489	0.0718	0.09491
Total Income	0.000771	0.00010436	0.0001	0.19476
Total Land Holding	26.869884	4.03452555	0.0001	0.23280
Dummy of respondent	7.420041	6.66246656	-	-
R^2 = 0.8579	F_{hit} = 39.687		Prob>F = 0.0001	
Terracing				
Intercept	-3.809060	22.94906095	-	-
Age	-0.127861	0.37303063	0.7333	-0.03821
Education	5.764714	1.07841731	0.0001	0.37329
Farming Experience	1.583596	0.43829080	0.0007	0.19942
Member of Household Age > 15	0.425935	2.85908365	0.8822	0.00908
Total Income	0.001311	0.00012573	0.0001	0.32527
Total Land Holding	8.013667	4.86076057	0.1060	0.06818
Dummy of respondent	23.520753	8.02688056	-	-
R^2 = 0.8578	F_{hit} = 39.655		Prob>F = 0.0001	

Program of Alley Cropping

Behavior of respondents' WTP at program of alley cropping almost 85.79% can be explained by explanatory variables included in the model and only about 14.21% by other

variables. At this program, age of respondent also have a significant negative effect to their WTP. While other variables such as education, farming experience, number of productive age of family member, household's income, and size of land holding have significant positive influence to respondent's WTP. Based on the value of parameter estimate, likely land holding have the biggest influence to respondents' WTP.

WTP of respondents at program of alley cropping likely less respond to any change of its explanatory variables. In other words, if any explanatory variable change equal to 10% hence will cause changing value WTP < 10%, which is indicated by its elasticity value<1. However, WTP relatively more respond to the change of age of respondents and at least respond to the change of productive family member.

This situation implies that effort on sustainability of natural resources through program of alley cropping relatively will be more succeed if applied at younger respondents. Similar to reforestation program, Value dummy parameter estimate indicates that farmer more committed than professional.

Program of Terracing

Terracing represent one of the program, which is also suitable to sustainability of natural resources that addressed for the prevention of erosion and floods. This program is very compatible applied especially for farms at upstream area of Citarum river basin. However, the accomplishment of this program is very much determined by the respond and participation of local community. In general result of parameter estimate showed that the variability of respondents' WTP at program of alley cropping explained about 85.78% by the explanatory variables included in the model.

Furthermore, result of parameters estimate indicate that although is not significant but respondents age negatively influence to WTP. Meanwhile, other variables like education, farming experience, household's income and size of land holding have a significant positive effect on WTP of respondents, except land holding, which is significant at 15% level. Although number of productive age family member also have a positive effect to WTP however statistically is not significant. From the magnitude and value of parameter estimate, variability of respondents' WTP likely is very determined by

size of land holding but less determined by household's income. This situation indicates that respondent with bigger land holding size has higher WTP as long as he gets more impact of the program of terracing for a higher investment.

Although respondents' WTP at program of terracing less respond to its explanatory variables but some implications can be drawn. If this program represent one of the alternative option to be applied by the government, it is better to take in account the level of household's income of local society, considering this program is anticipated to have better opportunity to success at households with higher income level. Meanwhile, dummy variable indicates that WTP of farmer respondents is higher than professional.

Parameters estimate of WTP model for programs of water reservoir, irrigation system, household' well, and agro-forestry at upstream area are presented in Table 5.

Program of Embung (Water Reservoir)

Combine effect of exogenous variables showed that the variability of respondents' WTP with respect to water reservoir is almost perfectly explained by these variables. This is showed by coefficient of determination (R^2) equal to 0.9015. In contradiction, respondents' WTP at program of reforestation, alley cropping, and terracing, age of respondents at water reservoir program have significant positive influence to WTP. Positive influence to WTP is also given by variable of farming experience, household's income and size of land holding of respondents, which is statistically significant at 10% and 1% successively. Although is not significant, respondents' level of education is also has positive effect to WTP. Contrarily, number of productive age family member is negatively influencing the respondents' WTP to this program.

In addition, respondents' WTP at water reservoir program less respond with respect to its exogenous variables, which is shown by its value of elasticity <1. However, in more detail, respondents' WTP at water reservoir program relatively more respond to change age of respondents compared to other variables. Consistently, farmer's respondents showed better commitment in relation to WTP at this program.

Program of Irrigation and Drainage System

Result of analysis indicate that variation of readiness of society in participating at program of irrigation and drainage system about 72.0% can be explained by its exogenous variables, and the rest equal to 28.0% by other variables, which area not included in the WTP model. The variable consists of age, education level, farming experience, number of productive age family member, household's income, size of land holding, and dummy variable differentiate between farmers' respondent and professional. All sign of parameter estimate are according to expectation, except number of productive age family member, which has negative sign but statistically is not significant. This phenomenon indicates that there is no quite strong relation between] number of productive age family member with level of respondents' WTP. Furthermore, value of parameter indicates that size of land holding has the biggest influence to respondents' WTP at this program, while the smallest influence showed by household's income.

Elasticity value of < 1 indicating that respondents' WTP at irrigation program less respond to its exogenous variables. For example, 10% change of exogenous variables only can change value of WTP between 1.1-5.6%. Furthermore, the implication of condition that this program is predicted will be more succeed if executed at society with higher level of education. At this program also seen that readiness of society to participate to this program, especially farmer is better compared too professional.

Program of Household's Well

The WTP model of respondents at household's well program empirically is as good as similar model at other programs that was discussed previously. At this program, only about 68.03% of the real WTP can be explained by all exogenous variables included in the model and the rest equal to 31,97% by other variables. However, all parameter estimates have sign as expected, and even variable of age, farming experience, number of productive age family member, and household's income significantly influence the respondents' WTP successively at 1%, 15%, 1%, and 20%. While level of education and size of land holding although have positive sign but is not significantly affect the WTP.

