Environmental Economics and Policy Studies

Download PDF

Environmental Economics and Policy Studies
April 2018, Volume 20, Issue 2, pp 305–324 | Cite as

Psychological influence on survey incentives: valuing climate change adaptation benefits in agriculture

- Authors
- Authors and affiliations

- Uttam Khanal
- Clevo Wilson
- Shunsuke Managi
- Boon Lee
- Viet-Ngu Hoang
- Robert Gifford

Research Article
First Online: 23 August 2017

Abstract

Psychological influences affect the way people value the environment. However, traditional economic valuation models often do not account for how people are asked about valuing the environment. We examined how valuations by Nepalese farmers differ based on how the questions are asked and which incentives are provided. In a face-to-face choice experiment, incentive receivers spent more time than incentive non-receivers answering the survey, but were not more likely to choose a status quo option. Prepaid survey incentives had minimal effect on the stated welfare measures. The results suggest that prepaid incentives increase response rates, but do not increase welfare estimates. The findings also strengthen the methodological validity of our results, which indicated that farmers are willing to pay a substantial amount to secure climate change adaptation benefits on their land.

Keywords

Choice experiment Survey incentives Response behavior Climate change adaptation

JEL Classification

Q18 Q51 Q56

1 Introduction

This study examined how psychological influences can affect the way people say that they value the environment. It sought to determine whether the use of survey incentives influences the respondents' answers in a choice experiment study valuing climate change adaptation. In stated preferences analyses, the use of choice experiments for valuing the benefits of environmental goods and services has increased substantially in the recent years. In a choice experiment, respondents are asked to choose the most-preferred alternative among different bundles of goods and services, which are described in terms of their attributes and levels (Hanley et al. 1998). A number of pecuniary and non-pecuniary factors such as cultural values and beliefs (Price et al. 2014), altruistic attitudes, and the socio-demographic context (Clark et al. 2003) can influence the importance that individuals place on environmental goods and services. Although studies devote significant attention to experimental design, questionnaire development, and econometric estimation of welfare measures (e.g., Bech et al. 2011; Carlsson et al. 2012; Hensher 2006; Louviere et al. 2008), the impact of the context of face-to-face interviews is given little consideration.

In recent decades, the response rate for surveys has been falling considerably (Battaglia et al. 2007; De Leeuw and De Heer 2002). To combat this, researchers have offered cash or in-kind incentives to potential respondents to motivate increased levels of participation (Cantor et al. 2008; Moyer and Brown 2008). These incentives are prepaid or promised. Prepaid incentives are an unconditional upfront payment given to the respondent, whereas promised incentives are given upon the completion of the interview as a reward for the respondents' time and effort. Prepaid incentives do motivate respondents to participate in surveys (Ryu et al. 2006; Trussell and Lavrakas 2004). Incentives offered before the interview motivate respondents to invest more effort into answering the survey questions (James and Bolstein 1990). According to social exchange theory, providing prepaid incentives helps to build a positive relationship between the researcher and the respondent, and consequently, they may respond more honestly to the questions. Social exchange is based on the norm of reciprocity (Gouldner 1960). When respondents receive an incentive before the interview, they feel more compelled to give something back in return. This feeling of obligation to the researcher may lead the respondent to focus more on pleasing the researcher (Dillman et al. 2009) and, as a result, respondents may provide more researcher-favored responses to survey questions than they otherwise would have (Medway 2012). For example, in one mail survey, respondents who received a prepaid incentive provided comments that were more favorable toward the survey sponsor than those who did not receive an incentive (James and Bolstein 1990). Also, prepaid incentives may alter the quality of the answers respondents give to survey questions. The majority of studies on incentives have focused on the effect of incentives on the response rate. Fewer studies have examined the effect of incentives on item non-response (Cantor et al. 2008; Goldenberg et al. 2009; James and Bolstein 1990) and responses to open-ended questions (James and Bolstein 1990).

The decision whether to use a survey incentive is relatively difficult because the norm of reciprocity must not become a compulsion to respond (Ahlheim et al. 2013). Despite the large body of literature on the effect of incentives on survey research, relatively few studies have examined the effect of incentives in stated preference studies. In a contingent valuation study, Hidano et al. (2005) found a reciprocity effect on respondents' cognitive effort, but the amount of money paid to the respondents did not affect their level of reciprocity. Ahlheim et al. (2013) using contingent valuation techniques analyze the effect of incentives on stated willingness to pay (WTP) for environmental improvement in Southwest China and found that incentives influenced respondents' inclination to state a positive WTP, rather than zero. However, incentives did not increase average WTP significantly, compared to a reference sample. To the best of our knowledge, only one study has examined the effect of incentives in studies using choice experiments (Gajic et al. 2012). These researchers considered the cost-effectiveness of cash versus lottery incentives in a web-based study. The prepaid cash incentive generated higher response rates than a high-value lottery and therefore was the most cost-effective incentive option. However, the effects of incentives on response behavior and welfare estimates were not examined.

In the present study, our interest lies in investigating the impact of prepaid survey incentives versus no incentive on response behavior and mean WTP estimates in a face-to-face choice experiment. The empirical context of the study concerned the benefits of climate change adaptation (CCA) in rural agricultural lands in Nepal.

Individual preferences and behavioral responses to climate change adaptation and mitigation have received increasing attention in the recent years (de Jalón et al. 2013; Gifford 2011; Islam et al. 2013, 2016; Rajmis et al. 2009; Whitmarsh 2009). However, most of these studies were conducted in developed countries. The present study also seeks to better validate the survey methodology used to measure farmers' preferences for adaptation programs that enhance the capacity and resilience of agricultural systems to the adverse impact of changing climate.

The rest of the paper is organized as follows; the next section describes the choice experiment approach with details on choice attributes and experimental design. This section also presents study sites and data collection. Section 3 presents the results on the impact of incentives on the respondents' behavior and willingness to pay estimates. Section 4 presents the discussion and conclusions of the study.

2 Methodology

2.1 The choice experiment approach

To examine the effect of survey incentives on response behavior and willingness to pay (WTP) for climate change adaptation benefits, we undertook a discrete choice experiment (DCE). The objective was to examine whether rural farmers are willing to participate in, and contribute to, the implementation of climate change adaptation programs. In doing so, the design of the experiment provided a means of investigating whether response behavior and WTP for climate change adaptation benefits would differ if respondents are provided with incentives before their participation in the survey interview.

