

DETERMINANTS OF WILLINGNESS TO PAY FOR DIGITAL EXTENSION SERVICES AMONG DAIRY FARMERS

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ABSTRACT

Agriculture and dairy sector have become increasingly information driven. Timely and accurate information can boost farmers economic returns. Digital extension services can provide real-time, personalized advisories on crops, livestock, weather and markets. A study was conducted to see the scalability and sustainability of these services among 320 dairy farmers across four districts (Kurnool, Chittoor, Nellore and Prakasam) of Andhra Pradesh following ex-post facto research design using an interview schedule. The findings revealed that around 42.19 per cent of farmers were willing to pay to digital extension services with amount varying from INR 500 to INR 2000. Even though majority of variables showed positively related with willingness to pay (WTP), only five of them had significant influence on dairy farmers WTP like family education, land holding, herd size, annual income and extension contact. Path analysis revealed that WTP is influenced by both direct effects and indirect pathways, with variables exhibiting strong total effects namely annual income and extension contact emerging as major factors.

Keywords : digital extension services, path analysis, willingness to pay

INTRODUCTION

Agricultural extension is crucial for empowering farmers and promoting agricultural development through provision of timely advisories and practical help for the farmers (Jagadeeswari *et al.*, 2019). Traditional extension services relied on face-to-face interactions, field demonstrations, farm visits etc which has been constrained with limited manpower. In this scenario, Information and Communication Technology (ICT) has emerged as a powerful extension tool, significantly accelerating development across multiple sectors, especially in agriculture by creating new possibilities for farmers to access timely, reliable and relevant information (Chauhan *et al.*, 2016; Pratik and Vinaya, 2021). Mallick *et al.* (2023) reported that, among the different information sources available for the farming community, digital tools are being seen as relatively most preferred medium for getting information. They help in reducing information gaps and encourage technology adoption (Pratik *et al.*, 2023; Gouroubera *et al.*, 2024). Increasing evidence shows that personalized digital extension services has positive influence on input use, production diversity and farm income in India. These findings underline the growing importance of digital tools in providing information to farmers based on their needs and thereby improving their overall decision-making (Rajkhowa and Qaim, 2021).

Social media emerged as prominent informal information networks among farmers. Platforms such as WhatsApp and YouTube have emerged as potent communication channels for expert-farmer interaction and quick sharing of knowledge (Ramavhale *et al.*, 2024). To effectively use these digital platforms among all the farmers, improving their digital literacy by tailored interventions is a pre-requisite (Rathwa *et al.*, 2024). However, social media based information differs widely in quality, reliability, and relevance. This inconsistency has created a strong demand for structured and professionally managed digital advisory services.

Digital advisory services offered by government departments, private agri-tech firms, start-ups, cooperatives, and NGOs aim to fill this gap by providing scientifically validated and region-specific recommendations tailored to farmers needs. Yet, the long-term sustainability of digital advisories depend not only on technology but also on farmers WTP for using that services.

Willingness to pay is influenced by various socio-economic and behavioural factors. Although many government digital platforms provide information at free of cost, private service providers use subscription or fee-based models to provide advisory services. This shift makes it necessary to know whether dairy farmers are ready and can pay for timely and specialized digital extension support,

especially in regions where traditional extension services are either limited or unable to meet the requirements.

OBJECTIVE

To assess Willingness to Pay for Digital Extension Services among Dairy Farmers and factors influencing it.

METHODOLOGY

The research was conducted in Andhra Pradesh state by adopting ex-post facto research design. Two regions namely Rayalaseema and Coastal Andhra were selected and from each region two districts (Kurnool and Chittoor from Rayalaseema, Prakasam and Nellore from Coastal Andhra) were purposively selected based on dairy animals population and districts having more than one Krishi Vigyan Kendra (KVK) as criteria. From each district, two mandals were

selected by grouping mandals under each respective KVK jurisdiction and then randomly selecting one mandal from each group to ensure balanced representation of both KVK operational areas and subsequently from each mandal two villages were chosen at random. From each village, 20 dairy farmers were chosen at random resulting in a total sample size of 320 dairy farmers. A well-structured interview schedule was used for gathering the data. Willingness To Pay was defined as the highest amount a respondent is ready to pay to access digital extension service, representing the perceived utility and economic value of such information (Altobelli *et al.*, 2019). To assess this, an open-ended Contingent Valuation Method (CVM) was used to collect data, asking farmers to tell their readiness to pay for the services. Statistical tools namely mean, frequency, percentage, correlation, probit regression model and path analysis were used for data analysis.