Meanwhile, elasticity value indicates that WTP of respondents at household's well program less respond to change of its explanatory mentioned above. For example, change

of these variables at 10% only can change WTP between 0.04 – 2.6%. This elasticity value also indicates that the efficacy of household's well program upstream area of Citarum river basin is anticipated very low or improper be achieved. This condition is indicated by low respond of society with respect to this program. This phenomenon also supported by farmer's WTP lower than WTP of professional. It's meaning that this program is getting less support from the society, which is mostly farmer. While professional ready to more for this program is solely see the function of household's Well program as the main source of clean water.

Program of Agro-Forestry

As does at household's well program, ability of explanatory variables to explain variation of respondents' WTP at program of agro-forestry only about 61.35% and the rest equal to 38,65% by other variables, which are not included in the model. All parameter estimates sign give direction as according to expectation, except number of productive age family member. Almost all variables give significant influence to respondents' WTP except to household's income that influence next to nothing, because for every USD100 increase of income only causing the make-up of WTP equal to USD 8. The biggest influence given by variable size of land holding, where to every one unit increase of this variable will improve respondents' WTP by 25.14 units.

Table 5. Result of Parameter Estimate and Elasticity of WTP on Program of Water Reservoir, Irrigation and Drainage, Household's Well and Agro-Forestry Equation at Upstream Area of Citarum, Bandung District, 2003.

Program/Dependent Variable	Parameter Estimate	Standard Error	Prob > (T)	Elasticity
Water Reservoir				
Intercept	+-9.693127	20.40264482	-	-
Age	1.716955	0.33163934	0.0001	0.57791
Education	1.068562	0.95875667	0.2708	0.07797
Farming Experience	0.666259	0.38965827	0.0940	0.09450
Member of Household Age > 15	-14.731902	2.54184119	0.0001	-0.35357
Total Income	0.001482	0.00011178	0.0001	0.41431
Total Land Holding	16.789132	4.32141305	0.0003	0.16089
Dummy of respondent	24.028832	7.13622198	-	-
R^2 = 0.9015	F_{hit} = 60.133		Prob>F = 0.0001	
Irrigation System				

Intercept	-70.638691	31.07605924	-	-
Age	0.574420	0.50513274	0.2614	0.18208
Education	8.378164	1.46031946	0.0001	0.57547
Farming Experience	3.324980	0.59350362	0.0001	0.44413
Member of Household Age > 15	-4.744490	3.87157684	0.2266	-0.10723
Total Income	0.000599	0.00017026	0.0010	0.15771
Total Land Holding	13.389831	6.58211174	0.0477	0.12084
Dummy of respondent	34.108622	10.86945633	-	-
R^2 = 0.7200	F_{hit} = 16.901	Prob>F = 0.0001		
Household's Well				
Intercept	40.884577	12.42321853	-	-
Age	0.508638	0.20193598	0.0153	0.26101
Education	0.192737	0.58378920	0.7428	0.02143
Farming Experience	0.381444	0.23726384	0.1147	0.08248
Member of Household Age > 15	5.199405	1.54773309	0.0016	0.19024
Total Income	0.000097	0.00006806	0.1584	0.04158
Total Land Holding	0.276839	2.63131860	0.9167	0.00404
Dummy of respondent	-12.082155	4.34526239	-	-
R^2 = 0.6803	F_{hit} = 13.985	Prob>F = 0.0001		
Agro-forestry				
Intercept	-72.315383	43.59595633	-	-
Age	1.539424	0.70864020	0.0350	0.46618
Education	10.546652	2.04865176	0.0001	0.69208
Farming Experience	1.844861	0.83261387	0.0317	0.23543
Member of Household Age > 15	-22.784247	5.43135453	0.0001	-0.49197
Total Income	0.0000810	0.00023885	0.7359	0.02038
Total Land Holding	25.137352	9.23390748	0.0091	0.21673
Dummy of respondent	93.923344	15.24853392	-	-
R^2 = 0.6135	F_{hit} = 10.432	Prob>F = 0.0001		

Respondent's WTP for this program also less respond to change of its explanatory variables as showed by the elasticity value < 1. However, if this program represent one of the pre-eminent program to be implemented at upstream area of Citarum, hence is better initially executed at region, which is its society have relative higher education compared to other region. This approach is considering that WTP of respondents is relatively most respond to the change of education. In contrary, the approach will not suitable if it is pursuant to household's income. For the region of upstream, society almost 95% is farmer. So that related to this condition, hence above approach will be strongly supported by the community because farmer respondents have better WTP compared to professional as shown by parameter estimate of dummy variable.

Result of Parameter Estimate and Elasticity of WTP of Programs at Middle Stream Area of Citarum

Program of Reforestation

Result of parameter estimates of re-forestation, alley cropping, and rice terracing program at middle area of Citarum river basin, which is located mostly at Cianjur District, is presented in Table 6.

The estimates of re-forestation equation show that the ability of exogenous or explanatory variables to explain variation of respondents' WTP at program of reforestation at middle stream area Citarum is quite good, that is coefficient of determination (R^2) equal to 85.28%. All sign of parameter estimates have positive sign, which are matching with the expectation except variable age respondents. Almost all explanatory variables included in the model have very strong influence to the variability of WTP at program of reforestation, which is statistically significant at level < 1%. Number of productive age family member is the only variable, which is not significantly affect the WTP of respondents at middle stream area of Citarum river basin.

Furthermore, value of elasticity (<1) indicating that this program is anticipated wills less success to be applied at middle area of Citarum. This can be seen for example, for every 10% change of value of explanatory variable only can change the respondents' WTP < 2%. This condition is strengthened by the existence of phenomenon that readiness of farmer society to participate in this program is lower than professional.

Program of Alley Cropping

Result of analysis indicates that in combination, all explanatory variables can explain the variation respondents' WTP at this program with coefficient of determination (R^2) about 0.840. Empirically, parameter estimate of age of respondents has negative effect to WTP and statistically significant at level of 1%. While sign of other parameter estimates have positive sign that easily can be understood. Farming experience and education level have strong positive influence to respondents' WTP because both variable significant at level of 1%. Meanwhile, size of land holding significantly influences the WTP only at level of 20%. Finally, number of productive age family member and household's income has no significant effect to the WTP of respondents at this area.

