

## Factors influencing farmers' willingness to pay for animal health services and preference for private veterinary practitioners

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### ABSTRACT

The study was carried out in Tarai region of Uttarakhand, with the objectives of ascertaining factors influencing farmers' willingness to pay for animal health services (AHS) and preference for private veterinary practitioners. The findings of the study revealed that para-veterinary staff compared poorly with private and government veterinarians in regard to quality of services provided. Indeed quality was perceived by vast majority of farmers as their most preferred attribute of AHS. Price as an attribute was rated quite low compared to quality and even other attributes like proximity, which implied that if quality AHS is guaranteed, price is not an important determinant in the farmers' uptake decisions. A vast majority of farmers asserted that they were willing to pay (WTP) for quality AHS. Furthermore, the poorer the farmer, the greater was the probability that he will be WTP. Distance to market was observed as a significant determinant of WTP. The findings also revealed that the preference for private veterinarian increased with the wealth status. Risk attitude was also found to influence choice of AHS provider. Risk averse farmers preferred government veterinarians while risk taking farmers showed a tendency to prefer private practitioner. The overall message of the findings was that there are variations in the valuation of AHS attributes – price being only one of them - that cause farmers belonging to different wealth categories to prefer different AHS providers. The study suggests that the animal health delivery system may be reformed to enable greater participation of private sector.

**Key words:** Animal health services, Privatization, Willingness to pay

Livestock sector is an integral part of Indian agriculture and plays a critical role in the livelihood of rural population. It provides food, income and employment and for low income producers, serves as a store of wealth, provides draught power and organic fertilizer for crop production and a means of transport. Recent decades have witnessed a radical transformation in consumption patterns in India in favour of livestock food products, like milk. The distinct increase in the demand for such products not only contributes to nutritional security, but also provides income growth opportunities for millions of smallholder livestock producers.

However, exploitation of the opportunities offered by the livestock sector requires a vibrant Animal Health Delivery System (AHDS) as it plays a vital role in sustaining the productivity and viability of livestock sector. Animal Health Services (AHS) and disease control in India have been and still are in the domain of the public sector. State AHS are usually heavily subsidized and have tended to depress private

sector activity. However, in the face of growing budgetary constraints and inadequate cost recovery, more and more state governments are finding it increasingly difficult to sustain these services. Scarcity of funds for essential supplies and medicines and limited staff available for disease control have contributed to deterioration in the availability and quality of publicly provided AHS.

Privatization is now being advocated from various fora as a means of overcoming inherent problems associated with the state AHDS and for improving overall efficiency. Continuing increase in the number of qualified veterinary graduates beyond the absorptive capacity of the state has also contributed to the debate on privatization.

However, any policy orientation in favour of privatization needs to be supported by quantitative data from field level which evaluate and quantify potential benefits of the proposed programmes. Studies on farmers' willingness to pay (WTP) for AHS and factors which influence their preferences for different AHS providers would give valuable insight into the feasibility or otherwise of privatization process. Knowledge on such aspects is urgently required to guide policy formulation regarding delivery of AHS.

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In view of the above, this study was carried to evaluate factors which influence farmers' WTP for AHS and preference for private veterinary practitioner.

### MATERIALS AND METHODS

The study was carried out in U.S. Nagar district of Uttarakhand. The district lies in the Tarai region of the state and accounts for a major share of the state's cattle and buffalo population. Dairy husbandry forms a source of livelihood for almost all the rural households of this region. Moreover, on account of this district being the most progressive region of the state, and it is widely considered as the most likely location for the promotion of privatized AHS.

Out of eight blocks in the district, Rudrapur block was selected for the study as it is an agriculturally frontline region. Two villages were selected from the block, viz. Anandpur and Azad Nagar. The villages were selected so as to ensure adequate representation of areas which vary in regard to proximity to markets, main occupation pursued, herd size and credit availability. Complete enumeration of all rural households in the two villages was then made and households, possessing at least one milch animal were selected for the study. Thus, a total of 40 households were selected as the final sampling units. Primary data were collected by personally interviewing the head of the household with the help of a well-structured and pre-tested schedule.

#### *Variables considered in the study*

There are many factors which might influence a farmer's WTP and his choice of AHS provider. The variables considered in the study may broadly be grouped into: i. Socio-economic variables (age, farm experience, wealth status, occupation, etc.); ii. Psychological variables (attitude and perception towards risk) and iii. Institutional variables (access to credit and output market). Definitions of the variables analyzed in this study are presented in Table 1.