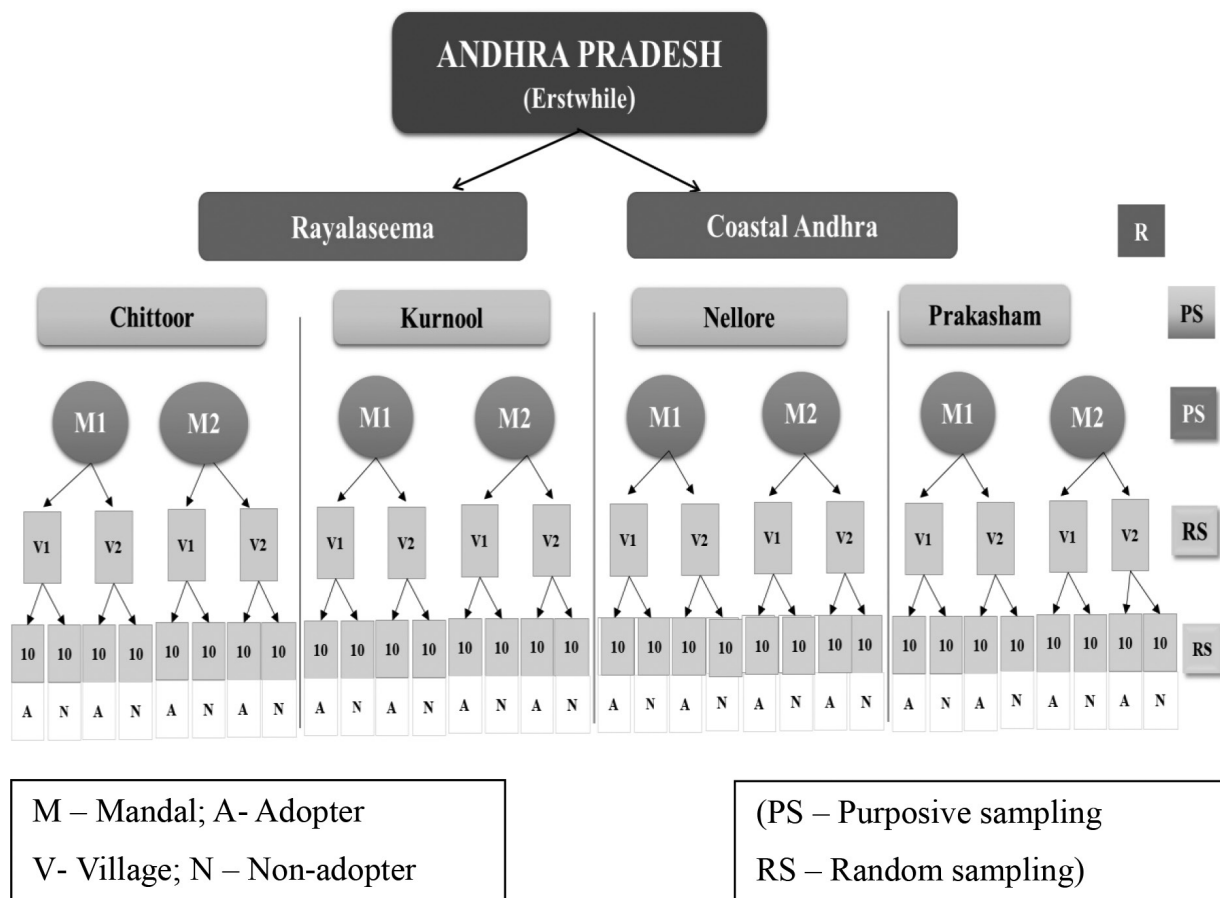


Fig 1 : Sampling plan

RESULTS AND DISCUSSION

Table 1 gives information regarding willingness of dairy farmers to pay for digital extension services. Among 320 dairy farmers, only 135 dairy farmers were ready to pay for digital extension services. The data in table 2 shows the

distribution among 135 dairy farmers who were interested to pay, more than half (57.04 %) of the dairy farmers fell under low category, followed by 23.70 per cent of them under high category and 19.26 per cent of them under medium category. The possible interpretation for most of them not willing might be because

Table 1: Distribution of respondents based on their WTP
(n=320)

Willingness	Frequency	Percentage
Not willing to pay	185	57.81
Willing to pay	135	42.19

of financial ability and existence of free digital advisory services in some places provided by KVK's, Cooperatives etc. Yet, some of them were willing as they believe this can significantly benefit them in gaining knowledge and enables them in taking proper decisions

that can enhance productivity and profitability in their dairy farming. The variations in amount can be attributed to differences in income levels, awareness, perceived benefits and satisfaction obtained through digital extension services.