Meanwhile, elasticity value indicates that respondents' WTP at program of alley cropping do not respond to change of its explanatory variables. For example, change of 10% at explanatory variables only able to change value of WTP between 0.3%- 6.0%. If compared pursuant to value of elasticity, this program is anticipated will relatively succeed to be applied at society, which have more farming experience. Readiness of farmer to participate in this program is lower than professional.

Program of Terracing

Explanatory variables that included in the model of respondents' WTP at terracing program at middle area of Citarum empirically explained about 84.93% of WTP variation. Among six explanatory variables, three variables have negative and positive parameter estimates respectively. Positive sign showed by parameter estimates of level of education, farming experience, and size of land holding. These variables have strong influence to respondents' WTP and significant at level of 1%. While parameter estimates of explanatory variables with negative sign are age of respondents, number of productive age family member, and household's income.

Table 6. Result of Parameter Estimate and Elasticity of WTP on Program of Re-Forestation, Alley Cropping, and Terracing Equation at Middle Stream, Cianjur 2003.

Program/Dependent Variable	Parameter Estimate	Standard Error	Prob > (T)	Elasticity
Re-forestation				
Intercept	48.670847	3.73730284	-	-
Age	-0.303061	0.04536912	0.0001	-0.17920
Education	2.235254	0.28086910	0.0001	0.19987
Farming Experience	0.655639	0.08483800	0.0001	0.17088
Member of Household Age > 15	0.380349	0.36257066	0.2992	0.01578
Total Income	0.000888	0.00022476	0.0002	0.06684
Total Land Holding	18.044475	1.65987467	0.0001	0.12188
Dummy of respondent	-1.123994	1.15893625	-	-
R^2 = 0.8528	F_{hit} = 41.390		Prob>F = 0.0001	
Alley Cropping				
Intercept	25.023523	6.33889619	-	-
Age	-0.475829	0.07695126	0.0001	-0.36719
Education	3.261698	0.47638635	0.0001	0.38061
Farming Experience	1.751505	0.14389503	0.0001	0.59574
Member of Household Age > 15	0.556873	0.61496161	0.3695	0.03015
Total Income	0.000492	0.00038121	0.2028	0.04835
Total Land Holding	3.883293	2.81533867	0.1739	0.03423
Dummy of respondent	-12.378925	1.96568941	-	-
R^2 = 0.8400	F_{hit} = 37.504		Prob>F = 0.0001	
Rice Terracing				

Intercept	16.221753	8.00003278	-	-
Age	-0.560170	0.09711668	0.0001	-0.39310
Education	4.522827	0.60122556	0.0001	0.47995
Farming Experience	2.272968	0.18160337	0.0001	0.70305
Member of Household Age > 15	-0.036879	0.77611509	0.9623	-0.00182
Total Income	-0.000106	0.00048111	0.8273	-0.00943
Total Land Holding	15.001186	3.55311098	0.0001	0.12025
Dummy of respondent	-14.439180	2.48080726	-	-
R^2 = 0.8493	F_{hit} = 40.257	Prob>F = 0.0001		

However, only variable of age anticipated to have strong influence, while two other variable is anticipated do not have significant effect to WTP. In general, respondents' WTP at program of terracing do not respond to change of its explanatory variables as shown by elasticity value <1. Change of variable of 10% only can change value of WTP gyrate 0,01 - 7,03%. However, program of terracing represent one of the programs to be recommended at middle area of Citarum river basin, approach pursuant to farming experience from local community must be taken into account as first priority. At this location, farmer society have readiness to participate in the program of terracing is lower than professional society.

Program of Embung (Water reservoir)

Meanwhile, parameters estimate of water reservoir, irrigation and drainage system, household's well and agro-forestry equation model consecutively is presented in Table 7.

The ability of explanatory variables to explain the variation of respondents' WTP at water reservoir program is not as good as at previous programs such as reforestation, alley cropping, and terracing. In this model, these variables explained variation of WTP equal to 64.86%. Almost all explanatory variables has positive sign of parameter estimates except age of respondents that have negative sign and statistically is not significant level of 20%. Education level, number of productive age family member and size of land holding have strong influence respondents' WTP and significant at level of 10%. Meanwhile, variable of household's income fairly influence WTP since only significant at level of 20%. While farming experience of household is the only explanatory variable has no influence to the variation of WTP.

Program water reservoir seems to be difficult to be developed at middle area of Citarum. This phenomenon is shown by its elasticity value, which is very small. For

example, change of 10% of explanatory variable only can change value of WTP between 0.07 – 4.0%. On the other hand, the parameter estimate of dummy variable, which has positive sign indicates that readiness of farmer to participate at water reservoir program is higher than professional.

Program of Irrigation Drainage System

Result of parameter estimates at equation of WTP at irrigation and drainage system program indicates that in combination, explanatory variables can explain about 80.45% of the variation of WTP. And all variables have quite strong influence to WTP and significant at level of 10%. However, sign of parameter estimate of age and number of productive family member were not as expected.

Similar to water reservoir program, likely irrigation and drainage program also represent one of the program, which is difficult to be developed at middle area Citarum since WTP is not exhibited significant respond to any change in its explanatory variables. For example, WTP of respondents only change between 0.9% - 4.6% for every 10% change of its explanatory variables. If this program is included as one of the program, which must be developed at middle area of Citarum, hence the approach if better addressed at community with better level education. Nevertheless, farmers' readiness to participate at this program as shown by their WTP is fairly lower compared to professional society.

Program of Household's Well

Respondents WTP model at household's well program at middle area of Citarum could not be explained by its explanatory variables. This is shown by the coefficient of determination (R^2), which is only equal to 50.52%, and the rest about 49.48% explained by other variables, which are not included in the WTP model. This is become the worst model of WTP among programs that introduced to the respondents. This estimated model indicates that program of household's well is seem very difficult to be implemented and adopted by community at middle area of Citarum river basin.