Herd size per household was calculated in terms of Standard Animal Units (SAUs) as per the specifications provided by Kumbhare *et al.* (1983).

The wealth status variable was derived by adopting a method as described in Kristjanson *et al.* (2005). In each of the two villages, four individuals familiar with every member of the village, were asked to conduct a wealth ranking exercise for each of the households selected for the study. Three wealth ranks were used resulting into a score of 3 points for households they classified as relatively wealthy, a score of 2 for those in the middle category and a score of 1 for relatively poorer groups. The four scores were then averaged for each household and on the basis of this score, a household was classified as poor (if the score was less than (mean score-SE), middle-class if the score was in between (mean score-SE) and (mean score+SE) and rich (if the score was more than (mean score+SE).

Risk attitude and risk perception of farmers are important determinants of his decision making process. In the context of this study, farmers with different risk attitudes (risk averse or risk taking) and similarly farmers with different risk perceptions (high or low) may vary in their choice of AHS provider, their WTP and the attributes they value in AHS provision. Risk attitude and risk perception are two different concepts. Risk attitude reflects the decision-maker's interpretation of the content of the risk and how much he dislikes this risk. In contrast, risk perception expresses the decision-makers interpretation of the chance that he will be exposed to the content of the risk (Pennings and Egelkraut 2005).

In this study, two three-item scales were developed to measure farmers' risk attitude and risk perception. The respondent's rating of the items on a 5-point continuum was summed up to yield an aggregate score for the respondents, which was a quantitative measure of his risk attitude and risk perception. The scales had a composite reliability (as measured by Cronbach's coefficient alpha) of 69.1% (risk attitude) and 65.1% (risk perception). To categorize an individual as having risk averse or risk taking attitude and having high or low risk perception, the ratings given by the respondents to each of item were subjected to factor analysis. Two principal components emerged – for each of the two scales – with Eigen values greater than 1. Therefore, two factor scores were obtained for each individual. These factor scores were weighted by their respective contribution to total variance and then aggregated. The mean aggregate scores for all the respondents were obtained. The entire sample was then grouped into respective categories, viz. risk averse and high risk perception (having scores above mean) and risk taking and low risk perception (having scores below mean).

#### *Data analysis*

Descriptive statistics were used to characterize different variables considered in the study (Table 1). Manual tallying and calculation of proportions were done to assess AHS providers access and perception towards AHDS.

*Estimation of WTP:* To elicit farmers' WTP, a contingent valuation approach was adopted in this study. Contingent scenario places respondents in a hypothetical market situation and most researchers agree that contingent valuation studies give an approximation of true behaviour (Vanslebrouck *et al.* 2002). Further, the application of this approach is valid in the study area as Government has already introduced some fees for livestock services like Artificial Insemination (AI) and many farmers are already paying for availing AHS.

The contingent valuation scenario that was presented to the farmers mainly comprised asking the farmers about the amount they would be WTP for an offer by the government for providing annual AHS at farmers' door steps. Those who accept the offer will be assured of guaranteed service at their home whenever they need it for a year. Similar contingent

surveys were used earlier by Ahuja *et al.* (2003a) and Kathiravan *et al.* (2007). However, while in such studies, various offer prices (dichotomous choice) were used to elicit the farmers' WTP, in this study, the method of elicitation comprised open ended question, wherein the respondents were simply asked to state the maximum amount they are WTP, given the contingent scenario presented before them (Reddy 2005).

**Model:** In this study the choice is dichotomous in regard to whether the respondent is WTP for AHS or not and also whether his most preferred AHS provider is private veterinarian or not. The decision problem is modeled by using two Logit discrete binary regression models. The models specify binary response functions in which the dependent variable is a dummy variable being dichotomous in nature. To generate the dependent variables, the farmers were classified in two groups in each of the two Logit models. In the first model, the groups are those who are WTP for AHS (dependent variable assumes a value of 1) and those who are not WTP (dependent variable assumes a value of 0) and in the second model, those who had private practitioner as their most preferred AHS provider (dependent variable assumes a value of 1) and those who preferred other AHS providers (dependent variable assumes a value of 0).

The Logit model used is of the form:

$$\ln(P_i/1-P_i) = \alpha + \sum \beta_i X_i + e_i$$

where,  $X$  is the vector of independent variables and  $\beta_i$ 's are the coefficients to be estimated.