DCE is based on Lancaster's (1966) theory of value. It assumes that consumers derive utility from the attributes of goods rather than from the goods themselves. Respondents are hypothesized to choose the alternative that provides the highest expected level of utility. Thus, for an alternative *i,* an individual *n* is assumed to obtain utility U_{in}, which can be represented as

$$U_{in} = V_{in} + \varepsilon_{in} .$$

(1)

The individual's utility from each alternative is decomposed into an observable component (V_{in}) and an unobserved random error term (ε_{in}) that is an independently and identically distributed (iid) extreme value. Selection of one alternative over another

implies that the utility (U_{in}) of that alternative is greater than the utility of all other alternatives (U_{jn}) in the choice set (C_n).

$$U_{in} > U_{jn} ,\quad \forall_{j} \in C_{n} ,\quad i \, \ne \, j$$

(2)

Several choice analysis models can be used to analyze the data obtained from discrete choice experiments (for details, see Adamowicz et al. 1998; Colombo et al. 2009; Hensher et al. 2005). In this study, we analyzed the data by estimating a random parameter logit model (RPL), which is expressed as

$$U_{in} = (\beta + \gamma)X_{in} + \varepsilon_{in} ,$$

(3)

where X_{in} are the climate change adaptation program attributes, β is the vector of coefficients associated with these attributes, and γ is a vector of standard deviation parameters. Given this specification, each individual has his or her own vector of parameters, β_n, which deviates from the population mean β, by the vector γ.

The standard logit choice probability that the nth individual choose alternative i among options j is given as

$$P_{in} \left({\beta_{n} } \right) = \frac{{\exp \beta X_{in} }}{{\mathop \sum \nolimits_{j = 1}^{j} \exp \beta X_{jn} }};\quad j \, = \, 1, \ldots i, \ldots j, \, \quad i \, \ne \, j,$$

(4)

where $P_{in}(\beta_n)$ is the standard logit choice probability evaluated at the unobserved parameters β. The expected probability over the random parameter distribution, $E(P_{in})$, is generated by integrating the standard logit probability over all possible values of the vector of coefficient β_n

$$E(P_{in}) = \, \int P_{in} (\beta)f\left(\beta \right){\text{d}}\beta ; \, \quad j \, = \, 1, \ldots i, \ldots j,\quad \, i \, \ne \, j$$

(5)

or,

$$E\left({P_{in} } \right)_{{}} = \mathop \int \nolimits \left({ \frac{{\exp \beta X_{in} }}{{\mathop \sum \nolimits_{j = 1}^{j} \exp \beta X_{jn} }}} \right)f(\beta){\text{d}}\beta ; \quad j = 1, \ldots i, \ldots j,\quad i \ne j^{ } ,$$

where \(f(\beta)\) is the probability density function of \(\beta\).

If one of the included attributes is the price of the alternative, welfare estimates of change in the environmental attribute can be estimated and compared (Boxall et al. 1996). Once the random utility model is estimated, welfare estimates that is, willingness to pay (WTP), can be derived for each attribute by using formula (6) (Hanley et al. 2001)

$${\text{WTP}}_{c} = \, - \, \beta_{c} /\beta_{y} ,$$

(6)

where β_c is the coefficient of any of the attributes and β_y is the coefficient for the cost attribute.

2.2 Choice of attributes and experimental design

Defining the good to be valued in terms of its attributes and levels is the first step in designing a DCE. We selected attributes for this study following four steps. First, we reviewed studies that have employed choice experiments in the agriculture and environment sectors and associated policies in Nepal to acquire a general background knowledge of the attributes and levels. Second, we considered adaptation strategies identified by least-developed countries in their National Adaptation Programs of Action (NAPAs)[1] submitted to United Nations Framework Convention on Climate Change (UNFCCC). Third, we conducted three stakeholders' workshops with local agriculture and environment experts to further refine the attributes. Finally, three focus groups with farmers were conducted, to supplement experts' information. In this way, we determined the final attributes and their levels that are the most important to the farmers (Table 1). A cost attribute should be defined and included in the choice set for estimating welfare changes. A one-time per month payment was chosen as the payment vehicle.

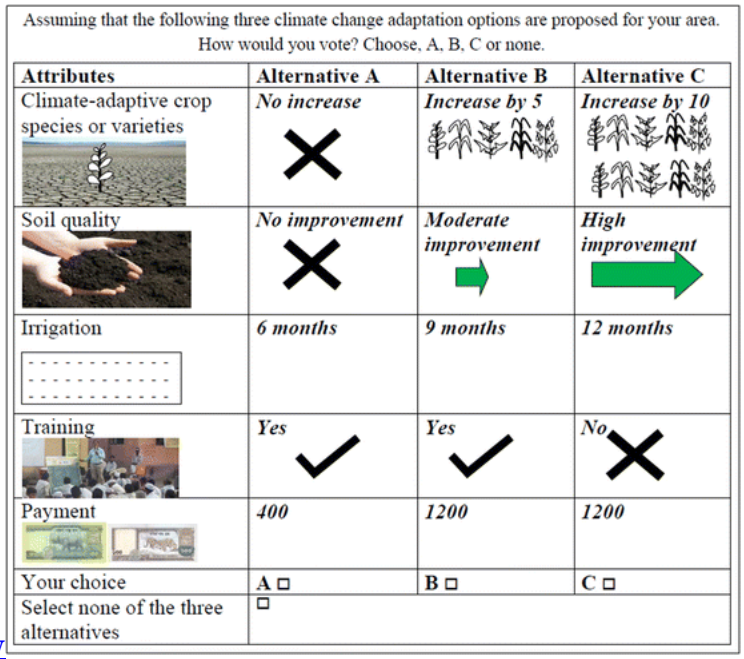
Table 1
Attributes, their definition, and levels

Attribute	Definition	Attribute levels	Coded using
Climate-adaptive crops	Increase in the number of crop species or varieties tolerant to climate change impacts (such as drought and flood)	No increase, increase by 5, increase by 10	Actual levels

Attribute	Definition	Attribute levels	Coded using
Soil quality	Improvement in soil quality (improvement in soil fertility and water-holding capacity and reduction in soil erosion) caused by implementation of climate-adaptive farming	No improvement, moderate improvement, high improvement	Effect coding
Irrigation	Number of months with irrigation water availability	6, 9, 12	Actual levels
Farmers' capacity building	Regular training (at least one per month) for farmers in climate-adaptive farming	Yes, no	Effect coding
Payment	Required payment in Nepalese Rupees (NRs) per household per month for climate change adaptation program	400, 1200, 2000	Actual levels

From the five attributes (four with three levels and the remaining one with two levels) we generated 36 choice scenarios using an orthogonal fractional experimental design technique (Hensher et al. 2005). To reduce the cognitive burden on respondents, the 36 choice sets were, in turn, randomly assigned to 6 blocks of 6 choice sets, using a blocking factor, so that each respondent had to answer one block of six choice sets. Each choice set contained three alternatives and an option to select the no scenario, i.e., the status quo.[2] An example of a choice set is presented in Table 2.