Table 7. Result of parameter estimate and elasticity of WTP on Program of water reservoir, irrigation and drainage, household's well, and agro-forestry equation at Middle-Stream, Cianjur District 2003.

Program/Dependent Variable	Parameter Estimate	Standard Error	Prob > (T)	Elasticity
Water Reservoir				
Intercept	17.454100	12.33325464	-	-
Age	-0.119134	0.14971999	0.4300	-0.07056
Education	2.441792	0.92687970	0.0112	0.21871
Farming Experience	0.027558	0.27996893	0.9220	0.00719
Member of Household Age > 15	9.686882	1.19649823	0.0001	0.40261
Total Income	0.001001	0.00074171	0.1833	0.07549
Total Land Holding	9.321357	5.47765536	0.0950	0.06307
Dummy of respondent	10.062578	3.82453778	-	-
R^2 = 0.6486	F_{hit} = 13.186		Prob>F = 0.0001	
Irrigation and Drainage				
Intercept	17.829452	5.59338675	-	-
Age	-0.246741	0.06790112	0.0007	-0.19208
Education	3.942317	0.42035917	0.0001	0.46408
Farming Experience	0.931494	0.12697172	0.0001	0.31961
Member of Household Age > 15	-0.966597	0.54263676	0.0809	-0.05280
Total Income	0.000977	0.00033638	0.0055	0.09686
Total Land Holding	11.743033	2.48423030	0.0001	0.10442
Dummy of respondent	-3.296827	1.73450720	-	-
R^2 = 0.8045	F_{hit} = 29.398		Prob>F = 0.0001	
Household' Well				
Intercept	29.686969	5.92880656	-	-
Age	-0.020065	0.07197296	0.7816	-0.01888
Education	1.207502	0.44556693	0.0092	0.17179
Farming Experience	0.225792	0.13458586	0.0997	0.09363
Member of Household Age > 15	2.294857	0.57517717	0.0002	0.15150
Total Income	0.000337	0.00035655	0.3497	0.04033
Total Land Holding	1.891165	2.63320267	0.4760	0.02032
Dummy of respondent	-4.100381	1.83852076	-	-
R^2 = 0.5052	F_{hit} = 7.293		Prob>F = 0.0001	
Agro-forestry				
Intercept	24.218312	5.68782863	-	-
Age	0.036137	0.06904760	0.6030	0.03279
Education	1.087611	0.42745675	0.0141	0.14923
Farming Experience	0.500264	0.12911558	0.0003	0.20008
Member of Household Age > 15	1.590927	0.55179894	0.0058	0.10129
Total Income	0.001762	0.00034206	0.0001	0.20366
Total Land Holding	1.614675	2.52617544	0.5256	0.01674
Dummy of respondent	-13.581419	1.76379359	-	-
R^2 = 0.8047	F_{hit} = 29.429		Prob>F = 0.0001	

However, almost all variables have positive sign parameter except to variable age, which is not significant at level of 20%. Among explanatory variables that have positive sign and significant at least at 10% level are education level, farming experience, and number of productive age family member. While variable of total household's income and size of land holding although has positive sign parameter estimates but do not have significant effect to respondents' WTP.

This program also seems very difficult to be developed at middle area of Citarum, because WTP of respondents is not respond to any change of its explanatory variables. This condition is showed by elasticity value, which is very small and almost come near to zero. In addition, readiness of farmer society to participate at this program is also lower than professional society.

Program of Agro-Forestry

Result of analysis indicates that variation of respondents' WTP at program of agro-forestry can be better explained by its explanatory variables, which posed by coefficient of determination (R2) equal to 0,8047, like presented at Table 4.18. Furthermore, all variables have positive sign parameter estimates. Among six explanatory variables, there are four variables, which is significantly affect to WTP that are education level, farming experience, number of productive family member, household's income and statistically significant at level of 10%. Meanwhile variable age and size of land holding seems has no significant effect to value of respondents' WTP.

WTP at program of agro-forestry also exhibited no significant respond to its explanatory variables, posed by its very small elasticity value that is between 0.02 – 0.20. Similarly, readiness of farmer society to participate in this program significantly lowers than professional.

Result of Parameter Estimate and Elasticity of Respondents' WTP at Downstream in Karawang District for Programs at Upstream Area

Society in downstream area of Citarum in Karawang District respond that, the existence of floods in this region besides because of condition of environment in its area which less adequate, also effect of existence of damage of environment at upstream due to human being activity which without any concern. So that in the effort to lessen floods at downstream area must be conducted comprehensively through various programs, which is function relative differ upstream, middle and also downstream. Execution of program at three regions ought to get support from the society at downstream area of Citarum such as in Karawang District. For this purpose, especially at downstream area, this study successively will see farmer respond to executed programs at upstream, middle as well as executed programs at its own area or downstream area. Result of parameters estimate of re-forestation, alley cropping, and terracing programs equation are presented in Table 8.

Programs of Re-Forestation

Variation of respondents' WTP in program of reforestation is excellently explained by its explanatory variables. In combination, all explanatory variables, which consist of age, education, farming experience, number of productive age family member, household's income, size of land holding, and dummy could explained about 91.38% of the variation of WTP. The rest that equal to 8.62% is explained by other variables, which are not included in the model. All sign of parameter estimates is as expected, except to

variable old age and number of productive age family member, which have negative sign. Almost all variables have strong influence to the value of WTP, which is significant at level of 10%, except to variable of age of respondents, which is not significant. Education level of respondents has the strongest influence to the change of WTP value, where for every one unit change in this variable can change value of WTP equal to 7.2 units. Meanwhile, for one unit change of other variables only change respondents' WTP between 0.001 – 3.7 unit.

The elasticity value less than 1.0 indicates WTP of respondents at program of reforestation less responds to the change of its explanatory variables. However, if seen further WTP in fact quite respond to the change of education level, which almost come near one (e = 0.98). From parameter estimate of dummy variable, it can be interpreted that readiness of farmer respondents in realizing WTP at program of reforestation to be executed at upstream and middle area is significantly higher compared to professional.

