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ICT TOOLS UTILIZATION IN DAIRY FARMING: RELATIONSHIP WITH DAIRY FARMERS' PROFILE AND A SWOC ANALYSIS

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ABSTRACT

Information and Communication Technology (ICT) tools in dairy farming has the potential to enhance productivity, efficiency and profitability. However, the extent to which farmers use ICT differs depending on their socio-psychological and personal characteristics. In light of this, the present study was conducted to determine the relationship between the dairy farmers' profiles and their ICT tools utilization. Additionally, Strengths, Weaknesses, Opportunities and Challenges (SWOC) analysis was conducted to evaluate the factors influencing ICT utilization. This research was carried out in Dharwad and Belagavi districts of North Karnataka employing an Ex- post facto research design. From each district, two taluks and from each taluk two hoblis were selected randomly. Thereafter, fifteen dairy farmers were randomly selected from each hobli, resulting in a total sample size of 120. The study revealed that dairy farmers frequency and preference of utilization of ICT tool had positively significant relationship with education, source consultancy pattern, ICT tools possession, extension contact, achievement motivation, economic motivation, scientific orientation, innovativeness and credibility of ICT tools at one per cent level of significance. SWOC analysis revealed that cent per cent of dairy farmers expressed that possessing own ICT tools was major strength, inadequate training and practical skills to handle ICTs (95.00 %) was major weakness, training facilities on ICTs to dairy farmers (100.00 %) was major opportunity and non- availability of dairy information in local language in various ICT tools (95.83 %) was the major challenge. The study act as a roadmap for the line departments of state for selecting the right ICT tools for sharing information on dairy.

Keywords: *socio-psychological, strengths, weaknesses, opportunities, challenges*

INTRODUCTION

The dairy industry plays a crucial role in global agriculture, contributing significantly to food security, employment and economic development. With the increasing demand for dairy products, the use of Information and Communication Technology (ICT) tools has become essential for improving farm productivity, efficiency and profitability. ICT tools, including mobile applications, farm management software and automated milking systems, provide dairy farmers with real-time data, market insights and best practices for enhanced decision-making. Information and Communication Technology (ICT) is one such paradigm in the current era that can offer timely, affordable and accurate information for the rural people (Monikha *et al.,* 202; Chauhan *et al.* (2016). Information and Communication Technology (ICT) has proven to be an effective extension strategy for accelerating progress across multiple sectors, predominantly in agriculture (Kashem *et al.,* 2010; Pratik and Vinaya, 2021) and also ICT tools are used by the costal farmers during natural calamities (Mallick *et al*., 2023). ICT has enabled effective knowledge exchange between researchers, extension personnel and farmers within the agricultural community (Adegbidi, 2012 and Panda *et al.,* 2019).

The extent to which dairy farmers utilize ICT tools is influenced by various socio-psychological and economic factors such as age, education level, farm size, income and access to digital resources. Understanding this relationship is vital in developing targeted strategies to enhance ICT utilization among dairy farmers. Moreover, assessing the Strengths, Weaknesses, Opportunities and Challenges (SWOC) of ICT utilization in dairy farming provides valuable insights into the benefits and barriers associated with digital transformation in the sector. This study aims to examine the relationship between dairy farmers' profiles and their ICT tool utilization, alongside conducting a SWOC analysis to identify key factors that influence the effective implementation of technology in dairy farming.

OBJECTIVES

(1) To study the relationship between dairy farmers' profiles and their ICT tool utilization

(2) To analyse the SWOC of ICT tools using dairy farmers

METHODOLOGY

This research was carried out in two districts of North Karnataka during the year 2023 employing an *Ex-post facto* research design. Through purposive sampling, two districts (Dharwad and Belagavi) were chosen from North Karnataka, as dairy animals' population in these districts was high. From each district, two taluks and from each taluk two hoblis were selected randomly. Thereafter, fifteen dairy farmers were randomly selected from each hobli, resulting in a total sample size of 120 (who were using at least one ICT tools). The information was gathered through a pre-tested structured interview schedule and analysis was done using descriptive statistics viz., frequency and percentage in MS Excel (Version, 2021). The degree of association between farmers' profile and utilization of various ICT tools was determined through correlation and regression analysis in SPSS V.26.

Furthermore, SWOC analysis of ICT tools using dairy farmers were analyzed by preparing the statements separately regarding strengths, weaknesses, opportunities and challenges of ICT tools utilization by the dairy farmers following Vidya (2022) with suitable modification. The respondents were asked to give their responses on two-point continuum scale viz., agree and disagree with scores of 1 and 0 respectively. The obtained data was analyzed using frequency and percentage.

