Influences on bid prices in the Vegetation Incentives Program

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In a conservation auction there are many possible influences on bid prices. This paper considers a range of factors that influenced the bids submitted to the Queensland Government's Vegetation Incentives Program (VIP). The relationships between total bid price and a variety of variables are examined. The VIP appears to be a unique example of a program that asks landholders to separate management and covenant costs in their tender. Forgoing payment on the covenant may be an indicator of low opportunity cost or altruism on the part of the landholder. Accordingly this paper also investigates the influences on covenant bids.

Keywords: auctions; market-based instruments; vegetation management; conservation covenants

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1. Introduction

Auction theory can be applied to the problem of funding natural resource management on private properties. An adequate market for providing public goods from private land does not exist, which is why there is an under-provision of environmental goods and services. Auctions can help form a quasi-market for environmental public goods (Latacz-Lohmann and Van der Hamsvoort 1998:335). This market has several distinguishing characteristics, such as only having one buyer (usually the government) and many sellers with a wide range of opportunity costs (Latacz-Lohmann and Van der Hamsvoort 1998:335-37). As in standard procurement auctions, in conservation auction the bidders with the best tenders win the contracts. This means that price, the ecological significance of the property and sometimes the management actions offered (or the ecological change expected) are used to choose the winning bids. An auction encourages landholders to reveal their opportunity cost and the purchaser to reveal information on the best management actions. This leads to better coordination of demand to protect biodiversity and landholders willing to supply the services. It also provides a more cost-effective use of public funds.

In a conservation auction there are many possible influences on bid prices. The design of a conservation auction can change which participants are attracted to the program and influence bid values. This aspect of the mechanism has not been widely explored using data from an on-ground conservation auction. The aim of this paper is to assess the influences on bids submitted to the Queensland Government's Vegetation Incentives Program (VIP). A participant survey allowed data on the VIP's participants and characteristics relevant to their bids to be gathered and analysed. These characteristics relate to the opportunity cost of participation, information rent in the bid, opinions of the program and socio-economic characteristics of bidders. The structure of the bids also allowed for the influences on covenant values to be tested separately.

This paper is organised as follows: In the next section the VIP is described and the bid levels are reported. In section 3 the possible theoretical influences on bid levels are briefly described. In section 4 a series of bivariate correlations between the total bid level and a variety of variables are reported and an OLS regression undertaken. In section 5 a similar series of bivariate correlations between the covenant bid and a range of variables are reported and a logistic regression undertaken. Conclusions are drawn in the final section.

2. Background to the VIP

The Queensland Department of Natural Resources and Water (NRW) introduced the VIP, with a $12 million budget, as part of a financial assistance package that accompanied extensive changes to the state's vegetation management legislation in 2004. The VIP was designed as a single round, sealed bid discriminatory-price auction to fund the protection and management of non-remnant vegetation in Queensland. To simplify administration the program was run in three phases. The program commenced in the Southern Grazing Lands in September 2004. The second phase, for the rest of QLD excluding South East

Queensland (SEQ), started in June 2005. The SEQ phase started in late 2005 and finished in June 2006. The results of the program are summarised in the table below.

	Southern *Phase One*	**Far North/Coastal** *Phase Two*	**Central/Western** *Phase Two*	**South East** *Phase Three*
Date finished	July 2005	December 2005	December 2005	June 2006
Queries (approx)	76	160	90	500
Expressions of interest	21	58	26	112
Applications	8	31	7	62 (51 people)*
Approved	0	14	2	22
Average size property	130	11.5	2441	130

**Some people put in more than one tender*

Table One: Summary of the VIP

Greening Australia was chosen through a tender process to deliver the VIP in each region. Landholders received a site visit to help them develop a five year management plan, and also had to sign a permanent covenant that was attached to their land title. A very restrictive covenant was designed for the use of the VIP in the first round. This was a main cause of the low participation rate and high bid levels for this phase. No tenders were funded as the bid prices were felt to be too high for the expected environmental gains. As a result, other permanent protection options were made available in the next two rounds. Most participants have chosen to use a Nature Refuge covenant, which is managed by the Environmental Protection Agency (EPA). In the subsequent phases 38 tenders were accepted. In total, 18 880 hectares of high conservation value non remnant vegetation was protected across Queensland.

