

## Management and Utilization of Wild Rice Relatives in Sri Lanka: Stakeholder Preferences

W.W.D. CHANIKA<sup>1</sup>, U.K. JAYASINGHE-MUDALIGE<sup>1</sup>, J. M. M. UDUGAMA<sup>1</sup>,  
J.C. EDIRISINGHE<sup>1</sup> and S.M.M. IKRAM<sup>2</sup>

<sup>1</sup>Department of Agribusiness Management, Faculty of Agriculture and Plantation Management,  
Wayamba University of Sri Lanka, Makandura, Gonawila (NWP)

<sup>2</sup>Nielsen Lanka Company (Pvt) Ltd, Colombo 08

### ABSTRACT

The purpose of this study was to explore the preferences of key stakeholders for management and utilization of Wild Rice Relatives (WRR) in Sri Lanka. The information contained in a databases from a series of empirical analyses carried out with the key stakeholders, including the: (a) Breeders (n=30); (b) Environment managers (n=65); (c) Government officials (n=40); (d) Rural communities (n=50), and (e) Urban communities (n=300) were used to select the most relevant attributes pertaining to management of conservation of WRR, including: (1) responsibility for conservation; (2) utilization of WRR sites; (3) the best conservation method, and (4) Marginal Willingness-To-Pay (MWTP). The secondary data from these databases were further used to carry out a Contingent Ranking method to evaluate the overall MWTP of the stakeholders. The results show that the majority of stakeholders prefer government takes the sole responsibility of conservation of WRR and the adjacent communities should be allowed to utilize WRR sites under the supervision of government. All the stakeholders preferred in-situ conservation. The highest MWTP was observed from the rural communities, while the overall MWTP for all stakeholders was estimated to be Rs. 4.83.

**KEYWORDS:** Conservation, Stakeholder preferences, Utilization, Wild Rice Relatives, Willingness-To-Pay

### INTRODUCTION

The wild relatives of crop plants or “Crop Wild Relatives” (CWR) include the progenitors of crops as well as other species more or less closely related to them. Out of 415 CWR species identified in Sri Lanka, 239 are native while 83 species are found to be endemic. With regard to rice, there are 20 “Wild Rice Relatives” (WRR) found to exist globally and 5 of which are already identified in Sri Lanka, including: (1) *Oryza nivara* (2) *Oryza granulata*; (3) *Oryza rufipogon*; (4) *Oryza eichingeri*, and (5) *Oryza rhizomatis*, which is endemic to the nation (Ilankoon and Wijesekara, 2008). These species constitute an increasingly important resource for improving agricultural production and increasing food security and are indispensable for maintaining sustainable agro-ecosystems.

Modern cultivars of most crops contain some genes that are derived from wild relatives. The gene sequence of WRR in different geographies differs. As the gene mapping of these has not still been completed due to various reasons, the in-situ conservation of the total WRR populations is highly warranted. In the case of WRR, for example, the *Oryza nivara*, which is commonly known as “Uru wee”, contains grassy stunt tolerance gene and with research and development, it may be possible to produce resistant against the Brown Plant Hopper (BPH) attacks.

It is also evident that *Oryza rufipogon* which is commonly known as “monara wee” contains the lodging and flood tolerant genes and *Oryza granulata* is characterized by the drought tolerant genes. Further, *Oryza rhizomatis* contains a rhizome, which has the potential of being used to develop as perennial rice. These suggest that with the advent of climate change and greater ecosystem instability, WRR have a potential to be emerged as critical resources in ensuring food security and nutrition in the new millennium.

The government is in a mission to seek solutions to the problems emerging out of environmental changes such as droughts, floods, etc. and threats to food cultivation., The government aims to raise the quality of local rice, which would play a key role in ensuring food security of the country. The problem is the natural populations of many WRR are increasingly at risk currently due to habitat loss through the destruction and degradation of natural population of WRR.

In light of this, the specific objective of this study was to explore why and how Wild Rice Relatives (WRR) in Sri Lanka should be conserved and to evaluate the preferences of key stakeholders for management and utilization of WRR sites in terms of a number of important attributes, including responsibility, utilization, conservation vehicle, and Marginal Willingness To Pay.

**METHODOLOGY**

**Conceptual Framework**

There were number of studies on CWR have been carried out by the scientists attached to the Ministry of Environment and Department of Agriculture in the recent past to identify the sites of CWR and Wild Rice Relatives (Crop Wild Relative Project, 2006). For the purpose of economic valuation of Wild Rice Relatives, Jayasinghe-Mudalige *et al* has carried out series of researches during the period of 2009 to 2011. Choice experiment modeling (CM), a research technique belonging to the family of stated preference methods in environmental valuation, has been used in these studies and the information about preferences of the focused sample was, in turn, elicited using a specifically designed questionnaires.