One problem with the application of this model in this study is the small sample size. To address this issue and to save degrees of freedom, Chi-square test of independence was used to compare variables considered in the study across those who are WTP and not WTP and also across different categories of respondents based upon their most preferred AHS providers. The analysis provided an estimate of the factors associated with the respondent's WTP and his choice preference for AHS provider. These factors were then included as regressors in the Logit model to have a better understanding of the nature and extent of their influence on the dependent variable.

## RESULTS AND DISCUSSIONS

The study area was a relatively well-off region than other backward rural areas of India as indicated by the greater proportion of rich households (38%) compared to poor (20%) ones in the sample and also the relatively large average landholding per household (4.33 hectares). The study area and respondents were chosen keeping in mind the primary objective of the study which was to provide a preliminary assessment of the factors influencing WTP for AHS and preference for private veterinary practitioner. Private veterinary practice is relatively well-established in this region on account of it being an agriculturally prosperous area. This explains sampling method adopted in this study.

Table 1 elicits the wealth status wise distribution of respondents according to AHS providers accessed in the last 12 months. The figures are not mutually exclusive as in several instances respondents reported that they had accessed more than one AHS provider during the reference period. The largest proportion of the respondents had accessed Government veterinarian, designated as Veterinary Officer (VO) (65%), followed by private practitioner (58%) and para-veterinary staff (48%). Relatively negligible proportion accessed a doctor from a NGO/Dairy cooperative and Community Based Animal Health Workers (CBAHWs). This indicates that Government veterinarian, Private practitioner and Para-veterinary staff are the major AHS providers which are readily available to the farmers in the study area. In terms of AHS providers accessed by respondents wealth category wise, greater proportion of poor respondents accessed the services of a VO than rich households. On the other hand, higher proportion of rich households accessed a private veterinary practitioner as compared to poor households. In case of para-veterinary staff, the proportion of respondents who accessed their services declined with wealth status.

Table 1 also presents the average price paid by farmers to different AHS providers for using their services at home. The estimated average price for a home visit by a VO and private practitioner was Rs 126 and Rs 130, respectively. Thus, there was negligible difference in the price charged by a Government veterinarian and a private practitioner. The average price paid to LEO for each home visit was much lower at Rs 61, while the price paid to a milk cooperative society doctor was equivalent to the prescribed fees of Rs 50. The farmers took their animals for in-centre service only to veterinary hospitals and the price paid for such service was the prescribed charges of Rs 10. All other AHS providers delivered their services at farmers' home. When analyzed wealth category wise, although rich households paid a higher price per visit for both VO and private practitioner than poor households, the differences in prices paid by these two categories of households were not substantial. In case of other service providers also, there were not significant differences in regard to the price paid by rich and poor farmers for home visits. This indicates that there is substantial demand for AHS delivery at home in the study area irrespective of wealth status. When the average expenditures made in the last 12 months on AHS were estimated, it was observed that the expenditures made on AHS - including preventive and curative services - was highest for rich farmers (Rs 571), followed by middle class (Rs 561) and poor (Rs 254) farmers. Thus, even though, there were no significant differences among different wealth category farmers regarding price paid to AHS providers, the annual expenditures made on AHS were much higher for rich and middle class households than their poor counterpart. Annual expenditures made by households may vary according to herd size. However, there were no significant differences in herd sizes across different wealth category households,

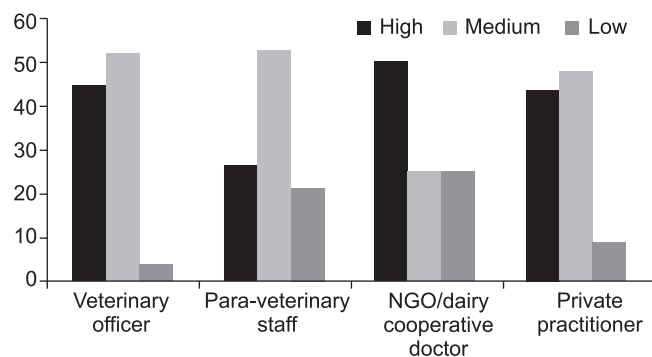


Fig. 1. Level of satisfaction with services of different AHS providers as reported by respondents

which imply that greater resource endowments on the part of richer farmers might have made it possible for them to avail more medicines, dewormers and vaccines.

