Quality Improvements in Public Livestock Services Delivery: Are Farmers Ready to Pay? An Inquiry in South India

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Abstract: Farmers Willingness To Pay (WTP) for improving the quality of public livestock services delivery, in terms of Service Provider and Farmer Relationship (SPFR), chance of recovery from ailments and chance of conception following Artificial Insemination (AI), was assessed through Contingent Valuation (CV) in southern peninsular state of India, the Tamil Nadu State. The districts of the state were categorized as 'Livestock Developed' (LD) and 'Livestock Under Developed' (LUD) based on initial base line developed. Contingent Valuation (CV) approach and Tobit regressions were used to assess variations in the stated Willingness To Pay (WTP) values, and the probability of stating a positive WTP value for respondents who declared that they were not willing to pay. Overall, the respondents in the study area were willing to pay INR 3.91 for improving the SPFR attribute of the public veterinary centre, while they were ready to pay INR 5.84 for augmenting the chances of recovery from illness by the services of public veterinary centres. In order to benefit from improved chance of conception of their bovines after AI, the farmers were willing to pay INR 11.71. An absolute concordance on the levels of attributes and the variations in the stated positive WTP values for quality improvements was noticed. Tobit regression analyses on the improvements of all above attributes indicated that the farmers who were at disadvantaged levels of an attribute were willing to pay more compared to those at an advantaged level.

Keywords: Livestock Services, Willingness To Pay, Contingent Valuation, Animal Health Care, Bovine Breeding, WTP, Veterinary Services, India.

INTRODUCTION

The role of livestock sector in the Indian agrarian economy is pivotal. The contribution of this sector to the Gross Domestic Product was 5.26% in 2006-07 at 1999-2000 prices, with the overall growth rate being around 4-5% [1]. This commendable growth in livestock sector vis-à-vis agriculture has been achieved, although allocation of resources was not substantial.

Livestock production systems across the country are characterized by little input and poor productivity, with the system of production by and large being 'extensive' or 'semi-intensive' and production by mass, but not by mass production. Majority of livestock owners are only marginal farmers with an average herd size of 3.7 cattle and buffaloes. The relationship between land and livestock holdings, excluding landless category, is inverse [2], which indicates better equity of farmers with respect to livestock holding. That is, the distribution of livestock is more equitable than that of land, with the bottom 60% of rural households owning 65% of milch animals, leading to a much more equitable distribution of gains from livestock production [3].

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Livestock sector is growing faster than any other agricultural sub-sector and during the current decade, this sub-sector is predicted to produce more than half of the total agricultural output values in India, which was 31.6% in 2007-08 (Central Statistical Organization of India). As the demand for livestock products is income elastic, the demand growth for these products is primarily expected to originate due to human population growth, increasing urbanization and rising income [4]. These developments present enormous opportunities to boost rural income and accelerate the pace of poverty reduction through promoting livestock sub-sector. However, this requires a policy regime that would facilitate sustainable growth in livestock productivity and competitiveness, for which livestock services are critical.

Effective and efficient delivery of animal health and production services is considered as vital for gainful livestock development and hence, efficient delivery of livestock services has become a subject of rising concern to many national and international organisations including FAO [5]. In India, the services are provided free following the concept that livestock producers are poor, but the experience shows that these poor sections of society hardly have any access to the free services. As has been pointed out in the report of the Indian Planning Commission [1], the services are neither sufficient nor totally free. The Department of Animal Husbandry and Dairying, both at Centre and in the States, maintains a large

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infrastructure, which is outdated, and not in tune with the expertise and equipment required for competent livestock production system.

Although public sector is believed to be the appropriate means of delivering livestock services, in reality the government generally could not perform, with the competence with which it should have done [6]. Growing fiscal pressures exacerbated by the huge subsidy extended and less than adequate cost recovery for the services, had left the governments to bring down their priorities and budget allotments towards improving the quality of public provision of livestock services. In addition, recent policies of Government of India, such as National Livestock Policy draft, Milk and Milk Products Order 1992, Multi State Cooperative Act, etc., are all driving for the privatization of livestock sector services [7]. However, policy initiatives aimed at cost recovery, which could alleviate these financial burdens of the state, are often declined by the policy makers on the assumption that the farmers would not be willing to pay for these services.