Table 8. Result of Parameter Estimate and Elasticity of WTP on Program of Re-Forestation, Alley Cropping, and Terracing Program Equation at Down-Stream-Karawang, 2003.

Program/Dependent Variable	Parameter Estimate	Standard Error	Prob > (T)	Elasticity
Re-forestation				
Intercept	-49.242731	10.57190854	-	-
Age	-0.064157	0.19003437	0.7373	-0.05131
Education	7.182973	0.85671299	0.0001	0.98059
Farming Experience	1.141188	0.26165224	0.0001	0.37965
Member of Household Age > 15	-1.991186	1.18630225	0.1007	-0.12263
Total Income	0.000981	0.00016092	0.0001	0.26242
Total Land Holding	3.696163	1.43898366	0.0139	0.12091
Dummy of respondent	29.217577	3.86881197	-	-
R^2 = 0.9138	F_{hit} = 63.581		Prob>F = 0.0001	
Alley Cropping				
Intercept	0.328546	2.61277894	-	-
Age	0.058924	0.04696577	0.2166	0.12492
Education	0.271037	0.21173108	0.2075	0.09809
Farming Experience	0.192992	0.06466566	0.0047	0.17021
Member of Household Age > 15	1.552964	0.29318694	0.0001	0.25355
Total Income	0.000411	0.00003977	0.0001	0.29115
Total Land Holding	0.640033	0.35563552	0.0791	0.05550
Dummy of respondent	-0.317235	0.95615190	-	-
R^2 = 0.8990	F_{hit} = 53.402		Prob>F = 0.0001	
Terracing				
Intercept	-4.777538	3.65919865	-	-
Age	0.225934	0.06577559	0.0013	0.51583
Education	0.601368	0.29652952	0.0489	0.23438
Farming Experience	0.185638	0.09056430	0.0467	0.17632
Member of Household Age > 15	0.715958	0.41060851	0.0885	0.12588
Total Income	0.000152	0.00005570	0.0094	0.11581
Total Land Holding	-0.744995	0.49806779	0.1422	-0.06958
Dummy of respondent	4.756786	1.33909138	-	-
R^2 = 0.6395	F_{hit} = 10.646		Prob>F = 0.0001	

Program of Alley Cropping

Almost equal to 89.90% respondents WTP variation at downstream area at program of Alley Cropping can be explained by its explanatory variables. All variable parameter estimates have sign, which are positive and match with the one, which expected. In more detail, for every increase of one unit of variable such as number of productive family member relatively showed the biggest influence to value of WTP that is equal to 1.56 unit, while the smallest is household's income. Except age respondents, all explanatory variables give very strong influence to value of WTP at alley cropping program, which is significant at level of 1-10%.

Respondents' WTP seems has less respond to change of its explanatory variables. This empirical finding can be seen for example every 10% change of explanatory variable can only change the value of WTP less than 3%. From this elasticity value, can also be said that the execution of alley cropping program at upstream area may not get full support from the society at downstream. This condition is anticipated possible to happen since the knowledge and experience of society downstream especially farmer respondents not yet known many about this program. This phenomenon is strengthened from the value of dummy at this program, which indicate that readiness of farmer respondents in paying WTP for this program is higher than professional.

Program of Terracing

Result of parameter estimates of terracing equation showed that explanatory variables could explain the variation of respondents' WTP at this program only about 63.95% and the rest 36.05% by other variables, which are not included in the WTP model. However, all explanatory variables has positive parameter estimate as expected and significant at level of 10 %, except size of land holding, which has negative sign significant at level of 15%.

Similar to other programs, WTP of respondents at terracing program is less respond to the change of its explanatory variables. This condition is marked by elasticity value for each variable less than one. It means that for 10% of explanatory variable only can change respondents' WTP between 0.7 – 5.2%. However, among explanatory variables likely WTP at this program relatively more respond to the change of age of

respondents. The elasticity value showed that WTP of younger respondents is better than the older at downstream society, which with relatively younger resident. So that if this program will be executed then needs more effort to socialize the program at younger society. However, this program seems also get quiet significant support from farmer society compared to professional. This phenomenon is proven from readiness of farmers at downstream area to actualizing their WTP is higher than professional.

Program of Embung (Water Reservoir)

How society at downstream area responds to the introduced program such as water reservoir, irrigation and drainage system, household's well and agro-forestry, the information is presented in Table 9. For example, construction of water reservoir at upstream of Citarum is aimed to temporarily detain rain fall water to reduce erosion and floods as well as for other purposes such as fresh water fish culture and stimulate agro-tourism. First of all, the ability of explanatory variables to explain the variation respondents' WTP is quiet good as showed by its coefficient of determination that equal to 81.04% and only about 18.96% explained by other variables. Age of respondents, education, farming experience and household's income give influence which are positive to value of WTP. Conversely, number of productive family member and size of land holding negatively influence the WTP of respondents. Almost all explanatory variables showed strong influence to WTP and significant at level of 5%, except size of land holding, which is significant at level of 15%.

Respondent's WTP at water reservoir program also less respond to the change of its explanatory variables. To all changes in value of explanatory variable at 10% only can change WTP between 0.7 – 6.7%. WTP of respondents at this program relatively only respond to the change of number of productive age family member and respondents age. Based on the sign and magnitude of dummy variable, readiness of farmer society to participate at this program is higher than professional.

Program of Irrigation and Drainage System

Result of parameter estimates and elasticity of WTP at irrigation and drainage program in Karawang representing down stream area of Citarum indicate that ability of

explanatory variables to explain the variability of respondents' WTP is excellence that is equal to 93.08%. From six explanatory variables included in the model, accounted 4 parameter estimates has positive sign and as according to expectation. Those variables are education level, farming experience, household's income, and size of land holding. Furthermore, all explanatory variables give strong influence to the value of respondents' WTP and statistically significant at level of 1%, except household's income, which is not significant although at level of 20%.