RESULTS AND DISCUSSION

The data in Table 1 reveals the association of personal, socio-psychological and economic characteristics of dairy farmers with their frequency of utilization of ICT tools. The dairy farmers frequency of utilization of ICT tools had positively significant relationship with education (0.704), source consultancy pattern (0.804), ICT tools possession (0.842), extension contact (0.870), achievement motivation (0.842), economic motivation (0.809), scientific orientation (0.793), innovativeness (0.817) and credibility of ICTs (0.845) at one per cent level of significance. Whereas, variables namely age (0.445) and experience in dairy farming (0.479) had negatively significant relationship at one per cent level of significance. Further, other variables like occupation, annual income and herd size were non- significantly correlated with the dairy farmers frequency of utilization of ICT tools.

The possible reason may be that young age, less experience in dairy farming and higher education encourages individual to use ICT tools to further enhance their knowledge of dairy farming practices. Dairy farmers might be assisted in obtaining dairy-related information from a variety of sources and to excel in dairy farming by using ICTs to satisfy their timely information need by greater source consultancy, a good number of ICTs possession and adequate extension contact. Use of ICT tools contribute to the economic motivation of dairy farmers by providing demand-driven, value-added information and experts' advice at the right time. Dairy farmers with varying degrees of economic motivation need to keep themselves up to date with latest technologies to earn more profits and make quick progress by going for expansion of dairy farmers. Transforming the traditional beliefs and methods in dairy farming with scientific methods using ICT tools helps dairy farmers to make dairy farming economically more profitable. Dairy producers are more informed and more likely to adopt innovations in dairy farming techniques because of high level of authenticity in using the ICT to certain extent. The findings are in consistent with the finding of Patil *et al.* (2021), Khodifad and Solanki (2023) and Bharath *et al.* (2024).

Table 1: Association of personal and socio-psychological characteristics of dairy farmers with their frequency of utilization of ICT tools

(n =120)

Sr. No.	Variables	Correlation Coefficient (r)
X_1	**Age**	-0.445**
X_2	**Education**	0.704**
X_3	**Experience in dairy farming**	-0.479**
X_4	**Occupation**	0.167^{NS}
X_5	**Annual income**	0.025^{NS}
X_6	**Herd size**	0.037^{NS}
X_7	**Source consultancy pattern**	0.804**
X_8	**ICT tools possession**	0.842**
X_9	**Extension contact**	0.870**
X_{10}	**Achievement motivation**	0.842**
X_{11}	**Economic motivation**	0.809**
X_{12}	**Scientific orientation**	0.793**
X_{13}	**Innovativeness**	0.817**
X_{14}	**Credibility of ICTs**	0.845**

**Significant at 1 per cent level
*Significant at 5 per cent level
NS- Non- Significant

Table 2: Relationship between personal and socio-psychological characteristics of dairy farmers with their frequency of utilization of ICT tools

(n = 120)

Variable code	Variables	Regression coefficient (b)	't'- value
X_1	**Age**	0.264	0.503^{NS}
X_2	**Education**	0.110	1.909*
X_3	**Experience in dairy farming**	0.238	-0.641^{NS}
X_4	**Occupation**	0.363	1.950*
X_5	**Annual income**	0.068	0.179^{NS}
X_6	**Herd size**	0.038	-0.741^{NS}
X_7	**Source consultancy pattern**	0.106	-1.231^{NS}
X_8	**ICT tools possession**	0.186	3.382**
X_9	**Extension contact**	0.122	2.120*
X_{10}	**Achievement motivation**	0.213	1.809^{NS}
X_{11}	**Economic motivation**	0.202	-1.306^{NS}
X_{12}	**Scientific orientation**	0.064	3.494**
X_{13}	**Innovativeness**	0.155	-1.155^{NS}
X_{14}	**Credibility of ICTs**	0.223	1.036^{NS}

$R^2 = 0.842$ F= 39.98

**Significant at 1 per cent level

*Significant at 5 per cent level

NS- Non – Significant

The data in table 2 reveals the relationship between personal socio-psychological and economic characteristics of dairy farmers with their frequency of utilization of ICT tools**.** The coefficient of determination (R^2) is 0.842, indicating that 84.20 per cent changes in the dairy farmers frequency of utilization of ICT tools was contributed by all these independent variables chosen for the study. The variables namely ICT tools possession and scientific orientation contributed significantly at one per cent level of significance. Whereas, variables like education, occupation and extension contact contributed significantly at five per cent level of significance.