Table 2
An example of a choice set



Assuming that the following three climate change adaptation options are proposed for your area. How would you vote? Choose, A, B, C or none.

Attributes	Alternative A	Alternative B	Alternative C
Climate-adaptive crop species or varieties	*No increase*	*Increase by 5*	*Increase by 10*
Soil quality	*No improvement*	*Moderate improvement*	*High improvement*
Irrigation	*6 months*	*9 months*	*12 months*
Training	*Yes*	*Yes*	*No*
Payment	*400*	*1200*	*1200*
Your choice	A ☐	B ☐	C ☐
Select none of the three alternatives	☐		

Open image in new window

2.3 Survey implementation and data

Nepal is a small country with a total area of 147,181 km² comprised of three agro-ecological regions (Terai, Hill, and Mountain), with a length of approximately 885 km east–west, a width of about 200 km north–south, and an elevation range of 70 m above sea level in the south to the world's highest altitude (8848 masl) in the north. The climate varies from tropical in the south to cold tundra in the north. The wide altitudinal and climatic variation produces considerable geographical, ecological, and social diversity. Administratively, the country is divided into 75 districts. To take into account the variation across agro-ecological regions, six districts (Chitwan, Dhading, Kaski, Mustang, Rasuwa, and Rupandehi)—two from each ecological zone—were selected. The study was carried out through two Village Development Committees (VDCs)[3] of each of the selected districts. Sixty households from each VDC were selected through random sampling techniques. The survey was conducted between October 2015 and January 2016.

A composite vegetable seed packet that costs Nepalese Rupees (NRs) 75 (equivalent to 0.71 USD)[4] was used as an incentive to complete the survey interview. Respondents were equally divided into two groups based on whether they received survey incentives before or after the interview. Respondents in one VDC in each district were offered survey incentives while making contact for the survey, whereas the respondents in the other VDC were not offered the incentives. Respondents in the latter case did receive the incentive after the survey was completed. In sum, 360 respondents were provided with the incentive before the interview and 360 were provided with it later. The latter respondents were unaware they were to receive an incentive. Also, the interviewers were blind as to whether the incentives were to be initially provided to the respondents or not.[5]

The data were obtained in face-to-face interviews and which sought Nepalese farmers' attitudes to the adoption of climate change adaptation strategies. As part of the interview a choice experiment was included on the benefits of implementing adaptation strategies[6] in farmers' fields. Apart from the choice experiment, the questionnaire included questions about respondents' perception of climate change, their knowledge of adaptation, agricultural production, and productivity. To determine the effect of incentives on response behavior, we estimated the response rate, response time, respondent effort, and respondent satisfaction in answering the questions. Response time was measured as the length of time the interview took. Our hypothesis was that the respondent who received an incentive would listen to survey questions more carefully and make more effort in responding to the questions, so that their mean interview time would be longer than that of the non-receiver group. The start and end time of each interview was recorded to examine the incentive effects on interview length. To assess the level of effort used by respondents in choosing the most-preferred choice scenarios, interviewers were asked to rate each respondent's effort in selecting choice scenarios on a four-point scale from "high effort" to "no effort at all." We assumed that with the interaction that interviewers would have with respondents throughout the interview, they would gain a reasonably accurate impression of the amount of effort[7] made by the respondents. To assess the respondents' level of satisfaction during the survey, we asked respondents whether they would like to take part in a similar survey next year using a four-point scale from "certainly yes" to "certainly not."

3 Results

3.1 Subsample comparisons in household characteristics

Table 3 presents the descriptive statistics for household characteristics for each subsample. Several significant differences were found between the three agro-ecological regions in terms of household characteristics, except for education level. However, no significant differences occurred between the subsamples for incentive receiver and non-receiver in household characteristics, except in household members' involvement in institutions.

Table 3
Means of household characteristics

Characteristics	Terai	Hill	Mountain	Incentive receiver	Non-receiver	Pooled	Sig.
Age	45.04	51.94	40.40	46.36	45.21	45.79	a, b, c

Characteristics	Terai	Hill	Mountain	Incentive receiver	Non-receiver	Pooled	Sig.
Education	8.08	7.46	7.42	7.87	7.42	7.65	
Family size	5.78	5.80	6.60	6.01	6.10	6.06	b, c
Income trend	0.48	0.32	0.38	0.38	0.40	0.39	a, b
Income source	0.75	0.75	0.55	0.68	0.67	0.68	b, c
Extension	8.52	20.96	10.53	13.13	13.52	13.33	a, b, c
Land holding	0.76	0.54	0.36	0.55	0.54	0.55	a, b, c
Farm parcel	3.10	2.41	3.22	3.00	2.82	2.91	a, c
Institution	0.86	0.43	0.79	0.64	0.73	0.69	a, b,

Characteristics	Terai	Hill	Mountain	Incentive receiver	Non-receiver	Pooled	Sig.
							c, d
Awareness	0.25	0.31	0.13	0.25	0.21	0.23	a, b, c

Age = age of the household head in years, Education = education of the household head in number of years, Family size = Total number of family members in the household, Income trend = trend of income from agriculture in the household, coded 1 for increasing and 0 otherwise, Income source = household income source diversification: coded 1 if multiple source of income and 0 if single source, Extension = distance from home to extension service in kilometers, Land holding = household land holdings in hectares, Farm parcel = total number of farm parcels, Institution = household involvement in an institution, coded 1 if any member of the household is involved in an institution and 0 otherwise, and Awareness = awareness index on climate change impact and adaptation