Fig. 1 elicits the level of satisfaction with different AHS providers as reported by proportion of respondents who availed services. Almost same proportion of respondents who availed their services cited high level of satisfaction for VO and private practitioner. This probably indicates that quality-wise there might not be much difference between these two categories of AHS providers. Relatively less proportion of the farmers reported high level of satisfaction with para-veterinary staff. The percentage of respondents who cited low level of satisfaction was high for this category of AHS provider, while the same for VO and private practitioner was quite low. The low level of satisfaction with para-veterinary staff indicates that it might be necessary for the Veterinary Association and Animal husbandry Department to scrutinize their performance and also ensure that they operate under qualified veterinarian and observe professional ethics.

A large proportion (48%) of farmers cited private practitioner as their most preferred AHS provider (Fig. 2). Another 43% cited their preference for VO, while much lesser proportion preferred other AHS providers. When analyzed in terms of wealth status, noticeable differences were observed in regard to preference for AHS providers. Preference for private practitioner increased with wealth status, while preference for VO increased with decline in

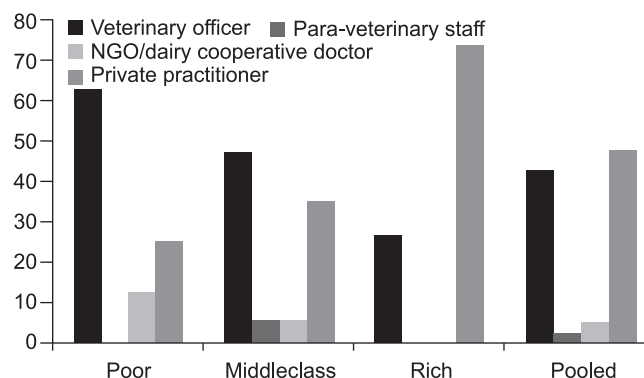


Fig. 2. Most preferred AHS provider as reported by proportion of respondents

wealth status. Ahuja *et al.* (2003b) had reported that the proportion of farmers who opted for private veterinarian increased with income in Rajasthan and Kerala. This implied that the services of VO are valued more by the poorer households while richer households prefer to use the services of private practitioner. This might be due to the fact that the poorer households get free medicines from the government veterinarian, especially during in-centre visit. Wealthier farmers, on the other hand, on account of their social and economic status, can afford to enter into informal contract with private practitioner. Furthermore, for this section of respondents, getting clinical services at home and buying medicines from private medicinal shop might be a more

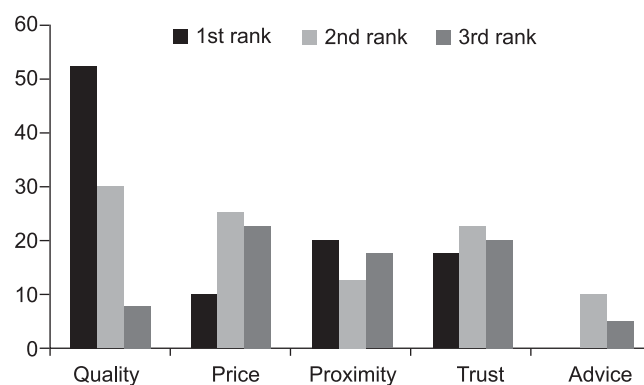


Fig. 3. Attributes of AHS provider that is valued most by the respondents

Table 1. AHS providers accessed in last 12 months and prices paid by farmers for accessing their services (Rs)

| AHS providers                | Percentage of respondents who availed service according to wealth category |              |            | Pooled      |
|------------------------------|----------------------------------------------------------------------------|--------------|------------|-------------|
|                              | Poor                                                                       | Middle class | Rich       |             |
| Veterinary officer           | 75.00(113)                                                                 | 64.71(134)   | 60.00(117) | 65.00(126)  |
| Para-veterinary staff        | 62.50(57)                                                                  | 48.18(66)    | 46.67(55)  | 47.50 (61)  |
| NGO/Dairy cooperative doctor | 12.5(50)                                                                   | 5.88(50)     | 6.67(50)   | 10.00 (50)  |
| Private practitioner         | 62.50(114)                                                                 | 35.29(143)   | 73.33(121) | 57.50 (130) |

Figures in parentheses indicate per-visit prices paid by farmers for home visits by AHS providers.

preferred proposition than taking their animals to the veterinary hospitals and getting free medicines.