In the light of above context, this study was undertaken in southern peninsular state of India, Tamil Nadu, to assess (i) variations in the stated Willingness To Pay (WTP) values, and (ii) variations in the probability of stating a positive WTP values for respondents who declared that they were not willing to pay. The study is expected to provide an idea on the cost recovery measures or deciding whether the government should provide these services at all.

MATERIALS AND METHODS

The southern peninsular state of India, the Tamil Nadu State was chosen for this study. Subsequently, the districts of Tamil Nadu State were categorized as 'Livestock Developed' (LD) and 'Livestock Under Developed' (LUD) based on initial base line data gathered using the value of livestock output, rural human population and common property resources available for livestock farming. Four districts, two each from Livestock 'Developed' (Coimbatore and Villupuram districts) and 'Livestock Under Developed' (Thanjavur and Sivagangai districts) areas were selected randomly. From the districts so selected, a total of 320 farmers (80 from each district) were chosen by adopting multistage random sampling technique. Information on socio-economic status of the selected farmers, livestock possession, accessibility of veterinary services, costs incurred, true maximum WTP for total annual health care services for sheep and goats, etc. were collected by personal interview through the structured and pilot-tested interview schedule.

The respondents were asked to characterise the status quo level of service attributes of public livestock services and assess a transition from the status quo to the preferred state. The attributes of public livestock services listed were, i) Service Provider and Farmer Relationship (SPFR), ii) Chance of recovery (score), and iii) Chance of conception (score). Contingent Valuation (CV) approach was used to study whether the farmers would be willing to pay any extra fee to receive a better quality service, followed by presenting a payment card, having anchors of INR 5, starting from INR 5 to INR 500, if their answer to the above question was positive.

MODELLING

Tobit model was used to analyse the association between willingness to pay values for the stated quality improvements in the public livestock services and the respondents' demographic and socio-economic characteristics in the study area as described by Tobin [8]. Following Mataria *et al.* [10] and Ghorbani and Hamraz [14], three Tobit regression analyses, each followed by Ramsey's [15] RESET test were carried out to explore the relationship between each of the partial WTP values and the status quo level of corresponding quality attribute,, adjusting for farmers' socio-demographic and economic characteristics, besides variables concerning the location of the public veterinary centre. The marginal effects of variations in the positive WTP values, and in the probability of stating a positive WTP value for respondents, who declared that they were not willing to pay, were estimated. The list of explanatory variables and their specifications are presented in Table **1**.

RESULTS AND DISCUSSION

Service Provider and Farmer Relationship (SPFR)

In order to gain from the better SPFR established, the farmers in LUD and LD districts were willing to pay a mean sum of INR 3.93 and INR 3.88, respectively, the difference was non significant. Overall, the respondents in the study area were willing to pay INR 3.91 for improving the relationship with the service providers of public veterinary centre (Table **2**).

A highly significant and negative coefficient of SPFR score was an expected result (Table **3**). This means

Table 1: Specification of Explanatory Variables for the Tobit Regression Models

Quality parameters stated to be improved	Levels of attributes	Scoring/measurement scale
Receiving adequate information on the sickness and treatment of animals	Service provider (SP) spent sufficient time and explained: the health status/heat stage, how to use the medicaments, what to do to prevent/ not to complicate; information was clear and sufficient	The service provider-farmer relationship: Multi-item Likert scaling - average of five items' scores multiplied by 20, range [20,100]
Chance of recovery after visiting the centre	SP at centre is competent, recovered after treatment at centre, not recovered and sought for re-examination by others, others SPs are competent	Multi-item Likert scaling - average of five items' scores multiplied by 20, range [20,100]
Chance of conception after inseminating at the centre	Animal becomes pregnant after inseminating at this centre, calves born are superior at centre, not conceived and went to private, private insemination calves are superior, prefer natural service	Multi-item Likert scaling - average of seven items' scores multiplied by 20, range [20,140] converted into percentage (100% = 140 score)
Socio-economic parameters		
Sex of respondent	Male; female	1 – male; 0 – otherwise
Age of respondent	Continuous	In years
Educational level of respondent	Illiterate; primary; secondary; collegiate	0 – illiterate; 1 – primary; 2 – secondary; 3 - collegiate
Annual household income	Continuous	In INR '000
Livelihood share of livestock	Continuous	Proportion of income from livestock to total income
Milk price	Continuous	INR per litre
Quantity of milk sold	Continuous	Litres per day
Possession of crossbred/graded buffaloes	Possessing; not-possessing	1 – if possessing; 0 - otherwise
Veterinary livestock unit	Continuous	Units
Purpose of visit to public veterinary centre	Treatment; AI	1 – if treatment; 0 – otherwise
No. of previous visits made during the last year	Continuous	Counts
Distance from the public veterinary centre	Continuous	Travel time in minutes