In general, respondents' WTP at irrigation program less respond or inelastic with respect to change of its explanatory variables. This condition is shown by its elasticity value, which is less than one. To all changes of explanatory variables equal to 10% only can change WTP of respondents' at range of 0.02 – 8.5%. Furthermore, WTP of respondents at this program relatively showed the highest respond to education level of respondents. This condition indicates that this program get enough support at downstream society especially having better education. Dummy variable also indicates that readiness of farmer society to participate and support this fairly higher than professional.

Program of Household's Well

Nevertheless, results of analysis showed that ability of explanatory variables to explain variation of respondents' WTP at Well program is fairly good that is equal to 89.79%. Parameter estimates sign showed that result of this analysis much the same to with analysis of WTP at irrigation and drainage program. Among six explanatory variables, accounted 4 parameter estimates has positive sign as expected that is education level, farming experience, household's, size of land holding. However, magnitude of its influence to WTP of respondents gives different result. Only farming experience, household's income and size of land holding having an effect, which is significant at level of 1%. Meanwhile, education level of respondents is the only explanatory variable has no on to the WTP. Meanwhile, explanatory variables that negatively influence WTP of respondents are age of respondent and number of productive age family member and significant at] level of 20% and 5% successively. This condition indicates that younger

productive family member at down stream such as in Karawang consider this program is not important to lessen drought and floods.

Elasticity of WTP with respect to explanatory variables in the model also showed that this program is relatively difficult to be implemented at downstream area. This condition can be observed from respond of society, which is very low as presented by six explanatory variables. For example, any change of 10% at each explanatory variable only can change WTP of respondents' gyrate at range of 0.6-3.0%. However, parameter estimate of dummy variable indicates that readiness of farmer society to participate in this program is bigger than professional.

Table 9. Result of Parameter Estimate and Elasticity of WTP on Program of Water Reservoir, Irrigation and Drainage System, Household's Well, and Agro-Forestry at Down-Stream, Karawang, 2003.

Dependent Variable	Parameter Estimate	Standard Error	Prob > (T)	Elasticity
Water Reservoir				
Intercept	17.390781	7.85746096	-	-
Age	0.450124	0.14124107	0.0027	0.48055
Education	1.491638	0.63674301	0.0240	0.27185
Farming Experience	0.578227	0.19447030	0.0049	0.25681
Member of Household Age > 15	-8.169181	0.88170680	0.0001	-0.67165
Total Income	0.000554	0.00011960	0.0001	0.19785
Total Land Holding	-1.637869	1.06950962	0.1332	-0.07153
Dummy of respondent	8.276371	2.87545422	-	-
R^2 = 0.8104	F_{hit} = 25.641		Prob>F = 0.0001	
Irrigation and Drainage				
Intercept	0.924559	2.46459423	-	-
Age	-0.112320	0.04430209	0.0150	-0.21535
Education	2.585860	0.19972268	0.0001	0.84636
Farming Experience	0.243158	0.06099812	0.0003	0.19395
Member of Household Age > 15	-1.077037	0.27655874	0.0003	-0.15903
Total Income	0.000004	0.00003752	0.9158	0.00256
Total Land Holding	2.375855	0.33546552	0.0001	0.18634
Dummy of respondent	4.077446	0.90192340	-	-
R^2 = 0.9308	F_{hit} = 80.711		Prob>F = 0.0001	
Household's Well				
Intercept	5.912351	1.90893710	-	-
Age	-0.044943	0.03431392	0.1974	-0.14205
Education	0.116612	0.15469404	0.4552	0.06292
Farming Experience	0.173016	0.04724574	0.0007	0.22749
Member of Household Age > 15	-0.449395	0.21420696	0.0420	-0.10939
Total Income	0.000147	0.00002906	0.0001	0.15523
Total Land Holding	2.316580	0.25983287	0.0001	0.29951
Dummy of respondent	2.031754	0.69857951	-	-
R^2 = 0.8979	F_{hit} = 52.739		Prob>F = 0.0001	
Agro-forestry				

Intercept	-0.620136	0.91260125	-	-
Age	-0.081049	0.01640438	0.0001	-041267
Education	0.070776	0.07395423	0.3440	0.06152
Farming Experience	0.378008	0.02258667	0.0001	0.80069
Member of Household Age > 15	0.643977	0.10240544	0.0001	0.25251
Total Income	0.000029	0.00001389	0.0373	0.05087
Total Land Holding	1.169658	0.12421771	0.0001	0.24361
Dummy of respondent	1.084075	0.33396833	-	-
R^2 = 0.9662	F_{hit} = 130.927		Prob>F = 0.0001	

Program of Agro-Forestry

Agroforestry is one of the environmentally sound programs addressed to lessen erosion and floods. Combination of agricultural activity and reforestation especially industrial forest is not only aimed to sustain natural resources but also improve the quality of environment as well as use of this program as one of the source of household's income. This program is mainly executed at the upstream area of Citarum river basin, which is located at Bandung District in West Java. Agroforestry is expected to get more support from the community at this area since this program is not totally move people that have open forest for extensive farming.

Result of analysis parameter estimates and elasticity of respondents' WTP at this program indicates that ability of explanatory variables to explain the variability of WTP is excellence as shown by coefficient of determination that is equal to 96.62%. Most of explanatory variables parameter estimates have positive, except variable of age, which has negative sign. Farming experience, number of productive age family member, household's income, and size of land holding are strongly influence the variability of respondents' WTP, which is statistically significant at level of 5%. Although variable level of education have positive sign parameter estimate, however it is not significantly influence the WTP of respondents.

Meanwhile, elasticity value indicates that WTP of respondents at downstream area less respond to agroforestry program that will be executed at upstream area of Citarum. This phenomenon is shown by inelastic respond of WTP as its explanatory variables. For example, 10% change of any explanatory variable only can change value respondents' WTP at range of 0.5 – 8.0%. However, readiness of farmer society to participate at this programs a little bit higher than professional society.