A sequence of “choice sets” with key “attributes” that are specified at different “levels” have been developed for this purpose, and this included a questionnaire for which the respondents were asked to indicate their preferences on each choice set. There were five studies were carried out for evaluate the preference of: (1) Breeders; (2) Environmental managers; (3) Government officials; (4) Rural community, and (5) Urban community for the wild rice conservation program.

To evaluate the preferences of breeders, *face-to-face* interviews supported by the questionnaire have been conducted with a cross section of 30 senior rice researchers and breeding experts in 2009. A sample was randomly selected from government and private institution in Sri Lanka. To elicit the preference of environmental managers, the sample was consisted with 65 respondents from various government based environmental management institutions in Sri Lanka (Rodrigo and Saranga, 2011).

A sample of 40 regional level authorized government officials, Grama Niladari officers in Puttalam district have been interviewed in 2009 to investigate their opinion of conservation. A survey has been conducted with 300 urban dwellers in Battaramulla area to evaluate the urban community preferences for wild rice conservation. Wavulpane village located in Rathnapura district was selected as the study area to collect data from a sample of 50 households to elicit preference of rural community in 2009.

The Contingent Ranking method was selected to value the outcomes of several conservation options and calculate the overall MWTP. Contingent Ranking, was originally developed by marketing practitioners to isolate the value of individual product attributes or

performances in hypothetical situations where these attributes, or combinations of these attributes, are not available in the market (Foster and Mourato, 2000). Stated preference data are the respondent expressed preferences for those attributes in hypothetical scenarios. In this method, respondents are asked to rank their choices completely rather than just choose the one that they most prefer (Lareau and Rae, 1989).

**Data Collection and Analysis**

The information contained in databases pertaining to five studies mentioned above was used. The percentage of a given level of an attribute selected by the respondent was estimated in order to identify the most preferred levels of an attribute. We were, in particular, interested of evaluating the validity of following propositions through this study:

1. The government is solely responsible for development, conservation and management of WRR site.
2. “In-situ” conservation of WRR preferred over “ex-situ” conservation
3. Identified CWR sites should not be allowed to utilize, or in other words, they should be highly protected.
4. The MWTP should be very small (or zero) given the fact that WRR is a “public good”.

The data gathered from 485 stakeholders participated to those studies were re-coded and analyzed using an Ordered Probit model to evaluate the MWTP for the four main attributes explained in Table 1.

**Table 1. Attribute and levels**

Attributes	Levels
Responsibility of protecting WRR sites	a. Entirely under the authority of government b. Equally shared by government and the private sector c. Handed over potential private enterprise
Utilization of resources available in WRR sites	a. Not to be allowed to anybody b. Limited the current access c. Allowed to anybody
Best suited conservation vehicle	a. IN-SITU conservation through enhanced information b. EX-SITU conservation through enhanced information c. No need of having special conservation program
How much like to contribute for conservation:	a. Rs 0-60 b. Rs. 60-120 c. Free of charge

**RESULTS AND DISCUSSION**

**Responsibility of Protecting CWR**

The majority (56%) of breeders, the urban community (51%), and the rural community (100%) preferred that government take the responsibility of conservation, development of WRR sites. Most of the managers (69%) favored that 50% government and 50% other part (NGOs and private sector) should take the responsibility (Figure 1). The results revealed that the majority of stakeholders were in favor of involving the government to conserve and manage WRR sites by formulating appropriate national policies and establishing appropriate institutions for conservation.

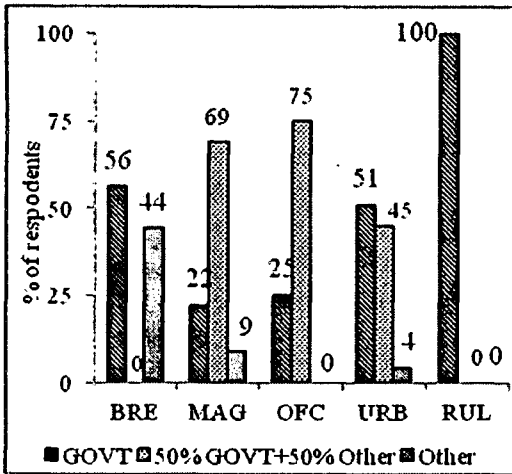


Figure 1. Stakeholder preferences for responsibility of protection WRR

Note: BRE=Breeders, MAG= Environmental Managers, OFC=Government Officials, URB=Urban Community, RUL=Rural Community

