Are Consumers Willing-to-Pay a price premium for Environmentally Friendlier Foods?

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AAEA Annual Meeting, Seattle, Washington, July 12-14, 2012

1. Introduction

Globally agriculture has been one of the major sources of greenhouse gases (GHG). In USA, Agriculture accounted for 7.24% of global GHG emissions (US.EPA, 2010).

Rice is a staple food for a large part of the world's human population. since, it is a labor, water, and energy intensive crop, rice is one of the major sources of agricultural anthropogenic GHG emissions in USA.

Given the introduction of lower GHG varieties, like some hybrid rice, which are higher yielding (approximately 15-20%) than conventional rice and use roughly the same input amounts, the American Mid-South rice industry has the opportunity to lower its GHG emissions per bushel of rice.

However, one of the main barriers to the adoption of lower GHG varieties is the cost of seeds to producers. Currently all hybrid varieties are released by private industries (as opposed to the cheaper conventional rice released by Universities) and the cost is higher to recoup research and development costs.

If consumers are found to have a preference, and are willing to pay for that preference, for rice varieties possessing environmental attributes then economic signals can be conveyed to rice producers who can benefit.

The existing literature is sparse on consumers' preferences and willingness to pay (WTP) for true commodities which possess environmental benefits. Because there is a cost associated with producing rice that is "environmentally friendlier" we propose to investigate if consumers are willing to bear that cost.

Given that the GHG released by the transportation of foods (i.e. food miles) and the origin of products can affect consumers' preferences and WTP for environmentally friendly food product, we also considered the assessment of the effect of this kind of information and it interaction with the effect of GHG emissions on consumers' WTP.

2. Experimental design

To assess the effect of GHG emissions released by the production of conventional and hybrid rice as well as their corresponding food miles and origins on consumers' WTP, we conducted a non-hypothetical experimental auction (BDM: Becker, DeGroot and Marschak) in five rounds.

A total of 350 real consumers from Fayetteville (AR) participated in the experimental auction. Participants were randomly assigned to seven treatments of five sessions each. In each session participated 10 subjects.

Depending on the treatment, participants received a different type of information in each round (carbon emission (i.e. 8.21oz/lb v. 9.97oz/lb, food miles (i.e. 250 miles v. 422 miles) or origin (i.e. Arkansas vs. Missouri) of the product). After each round participants were asked to report their WTP for each of four rice varieties (participant who does not want to buy the product can bid $0.00). Since treatment 1 served as a control treatment, participants in that treatment did not receive any type of information in all the rounds (for more details see Figure 1).

In all the treatments except the first one, participants were invited to taste each rice variety (uniformly cooked) before providing bids in the fifth auction round.

After finishing the auction, all participants were asked to complete a questionnaire about various aspects related to environmentally friendly foods with the purpose of characterizing the sample and analyzing their attitudes and purchase habits. This information was to determine the major factors that influence consumers' WTP a price premium for rice varieties with a lower GHG emissions.

Figure 1: Experimental design

Round	T1	T2	T3	T4	T5	T6	T7
1	No Inf.	No Inf.	No Inf.	No Inf.	No Inf.	No Inf.	No Inf.
2	No Inf.	CO_2e	CO_2e	F.Miles	F.Miles	Origin	Origin
3	No Inf.	F.Miles	Origin	CO_2e	Origin	CO_2e	F.Miles
4	No Inf.	Origin	F.Miles	Origin	CO_2e	F.Miles	CO_2e
5	No Inf.	Taste	Taste	Taste	Taste	Taste	Taste
Participants	50	50	50	50	50	50	50

No Inf. = No information was provided

3. Results

The results displayed in Table 1, 2 and 3 represent the effect of information on consumers' WTP in treatment 1 and 2. in the other treatments we found similar results leading to the same conclusions. Since participants were asked to report their WTP for four varieties, the analyzed variable here is the difference between the WTP for two different rice varieties (see bellow for the meaning of the abbreviations included in the tables).

C-AR: Conventional rice from Arkansas **C-MO**: Conventional rice from Missouri

H-AR: Hybrid rice from Arkansas **H-MO**: Hybrid rice from Missouri

#: Different **=**: Same

Example: **H-AR - C-AR**: is the difference between the WTP for H-AR and the WTP for C-AR

Table 1: # CO_2e, **=** Food Miles & **=** Origin

	Round1	Round2	p-value	Round2	Round4	p-value	Round1	Round4	p-value
H-AR - C-AR	.19	.43	**.00**	.43	.48	.49	.19	.48	**.00**
H-MO - C-MO	.11	.37	**.00**	.37	.26	.13	.11	.26	**.04**

Table 1: = CO_2e, **#** Food Miles & **#** Origin

	Round1	Round2	p-value	Round2	Round4	p-value	Round1	Round4	p-value
C-AR - C-MO	-.07	-.05	.79	-.05	.12	**.03**	-.07	.12	**.04**
H-AR - H-MO	-.01	-.01	.96	-.01	.34	**.00**	-.01	.34	**.00**

Table 1: # CO_2e, **#** Food Miles & **#** Origin

	Round1	Round2	p-value	Round2	Round4	p-value	Round1	Round4	p-value
H-MO - C-AR	.18	.42	**.00**	.42	.14	**.00**	.18	.14	.60
H-AR - C-MO	.12	.38	**.00**	.38	.60	**.02**	.12	.60	**.00**

4. Conclusion

We found that consumers are willing to pay 51%, 11% and 7% more for rice with lower GHG emissions, local rice and rice with lower food miles, respectively.

Our results showed that consumers are willing to pay 77% more when they are informed that the auctioned frice is local and has lower GHG emissions and food miles.

Interestingly, we found that consumers are willing to pay a price premium when they are informed, in first place, that the auctioned product has a lower GHG emissions. However, when they are subsequently informed that the product with a lower GHG emissions is not local and has a higher food miles their WTP decreases and becomes insignificantly different from zero.

We found similar results when participants, first, receive information on food miles or origin and then they are informed about the GHG emissions of the auctioned product. For example, participants' price premium for a local rice variety becomes insignificantly different form zero when they are informed that that product has a higher GHG emissions.

Hence, consumers are willing to pay a price premium for foods with environmental attributes. However, additional controversial information can reduce that price premium to zero.