The preference for specific AHS provider needs to be analyzed in the perspective of various attributes that are associated with AHS delivery. Seven attributes were presented before the respondents and they were asked to rank in chronological order the first three attributes they value most. Out of seven attributes, five received any kind of ranking. Quality of AHS was the most valued attribute for 53% of the farmers (Fig. 3). In contrast, much lesser proportion of the respondents cited price, proximity or trust as their most valued attribute. Thus, compared to other attributes, quality was the attribute of overwhelming importance to majority of farmers.

Chi-square procedure was used to analyze variables upon which choice of most valued attribute of AHS is dependent. The variables education, risk perception, distance to market ( $P < 0.1$ ) and wealth category ( $P < 0.01$ ) were found significant. The results of this analysis with respect to these significant variables are presented in Table 2. Higher proportion of respondents who were illiterate or with lower level of education cited quality as their most valued attribute. Relatively greater proportion of farmers with low risk perception preferred quality, than farmers having high risk perception. On the other hand, higher percentage of the latter category as compared to respondents from the former category valued trust. Greater proportion of those farmers who live within 10 kms from the market preferred quality compared to farmers residing more than 10 km from market. As expected, higher proportion of the latter category preferred proximity than that of the former category. Wealth status was

Table 2. Variables upon which choice of most valued attribute of AHS is dependent (% of respondents in each variable category)

|                     | Variables Most valued attribute of AHS |       |           |       |
|---------------------|----------------------------------------|-------|-----------|-------|
|                     | Quality                                | Price | Proximity | Trust |
| Education*          |                                        |       |           |       |
| Illiterate          | 61.54                                  | 7.69  | 7.69      | 23.08 |
| Upto High School    | 60.00                                  | 20.00 | 13.33     | 6.67  |
| Intermediate        | 75.00                                  | 0     | 25.00     | 0     |
| Graduate            | 33.33                                  | 0     | 66.67     | 0     |
| Post Graduate       | 0                                      | 0     | 40.00     | 60.00 |
| Risk perception*    |                                        |       |           |       |
| High                | 44                                     | 8.00  | 20.00     | 28.00 |
| Low                 | 66.67                                  | 13.33 | 20.00     | 0     |
| Wealth category**   |                                        |       |           |       |
| Lower               | 87.50                                  | 0     | 12.50     | 0     |
| Middle              | 58.82                                  | 23.53 | 11.76     | 5.88  |
| Upper               | 26.67                                  | 0     | 33.33     | 40.00 |
| Distance to market* |                                        |       |           |       |
| <10                 | 59.26                                  | 7.41  | 11.11     | 22.22 |
| >10                 | 38.46                                  | 15.38 | 38.46     | 7.69  |

Chi-square value significant at \*10% and \*\*1% level of significant.

highly significant variable in explaining the variations in valuation of attribute. About 88%, 59% and 27% of respondents in the poor, middle class and rich categories, respectively valued quality. The finding that quality as an AHS attribute was valued by a much larger proportion of poorer respondents than that of a richer section is not surprising, given the relatively greater importance of livestock for the rural poor – for whom it constitutes an important source of supplementary income – than the richer section. Hence quality of AHS is crucial for them to ensure that the proportion of their limited resource endowments that they spend in treating their animals bring better results. Greater proportion of wealthy farmers preferred proximity and trust as compared to poor and middle class farmers. No respondents from poor and rich categories cited price as the most valued AHS attribute in their uptake decisions. Thus it becomes clear that there are variations in how farmers belonging to different wealth categories value different AHS attributes. Such variations might explain their different preferences for AHS providers. However, it is not to say that since poor households value quality as the most important attribute and also at the same time they prefer VO, there are quality differentials in the services of VO and private veterinarian. It only implies that the richer section along with quality also takes into account other attributes associated with AHS while opting for AHS provider. The finding that price ranks quite low in the valuation of AHS attributes has important policy implications. It implies that there is rationale for the government to provide AHS on cost recovery basis or delineate some identified AHS for the private sector provided quality is ensured.