Note: Attitude = "Good" and "Fair" are combined and included in the constant.

that, the probability that a farmer declaring a positive WTP value would decrease as SPFR score increases (an increase in SPFR score indicated that the farmer was much more satisfied from his relation with the service provider). The stated WTP values for improvements over this attribute behaved similarly; that is, as the SPFR score increased, farmers WTP values decreased ($P \leq 0.01$). A percentage increase in the score implied a reduction of 0.0165 and Re.0.15 in the probability to state a positive WTP value and in the stated WTP value themselves, respectively. As the educational level of respondent increased, the marginal probability of stating a positive WTP value increased by 0.1040 and their willingness to pay also increased by Re.0.92 for developing a better relationship with the service provider in the centre. The distance from the public veterinary centre, which is measured in terms of travel time (minutes), showed a significant positive probability (0.0038) to state a positive WTP value. The results also indicated that the farmers' WTP value would increase by Re.0.03 for every additional minute that he was expected to travel to reach the public veterinary centre. That is, the farmers visiting from distant places were inclined to receive maximum information from service provider on the health status of his animals, as he could not frequently visit the centre. If the purpose of visit to public veterinary centre was availing animal health care, the marginal probability of a farmer extending a positive WTP would increase by 0.1797 ($P \leq 0.01$) compared to those visiting for artificial insemination of their bovines. The farmer who brought his animal for treatment in the centre would also be willing to pay an extra fee of INR 1.56 than those who brought their animals for artificial insemination.

Table 2: Status Quo Level of Attributes and their WTP Values for Improvement

Attribute	LUD districts	LD districts	Overall	't' value
SPFR Score	73.61 (0.77)	79.20 (0.22)	76.43 (0.43)	7.05**
WTP (INR)	3.93 (0.42)	3.88 (0.45)	3.91 (0.31)	0.08 ^{NS}
Chance of recovery from disease (score)	69.81 (0.67)	75.40 (0.53)	72.63 (0.45)	6.55**
WTP (INR)	5.28 (0.49)	6.40 (0.53)	5.84 (0.36)	1.54 ^{NS}
Chance of conception (score)	45.33 (0.54)	50.87 (0.59)	48.28 (0.44)	6.89**
WTP (INR)	12.58 (0.63)	10.93 (0.60)	11.71 (0.44)	1.89 ^{NS}

Figures in parentheses indicate standard errors; ^{NS}Not-significant (P≥ 0.05); ** Highly Significant (P≤ 0.01); * Significant (P≤ 0.05).

Table 3: Factors Influencing Partial WTP Values for Improving Quality Attributes (Results of Tobit Regression)