The possible reason may be that dairy farmers who possess ICT tools are more likely to use them frequently for getting timely dairy related information. Higher education and scientific orientation might generate interest in dairy farmers to use ICTs daily and encourage them to approach veterinary professional for getting need based information. Similar results reported by Jaswanth (2018) and Aldosari *et. al* (2019).

Table 3: Association of personal and socio-psychological and characteristics of dairy farmers with their preference to use ICT tools (n =120)

Variable code	Variables	Correlation Coefficient (r)
X_1	**Age**	-0.508**
X_2	**Education**	0.752**
X_3	**Experience in dairy farming**	-0.528**
X_4	**Occupation**	-0.083^{NS}
X_5	**Annual income**	0.071^{NS}
X_6	**Herd size**	0.013^{NS}
X_7	**Source consultancy pattern**	0.856**
X_8	**ICT tools possession**	0.850**
X_9	**Extension contact**	0.933**
X_{10}	**Achievement motivation**	0.894**
X_{11}	**Economic motivation**	0.879**
X_{12}	**Scientific orientation**	0.815**
X_{13}	**Innovativeness**	0.873**
X_{14}	**Credibility of ICTs**	0.942**

**Significant at 1 per cent level

*Significant at 5 per cent level

NS- Non- Significant

The Table 3 reveals the association of personal, socio-psychological and economic characteristics of dairy farmers with their preference to use ICT tools**.** The results shows that the dairy farmers preference to use ICT tools had positively significant relationship with education (0.752), source consultancy pattern (0.856), ICT tools possession (0.850), extension contact (0.933), achievement motivation (0.894), economic motivation (0.879), scientific orientation (0.815), innovativeness (0.873) and credibility of ICTs (0.942) at one per cent level of significance. Whereas, variables namely age (0.508) and experience in dairy farming (0.528) had negatively significant relationship at one per cent level of significance. Further, other variables like occupation, annual income and herd size were non- significantly correlated with the dairy farmers preference to use ICT tools.

The possible reason may be that young age, less experience in dairy farming and higher education enables dairy farmers to easily handle and operate various ICT tools because of their skill and expertise in using ICTs. Dairy farmers are assisted to have more preference for ICT tools in obtaining by greater source consultancy, a good number of ICTs possession and adequate extension contact. Good achievement motivation, economic motivation, scientific orientation, innovativeness and credibility of ICTs aids dairy farmers to prefer a greater number of ICT tools for availing information on dairy farming not only through formal and informal sources but also from various mass media sources. Similar outcomes reported by Jaswanth (2018) and Aldosari *et al.* (2019).

Table 4 reveals the relationship between personal socio-psychological and economic characteristics of dairy farmers with their preference to use ICT tools**.** The coefficient of determination (R^2) is 0.929, indicating that 92.90 per cent changes in the dairy farmers preference to use ICT tools was contributed by all these independent variables chosen for the study. The variables namely education and extension contact contributed significantly at one per cent level of significance. Whereas, credibility of ICTs contributed significantly at five per cent level of significance.

The possible reason may be that dairy farmers higher education might help them in using ICT tools for getting dairy related information and also to come in touch with good number of veterinarian specialists by using ICTs. Trustworthiness and authenticity of dairy information in various ICTs made them to prefer the use of ICT tools. Similar results reported by Jaswanth (2018).

Table 4: Relationship between personal and socio-psychological characteristics of dairy farmers with their preference to use ICT tools

(n = 120)

Variable code	Variables	Regression coefficient (b)	't'- value
X_1	**Age**	0.594	0.464^{NS}
X_2	**Education**	1.524	2.870**
X_3	**Experience in dairy farming**	0.971	-0.843^{NS}
X_4	**Occupation**	1.638	-0.932^{NS}
X_5	**Annual income**	0.167	0.510^{NS}
X_6	**Herd size**	0.038	-0.205^{NS}
X_7	**Source consultancy pattern**	0.190	-0.370^{NS}
X_8	**ICT tools possession**	0.504	-0.559^{NS}
X_9	**Extension contact**	3.041	5.167**
X_{10}	**Achievement motivation**	0.356	0.345^{NS}
X_{11}	**Economic motivation**	0.072	-0.073^{NS}
X_{12}	**Scientific orientation**	0.309	1.003^{NS}
X_{13}	**Innovativeness**	0.811	1.080^{NS}
X_{14}	**Credibility of ICTs**	3.514	3.260*

$R^2 = 0.929$ F= 98.52

**Significant at 1 per cent level

*Significant at 5 per cent level

NS- Non – significant

SWOC analysis of ICT tools using dairy farmers

SWOC analysis of ICT tools using dairy farmers is presented in table 5 as strengths, weaknesses, opportunities and challenges are listed as under O

Strengths

The data pertinent to strengths of dairy farmers in using ICT tools is shown in table 5 and indicates that cent per cent expressed that possessing own ICT tools and uninterrupted power supply were major strengths followed by better access to dairy information anytime and anywhere through ICTs (80.83 %), good internet facility (32.50 %), skills in using ICTs (31.66 %) and availability of adequate number of ICT tools (20.83 %).