Table 3 presents the results of contingent valuation survey. Of all the farmers surveyed, 75% were WTP for AHS. When analyzed in terms of wealth status, cent per cent of poor farmers were WTP, while 80% of wealthy respondents were WTP. The estimates suggest that the farmers on an average are WTP Rs 295 for assured home delivery of AHS. When analyzed wealth category wise, it was revealed that the maximum amount that farmers were WTP declined with wealth status. Subsidized government delivery of AHS has often been justified on the ground that the poor are unwilling or unable to pay for such services. However, in this study a large proportion of respondents asserted that they are WTP for AHS. Ahuja *et al.* (2003a), while analyzing potential

Table 3. Estimated willingness to pay (Rs)

| Category     | Proportion of respondents willing to pay | Estimated WTP |
|--------------|------------------------------------------|---------------|
| Rich         | 80.00                                    | 382.67        |
| Middle class | 58.82                                    | 274.21        |
| Poor         | 100.00                                   | 173.47        |
| Overall      | 75.00                                    | 294.73        |

Figures in parentheses indicate standard errors

impact of privatization of AHDS in three states of India, viz. Kerala, Rajasthan and Gujarat, found that the poor are WTP for veterinary services. Turkson (2004) reported that livestock owners in Ghana are WTP for quality services. Kathiravan *et al.* (2007) reported that the poor small ruminant owners in Southern Indian state of Tamil Nadu were WTP for ensuring adequate health cover to their sheep and goat. This study also reported that greater proportions of poor households are WTP than their richer counterparts. The estimated WTP is lower than what was estimated by Ahuja *et al.* (2003a) who reported that farmers in Gujarat and Rajasthan were WTP between Rs 630 and 680/household/year for home service. However, it should be kept in consideration that in this study, the farmers were simply asked to state the maximum amount they are willing to pay, given the contingent scenario presented before them. But Ahuja *et al.* (2003a) had obtained the WTP estimates by presenting before the farmers, different price levels. Hence, there are chances that the WTP amounts estimated in this study are on the lower side. Nevertheless, the amount the farmers are WTP, as estimated in this study suggests that there is significant scope for raising revenues from AHS delivered by the government by cost recovery approach or encouraging setting up private veterinary practice.

Chi-square test was used for the variables considered in the study to compare those who are WTP and those not WTP and also those who prefer different AHS providers. The variables land holding, wealth status, age and distance to market were significant ( $P < 0.1$ ) in the WTP analysis, while in the chi-square analysis for AHS provider preference, the variables found significant were herd size, risk attitude, wealth status, whether the farm owner is also the farm decision-maker ( $P < 0.1$ ) and distance to market ( $P < 0.01$ ). The

Table 4. Variables upon which WTP is dependent (% of respondents in each variable category)

| Variables           | WTP   | Not WTP |
|---------------------|-------|---------|
| Land owned*         |       |         |
| Landless            | 100   | 0       |
| < 5 acres           | 100   | 0       |
| 5–10 acres          | 57.14 | 42.86   |
| > 10 acres          | 76.47 | 23.53   |
| Wealth category*    |       |         |
| Lower               | 100   | 0       |
| Middle              | 58.82 | 41.18   |
| Upper               | 80.00 | 20.00   |
| Age*                |       |         |
| < 40                | 42.86 | 57.14   |
| 40–60               | 83.33 | 16.67   |
| > 60                | 80.00 | 20.00   |
| Distance to market* |       |         |
| < 10                | 92.31 | 33.37   |
| > 10                | 66.67 | 7.69    |

\*Chi-square value significant at 10% level of significant.

Table 5. Variables upon which choice of most preferred AHS provider is dependent (% of respondents in each variable category)

| Variables                           | Most preferred AHS provider |                      |        |
|-------------------------------------|-----------------------------|----------------------|--------|
|                                     | VO                          | Private practitioner | Others |
| Herd size (SAU)*                    |                             |                      |        |
| <4                                  | 50.00                       | 40.91                | 9.09   |
| 4–8                                 | 44.44                       | 33.33                | 22.22  |
| >8                                  | 22.22                       | 77.78                | 0      |
| Risk attitude**                     |                             |                      |        |
| Risk averse                         | 47.83                       | 34.78                | 17.39  |
| Risk taking                         | 35.29                       | 64.71                | 0      |
| Wealth category*                    |                             |                      |        |
| Lower                               | 62.50                       | 25.00                | 12.50  |
| Middle                              | 47.06                       | 35.29                | 17.65  |
| Upper                               | 26.67                       | 73.37                | 0      |
| Is the farm owner the farm manager* |                             |                      |        |
| Yes                                 | 54.54                       | 31.82                | 13.64  |
| No                                  | 27.78                       | 66.67                | 5.56   |
| Distance to market*                 |                             |                      |        |
| <10                                 | 55.56                       | 29.63                | 14.81  |
| >10                                 | 15.38                       | 84.62                | 0      |

Chi-square value significant at \*10% and \*\*1% level of significant.

results of this analysis with respect to the significant variables are presented in table 4 and 5. Proportion of farmers who were WTP declined with increase in land size, wealth status and distance to market, while it increased with age. In regards to variables upon which choice of AHS provider is dependent, preference for private veterinary practitioner increased with increase in herd size, risk taking attitude, wealth status, farms where owner is the decision maker and distance to market.