Result of Parameter Estimate and Elasticity of Respondents' WTP at Downstream in Karawang District for Programs at Their Own Area

Besides society respond at downstream area to some programs to be executed at upstream and middle area of Citarum, this study also try to investigate respondents' respond to three programs to be developed at their own area in Karawang District, which is representing downstream area of Citarum. The program comprised of water reservoir, irrigation and drainage system, and water pomp. The main target of these programs is the effort to lessen drought and floods during dry and wet season respectively. Following will be elaborated the society respond to these program through analysis of parameter estimates and elasticity. More detail information about variability of respondents' WTP with respect to program such as water reservoir, irrigation and drainage, water pump are presented in Table 10.

Program of Embung (Water reservoir)

Result of parameter estimates showed that in combination explanatory variables could explain about 83.92% of respondents' WTP at water reservoir program to be executed at downstream area in Karawang. Respondents' age and number of productive age family member are negatively influencing WTP of respondents, which is significant at level of 20% and 1% consecutively. Meanwhile, other explanatory variables such as education, farming experience, household's income, and size of land holding has positive effect on WTP of respondents at this water reservoir program and significant at level of 1%, except size of land holding, which is significant at level of 20%.

From level of elasticity value at all explanatory variables, which is less than one indicating that WTP of respondents at water reservoir program less respond to change of its explanatory variables. At this program, to all changes in value of explanatory variables equal to 10% only can change WTP of respondents at range of 0.6-5.4%. Magnitude of parameter estimate also showed that readiness of farmers to realize their WTP at water reservoir program also significantly higher than professional.

Program of Irrigation and Drainage System

Floods which often happened at study area one is caused by do not function of irrigation channel and drainage system over there. From other side the happening of sedimentation due heavy muddy stream, also affect the number of settlement along the channel that can reduce size of cannel. The performance of equation of respondents' WTP, which is analyzed in this program, is excellence. This is showed by its explanatory variables that can explain about 93.22% WTP variability and only about 6.72% explained by other variables.

At this program as respondents getting older they readiness to participate in this program progressively decline, although is not significant at level of 20%. This condition happened is anticipated that at younger society have higher spirit in effort to lessen floods. And so do variable of number of productive age family member, in which its parameter estimate indicates that there is no significant relation between readinesses to realize WTP with number of productive age family member. Level of readiness or respondents even decline pursuant to number of productive age family member. Meanwhile, variable level education, farming experience, household's income, and size of land holding have significant and positive parameter estimates at level of 5%.

Table 10. Result of parameter estimate and elasticity of WTP on program of water reservoir, irrigation and drainage, and water pump equation if introduced at their region at down-Stream, Karawang, 2003

Program/Dependent Variable	Parameter Estimate	Standard Error	Prob > (T)	Elasticity
Water Reservoir				
Intercept	2.491225	11.44859906	-	-
Age	-0.284994	0.20579324	0.1734	-0.21253
Education	4.239892	0.92775713	0.0001	0.53975
Farming Experience	1.389184	0.28335012	0.0001	0.43097
Member of Household Age > 15	-4.327085	1.28467805	0.0016	-0.24850
Total Income	0.000771	0.00017427	0.0001	0.19226
Total Land Holding	2.039481	1.55831342	0.1977	0.06221
Dummy of respondent	19.313575	4.18963870	-	-
R^2 = 0.8392	F_{hit} = 31.308		Prob>F = 0.0001	
Dependent Variable	Parameter Estimate	Standard Error	Prob > (T)	Elasticity
Irrigation and Drainage				

Intercept	-34.173254	14.20677058	-	-
Age	-0.157743	0.25537250	0.5401	-0.08786
Education	4.370083	1.15127035	0.0005	0.41554
Farming Experience	1.779805	0.35161421	0.0001	0.41242
Member of Household Age > 15	-3.617693	1.59417988	0.0284	-0.15518
Total Income	0.001271	0.00021625	0.0001	0.23673
Total Land Holding	18.217839	1.93373889	0.0001	0.41509
Dummy of respondent	25.419930	5.19899731	-	-
R^2 = 0.9322	F_{hit} = 82.504	Prob>F = 0.0001		
Water Pump				
Intercept	-0.084399	6.60754094	-	-
Age	-0.038072	0.11877324	0.7501	-0.28924
Education	-0.274177	0.53545357	0.6113	-0.35559
Farming Experience	0.182647	0.16353508	0.2704	0.57727
Member of Household Age > 15	-0.311699	0.74144992	0.6763	-0.18237
Total Income	0.000124	0.00010058	0.2227	0.31631
Total Land Holding	2.180860	0.89937814	0.0197	0.67775
Dummy of respondent	2.639629	2.41804338	-	-
R^2 = 0.3756	F_{hit} = 3.609	Prob>F = 0.0039		

All elasticity value of WTP to its explanatory variables is inelastic. This condition indicates that WTP of respondents at irrigation and drainage program do not respond to the change of its explanatory variables. To all changes in 10% explanatory variable only can change the WTP respondents at range of 0.8 – 4.2%. However, variable of education, farming experience, and size of land holding represent the main variables that determine the success of this program, considering WTP of respondents relative respond to three variables compared to other explanatory variables. In general readiness of farmer respondents to participate in this program is higher than professional.

Program of Water Pump

Heavy floods use to happens at downstream area of Karawang during wet season especially when the rain fall relatively high between November to February. Conversely when dry season come many rice field do not have enough irrigate water due to limited availability of water supply. So that most of farmers in this area grow rice 2 times a year and very limited area could grow secondary crops at the third season. First planting season of rice is usually October to January, and second planting season is between February/March to May and third planting season is June to August. During September there is activity to rehabilitate damage irrigation canal.

Result of analysis indicates that explanatory variables unable to explain well the variability of respondents' WTP program of water pumps. This condition showed by the coefficient of determination, which is only about 37.56%, and accounted of 62.44% explained by other variables, which are not included in the model of WTP. This condition happened because of between respondents that experience floods and respondents that experience drought were not separated in this study. Thereby many respondents only experiencing of floods and only experience of drought when dry season come, so that they less interested to water pump program.