Table 2: Categorisation of respondents according to their WTP
(n=135)

WTP	Frequency	Percentage
Low (₹ 500 - ₹ 652.79)	77	57.04
Medium (₹652.80 - ₹ 1075.02)	26	19.26
High (₹ 1075.03 – ₹ 2000.00)	32	23.70

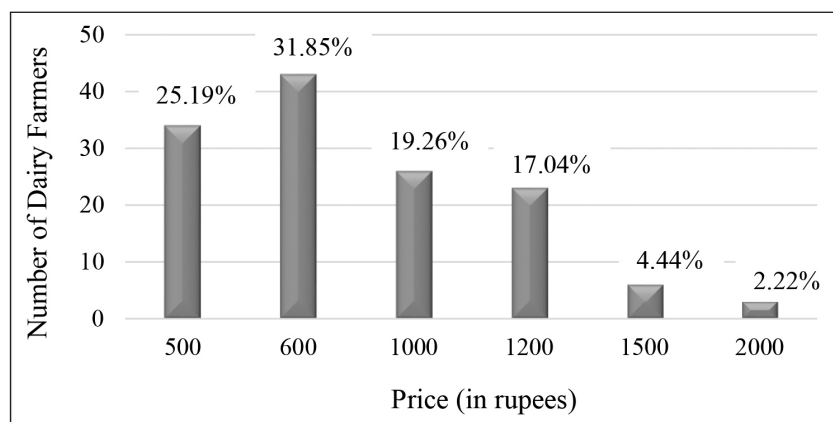
**Fig 2: Distribution of dairy farmers according to amount they were willing to pay**

Figure 2 infers that among 135 dairy farmers, who were willing to pay, 25.19 % were willing to pay INR 500 per annum, while 31.85% of them were willing to pay INR 600 per annum. Around 19.26% of them were ready to pay up to INR 1000 per annum, followed by 17.04 % of them at INR 1200 per annum. Only a small proportion 4.44% and 2.22% of them were willing to pay upto INR 1500 and INR 2000 per annum. Farmers willing to pay was analysed across various domains in dairy farming, to provide insights into the areas of information they value the most and were ready to invest. WTP varied across domains, as per their perceived relevance, need and potential economic returns of each service. Among 135 dairy farmers, 100.00 per cent of them showed interest to pay for digital advisory services related to disease management, followed by 65.19 per cent of them for weather information and necessary precautions to be taken. Around three-fifth (59.26%) of them showed willingness towards information related to buying and selling of animals, 54.81 per cent for feeding related information, 41.48 per cent

of them for breeding related advisories. Relatively lower willingness to pay was showed for information to vaccination aspect.

The data in table 3 revealed that, age (-0.169**) exhibited a negative and significantly related with WTP, depicting that older dairy farmers, depend more on traditional knowledge and display greater reluctance to new technologies, are less inclined to pay for digital services. Conversely, family education (0.308**) showed a positive and significant influence, as better family education enables farmers to understand and utilize digital extension services. Family size (0.079^{NS}) and experience in dairying (-0.027^{NS}) were not significantly related to willingness to pay. Occupation (0.141*), herd size (0.221**), landholding (0.261**) and annual income (0.470**) exhibited a positive and statistically significant association with WTP, indicating that farmers who are more dependent on agriculture and dairy, possessing

Table 3: Relationship between independent variables and Willingness to pay among dairy Farmers
(n=320)

Sr. No	Independent Variables	Total dairy farmers
		r value
X ₁	Age	-0.169**
X ₂	Family Education status	0.308**
X ₃	Family size	0.079 ^{NS}
X ₄	Occupation	0.141*
X ₅	Herd size	0.221**
X ₆	Land holding	0.261**
X ₇	Experience in dairying	-0.027 ^{NS}
X ₈	Annual income	0.470**
X ₉	Extension contact	0.342**
X ₁₀	Innovativeness	0.188**
X ₁₁	Risk orientation	0.211**
X ₁₂	Orientation towards digitalisation	0.241**
X ₁₃	Achievement motivation	0.130*

** . Significant at the 0.01 level, * . Significant at the 0.05 level and NS – non-significant

larger herds and land, and have higher incomes tend to place greater value on quality information that enhances animal productivity, even at an additional cost. So, they perceive digital services as worthwhile investments for improving productivity and managing risks.