Participants in the VIP were sent a questionnaire which asked landholders questions about influences on their participation and bid levels, socio-economic factors and their property. There was a response rate of almost 57%. A case number assigned to each landholder allowed the questionnaire data to be matched to the bidding and property data gathered by NRW. Due to the high participation rate in peri-urban areas, only 58% of the respondents reported agricultural production on their land, with an average across all participants of 27% of land under agricultural production. Participants had a positive environmental worldview, and were generally participating because of the chance to help the environment. Most had had previous experience with government NRM programs, were far more educated than the average Queensland resident and had slightly higher income.

VIP applicants were requested to submit a bid that contained a price for the five year management plan and a price for the covenant payment. The covenant payment

represented the opportunity cost of signing the covenant, including any option value or transaction costs that the landholder deemed relevant. No financial advice was provided on either element of the total bid. This system was established following advice that separating the two elements would simplify taxation for the landholder. The separation of prices meant that information on the landholder's valuation of the management plan and the covenant was available. In the analysis in this paper bids are grouped into three geographical groups: Southern and Central Grazing Lands (SCGL), FNQ and SEQ.

There was a wide range of total bids (made up of the management plan and covenant bids) both within and between regions. The lowest bid was $40/ha (in SCGL) and the highest $121 306/ha (in SEQ). These bid amounts were for all bids submitted to the VIP, not just the bids that were eventually successful. The average price for the funded tenders was $151/ha, indicating that there may have been a high level of speculative bids.

The average covenant bid per hectare was 80% of the average total bid in SCGL, 24% in FNQ and 23% in SEQ. In the first round, all of the eight participants submitted a bid for the covenant payment. In the second round SCGL all of the applicants again asked for a covenant payment. However, in FNQ 10 of the 33 bidders did not ask for a covenant payment. In round three in SEQ, only sixteen out of the fifty-one applicants (31%) requested a covenant payment, which was the lowest proportion of all the rounds. The difference between SCGL and the other regions may reflect the greater foregone opportunity cost from agriculture in SCGL and the greater proportion of altruistic conservation-focused landholders in SEQ and FNQ. As with the total bids, the amount of money requested for the covenant payments varied widely, from $15/ha (SCGL) to $56 167/ha (SEQ). Some landholders seemed to be asking for a token amount of money while others submitted complex calculations for lost income.

3. Possible influences on bid price

When forming a bid a landholder must balance net payoffs and acceptance probability. Although a higher bid increases the net payoff it reduces the probability of winning, and vice versa. Fundamentally, landholders need to base their bid on their opportunity cost of participation. This can include the costs of carrying out any management as well as lost income from participating. Economic theory suggest that producers have differing opportunity costs based on a variety of factors such as the productivity of their land, ownership costs, returns available from other uses of the land, expectations for their business' future, and other less quantifiable factors such as the desire of the landholder to conserve the land (GAO 1989:36). A first best outcome for an auction is having bids based solely on opportunity costs (Stoneham et al 2003:490). This means that the maximum amount of environmental improvement is achieved for the money spent.

However, as well as opportunity cost landholders often include information rent in their bids. Generally there is information asymmetry in a conservation auction: the funder holds information on the significance of the properties and the most appropriate management actions, while the landholder holds the information on the opportunity cost of changing their natural resource management practices. Latacz-Lohmann and Van der

Hamsvoort (1998) describe how the hidden information of the landholder can lead also to the principal-agent problem of adverse-selection. Information asymmetry can manifest itself in higher costs for a program through adverse selection – where those with low costs choose to participate and be overpaid – and through landholders misrepresenting their costs in an effort to be overpaid. Basically, landholders can take advantage of information asymmetry and be paid above their true opportunity costs (Latacz-Lohmann 1998). Information rent is based on the likelihood of the bid succeeding - as the probability of being accepted increases, landholders increase the information rent in their bid, which leads to higher bids (Stoneham et al 2003:490). Many factors contribute to the landholder's perceived probability of being accepted, including the amount of information they hold about the relative importance of their property, the presumed range of bids submitted by other participants and the perceived level of competition in the process. Altruism towards the goal of the program can encourage landholders to reduce information rent.