[a]Significant difference between Terai and Hill at less than 5% level of significance

[b]Significant difference between Terai and Mountain at less than 5% level of significance

[c]Significant difference between Hill and Mountain at less than 5% level of significance

[d]Significant difference between incentive receiver and non-receiver at less than 5% level of significance

3.2 Behavioral results

The overall response rate for the survey was 90.6%[8] (Table 4). Incentive receivers spent, on average, more time in answering the survey questionnaire. The difference in mean interview length was 11 min (66 versus 55 min), which is statistically significant at the 1% level (*t* test). Similarly, we find statistically significant differences between incentive receivers (27.21 min) and non-receivers (16.81 min) in the mean interview length for that part relating to the choice experiment. Although whether longer interviews are always associated with higher quality responses is not clear (Liebe et al. 2015), but our results seem to indicate that the respondents who received incentives before the interview were more motivated and therefore devoted more time and effort in answering survey questions. This is further supported by the finding that incentive non-receivers were more likely to interrupt the interview (14 versus 9%), a difference which was statistically significant at the 5% level (χ^2 test). Interrupts were defined as taking breaks during interview, engaging in other activities while interviewing, and digressing on

unrelated topics. As perceived by the interviewers, incentive receivers were more likely to put more effort in answering choice experiment questions than incentive non-receivers (χ^2 test, $P < 0.1$). Similarly, as also perceived by the interviewers, incentive non-receivers were less satisfied with the interview and were less ready to participate in a similar survey the following year (χ^2 test, $P < 0.1$). As for the tendency to choose the status quo option in the dataset, the data do not show significant differences between incentive receivers and non-receivers.

Table 4
Choice behavior by incentive groups

Variables	Incentive receiver	Non-receiver
Number of approaches	387	408
Number of responses	360	360
Response rate	93.02%	88.24%
Total length of interview (in minutes)***	66.82	55.16
Length of interview of the choice experiment part (in minutes)***	27.21	16.81
Interruptions during interview (1 = yes, 0 = no)**	9.44%	14.17%
Respondent efforts (% of respondent)		
High effort*	43.06	36.67

Variables	Incentive receiver	Non-receiver
Medium effort	51.94	55.28
Little effort	4.44	5.83
No effort*	0.56	2.22
Respondent satisfaction (% of respondent)		
Certainly yes	52.78	51.39
Yes	33.61	28.89
No	8.33	10.83
Certainly no*	5.28	8.89
Status quo option chosen (% of observation)	7.22	8.89
Number of respondent	360	360
Number of observation	2160	2160

***, **, * Significant difference between incentives and no incentives group at 1, 5, 10% significance level

3.3 Model results

The results of three versions of the random parameter logit (RPL) model are presented in Table 5. The pooled RPL model includes all observations, whereas the other two RPL models provide separate estimates for incentive receiver and non-receiver groups of respondents. The goodness-of-fit statistic shows that all the three RPL models predict preferences well. All the model coefficients are statistically significant and have the expected signs. Respondents had positive preferences for climate-adaptive crops, soil quality, irrigation, and training. Respondents had negative preferences for the higher payments.

Table 5
Random parameter logit estimates for climate adaptation attributes

Attributes	Incentive receiver		Non-receiver		Pooled	
	Coeff. (SE)	Coeff. std. (SE)	Coeff. (SE)	Coeff. std. (SE)	Coeff. (SE)	Coeff. std. (SE)
Constant	1.19*** (0.20)	0.02 (0.50)	1.89*** (0.20)	0.02 (0.52)	1.49*** (0.15)	0.02 (0.32)
Climate-adaptive crop species or varieties	0.12*** (0.01)	0.06 (0.05)	0.11*** (0.01)	0.03 (0.10)	0.11*** (0.01)	0.04 (0.05)
Soil quality (high improvement)	0.65*** (0.07)	0.02 (0.37)	0.82*** (0.07)	0.53** (0.19)	0.71*** (0.05)	0.31 (0.19)

Attributes	Incentive receiver		Non-receiver		Pooled	
	Coeff. (SE)	Coeff. std. (SE)	Coeff. (SE)	Coeff. std. (SE)	Coeff. (SE)	Coeff. std. (SE)
Soil quality (moderate improvement)	0.09* (0.05)	0.58** (0.23)	0.24*** (0.06)	0.67** (0.23)	0.16*** (0.04)	0.59** (0.16)
Irrigation	0.22*** (0.02)	0.01 (0.069)	0.27*** (0.02)	0.03 (0.06)	0.24*** (0.01)	0.01 (0.04)
Training	0.67*** (0.06)	0.52*** (0.17)	0.65*** (0.04)	0.05 (0.26)	0.64*** (0.04)	0.27 (0.20)
Payment	−0.0009*** (0.77E−04)		−0.001*** (0.69E−04)		−0.0009*** (0.54E−04)	
Number of observations	2160		2160		4320	
Pseudo-R2	0.22		0.24		0.219	

Attributes	Incentive receiver		Non-receiver		Pooled	
	Coeff. (SE)	Coeff. std. (SE)	Coeff. (SE)	Coeff. std. (SE)	Coeff. (SE)	Coeff. std. (SE)
Log likelihood	−2329.28		−2260.89		−4607.21	
Replications for simulated probability	500		500		500	

***, **, * Significance at 1, 5, 10% level, respectively

To determine whether the estimated WTP was affected by the incentives provided, we conducted two analyses. The first used a likelihood ratio (Swait and Louviere 1993) to test for equality of coefficients in the WTP models between incentive receivers and non-receivers. This approach compares the sum of the log likelihood (LL) of the individual models to the LL of the pooled model.[9] The likelihood ratio (LR) test follows a Chi-square distribution. The LR test of equal parameters across two groups showed that the coefficients between incentive receiver and non-receiver were not equal. The calculated Chi-square of 34.06 is statistically significant at conventional significance levels. Thus, we rejected the hypothesis of coefficient equality in the parameter. This means that the preference between the two groups differed at least for one of the attributes (Bech et al. 2011).