Behavioural characteristics also played a greater role in strengthening willingness to pay. Extension contact (0.342**), innovativeness (0.188**), risk orientation (0.211**), orientation towards digitalisation (0.241**) and achievement motivation (0.130*) have exhibited positive and statistically significant relationships with willingness to pay. Farmers with better extension exposure, innovativeness, higher risk-taking ability recognize the value of timely and specialized information. Likewise, achievement-oriented farmers regard digital extension services as critical inputs for improving efficiency and productivity. The results are in line with the studies of Patel *et al.*, (2025); Anu *et al.*, (2025); *et al.*, (2025).

Table 4: Factors influencing willingness to pay among dairy farmers

(n=320)

Sr. No.	Independent Variables	Estimate	Std. Error	Wald	Sig.
	Threshold [code = 0]	6.025	1.074	31.472	0.000**
X ₁	Age	0.003	0.010	0.099	0.753
X ₂	Family Education status	0.071	0.027	6.921	0.009**
X ₃	Family size	-0.009	0.097	0.009	0.925
X ₄	Occupation	0.295	0.172	2.943	0.086
X ₅	Herd size	0.052	0.025	4.194	0.041*
X ₆	Land holding	0.067	0.023	8.617	0.003**
X ₇	Experience in dairying	0.000	0.009	0.001	0.970
X ₈	Annual income	0.00000611	0.0000009	40.611	0.000**
X ₉	Extension contact	0.088	0.034	6.778	0.009**
X ₁₀	Innovativeness	-0.024	0.036	0.437	0.509
X ₁₁	Risk orientation	0.028	0.052	0.292	0.589
X ₁₂	Orientation towards digitalisation	0.034	0.049	0.474	0.491
X ₁₃	Achievement motivation	-0.033	0.043	0.588	0.443

** . Significant at the 0.01 level, * . Significant at the 0.05 level and NS – non-significant

The Probit regression was considered for assessing the influence of thirteen socio-economic and other factors (X₁ - X₁₃) on farmers WTP for digital extension services. This was chosen mainly because the dependent variable (WTP for digital extension services) “Y” has two outcomes (i.e. 1= not willing, 2=willing to pay). The other factors which determine the impact on willingness to pay (Y) are X₁= Age, X₂= Family education, X₃= Family size, X₄= Occupation,

X₅= Herd size, X₆= Land holding, X₇= Experience in dairying, X₈= Annual income, X₉= Extension contact, X₁₀= Innovativeness and, X₁₁= Risk orientation, X₁₂= Orientation towards digitalisation and X₁₃= Achievement motivation. Among these thirteen factors, only five factors showed significance, which tells that respondents decision to pay for digital extension services were shaped by a limited set of key factors rather than the entire range of attributes considered in

the research like Family Education (X_2), Herd size (X_5), Land holding (X_6), Annual income (X_8) and Extension contact (X_9) with estimate values of 0.071, 0.052, 0.067, 0.00000611 and

0.088 units respectively. The regression coefficients of the remaining eight factors were found not significant.

Path analysis

Table 5: Path analysis showing various effects of independent variables on WTP

(n=320)

Sr. No	Independent Variables	Direct effects	Total Indirect effect	Substantial indirect effect through
X ₁	Age	0.027*	-0.196	0.010 (X ₁₃)
X ₂	Family Education status	0.129	0.179	0.080 (X ₈)
X ₃	Family size	-0.024	0.104	0.039 (X ₈)
X ₄	Occupation	0.074	0.068	0.061 (X ₈)
X ₅	Herd size	0.091	0.129	0.069 (X ₈)
X ₆	Land holding	0.158	0.103	0.043(X ₈)
X ₇	Experience in dairying	0.012**	-0.039	0.016 (X ₁)
X ₈	Annual income	0.364	0.107	0.035 (X ₉)
X ₉	Extension contact	0.200	0.143	0.063 (X ₈)
X ₁₀	Innovativeness	-0.027	0.215	0.096 (X ₉)
X ₁₁	Risk orientation	0.016**	0.195	0.113 (X ₉)
X ₁₂	Orientation towards digitalisation	0.048	0.192	0.120 (X ₉)
X ₁₃	Achievement motivation	-0.050	0.180	0.107 (X ₉)
Residual: 0.652				

Direct effect:

The data present in table 5 showed that annual income (0.364) had strongest positive direct effect on dairy farmers WTP followed by size of land holding (0.158) and family education status (0.129). This infers that, among all the variables, these above three variables had greater influence on WTP among dairy farmers. Whereas negative direct effect was shown by family size (-0.024), innovativeness (-0.027) and achievement motivation (-0.050).