Uncertainty may lead to participants increasing their bids. Participants in a procurement auction may increase their bids to avoid underbidding. It is possible that the landholder may not be fully aware even of their own opportunity costs. There is often an element of uncertainty about the impact of adopting some natural resource management practices. Landholders knowing their own costs of participation may be a reasonable assumption for simple physical projects or for the short term, but it is less likely to hold when estimating income foregone, especially in the long term. The subsequent increase in the bid is known as a risk premium (Windle and Rolfe 2005).

4. Influences on bid levels in the VIP

One of the major components of the bids in the VIP was the management costs associated with the five year management plan. Management activities included fencing, weed control, pest animal control, revegetation, fire management, installation of watering systems and monitoring and evaluation. The costs of different activities varied between regions, with fencing costing more on average in SEQ ($5264/km in FNQ and $8386/km in SEQ) and tree planting costing more on average in FNQ ($6/tree in FNQ and $4/tree in SEQ).[2] Even within the same activities in the same region there was a wide range of costs. For example revegetation bids in FNQ varied from 0.28 cents a tree to $12 a tree. These cost differences depended on what the landholder included in the bid (for example some included site preparation and on-going care) and how they proposed to undertake the activity. For example, some landholders had already established their own native tree nursery and provided free labour while others brought in contractors for the whole work. As discussed later, it is also possible that some of the higher costs included information rent on the part of the landholder. These differences in opportunity costs are part of what drive the cost savings possible in a competitive tender. Each landholder typically had a wide range of activities with different levels of provision. This meant that management plan costs were not comparable and so they were not statistically analysed in relation to bid costs.

[2] These costs are taken from the management plans that matched the questionnaire sample.

A wide range of other variables were statistically analysed in relation to bidding in the VIP. These variables are described in Table Four, along with the level of the variable and its name for the analysis.

Variable	**Type**[3]	**Coding**
VIP project area	Interval. Transformed	Project size
Property size	Interval – transformed	Property size
Total bid levels (inc all costs inc covenant bid)	Interval – transformed	Total bid $
Covenant bid	Interval – transformed	Covenant bid $
Requested a covenant payment	Dummy	Covenant
Environmental importance score	Normal interval	Score
Length of residency in the area	Normal interval	Length residency
New Ecological Paradigm score	Normal interval	NEP
Age of respondent in years	Normal interval	Age
Income	Non-normal interval	Income
Proportion of the property under agricultural production	Non-normal interval	Proportion agriculture
Presence of agricultural production on the property	Dummy	Any agriculture
Greater than 60% of income from off-farm sources	Dummy	High off-farm income
Belief that bidding will be competitive	Dummy	Competitive
Belief that bid likely to succeed	Dummy	Likely to succeed
Believe that covenant will decreased land value	Dummy	Land value
Belief in relative importance of their vegetation	Dummy	Vegetation importance
Want to keep their property in the family	Dummy	Family
Bachelor degree or higher	Dummy	Higher education
≥3 business activities or ≤80% less of their farm business in one activity	Dummy	Diverse agriculture
In an agricultural industry that is more likely to face opportunity cost from the covenant (all industries bar	Dummy	Opportunity cost

[3] All transformed variables used a natural log function.

tourism, water supply and education)		
A third party helped form the management plan	Dummy	Consultant
Understand the selection process	Dummy	Understand
Participate as like to set own price on work	Dummy	Own price
Participate as extra paid work will be useful to family	Dummy	Want paid work

Table Two: Variables tested

The bivariate correlations of independent variables with the total bid amount were calculated to test relationship strength. These correlations are reported in Table Five.[4] Only statistically significant relationships are reported.

Variable	**One tailed test**	**Correlation with total bid $ (*r*)**	**Correlation with total bid (τ)**
Project size	❖	0.573***	
Property size	❖	0.593***	
Any agriculture	❖		0.228**
Off-farm income	❖		-0.226**
Age		-0.503***	
Likely to succeed	❖		-0.271**
Understand process	❖		-0.211**
Diverse agriculture			0.285*
Own price	❖		0.219**
Want paid work	❖		0.186*

*=0.1 **=0.05 ***=0.01

Table Three: Correlation with transformed total bid variable ($).