Second, comparisons were made between the WTP estimates from the two separate receiver and non-receiver RPL models. Confidence intervals were calculated for each of the mean WTPs using the Wald test procedure and evaluated by whether the confidence intervals of the two estimates of mean WTP overlapped or not (Creel and Loomis 1991). The results show statistically significant WTP for all the attributes (Table 6). The WTP estimates were significant at the 1% level for all the attributes for both groups except for the moderate improvement in the soil quality attribute in the incentive receiver group, which was significant at the 10% level. However, the estimated WTP confidence interval for all the attributes overlapped across the incentive receiver and non-receiver groups, implying that no significant difference existed between the estimated WTPs of the respondents receiving and not receiving incentives.

Table 6
WTP and confidence intervals, in Nepalese Rupees

Attributes	Incentive receiver		Non-receiver		Pooled	
	WTP	95% interval	WTP	95% interval	WTP	95% interval bound
Climate-adaptive crop species or varieties	119.54***	96.48–142.61	106.53***	85.61–127.46	111.46***	95.98–126.97
Soil quality (high improvement)	659.09***	537.86–780.33	785.26***	656.53–913.98	713.97***	626.02–801.85
Soil quality (moderate improvement)	101.11*	8.21–210.43	225.75***	112.96–338.54	153.02***	75.64–230.39
Irrigation	224.56***	188.89–260.22	262.31***	225.49–299.13	243.00***	217.63–268.37
Training	688.60***	581.64–795.59	633.69***	542.18–725.21	657.85***	588.07–727.55

1 USD = NRs 106.07 (from website of the Nepal Rastra Bank, accessed on 12/01/2016)

***, **, * Significance at 1, 5, 10% level, respectively

3.4 Regional analysis

To better understand the regional dissimilarities in the responses and the welfare estimates, we divided the respondents in each agro-ecological region into incentive receiver and non-receiver groups. Appendix 1 presents the choice behavior results separately for the regional incentive receivers and non-receivers. The agro-ecological regions differed significantly in the length of their interviews and respondents' effort in answering survey questions. However, respondent satisfaction did not significantly differ across the regions. Incentive receivers spent significantly more time answering the questionnaire in all regions. Similarly, incentive non-receivers were more likely to interrupt the interview in all the regions. However this difference was statistically significant ($P < 0.05$) only in the Terai region. In the Terai and Mountain regions, incentive receivers were more likely to put more effort in answering choice experiment questions than incentive non-receivers. Furthermore, incentive non-receivers were, in general, less satisfied with the overall interview than incentive receivers.

WTP differed significantly across the agro-ecological regions (Appendix 2). Farmers in the Terai region were willing to pay significantly more than to those from the Hill and the Mountain regions for an increase in the number of climate-adaptive crops. However, farmers in the Mountain region were willing to pay significantly than those in the Hill region for a major improvement in soil quality. Similarly, farmers in the Hill region were willing to pay significantly more for an increase in the number of irrigated months.

Willingness to pay did not significantly differ between incentive receivers and non-receivers across the ecological regions (Appendix 3), except for an increase in the number of climate-adaptive crops in the Terai region, where incentive receivers were willing to pay significantly more than non-receivers.

4 Discussion and conclusions

This study investigated whether the use of survey incentives affects response behavior and welfare estimates in a choice experiment study used to value climate change adaptation benefits in agriculture. Some survey characteristics, such as interview length, interruptions during the interview, respondents' effort in responding to choice experiment questions, and respondents' satisfaction with the interview were significantly affected by the survey incentives. Compared to incentive non-receivers, incentive receivers spent more time answering survey questions. Interruptions during interviews were also less likely among the incentive receivers. This finding is consistent with previous findings that survey incentives are an effective tool in motivating respondents in carefully answering survey questions (Ahlheim et al. 2013; Petrolia and Bhattacharjee 2009; Simmons and Wilmot 2004). Although in this study the key outcomes were the same for those which were not offered an incentive, the need for greater time spent and thus, care in answering questions, may become of greater importance when greater complexity in choosing between alternatives in a choice experiments survey exists.

The estimated parameters for all attributes included in the model were statistically significant. The coefficient for climate-adaptive crop varieties was positive, implying that farmers are more likely to choose alternatives with a greater number of climate-adaptive crop species or varieties on their farm lands. This is also the case for soil quality, irrigation, and training, indicating that farmers prefer the alternatives that provide improved soil quality, increased irrigation months, and training for farmers. The positive and significant WTP amount suggests that farmers are interested in contributing to adaptation programs that increase climate-adaptive crop species and varieties, improve soil quality, improve irrigation, and provide them training for adaptive farming. No differences in status quo choice between the incentive receivers and non-receivers suggest that survey incentive receivers are not more likely to exhibit a status quo bias. In contrast, differences in preference parameter estimates between the two groups reveal that preferences between the two groups differed at least for one of the attributes under study. No significant difference in estimated WTP between the incentive receivers and non-receivers was found.

However, significant differences in response behavior and preferences for different adaptation alternatives across the agro-ecological regions were found. This may have been caused by spatial variations in regional climatic conditions and access to resources. That is, farmers in different regions have varying levels of access to resources, awareness of climate change impacts and adaptation (Table 3) with associated marked differences in their vulnerability, and adaptive capacity to the impact of climate change (MoE 2010). Even so, few differences in welfare estimates between incentive receivers and non-receivers across the regions seem to exist.

This study has three important outcomes. First, it contributes to the limited empirical literature on the application of choice experiments in developing countries. Although online surveys are becoming popular in developed countries, face-to-face interviewing is the most common method in less-developed countries, given that respondents often are illiterate and internet access may not exist for a large percentage of the population. Second, to our knowledge, this is the first study that examined whether the use of prepaid incentives affects survey characteristics and stated choices in a face-to-face choice experiment study in a developing country. Third, the study provides added methodological rigor to the important findings about the high level of willingness of poor farmers to contribute to the implementation of climate change adaptation strategies. This is important, given that many developing countries have been planning to adopt climate change-related adaptation plans and programs.

The study does have several limitations. The respondents' decision to participate, and their time and effort expended during the interview, may depend to an important degree on the importance they attach to the subject matter of the study and towards the goods under valuation. Furthermore, this study was limited to offering a single incentive to the potential survey respondents, which may limit the generalizability of the findings. Future research, consequently, should compare the impact of variable types and amount of survey incentives on respondent behavior and WTP estimates in choice experiment studies. In addition, whether gender, age, and other socioeconomic factors influence this association remains unanswered—an issue which also needs further research.