Explanatory variables	SPFR	A	B	Chance of recovery	A	B	Chance of conception	A	B
Service provider-Farmer relationship (SPFR): Score	-0.4590** (0.0983)	-0.0165**	-0.1458**	-	-	-	-	-	-
Chance of recovery: Score	-0.4295** (0.0749)	-0.0192**	-0.1848**	-0.4295** (0.0749)	-0.0192**	-0.1848**	-	-	-
Chance of conception: Score				-	-	-	-0.3035** (0.0686)	-0.0044**	-0.2491**
District versatility	2.0614 (1.6480)	0.0741	0.6550	4.1881** (1.2604)	0.1852**	1.8050**	-2.9227** (1.0198)	-0.0422**	-2.4047**
Sex of respondent	1.2625 (2.3270)	0.0450	0.3917	1.0999 (1.7737)	0.0496	0.4616	-0.2723 (1.3069)	-0.0039	-0.2244
Age of respondent	0.0816 (0.0852)	0.0029	0.0259	0.0608 (0.0690)	0.0027	0.0261	-0.0896 (0.0535)	-0.0013	-0.0735
Educational level of respondent	2.8898* (1.2627)	0.1040*	0.9181*	-0.5057 (1.0200)	-0.0226	-0.2176	-0.4462 (0.8297)	-0.0065	-0.3662
Distance from public veterinary centre (travel time in min.)	0.1068** (0.0544)	0.0038*	0.0339*	-0.0062 (0.0413)	-0.0003	-0.0027	-0.0364 (0.0309)	-0.0005	-0.0299
Milk price (INR per litre)	-0.7998 (1.0573)	-0.0288	-0.2541	0.1583 (0.7916)	0.0071	0.0681	2.3778** (0.5551)	0.0346**	1.9516**
Quantity of milk sold (litre per day)	0.2783 (0.1884)	0.0100	0.0884	0.1183 (0.1348)	0.0053	0.0509	0.2982** (0.1147)	0.0043*	0.2447**
Possession of crossbred cows/ graded buffaloes (dummy)	-0.2499 (2.2275)	-0.0090	-0.0797	3.4866* (1.7472)	0.1584*	1.4059*	8.9111** (1.4633)	0.2662**	6.1430**
Veterinary livestock units owned	-0.6982 (0.4353)	-0.0251	-0.2218	-0.2212 (0.3269)	-0.0099	-0.0952	-0.7959 (0.4635)	-0.0116	-0.6532
Annual household income (in INR '000)	-0.0004 (0.0009)	-0.0001	-0.0001	-0.0001 (0.0001)	-0.0000	-0.0001	-0.0000 (0.0001)	-0.0000	-0.0000
Livelihood share of livestock	-1.9110 (4.5220)	-0.0688	-0.6071	-0.1395 (3.4177)	-0.0062	-0.0600	-0.7126 (2.8495)	-0.0104	-0.5848
Purpose of visit to public veterinary centre (AI/Treatment)	5.1437** (1.7449)	0.1797**	1.5618**	-					
No. of visits made during the last year	0.0328 (0.2791)	0.0012	0.0104	0.0163 (0.2125)	0.0007	0.0070	0.0406 (0.1499)	0.0006	0.0333
Acute medical cases				10.5223** (1.4657)	0.3759**	5.6711**			

(Table 3). Continued

Explanatory variables	SPFR	A	B	Chance of recovery	A	B	Chance of conception	A	B
Acute surgical cases				9.5044** (2.0887)	0.3252**	5.3184**			
Chronic surgical cases				10.0680** (2.7213)	0.3267**	5.8386**			
Obstetrical cases				10.7635** (3.9763)	0.3317**	6.4397*			
Gynaecological cases				1.6410 (2.1499)	0.0712	0.7400			
Constant	23.6783 (12.1984)	0.1797**	1.5618**	21.0799* (8.4249)			4.501 (5.9997)		
Sigma	10.8163 (0.7941)	0.0012	0.0104	8.5877 (0.5155)			6.5666 (0.3357)		
No. of observations	320			320			252		
No. of censored observations	195			148			42		
LR χ^2 (14)	46.01			110.33			103.26		
Prob > χ^2	0.0000			0.0000			0.0000		
Pseudo R^2	0.0379			0.0718			0.0654		
Log likelihood	-583.3064			-713.0634			-738.0030		
RESET (probability > F)	0.0872			0.4119			0.8127		

SPFR- Service Provider and Farmer Relationship; A - Marginal effects for the probability being uncensored; B - Marginal effects for E(WTP | 0 < WTP).
Figures in parentheses indicate standard errors;* Significant (P≤ 0.05); ** Highly significant (P≤ 0.01).

Chance of Recovery

As shown in Table **2**, the farmers in the study area were willing to pay an average of INR 5.84 as user fee on every visit so as to improve the chance of recovery of their animals from ailments after getting treated at public veterinary centre. This WTP amount did not vary significantly between LUD and LD districts, the amounts being INR 5.28 and INR 6.40, respectively.