Predictably, project size was strongly correlated with the total bid amount r=0.573, $p \leq 0.001$. It was hypothesised that properties with large areas would be more able to afford participation in the VIP as they could better afford to give up some land. They are also more likely to have parts of the property that are lower quality for production, and thus have a lower opportunity cost of participation. However, landholders with larger properties were more likely to submit a higher bid r=0.593, $p \leq 0.001$. This could be due to the strong link between property size and project size (r=0.861, $p \leq 0.001$), however even when project size is controlled in a partial correlation, there is still a small correlation between property size and the total bid r=0.219, $p \leq 0.1$ one-tail. This could be due to the larger property owners being more dependent on income from their properties, with a strong negative correlation existing between off-income and property size r= -0.514, $p \leq .001$.

[4] Pearson's r is used for interval level data and nonparametric correlation measure of Kendall's tau-B (τ) is used for the dichotomous variables.

Landholders who were reliant upon their property for income were more likely to submit higher bids, as reflected by the negative relationship between high off-farm income and a lower bid level, r=-0.299, $p \leq 0.05$ one tail. Similarly having any agriculture was positively associated with a higher bid level, τ =0.228, $p \leq 0.05$ one tail. The correlation between the diverse agriculture variable and the bid level is a reflection of the impact of dependence on a business activity. The results show a moderate positive correlation between diverseness of agriculture and the bid level τ =0.285 $p \leq 0.1$. Although diversification of income is typically seen as reducing risk to income, it is possible these landholders felt financially less stable and this is revealed in their bid. Alternatively, the landholders may have seen the VIP as a source of income diversification.

Another form of opportunity cost is a decrease in land value due to the permanent covenant. Just over half of the VIP participants believed that a covenant will have a negative impact on their property value, with 30% believing that the value will decrease slightly and another 22% believing it will decrease significantly. Only 11% believed a covenant will increase their property value, with the rest of participants reporting that they were unsure or that the covenant would probably have no impact on value. Despite this widespread concern over the impact on land value, total bid levels were not significantly associated with a belief that land values will fall after signing a covenant τ = 0.085, ns.

Three items in the participant's questionnaire attempted to assess possible influences on information rent by bidders. These asked about the perceived level of competition in the region, the perceived quality of the bidder's vegetation compared to the region and the perceived likelihood of being accepted. Forty-two percent of respondents believed that bidding would be fairly competitive, and another 20% believed it would be very competitive. It was expected that a belief in competitiveness would lead to landholders decreasing their bids in an effort to maximise the chances of their bids being accepted. No respondents thought their vegetation was less environmentally important than other patches in their region, which is not surprising as it would seem unlikely for a landholder who believed this to participate in a competitive tender. Sixty-two percent believed their bush was of greater importance. It was anticipated that this would increase a bid level as participants would believe they could charge a premium and so increase the information rent in a bid. Nearly all respondents were confident that their bid would be accepted, with 68% saying that they thought it was likely and 16% that it was very likely. As with the previous factor, this is predicted to increase the bid level. The $12 million budget was widely advertised and discussed, which might have led to landholders believing large bids would be acceptable.

However in practice these questionnaire items are not particularly revealing of the information rent in a bid. Landholders who believed that their bid was likely to be accepted were more likely to have lower bids τ =-0.271, $p \leq 0.05$ one tail. This is contrary to the predicted direction. It is possible that participants who had low bids consequently thought they were likely to be accepted. The relationship between the bid price and the landholder's opinion of their vegetation was not statistically significant, r=0.006, ns.

Similarly, it does not appear likely that VIP participants conditioned their bids on their ecological benefits score. There was no significant link between scores and bid levels r= -0.190, ns. The relationship between bid levels and the belief of the competitiveness of bidding was also statistically non-significant τ =-0.008, ns. This might have also been due to the belief of landholders that they were submitting good bids and management plans so did not change their bids based on their perception of competitiveness. The recent Fitzroy Basin Association Biodiversity Tender survey found that successful landholders were less concerned about the competitiveness of their bids (Windle and Rolfe 2006:9).

There are a variety of reasons why information rent was not detectable in the VIP bids. The first is that the questionnaire sample was too small. Bid construction may have been rushed or confused due to the newness of the mechanism and the uncertainty surrounding the program's development. Finally, there may not have been much information rent. Competition may have reduced the scope for information rent or landholders may have been very altruistic.