Footnotes

1. 1.

   We reviewed 43 of 50 NAPAs submitted to UNFCCC. Seven (those of Benin, Burundi, Congo, Equatorial Guinea, Guinea, Djibouti, and Togo) were not reviewed because they were submitted in languages other than English. Of the 43 NAPAs submitted to UNFCCC, 35 identified developing resistant crop varieties as an adaptation strategy. Similarly, reducing soil erosion, diversification, and improvement of irrigation were identified as adaptation strategies in 34, 24, and 37 NAPAs, respectively. Furthermore, the need of farmers' capacity building for climate change adaptation was highlighted in all 43 NAPAs.

2. 2.

   Inclusion of an option to select the status quo or baseline alternatives is instrumental for achieving welfare measures that are consistent with demand theory. The status quo in this study is the existing farming condition, that is, no increase in climate-adaptive crops, no improvement in soil quality, no training on climate-adaptive farming, and irrigation water available for 6, 5, 5, 3, 4, and 6 months in Chitwan, Dhading, Kaski, Mustang, Rasuwa, and Rupandehi districts, respectively.

3. 3.

   A VDC is one of the smallest administrative units in Nepal. It is similar to a municipality.

4. 4.

   NRs 75 is equivalent to wage for 1.5 h of labor work. Wage rate for agricultural labor in rural areas of Nepal is NRs 400 per day, which is 8 h of work. Since an interview on average took 1 h to complete, we think the wage of 1.5 h is a reasonable amount for the value of time respondents spent in answering the question and consequently is a significant incentive to make a psychological influence. To put it in context, NRs 75 is the price of a meal in most rural areas of Nepal.

5. 5.

   Four interviewers were recruited for the survey. First, all four completed the survey interviews in one VDC of each district in Terai region (Chitwan and Rupandehi). Then the interviewers were divided into two groups. One group completed the survey in one VDC of Dhading and went to Rasuwa district. The other group went to Kaski and Mustang districts. Thus, the interviews were first conducted in one VDC in each of the selected districts. After all the interviews in the six VDCs (360 respondents) were completed, the interviewers were told about the incentives. The respondents were later provided with the incentives through the local village leaders. In another VDC in all the

selected districts, respondents were provided with incentives before the interview. The respondents who received incentives after the interview are considered as incentive non-receivers.

6. 6.

   To ensure that respondents properly understand the climate change adaptation scenarios, respondents first discussed their current farming condition. Then, they were given a detailed explanation of the adaptation programs they were offered. They were clearly instructed that the selection of the “none” option meant continuing with the existing farming situation.

7. 7.

   Choosing choice scenarios randomly or quickly on the basis of no or little thinking was considered to represent no or little effort.

8. 8.

   We interviewed 360 respondents in each category. To make the subsample size 360 in each category, we approached 387 and 408 households in incentive receiver and non-receiver groups, respectively.

9. 9.

   $${\text{LR}} = 2\times \left[{\left({{\text{LL}}_{\text{incentive}} + {\text{LL}}_{\text{no - incentive}} } \right)-{\text{LL}}_{\text{pool}} } \right]\sim \chi^{ 2}$$.

Notes

Acknowledgements

We thank Ken-Ichi Akao, the editor for this article, and the referees for their useful suggestions. The financial support provided by the Australia Endeavour postgraduate scholarship, and the QUT Business School, Queensland University of Technology, Australia is greatly appreciated. We are thankful to the respondents who shared their knowledge and information.

Compliance with ethical standards

Conflict of interest

The authors declare that they have no conflict of interest.

Appendix 1

See Table 7.

Table 7
Regional analysis of response behavior

Variables	Terai			Hill			Mountain			Sig.
	Incentive receiver	Non-receiver	Overall	Incentive receiver	Non-receiver	Overall	Incentive receiver	Non-receiver	Overall	
Total length of interview (in minutes)	81.16	65.65	73.41	56.41	51.87	54.14	62.88	47.96	55.42	a, c, d, e, f
Length of interview of the choice experiment part (in minutes)	41.16	24.23	32.69	18.05	13.23	15.64	22.42	12.98	17.70	a, b, c, d, e, f

Variables	Terai			Hill			Mountain			Sig.
	Incentive receiver	Non-receiver	Overall	Incentive receiver	Non-receiver	Overall	Incentive receiver	Non-receiver	Overall	
Interruptions during interview (1 = yes, 0 = no)	7.50%	14.17%	10.83%	10.83%	11.67%	11.25%	10.00%	16.67%	13.33%	f
Respondent efforts (% of respondent)										
High effort	42.50	27.50	35.00	40.83	40.00	40.42	46.67	41.67	44.17	a, f
Medium effort	57.50	56.67	57.08	56.67	57.50	57.08	41.67	50.83	46.25	a, b
Little effort	4.17	5.83	5.00	3.33	5.83	4.58	6.25	5.42	5.83	

Variables	Terai			Hill			Mountain			Sig.
	Incentive receiver	Non-receiver	Overall	Incentive receiver	Non-receiver	Overall	Incentive receiver	Non-receiver	Overall	
No effort	0.83	1.67	1.25	0.83	1.67	1.25	0.00	3.33	1.67	d
Respondent satisfaction (% of respondent)										
Certainly yes	45.83	53.33	49.58	54.17	50.83	52.50	58.33	50.00	54.17	
Yes	33.33	32.50	32.92	35.00	29.17	32.08	32.50	25.00	28.75	
No	7.50	10.83	9.17	6.67	10.83	8.75	11.20	10.40	10.83	
Certainly no	6.67	9.17	7.92	4.17	10.83	7.50	5.00	6.67	5.83	e
Status quo option chosen (% of	9.58	8.75	9.17	7.50	10.83	9.17	5.00	6.67	5.83	

Variables	Terai			Hill			Mountain			Sig.
	Incentive receiver	Non-receiver	Overall	Incentive receiver	Non-receiver	Overall	Incentive receiver	Non-receiver	Overall	
observation)										

[a]Significant difference between Terai and Mountain at less than 5% level of significance

[b]Significant difference between Hill and Mountain at less than 5% level of significance

[c]Significant difference between Terai and Hill at less than 5% level of significance

[d]Significant difference between incentive receiver and non-receiver in Mountain at less than 5% level of significance

[e]Significant difference between incentive receiver and non-receiver in Hills at less than 5% level of significance

[f]Significant difference between incentive receiver and non-receiver in Terai at less than 5% level of significance

Appendix 2

See Table 8.