The results of Tobit regression analysis specified a highly significant and negative coefficient for the chance of recovery scores included in the model (Table **3**). This means that a probability of a farmer declaring a positive WTP value decreased as his chance of recovery score increased (an increase in the chance of recovery score indicated that the respondent perceived higher probability of his animal recovering after visiting the centre). The stated WTP values for improvements over this attribute behaved in the same way; that is, as the percentage of chance of recovery scores increased, respondents WTP value decreased significantly (P≤0.01). A percentage increase in the chance of recovery score implied a reduction of 0.0192 and Re.0.18 in the probability to state a positive WTP value and in the stated WTP values themselves, respectively.

The explanatory variables, district versatility and possession of crossbred cows/graded buffaloes had been found to have higher probabilities of 0.1852 and 0.1584, respectively, to state a positive WTP value in order to improve the chance of recovery of ailing animals after visiting public veterinary centre. Further, the farmers in LD districts were willing to pay INR 1.81 as user fee more than the farmers in LUD districts, for this purpose. Similarly, those owning crossbred cows and/or graded buffaloes were willing to pay an extra amount of INR 1.41 compared to those not owning such animals. Among types of cases, acute medical (0.3759), acute surgical (0.3252), chronic surgical (0.3267) and obstetrical cases (0.3317) were attracted significantly (P≤0.01) for higher probabilities of stating positive WTP values as compared to chronic medical cases. In addition, these cases also predisposed for an additional WTP amount of INR 5.67, INR 5.32, INR 5.84 and INR 6.44, respectively. However, gynaecological cases did not show any significance over chronic medical cases. The probable reason for

the farmers expressing more WTP value for the above diseases could be the fact, that the services of private service providers would hike the cost of treatment manifolds.

Chance of Conception

In order to increase the chance of conception of bovines after inseminating at public veterinary centres, the farmers in LUD and LD districts were willing to pay a mean sum of INR 12.58 and INR 10.93, respectively, without any significant difference between them (Table **2**). Overall, the respondents in the study area were willing to pay INR 11.71 for improving the chance of conception of animals inseminated at public veterinary centres.

As expected, the coefficient of chance of conception score was significant (P≤0.01) and negative (Table **3**). The marginal probability of stating a positive WTP value, -0.0044, significantly decreased with an increase in the percentage score of chance of conception. Similarly, the value of WTP amount also decreased significantly at Re.0.25 for every per cent increase in the chance of conception score. This means that the respondents with high score were satisfied with the performance of the public veterinary centre and they declined to pay any extra amount. It is imperative to note that the farmers of LUD districts had a higher probability of 0.0422 compared to LD districts, to state a positive WTP value to have satisfied level of chance of conception in their bovines, and were also willing to pay an extra INR 2.41 on every visit for this purpose.

As exhibited in the availability of drug/AI attribute, all the milk related factors integrated in the model viz., milk price, quantity of daily milk sold and possession of crossbred cows and/or graded buffaloes showed higher probabilities of 0.0346 (P≤0.01), 0.0043 (P≤0.05) and 0.2662 (P≤0.01), respectively, to state a positive WTP value for improving the chance of conception of bovines inseminated at public veterinary centres. A rupee increase in milk price per litre would increase the WTP amount by INR 1.95, while a litre increase in the quantity of daily milk sold would increase the WTP amount by Re.0.24 to improve the conception rate in bovines. Similarly, farmers owning crossbred cows and/or graded buffaloes inclined to pay an extra user fee of INR 6.14 compared to those not owning such animals, to boost the conception rate in their bovines inseminated at public veterinary centres.

CONCLUSIONS

An absolute concordance on the levels of attributes and the variations in the stated positive WTP values for quality improvements was noticed. Tobit regression analyses on the improvements in various attributes indicated that the farmers who were at disadvantaged levels of an attribute were willing to pay more compared to those at an advantaged level. The study suggested that, as most of the livestock owners were willing to pay for high-quality animal health care and bovine breeding services, there is a need to improve the quality of public livestock services, in terms of SPFR, chance of recovery from ailments and chance of conception after AI. Public veterinary centres with a well motivated staff should be improved by equipping with necessary infrastructure, so that early recovery from illness and good probability of conception can be ensured, for which partial cost recovery measures from the users can be imposed as the farmers are willing to pay.

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