Total Indirect effect:

Table 5 revealed that innovativeness (0.215) had maximum positive total indirect effect followed by risk orientation (0.195) and orientation towards digitalisation (0.192). This tells us that, their influence operates through other explanatory variables, emphasizing their role as enabling factors rather than main factors influencing WTP. Whereas age (-0.196) and experience in dairying (-0.039) had shown total indirect effect. It means these variables adversely affect the intermediary variables that showed positive association with WTP among dairy farmers.

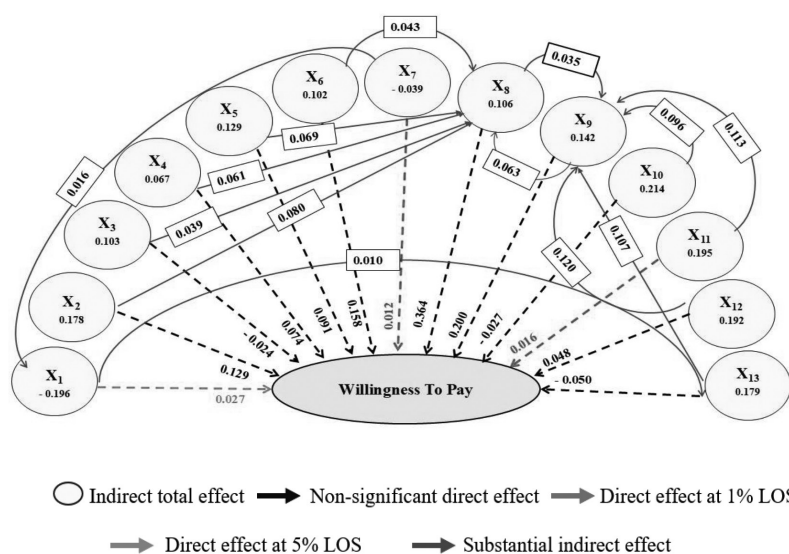


Fig. 3: Path analysis showing various effects of independent variables on WTP for digital extension services among dairy farmers.

Substantial indirect effect

The data showed in table 5, further inferred that among 13 independent variables, six variables were routed through annual income, five variables routed through extension contact, one variable routed through age and one through achievement motivation. Highest effect on WTP was put forth by orientation towards digitalisation (0.120) through extension contact, followed by risk orientation (0.113) through extension contact, achievement motivation (0.107) through extension contact, innovativeness (0.096) through extension contact, family education status (0.080) through annual income and herd size (0.069) through annual income. It can be explained as improvements in orientation towards digitalisation, risk orientation, achievement motivation and innovativeness enhances extension contact, which in turn positively influences WTP among the dairy farmers.

CONCLUSION

The analysis of farmers WTP for digital extension services highlights the increasing importance of digital extension in contemporary agriculture. Farmers are willing to invest in these services when they clearly perceive benefits such as timely access to information, better decision-making and improved productivity. The study indicated that while many factors were associated with farmers' willingness to pay, only few had statistically significant effect, suggesting that a few key determinants primarily influence their readiness to pay for digital extension services. The path analysis demonstrates the dairy farmers willingness to pay is shaped by both direct and indirect effects, reflecting the interdependent nature of its variables. The variables with strong total (direct + indirect) effects such as annual income and extension contact emerged as major factors, while others influence willingness to pay indirectly by strengthening key enabling factors (Vinaya & Bansal, 2026).

IMPLICATIONS

The findings highlighted the need for targeted and differentiated policy interventions to promote digital extension services. Segmented pricing approach may be adopted, wherein commercial and resource-rich farmers may be charged relatively higher fees, while smallholders must be supported through subsidies. Enhancing digital literacy and extension linkages, along with integration of services through Krishi Vigyan Kendras, can improve adoption. Additionally, fostering Public-Private Partnerships (PPP) can ensure long-term sustainability and expanded outreach.

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CONFLICT OF INTEREST

The authors declared that there is no conflict of interest regarding the publication of this paper or its content.

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