Two binary Logit models were fitted, one each for ascertaining the variables having significant influence on probability that a farmer will be WTP and the probability that a farmer will choose private veterinarian as the most preferred AHS provider. The results of the Logit analyses are presented in table 6.

Two variables (wealth status and distance to market) were found to significantly affect the probability of WTP. The estimated coefficients of wealth status and distance to market were negative. This implies that as wealth status declines and distance to market decreases the probability of WTP increases. Whether the farmers were WTP or not was found for 'assured' AHS, as presented in the contingent scenario before them. The finding that the poor farmers were more likely to be WTP can be attributed to probably greater difficulty encountered by the poorer farmers in getting assured and guaranteed service throughout the year than the richer farmers. The relatively greater importance of dairying in the livelihoods of the poor might also explain their greater likelihood of willingness to pay. The closer a farmer is to an output market, the greater access he has to selling milk and

Table 6. Logit results for WTP and choice of private veterinary practitioner as most preferred AHS provider

| Independent variables                 | WTP                    |                     | Choice of Pvt. vety. practitioner |                     |
|---------------------------------------|------------------------|---------------------|-----------------------------------|---------------------|
|                                       | Parameter coefficients | Wald $\chi^2$ value | Parameter coefficients            | Wald $\chi^2$ value |
| Landholding                           | 0.056(0.093)           | 0.360               | —                                 | —                   |
| Wealth category                       | -2.998**(1.462)        | 4.204               | 0.846*** (0.592)                  | 2.746               |
| Age                                   | 0.036(0.033)           | 1.201               | —                                 | —                   |
| Distance to market                    | -0.442*(0.166)         | 7.077               | 0.101(0.118)                      | 0.723               |
| Herd size                             | —                      | —                   | 0.130(0.137)                      | 0.906               |
| Risk attitude                         | —                      | —                   | -1.104** (0.229)                  | 4.772               |
| Farm owner is farm manager            | —                      | —                   | 1.615(0.807)                      | 2.009               |
| R <sup>2</sup> (McFadden)             | 0.365                  |                     | 0.291                             |                     |
| R <sup>2</sup> (Cox and Snell)        | 0.336                  |                     | 0.331                             |                     |
| Correct classification of respondents | 85.00                  |                     | 82.50                             |                     |

Significant at \*1%, \*\*5% and \*\*\*10% level of significance, respectively. Figures in parentheses indicate standard errors.

greater is his profitability. Thus, he has stronger incentive to pay for AHS than a farmer who is distantly located from a market. Ahuja *et al.* (2003c) in a study in Orissa, reported that demand for veterinary services is not determined by subsidized service delivery, but by access to output markets.

In regards to variables influencing probability of preferring private practitioner, wealth status and risk attitude had significant coefficients. The estimated coefficients for wealth category were positive, while that of risk attitude was negative indicating that likelihood of preferring private practitioner increases with increase in wealth status and risk taking attitude of farmer. The inference regarding wealth status and its influence on preference for AHS provider has already been discussed. Preference for private practitioner declined with increase in risk averse attitude of farmers, i.e. risk averse farmers preferred VO rather than private practitioner. Preference for VO by risk averse farmers might be explained by the fact that availing services from a government veterinarian assured them of continued service and follow-up. The estimated coefficients of distance to market, herd size and 'whether the farm owner is the farm decision-maker' were positive, but not significant.