Having a positive environmental attitude probably reduces the information rent in a participant's bid. The modified New Ecological Paradigm (NEP) scale for the participant responses was not internally consistent and lacked predictive capacity, including with the bid level r=0.032, ns. This was possibly due to a lack of unidemsionality and a homogenous group of participant responses. Widegren (1998) discovered that willingness to pay for environmentally friendly food was not correlated with NEP, and postulated that the high level of agreement amongst Swedes with the NEP questions may have resulted in a weak predictive capacity. There may have been a similar problem with the VIP participants.

There was widespread uncertainty amongst landholders over forming a bid amount, particularly for the covenant. Field officers did not offer advice to landholders on the formation of bids. Greening Australia field staff reported that many landholders expressed concern over forming a bid without explicit guidelines. One participant commented on their questionnaire that the "Bidding process needs some parameters to ensure bids are not a waste of time. i.e.: there would be massive differences in bid amounts". This may have resulted in landholders asking for a "risk premium". Not surprisingly, those who understand the selection process are likely to put in lower bids τ=-0.211, $p\leq0.05$ one tail. There is likely to be less of a risk premium included in a bid if a landholder feels confident about the program.

The only socio-demographic variable that had a statistically significant relationship with the bid level was age, with older participants being more likely to put in low bids. This was an unexpected result as there was no prior reason to hypothesize either way about the influence of age. Two of the reasons associated with the utility of income for participating – "I like being able to set my own price on the work" and "The extra paid work will be useful for family members" – are weakly associated with bid levels at τ=-0.219, $p\leq0.1$ one tail and τ =0.186, $p\leq0.1$ one tail, respectively. It is not surprising that landholders who participated for these reasons had higher bids, as these landholders

probably value their work highly and are less willing to let an opportunity to make extra income pass them by.

OLS regression analysis

An ordinary least squares (OLS) regression was undertaken to test if bid levels can be influenced by a combination of different variables. A model was created from the variables described in the preceding sections. The explanatory variables included variables representing the costs of participation, bid characteristics, and property, respondent and contract characteristics. Despite the problems with the score variable, it is included here as it strongly increases the explanatory power of the model. Casewise diagnostics were undertaken and it became apparent that one case was an outlier. When this case was removed, the model's explanatory power increased. The data fitted the model $F(9)=10.369$ $p\leq0.001$. The adjusted R^2 was 0.682, indicating that 68.2% of the variance in the total bid was explained by the model. The resulting regression output is shown in Table Six.

Variable	**β**	**SE**	**Beta**	**Significance**
Constant	9.609	.689		.000
Project size***	.365	.077	.529	.000
Any agriculture*	.507	.277	.229	.079
High off-farm income**	-.660	.259	-.304	.017
Competitive	.350	.238	.161	.153
Length residency***	-.033	.010	-.450	.002
Want paid work***	.831	.265	.320	.004
Score	.010	.023	.047	.658
Covenant**	.554	.231	.257	.023

Note. Adjusted R^2, 0.682. Standard error estimate 0.61724. F=10.369 ($p\leq0.001$).
*=0.1 **=0.05 ***=0.01

Table Four: OLS regression

The dependent variable is the bid amount, transformed by a natural log function to normalise its distribution. Of the nine independent variables, six were statistically significant. Because of the log transformation of the bid level, to interpret the substantive impact of the relationships with the independent variables the regression coefficients have to be exponentiated.

The opportunity cost variables were significant, and in the expected direction. A one unit increase in property size resulted in a 44% increase in bid prices. Bid levels of landholders with high off-farm income (over 60%) were approximately 52% lower than other landholders. Those with agricultural production had 66% higher bid levels. Including a covenant bid increased the total bid by 74%. The variable with the largest impact on bid size was a landholder's decision to participate based on wanting more paid work for family members, increasing bid levels by 130%. This is unexpectedly large.

An extra year of residency in an area meant that bid levels were likely to have 3% lower bids. This provides support for the notion that longer residency leads to a greater support for conservation. Alternatively, residents that have lived in an area might have lower opportunity costs due to a more established farm business or being aware of less expensive ways to carry out the management plan.