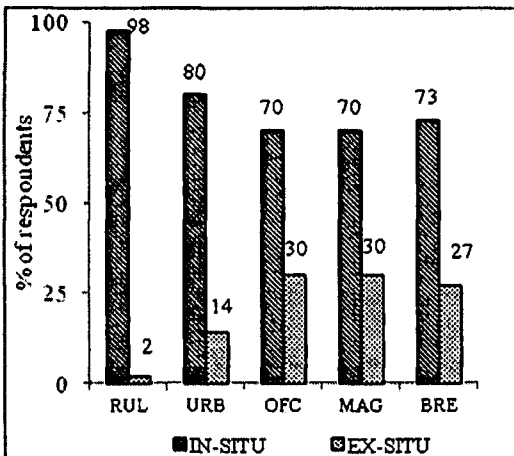


Figure 2. Stakeholder preference for WRR conservation method

**Conservation Method**

The entire stakeholders preferred in-situ conservation. It is concluded that in-situ conservation of wild rice relatives is preferred over ex-situ conservation by all the

stakeholders (Figure 2). The highest preferences towards in-situ conservation are due to inter- and intra- species genetic diversity of WRR in Sri Lanka. Species from the same region reveals high level of diversity. Therefore, it is important to conserve the population as whole (passive conservation) rather than an individual seed or plant.

**Utilization of WRR**

The majority of breeders (93%), environmental managers (98%), government officials (73%) and the rural community (70%) were in favor of utilization of WRR, i.e. people should be allowed to utilize the sites (Figure 3). For the future development of WRR should be done through the research and development programs. For that exploitation of WRR site should be allowed. Adjacent communities have direct contact with protection areas, and they interact with those areas in their daily activities. If the utilization is allowed, they composition with the protection site and recognize the current situation.

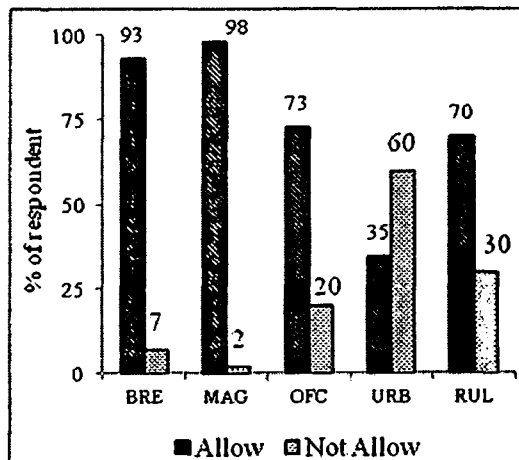


Figure 3. Stakeholder preferences for utilization of WRR

**Marginal Willingness to Pay**

The marginal willingness to pay (MWTP) of all five parties was derived from the choice experiment by taking the aggregate of all these prices. The results show that breeders were willing to pay approximately Rs. 10 per year for an individual. In contrast, managers and government officials were willing to pay approximately Rs. 7 and Rs. 20 per year respectively. The urban community was willing to pay Rs. 1.34 toward the conservation of WRR. The highest MWTP was recorded from the rural community that was approximately Rs. 83 per year (Figure 4)

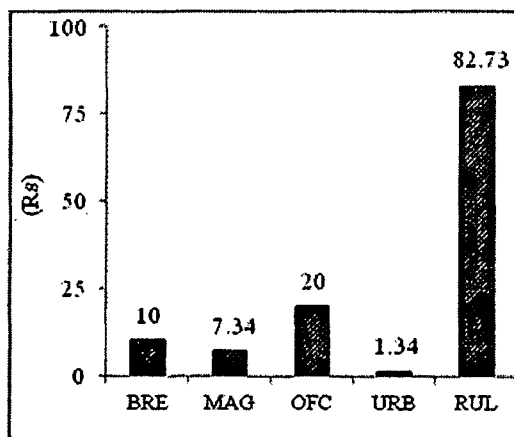


Figure 4. Stakeholder MWTP

The highest MWTP was observed from the rural communities. The rural community sees its contribution through labor. Its positive assessment shows awareness about conservation practices and moral obligations to cooperate in conservation. The lowest was recorded from the urban communities that could be their awareness, living style, and they are not much interacting with the WRR sites are some potential reasons for pay that much lesser amount.

**Outcome of Contingent Ranking Method**

The data was analyzed with Ordered Probit Model, which depicts the observed choices as a function of the attributes of conservation of WRR. According to the results, three out of four attributes assessed in the analysis were significant at 0.05 significant levels. The MWTP for a given attribute was the ratio between the parameter estimates of the monetary attribute. The implicit price calculated by taking the summation of all these prices.