Table 8
WTP and confidence intervals by agro-ecological regions

Attribute	Terai		Hill		Mountain	
	WTP	95% confidence interval	WTP	95% confidence interval	WTP	95% confidence interval
Climate-adaptive crops	139.01***	110.94–167.07	98.52***	81.22–116.02	77.36***	46.19–108.71

Attribute	Terai		Hill		Mountain	
	WTP	95% confidence interval	WTP	95% confidence interval	WTP	95% confidence interval
Soil quality (high improvement)	681.19***	543.97–818.41	536.36***	448.87–623.82	844.82***	636.25–1053.38
Soil quality (mod improvement)	222.41***	95.31–349.51	69.13	18.25–156.28	209.84**	43.02–376.69
Irrigation	212.08***	170.38–253.75	288.35***	254.95–321.67	222.05***	165.84–279.26
Training	534.33***	430.27–638.38	692.25***	612.63–771.77	742.96***	575.07–910.78

***, **, * Significance at 1, 5, 10% level, respectively

Appendix 3

See Table 9.

Table 9
WTP and confidence intervals by incentive groups across agro-ecological regions

Attribute	Terai				Hill				Mountain			
	Incentive receiver		Non-receiver		Incentive receiver		Non-receiver		Incentive receiver		Non-receiver	
	WTP	95% conf.	WTP	95% conf.	WTP	95% conf.	WTP	95% conf.	WTP	95% conf.	WTP	95% conf.
Climate-adaptive crops	185.35***	143.65 to 227.05	89.93***	53.07–126.80	99.06***	74.62 to 123.54	98.38***	73.42 to 123.33	88.37***	22.73 to 154.01	70.86***	38.67–103.05
Soil quality (high improvement)	804.73***	618.52 to 990.93	524.54***	327.96–721.12	531.93***	408.52 to 655.34	543.05***	419.81 to 666.29	948.04***	495.33 to 1400.74	776.59***	568.41–984.76
Soil quality (mod	168.82*	–0.17 to 3	286.34***	96.81–476	100.08	–24.60 to	36.53	–84.56 to	253.87	–846.57 to	186.80**	10.26–361

Attribute	Terai				Hill				Mountain			
	Incentive receiver		Non-receiver		Incentive receiver		Non-receiver		Incentive receiver		Non-receiver	
	WTP	95% conf.	WTP	95% conf.	WTP	95% conf.	WTP	95% conf.	WTP	95% conf.	WTP	95% conf.
improvement)		37.83		5.88		224.76		to 57.66		592.32		3.34
Irrigation	263.61***	203.21 to 324.01	161.46***	103.91 – 219.02	286.92**	239.85 to 333.99	291.01***	243.79 to 338.24	261.43***	138.31 to 384.54	199.46**	142.03 – 256.89
Training	565.68***	429.08 to 702.28	497.8***	342.84 – 653.13	914.9***	546.94 to 1282.89	803.5**	681.63 to 925.41	962.59**	558.25 to 1366.93	614.38**	456.53 – 772.23

Attribute	Terai				Hill				Mountain			
	Incentive receiver		Non-receiver		Incentive receiver		Non-receiver		Incentive receiver		Non-receiver	
	WTP	95% conf.	WTP	95% conf.	WTP	95% conf.	WTP	95% conf.	WTP	95% conf.	WTP	95% conf.
	27											

***, **, * Significance at 1, 5, 10% level, respectively

References

1. Adamowicz W, Boxall P, Williams M, Louviere J (1998) Stated preference approaches for measuring passive use values: choice experiments and contingent valuation. Am J Agr Econ 80:64–75CrossRefGoogle Scholar
2. Ahlheim M, Börger T, Frör O (2013) The effects of extrinsic incentives on respondent behaviour in contingent valuation studies. J Environ Econ Policy 2:45–70CrossRefGoogle Scholar
3. Battaglia MP, Khare M, Frankel MR, Murray MC, Buckley P, Peritz S (2007) Response rates: how have they changed and where are they headed? In: Lepkowski JM, Tucker C, Brick JM, de Leeuw ED, Japec L, Lavrakas PJ, Link MW, Sangster RL (Eds) Advances in telephone survey methodology. Wiley, Hoboken, NJ, USAGoogle Scholar
4. Bech M, Kjaer T, Lauridsen J (2011) Does the number of choice sets matter? Results from a web survey applying a discrete choice experiment. Health Econ 20:273–286CrossRefGoogle Scholar
5. Boxall PC, Adamowicz WL, Swait J, Williams M, Louviere J (1996) A comparison of stated preference methods for environmental valuation. Ecol Econ 18:243–253CrossRefGoogle Scholar
6. Cantor D, O'Hare BC, O'Connor KS (2008) The use of monetary incentives to reduce nonresponse in random digit dial telephone surveys. In: Lepkowski JM, Tucker C, Brick JM, de Leeuw ED, Japec L, Lavrakas PJ, Link MW, Sangster RL (Eds) Advances in telephone survey methodology. Wiley, Hoboken, NJ, USAGoogle Scholar
7. Carlsson F, Mørkbak MR, Olsen SB (2012) The first time is the hardest: a test of ordering effects in choice experiments. J Choice Model 5:19–37CrossRefGoogle Scholar
8. Clark CF, Kotchen MJ, Moore MR (2003) Internal and external influences on pro-environmental behavior: participation in a green electricity program. J Environ Psychol 23:237–246CrossRefGoogle Scholar
9. Colombo S, Hanley N, Louviere J (2009) Modeling preference heterogeneity in stated choice data: an analysis for public goods generated by agriculture. Agric Econ 40:307–322CrossRefGoogle Scholar