The unexplained variance in the model was likely due to the costs of implementing the management plan, which were unable to be captured. In addition the model did not explicitly capture any risk premium that a landholder included due to uncertainty over the new process and any unmeasured information rent.

5. Influence on covenant level

The requirement for a permanent covenant increased the cost of the program, as was revealed by the high proportion of costs attributed to the covenant in the VIP, as discussed in Section Two. The bivariate correlations between the amount of money requested for the covenant and a range of other variables were calculated to test what influenced covenant bids alone as opposed to total bid prices.[5] The results of significant correlations are reported in Table Seven**.**

Variable	**One tailed test**	**Correlation with covenant bid $ (τ)**
Project size	❖	0.232**
Property size	❖	0.297***
Proportion agriculture	❖	0.413***
Opportunity cost	❖	0.378***
Income	❖	-0.388***
High off-farm	❖	-0.418***
Decrease land value	❖	0.282**
Believe bid likely to succeed	❖	-0.316***
Higher education		-0.291**
Family		0.279**

Table Five: Kendall's tau correlation with covenant bid ($)
*=0.1 **=0.05 ***=0.01

These results show support for the idea that landholders with high opportunity cost submitted higher covenant bids. As the proportion of agriculture on a property increased the covenant bid also increased, with a positive relationship between the two $\tau = 0.413$, $p \leq 0.001$. Properties with a higher opportunity cost because of having agricultural production and being in an industry that might not be able to co-exist with the VIP (all agricultural industries bar tourism, water supply and education) were coded as

[5] As the distribution of the covenant bids was not normal, even when transformed, the nonparametric correlation measure of Kendall's tau-B (τ) is used.

"opportunity cost" in the analysis. There is a positive relationship between being in an agricultural industry that faces opportunity cost and submitting a covenant bid $\tau = 0.378$, $p \leq 0.01$. Respondents with sixty percent or more of their income from off-farm sources were more likely to submit lower covenant bids, with a strong relationship between the two variables $\tau = -0.418$, $p \leq 0.01$. Landholders with a higher average family income were also less likely to submit high bids $\tau = -0.388$, $p \leq 0.01$, perhaps because they did not require the additional income as much as other participants.

There was moderate positive link between increasing covenant bids and believing in the negative impact on land value $\tau = 0.282$ $p \leq 0.05$. This supports the idea that participants who fear a fall in their property value are taking the opportunity to be compensated for any future loss in value through the covenant payment.

Landholders with higher education levels submitted lower bids $\tau = -0.291$, $p \leq 0.05$. This supports the commonly held idea that more educated landholders are willing to participate in conservation. There is a positive relationship between wanting to keep a property in the family and submitting a covenant bid $\tau = 0.279$, $p \leq 0.05$. This suggests that participants with families may wish for a financial payment to help offset any negative impacts their decision to place a covenant on their vegetation would have on their children.

The environmental attitude variable was not significantly associated with asking for a covenant bid, $t(47)=0.734$, ns, $r=.107$. This does not lend support to the idea that altruism was a reason for the lack of a covenant bid, but could also be cause by the weak NEP scale for participants.

Unsurprisingly, project size was positively correlated with the covenant cost $\tau = 0.232$, $p \leq 0.01$, indicating that the opportunity cost of a covenant increased as the size of land set aside increased. As with the total bid analysis, landholders with larger properties were more likely to submit a larger covenant bid $\tau = 0.297$, $p \leq 0.01$. When project size is controlled in a partial correlation there is a stronger correlation between property size and covenant bid $\tau = 0.461$, $p \leq 0.01$.

The perceived likelihood of participation was negatively correlated with the covenant amount - the more a person thought their bid would succeed the more likely it was that their bid price would fall $\tau = -0.316$, $p \leq 0.01$. This certainty may be a result of not asking for a covenant price, rather than the belief in the success leading to a higher bid. The other two questions associated with information rent (opinion of level of competition in region and importance of vegetation) were not significantly associated with the covenant bid.

Logistic regression analysis

A logistic regression with "asking for a covenant payment" as a dichotomous dependent variable was constructed. This examines the multivariate relationships between selected independent variables and landholder's requesting a covenant payment. Independent

variables were taken from the list of statistically significant variables in the bivariate correlations described in Table Seven. There were indications of multicollinearity leading to the opportunity cost and off farm income dummy variables being removed. Predictors with weak strength were also removed as a smaller sample size benefits from a smaller variable to case ratio. In the end, only three dichotomous variables were included in addition to the constant. These were: having any agriculture on the property, a belief that land value would fall with a covenant and having a bachelor degree or higher.