This phenomenon is caught from parameter estimates, which many of explanatory variables have negative sign. For example, variable of age, education, and number of productive age family member, which are not significantly influence the WTP of respondents Similarly, although variable of farming experience and household's income have parameter estimates, which are positive however this variables were not significant at level of 20%. Size of land holding is the only explanatory variable having positive parameter estimate and statistically significant at level of 5%. This phenomenon indicates that readiness of society to participate at program of water pump solely only determined by size of land holding.

Similar to other two programs previously discussed, in the reality WTP of respondents at program of water pump also less respond to any change of its explanatory variables. To all changes in 10% explanatory variables only can change the WTP of respondents at range 1.6 – 6.8%. From the value of elasticity, furthermore can be anticipated that execution of water pump program have higher opportunity to success if its pursuant to the size of land holding especially those respondents that experience drought, considering that WTP relatively more respond to this variable.

CONCLUSION AND POLICY IMPLICATION

Conclusion

1. Readiness of respondents to participate in programs of floods prevention, which is measured as Willingness To Pay (WTP). In aggregate, WTP of farmer respondents at upstream area of Citarum is 10.66% higher than professional. Evaluation of respondents' WTP to each program introduced at upstream area indicates that the highest WTP of professional and farmer are addressed to program of *reforestation*. The next biggest WTP of respondents is shown with respect to program of *agro-forestry*, followed by *terracing* and *alley cropping*.
2. Meanwhile, regional WTP of professional at middle stream area of Citarum for flood, soil erosion and landslide prevention program is about 16.96% higher than farmer respondents. However, WTP of respondents at middle stream is very much lower or about 41.66% of respondents' WTP at upstream area. This significant different is mainly due to household's income gap between these two areas. According to programs raised at this area, professional shows the highest WTP with respect to program of *reforestation*. From seven existing alternative programs, the lowest professional's WTP is to household's Well program that is only 10.98% of the total WTP. Meanwhile, the biggest farmers' WTP is addressed to program of *alley cropping*. While the smallest farmers' WTP relative to other WTP is addressed to agro-forestry that is equal to 10.81%.
3. WTP of respondents at downstream of Citarum to all programs is equal to USD34,24 at professional and USD37.44 at farmer respondents. In this area, WTP of farmer is about 9.35% higher than professional's WTP. According to area, WTP of respondents at upstream of Citarum is the highest then come next middle stream and downstream.
4. From ten raised programs, either professional or farmer ready to pay the biggest amount at program of making *irrigation and drainage system* at downstream area and they also support *reforestation* program at upstream. At this program, WTP of professional and farmer is about 23.16% and 24.89% from total WTP respectively.
5. Introduced program at upstream mostly determined by factors such as: households' income, size of land holding, farming experience, education, and age of respondent. Meanwhile, reforestation and alley cropping that suited at middle stream is mostly determined by households' income, land holding, age, experience, and education. The last, irrigation and drainage system program at downstream is determined by size of land holding, age, education, experience, and number of households' member that > 15 year old.

Policy Implication

1. Government should attract the maximum capacity of society alongside Citarum river basin to participate in each environmentally sound program lunched to protect the sustainability of environment.

2. Since the main source of environment degradation is the deforestation of upstream area for extensive farming, then alternatives should be provided by the local government with support from the Central Government such as: (1) reallocation of people that practices extensive farming from upstream down to more secure land; (2) low enforcement of those doing deforestation without different treatment for the actors of this damaging agricultural practices.
3. Government as well as community at down stream area should become a part of investment target to rehabilitate the upstream and middle stream of Citarum. For example Government of DKI Jakarta must joint hand in hand with government of West Java Province to solve conflicting problem at upstream of Citarum. A lot of money invested to escape from yearly floods may not be effective since the upstream area of Citarum continuously deforested.

REFERENCES

Biswas A. K. and S. B. C. Agarwala, Environmental Impact Assessment for Developing Countries, Butterworth-Heinemann, Oxford, 1992.

Clark B. C., K. Chapman, R. Bisset, P. Wathern and M. Barrett, A Manual for the Assessment of Major Development Proposals, HMSO, London, 1981.

Cumming. R, D. Brookshire, and W. Schulze. 1986. Valuing Environmental Goods; An Assessment of the Contingent Valuation Method. Rowm and Allanheld, NJ.

Hanley, N; J.F. Shogren; and B. White. 1997. Environmental economics in theory and practice. MacMillan Press LTD, London.

Just, R; D. Hueth; and A. Schmitz. 1982. Applied Welfare Economics and Public Policy. Prentice-Hall. NJ.

Larson, D. 1992. Further results on willingness to pay for non-market goods. Journal of Environmental Economics and Management, 23(2), 101-122.

Leopold, L. B. et al., 1971. A Procedure for Evaluating Environmental Impact, US Geological Survey Circular 645, Highway Research Board, Washington DC, 1971.

Mtchell. R, and R. Carson. 1989. Using Surveys to Value Public Goods; The Contingent Valuation Method. Washington, DC: Resources for the Future.

Nishizawa, E., T. Yoshida, and T. Kato. 1991. The hedonic price approach to estimating benefits of amenity brought about by farm land and forest. *Nosokenkiho 11:* 1-8.

Jain, R. K. and L. V. Urban, A Review and Analysis of Environmental Impact Assessment Methodologies, Technical Report E-69, Construction Engineering Research Laboratory, Champaign, June 1975.

Season, P and W. Schaffer. 1978. Cost Benefit Analysis: A Handbook. Academic Press, NY.

Selan, A. 2003. Individual's willingness to pay for the Noise at nearby Soekarno-Hatta International Airport. Paper prensented at Master Degree Seminar. Bogor Agricultural University.

Willing, R. 1976. "Net Benefit Without Apology". American Economic Review. 66:589-97.

Yoshida, K., J. Kinoshita, and M. Goda. 1997. Valuing the environmental benefits of farmland and forests by the contingent valuation method. *Quarterly Journal of Agricultural Economy* 51, 1: 1-57.

Yoshida, K. 1999. Contingent valuation approach to the environmental benefits from agriculture in the less-favored areas. *Quarterly Journal of Agricultural Economy* 53, 1: 45-87.