10. Creel MD, Loomis JB (1991) Confidence intervals for welfare measures with application to a problem of truncated counts. Rev Econ Stat 73:370–373CrossRefGoogle Scholar
11. de Jalón SG, Iglesias A, Quiroga S, Bardají I (2013) Exploring public support for climate change adaptation policies in the Mediterranean region: a case study in Southern Spain. Environ Sci Policy 29:1–11CrossRefGoogle Scholar
12. De Leeuw E, De Heer W (2002) Trends in household survey nonresponse: a longitudinal and international comparison. Surv Nonresponse 41–54Google Scholar
13. Dillman DA, Phelps G, Tortora R, Swift K, Kohrell J, Berck J, Messer BL (2009) Response rate and measurement differences in mixed-mode surveys using mail, telephone, interactive voice response (IVR) and the Internet. Soc Sci Res 38:1–18CrossRefGoogle Scholar
14. Gajic A, Cameron D, Hurley J (2012) The cost-effectiveness of cash versus lottery incentives for a web-based, stated-preference community survey. Eur J Health Econ 13:789–799CrossRefGoogle Scholar
15. Gifford R (2011) The dragons of inaction: psychological barriers that limit climate change mitigation and adaptation. Am Psychol 66:290CrossRefGoogle Scholar
16. Goldenberg J, Han S, Lehmann DR, Hong JW (2009) The role of hubs in the adoption process. J Mark 73:1–13CrossRefGoogle Scholar
17. Gouldner AW (1960) The norm of reciprocity: a preliminary statement. Am Soc Rev 25:161–178CrossRefGoogle Scholar
18. Hanley N, Wright RE, Adamowicz V (1998) Using choice experiments to value the environment. Environ Resour Econ 11:413–428CrossRefGoogle Scholar
19. Hanley N, Mourato S, Wright RE (2001) Choice modelling approaches: a superior alternative for environmental valuation? J Econ Surv 15:435–462CrossRefGoogle Scholar
20. Hensher DA (2006) How do respondents process stated choice experiments? Attribute consideration under varying information load. J Appl Econom 21:861–878CrossRefGoogle Scholar
21. Hensher DA, Rose JM, Greene WH (2005) Applied choice analysis: a primer, 1st edn. Cambridge University Press, CambridgeCrossRefGoogle Scholar
22. Hidano N, Kato T, Aritomi M (2005) Benefits of participating in contingent valuation mail surveys and their effects on respondent behavior: a panel analysis. Ecol Econ 52:63–80CrossRefGoogle Scholar
23. Islam MM, Barnes A, Toma L (2013) An investigation into climate change scepticism among farmers. J Environ Psychol 34:137–150CrossRefGoogle Scholar
24. Islam M, Kotani K, Managi S (2016) Climate perception and flood mitigation cooperation: a Bangladesh case study. Econ Anal Policy 49:117–133CrossRefGoogle Scholar
25. James JM, Bolstein R (1990) The effect of monetary incentives and follow-up mailings on the response rate and response quality in mail surveys. Public Opin Quart 54:346–361CrossRefGoogle Scholar
26. Lancaster KJ (1966) A new approach to consumer theory. J Polit Econ 74:132–157CrossRefGoogle Scholar

27. Liebe U, Glenk K, Oehlmann M, Meyerhoff J (2015) Does the use of mobile devices (tablets and smartphones) affect survey quality and choice behaviour in web surveys? J Choice Model 14:17–31CrossRefGoogle Scholar
28. Louviere JJ, Street D, Burgess L, Wasi N, Islam T, Marley AA (2008) Modeling the choices of individual decision-makers by combining efficient choice experiment designs with extra preference information. J Choice Model 1:128–164CrossRefGoogle Scholar
29. Medway R (2012) Beyond response rates: the effect of prepaid incentives on measurement error. University of Maryland, College ParkGoogle Scholar
30. MoE (2010) National adaptation programme of action to climate change. Ministry of Environment, KathmanduGoogle Scholar
31. Moyer A, Brown M (2008) Effect of participation incentives on the composition of national health surveys. J Health Psychol 13:870–873CrossRefGoogle Scholar
32. Petrolia DR, Bhattacharjee S (2009) Revisiting incentive effects evidence from a random-sample mail survey on consumer preferences for fuel ethanol. Public Opin Quart 73:537–550CrossRefGoogle Scholar
33. Price JC, Walker IA, Boschetti F (2014) Measuring cultural values and beliefs about environment to identify their role in climate change responses. J Environ Psychol 37:8–20CrossRefGoogle Scholar
34. Rajmis S, Barkmann J, Marggraf R (2009) User community preferences for climate change mitigation and adaptation measures around Hainich National Park, Germany. Clim Res 40:61–73CrossRefGoogle Scholar
35. Ryu E, Couper MP, Marans RW (2006) Survey incentives: cash vs. in-kind; face-to-face vs. mail; response rate vs. nonresponse error. Int J Public Opin Res 18:89–106CrossRefGoogle Scholar
36. Simmons E, Wilmot A (2004) Incentive payments on social surveys: a literature review. Soc Surv Methodol Bull 53:1–11Google Scholar
37. Swait J, Louviere J (1993) The role of the scale parameter in the estimation and comparison of multinomial logit models. J Mark Res 30:305–314CrossRefGoogle Scholar
38. Trussell N, Lavrakas PJ (2004) The influence of incremental increases in token cash incentives on mail survey response is there an optimal amount? Public Opin Quart 68:349–367CrossRefGoogle Scholar
39. Whitmarsh L (2009) Behavioural responses to climate change: asymmetry of intentions and impacts. J Environ Psychol 29:13–23CrossRefGoogle Scholar

Copyright information

Authors and Affiliations

- Uttam Khanal
  - 1

Email author

- Clevo Wilson
  - 1
- Shunsuke Managi
  - 2
- Boon Lee
  - 1
- Viet-Ngu Hoang
  - 1
- Robert Gifford
  - 3

1. 1.QUT Business SchoolQueensland University of TechnologyBrisbaneAustralia
2. 2.Urban Institute, Department of Urban and Environmental Engineering, Faculty of EngineeringKyushu UniversityFukuokaJapan
3. 3.University of VictoriaVictoriaCanada

About this article

Cite this article as:

Khanal, U., Wilson, C., Managi, S. et al. Environ Econ Policy Stud (2018) 20: 305. https://doi-org.ezproxy.library.uvic.ca/10.1007/s10018-017-0195-4

- **Received** 13 March 2017
- **Accepted** 18 August 2017
- **First Online** 23 August 2017
- **DOI** https://doi-org.ezproxy.library.uvic.ca/10.1007/s10018-017-0195-4
- **Publisher Name** Springer Japan
- **Print ISSN** 1432-847X
- **Online ISSN** 1867-383X