The study also provides some information regarding the variables which did not significantly influence the probability of WTP and choice of AHS provider. Education, age and farm experience were non-significant variables, implying that apparent human endowments might not be important determinants of preference for private practitioners and WTP for AHS. Interestingly, occupation was also observed as a non-significant variable. It is generally expected that a farmer who relies overwhelmingly on dairying for his livelihood would behave differently than one who has other sources of income and hence not completely reliant on dairying. However, in this study area, there was not much difference among farmers in terms of whether dairying was pursued as main or subsidiary occupation. Agricultural labour was the main source of income for poor farmers, while agriculture

was mostly pursued as main occupation by the richer farmers. Most of the farmers, irrespective of wealth status, pursued dairying as subsidiary occupation. Thus, probably due to the lack of adequate variation, the impact of status of dairying as the a major source of livelihood or otherwise on choice behaviour of respondents, could not be captured in this study.

The study provided a preliminary assessment of factors influencing WTP for AHS and preference for private veterinary practitioner in the agriculturally developed Tarai region of Uttarakhand state. Government veterinarian, private veterinary practitioner and para-veterinary staff were the major AHS providers accessed by the farmers. The services of government and private veterinarian were rated almost equally by the farmers, while relatively lesser proportion derived high level of satisfaction from the services of para-veterinary staff. This indicates that there is a need for stricter measures to supervise the performance of the para-veterinary staff. Analysis of AHS attributes valued by farmers revealed that if assured and quality veterinary services are guaranteed, demand for AHS might not decline even if price charged for services is raised. Indeed, this was corroborated, when a vast majority of farmers asserted that they are WTP for quality AHS, provided charges are reasonable. What was more significant was that poorer the farmer, greater is the probability that he will be WTP. This is obviously due to greater importance of livestock in the livelihood of this section. Thus, the justification of subsidizing AHS on the assumption that poor farmers are unable or unwilling to pay for AHS seems rather unfounded. However, the important thing to note here is that although poor farmers are more likely to pay than their rich counterparts, their mean WTP values were lower than those estimated for richer sections. This implies that although there is scope for increasing revenues by cost recovery or encouraging private practice, the amount charged should be reasonable and not beyond the reach of the poor. Wealth status was positively related with choice of private practitioner as most preferred AHS

provider. This provides some indication that private veterinary practice has potential in areas where there is relatively greater concentration of wealthier farmers.

The message that the findings of this study provides is that since the poor are WTP for quality AHS, it does not mean that they would also prefer the services of private veterinary practitioner. There are variations in the valuation of AHS attributes – price being only one of them - that cause the farmers belonging to different wealth categories to prefer different AHS providers. Risk attitude of farmers is also an important determinant of choice of AHS provider. This denotes that there might be a section of farmers (risk averse) who perceive an element of risk involved in availing services of private veterinary practitioners and hence prefer government veterinarian. In view of these facts, it could be said that introduction of full cost recovery is definitely a feasible policy option as it would help to overcome budgetary constraints. However, some issues need to be considered before embarking on a policy of privatization, although there is a potential for private sector participation. Privatization of curative services for which the farmers are WTP would inevitably free technical staff and other resources from the veterinary departments which could then be mobilized towards preventive services and disease control. To create a favourable environment for remodeling AHDS, the government needs to first adjust official rates towards full cost recovery. This would prepare the animal owners for privatization. At the same time it is also essential to install a regulatory and supervisory mechanism so as to ensure compliance by the private practitioners to quality standards and professional ethics.

#### APPENDIX A

##### *Measures to elicit respondents' risk attitude and risk perception results*

To elicit respondents' risk attitude and risk perception, the respondents were asked to indicate their agreement with each item on a 5-point scale, ranging from 'strongly disagree' (score of 1) to 'strongly agree' (score of 5). Thus a higher aggregate score of the respondent was hypothesized to correspond to higher degree of risk aversion and risk perception.

##### *Risk attitude*

Cronbach's Coefficient Alpha\* (Construct reliability) = 0.691

1. I like to play it safe
2. With respect to the conduct of the business, I am risk averse
3. With respect to the conduct of the business, I like to take the sure thing instead of the uncertain thing.

##### *Risk perception*

Cronbach's Coefficient Alpha (Construct reliability) = 0.651

1. I am not able to predict product prices
2. The markets in which I operate are risky
3. I am exposed to large amount of risk when buying and selling

\* Cronbach's Coefficient Alpha measured as:

$$\alpha = \frac{k}{k-1} \left( 1 - \frac{\sum \sigma_i^2}{\sigma_y^2} \right)$$

where, k is the number of statements,  $\sigma_i^2$  is the variance of ith statement and  $\sigma_y^2$  is the total variance of the k-item scale. The higher is the Cronbach's coefficient alpha, the better is its reliability.

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