The results of the logistic regression are presented in Table Eight. The recommended sample size is probably too small for the logit model, as a minimum sample size is 100 or 50 cases plus a variable number that is a function of the number of predictors (Peng et al 2002). This probably explains the lack of statistical significance of many of the variables that were initially included. The large confidence intervals (reported in the 95% CI column) could also be the result of the small number of cases.

The data fitted the model as indicated by the statistical significance of the -2 log likelihood statistic and its associated chi-square statistic, χ^2 (3) = 19.917, $p \leq 0.001$. Between 35.1% and 47% of the variance of the covenant bid behavior was explained by the model according to the Cox and Snell and Nagelkerke R^2 statistics accordingly. The model correctly predicts 71.4% of the outcomes of the cases compared with 54.3% in the benchmark model, which is a strong improvement. No outliers were detected

Variable	B	SE	Significance	Exp(B)	95% CI
Any agriculture	2.539	0.855	0.003	12.671	2.370-67.741
Higher education	-1.529	0.774	0.048	0.217	0.048-0.987
Decrease land value	1.273	0.778	0.102	3.571	0.777-16.416
Constant	-1.790	0.895	0.045	0.167	

-2 log likelihood = 43.504

Table Six: Results of logistic regression

Only two variables, higher education and any agriculture, were statistically significant at the 95% level. The belief that a covenant would lead to a decrease in land value was almost significant at a 90% level. The positive and negative signs on the coefficients indicate if a landholder was likely to ask for a covenant bid or not, and the Exp(B) figures indicate the odds of a unit increase in the independent variables having an impact on the dependent variable. In this model, having agriculture on a property increases the odds of a participant asking for a covenant payment by a factor of 12.671, with an extremely large 95% confidence interval (CI) of 2.370-67.741. Believing that a covenant is likely to have a negative impact on property values increases the odds of asking for a covenant payment by a factor of 3.571. Alternatively, having a bachelor or postgraduate degree decreases the odds of asking for a payment by a factor of 0.217.

6. Conclusion

There was a wide range of bids submitted to the VIP. Analysis of the questionnaire responses and the tenders reveals that there was a wide range of factors that lay behind the differing bids. Facets of opportunity cost were the most likely to impact bid prices. This included both incurred costs in the management plan and opportunity costs such as the presence of agricultural production on a property. The variables relating to information rent were difficult to interpret, indicating that the items used to measure it were inadequate. It does not appear likely that landholders conditioned their bids on their environmental scores, however, and landholders with higher environmental quality may have submitted lower bids. The wide discrepancy between the average submitted bid and the average funded bid could indicate that there was information rent of some kind in the bids but this was not adequately measured. Length of residency also decreased the total bid amount. Participation in the program to generate paid work for family members, not surprisingly, increased bids. Age was strongly and negatively correlated with total bid levels, although it was insignificant in the regression analysis. Attitudes towards the environment are likely to be important to the bid level decision but they are difficult to measure and are not quantified here. Analysis from the participant survey data suggested that the VIP participants were altruistic and it is likely this influenced the bids, especially for the large number of bids that asked for nothing for the covenant payment.

Examining the covenant bids alone yielded additional interesting information. Landholders were more likely to ask for covenant bids when they thought their land value would fall and when they had agricultural production on their properties, and less likely to ask for a covenant payment when they were highly educated. Higher covenant bids were associated with the same agricultural opportunity cost factors as the total bid as well as wanting to keep a property in the family, having a higher education, thinking the land value will decrease with a covenant and being in a high opportunity cost industry. This suggests that if a covenant is to be paid for, participants should be informed if there is unlikely to be an impact on property value or potential for agricultural production, as this may lead to a lower bid. Lower covenant bids were associated with a higher income, high off-farm income and higher education. This suggests that a program that does not pay for covenants is more likely to attract this type of landholder rather than a "typical" farmer. The variables associated with the covenant bids more accurately reflect the opportunity cost of participation as well as altruistic behaviour, which is as predicted.

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