

# **Determinants of Rice farmers' willingness to pay for irrigation water in Rwanda.**

by

**Dr UWERA Claudine**

**Dr SEKOMO BIRAME Christian**

**Dr BIRASA NYAMULINDA**

**Dr RURANGA Charles**

# Introduction

- In Rwanda, water for irrigation is inefficiently managed due to the lack of appropriate instrument to regulate it;
- Farmers mostly challenged by unavailability of water during dry season and those who practice irrigation don't pay an amount proportional to the volumetric water use;
- Investments to expand water infrastructures become insufficient;

# Literature

- The CE method appeared recently in the field of water resource economics;
- Use of CE to analyze water demand has been quite limited in developing countries and in Rwanda as well;
- According to Young (2005) most goods traded in markets, prices reveal a product's scarcity via the signals it sends; whereas, for publicly provided goods and goods with a strong public good component, such as water, clear price signals are often lacking.
- These cases have required indirect valuation methods.

# *Questionnaire*

- Questionnaire divided into two parts: questions on respondents' socio-economic characteristics and questions for the Choice Experiment (CE);
- In the CE, enumerators had to start with a cheap talk and then explain the questions to respondents as well as the logic of the game;
- Respondents were asked to read the questionnaire carefully in turn and to make choice among various alternatives for improved irrigation water supply at different prices and other attribute levels, and a current situation in which water supply will reflect status quo level;
- Enumerator had to make sure that the respondent was able to read and write; otherwise, s/he had to fill in the questionnaire according to the answers given by the respondent.

# Sample

- Five areas selected in different provinces: western Province (Rusizi), Southern Province (Muhanga and Huye), Eastern Province (Rwamagana and Gatsibo).
- A sample of 200 farmers selected and 400 questionnaires have been filled.
- 200 questionnaires for socio-economic characteristics and 200 questionnaires for the Choice Experiment (CE).

- Respondents' current situation

Variable	Description	Mean	Std. Dev.	Min	Max
Water Availability	If water is available during dry season	0.55	0.49	0	1
Irrigation frequency	Irrigation frequency per month	2.62	2.63	0	6
Price irrigation	Cost for irrigation (RWF) per season	4976.99	6102.76	0	24000

# Socio-economic characteristic

Variable	Description	Mean	Std. Dev.	Min	Max
Age	respondents age	40.63	11.63	17	75
Male	=1 if respondent is male, 0 if not	0.55	0.49	0	1
Member of cooperative	=1 if respondent is member of cooperative, 0 if not	0.85	0.35	0	1
Household size	The Size of the household	4.57	1.85	1	11
Schooling	=1 if respondent went to school, 0 if not	0.83	0.37	0	1
Education level	1=Primary education dropped out 2=Primary education finished 3=Secondary education dropped out, etc.	2.095	1.44	1	8
Income	Monthly income (Rwf)	25905	20730.64	0	90000
Statuquo	1 if respondent chose SQ alternative for irrigation water use, 0 if not	0.05	0.22	0	1
WUA	If the household is a member of a water users' association	0.76	0.43	0	1

## Logistic regression of factors affecting choice of Status Quo

Variables	Coefficient	S.E.
Household size	-0.10	0.24
male	2.06*	1.13
Age	0.093**	0.04
Education level	-0.23	0.27
Income	-0.0001**	0.0004
WUA	-0.78	0.93
_cons	-8.98***	2.69

- Male prefer the status quo;
- Older people are not willing to cooperate for improved water;
- Respondents with higher income are more willing to choose the improved water for irrigation;
- Overall model shows that in general respondents are less willing to choose the current situation.

# Model estimates for irrigation water

	Conditional Logit	Mixed Logit
Variables	Coefficient (S.E.)	Coefficient (S.E.)
<i>Water characteristics</i>		
Watering frequency	0.343** (0.18)	0.33** (0.128)
Water availability	0.12 (0.14)	0.127 (0.142)
Price	-0.009* (0.012)	-0.0003* (0.001)
<i>Household characteristics</i>		
Male	-0.17 (0.30)	-0.189 (0.202)
Education level	0.05 (0.02)	0.36*** (0.10)
Income	0.0001* (0.0001)	0.0002** (0.0001)
WUA member	0.080** (0.45)	0.90*** (0.349)
Intercept	0.81** (0.35)	1.29*** (0.07)

- Used both conditional and mixed logit models
- Significance of the coefficients is increased in the mixed logit model.
- Intercepts statistically significant- in overall; households prefer the improved water for irrigation.
- Coefficients on watering frequency and water availability attributes are positive. Individual characteristics also included in the model.
- educated and higher income respondents more likely to choose improved irrigation water.
- Water User Association membership increases the likelihood of choosing the improved irrigation water.

## Marginal Willingness to Pay (MWTP)

Variable	Mixed Logit Coefficient	MWTP as % of monthly income
Watering Frequency	33.40*	0.10%
Water Availability	155.59**	1.13%

- For MWTP, coefficients are large and statistical significant

- Using mixed legit, MWTP for watering frequency (at least six times per month rather than three times per month) estimated at 0.10 % of household monthly income;
- MWTP for having water for five rather than two months of the dry season valued at 1.13 per cent of household total income.

# Conclusion

- Both conditional and mixed logit models were used to assess how water and household characteristics influence the choice of improved irrigation water;
- Significance of the coefficients is increased in the mixed logit model;
- Result showed that in general, rice farmers are willing to pay for an improved service;
- Overall situation shows that attributes in CE increased the utility derived from an improved service;



**Thanks for your kind attention!**