The total implicit price was Rs 4.83 per year of WRR sites for conservation. Since the dependent variable increases positive coefficient suggests the likelihood of protecting WRR sites increases. The sign of each variable may the direction of the protection of WRR particular choice set. The negative sign of utilization shows that there is a negative relationship between protection of WRR and utilization. When protection increases utilization decreases (Table 2).

Among the stakeholders the rural community is the most favorable party who wish to pay highest MWTP for conservation and the government lead in-situ conservation method. Managers preferred utilization allow basically for research purposes (Figure 5).

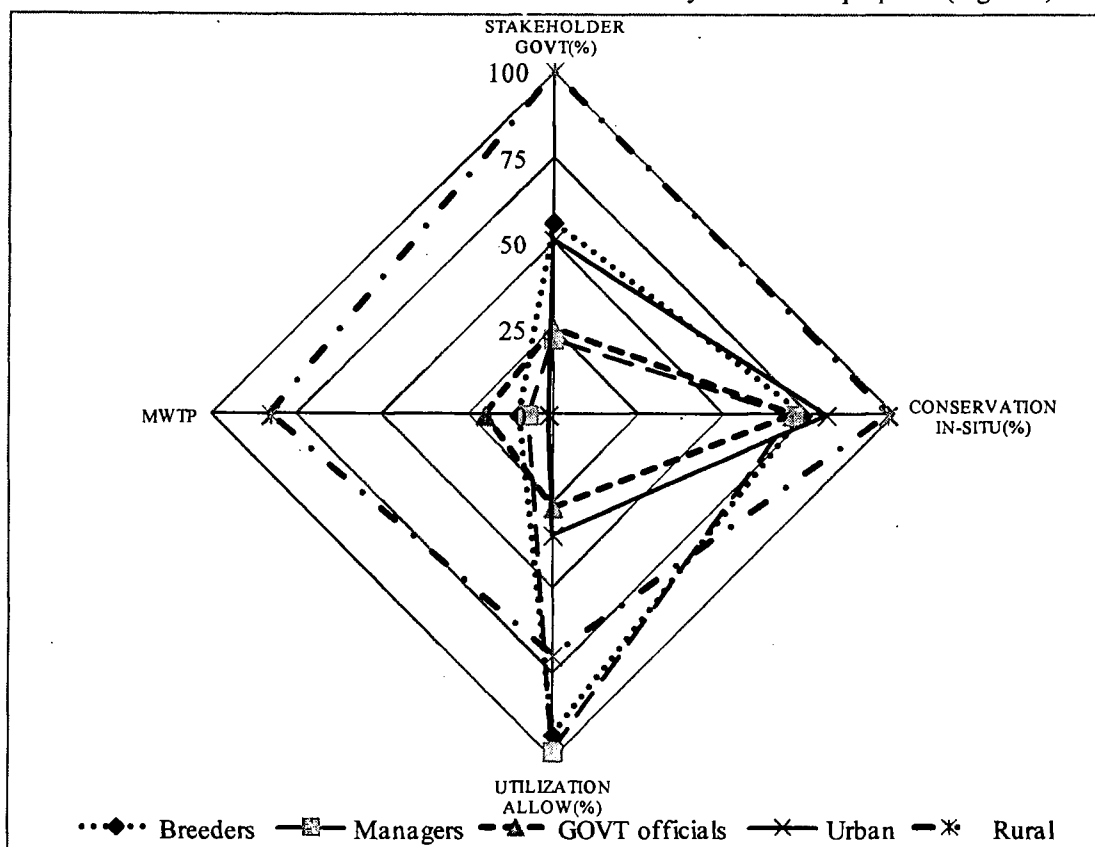


Figure 5. Preferences for attributes

**Table 2. Ordered Probit Model estimates for conservation of WRR**

Attribute	Coefficient	MWTP
Responsibility	0.007	0.092
Utilization	-0.171*	2.250
Conservation	0.189*	2.487
Price	0.076*	
Total implicit price (Rs)		4.83

Note: \*0.05 significant level, Pseudo  $R^2 = 0.02$

### CONCLUSIONS

This study was carried out to assess the preferences of key stakeholders for management and utilization of WRR sites in Sri Lanka. The outcome of analysis showed that all the stakeholders preferred to conserve WRR. In-situ conservation is the best-suited conservation vehicle to preserve WRR. The stakeholders believe that the government is responsible for conserving WRR sites. Utilization of WRR sites should be allowed to the general public, but under tight and regular monitoring.

Community awareness would play a major role in protecting the available WRR populations. The key stakeholders imply that appropriate steps must be taken to increase the public awareness about importance WRR, because the outcomes of previous studies showed that most of the damages occur due to lack of knowledge about WRR.

For the effective management of the WRR conservation program co-operation among stakeholders through participatory decision making at all levels should be promoted.

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