The possible reasons for the above findings could be that the availability and accessibility of some ICT tools to dairy farmers which helped them to get dairy related information anytime and anywhere. Own ICT possession with adequate power supply aided them in using the potential of ICTs for the betterment of dairy farming. Some of the dairy farmers might be using the smart phone might also be one of the reasons for getting above results.

Weaknesses

Clear look at table 5 indicates that major weakness of dairy farmers in using ICT tools were inadequate training and practical skills to handle ICTs (95.00 %), followed by technology fear (85.00 %), high cost (74.16 %), inadequate income to purchase ICT tools (72.50 %), low competency to use ICTs (68.33 %) and lack of awareness in using ICT tools (65.83 %).

The possible reasons for the above findings could be dairy farmers were not skilled enough to totally explore the potentials of ICTs. Lack of proper training and practical exposure to ICTs hindered them in getting timely dairy information. Dairy farmers technological fear and inadequate income to purchase ICTs prevented them in making best use of technology for betterment in dairy farming. However, all these issues did not discourage them to use ICTs in dairy farming. As these can help them to overcome this weakness through sufficient training and confidence building.

Opportunities

Table 5 shows that cent per cent of the dairy farmers felt that there is a lot of opportunities in dairy sector to use ICTs *viz.*, training facilities on ICTs to dairy farmers, creating awareness through digital literacy, continuous improvement of ICTs related to dairy farming, government subsidies in the purchase of ICT tools and availability of low-cost ICT tools, followed by development of new need- based dairy apps (85.83 %) were major opportunities for dairy farmers to use ICT tools.

The dairy farmers' low annual income may be the reason, making it difficult for them to afford ICT tools hence, adequate government subsidies and provision of low-cost ICT tools might help them to grab the potentials of ICTs. Training facilities on ICTs might give them hand on experience to get need based information on dairy farming, creating awareness and continuous upgrading of ICTs will equip them to search the relevant dairy information anytime and anywhere using the ICTs.

Challenges

Table 5: SWOC analysis of ICT tools using dairy farmers (n =120)

Sr. No.	Statements	Frequency (f)	Percentage (%)
A	**Strengths**		
1	Own ICT tools	120	100.00
2	Good internet facility	39	32.50
3	Uninterrupted power supply	120	100.00
4	Skills in using ICTs	38	31.66
5	Better access to dairy information anytime and anywhere through ICTs	97	80.83
6	Availability of adequate number of ICT tools	25	20.83
B	**Weakness**		
1	High cost of ICT tools	89	74.16
2	Lack of awareness in using ICT tools	79	65.83
3	Low competency to use ICT	82	68.33
4	Inadequate income to purchase ICT tools	87	72.50
5	Technology fear	102	85.00
6	Inadequate training and practical skills to handle ICT tools	114	95.00
C	**Opportunities**		
1	Training facilities on ICTs to dairy farmers	120	100.00
2	Development of new need- based dairy apps	103	85.83
3	Creating awareness through digital literacy	120	100.00
4	Continuous improvement of ICTs related to dairy farming	120	100.00
5	Government subsidies for the purchase of ICT tools	120	100.00
6	Availability of low-cost ICT tools	120	100.00
D	**Challenges**		
1	Lack of dairy specific and need- based content in ICTs	89	74.16
2	Unable to properly maintain ICTs	41	34.16
3	Less number of dairy websites and portals	111	92.50
4	Non- availability of need-based dairy apps	109	90.83
5	Non-availability of dairy information in local language in various ICT tools	115	95.83
6	Duplication and contradictory flow of dairy related information in different networking sites/ sources	112	93.33

Clear look at table 5 reveals that major challenges of dairy farmers in using ICTs were non- availability of dairy information in local language in various ICT tools (95.83 %) followed by duplication and contradictory flow of dairy related information in different networking sites/ sources (93.33 %), less number of dairy websites and portals (92.50 %), non- availability of need-based dairy apps (90.83 %), lack of dairy specific and need-based content in ICTs (74.16 %) and unable to properly maintain ICTs (34.16 %).

The possible reasons could be the lack of awareness about different mass media sources for getting dairy information as the dairy farmers were more dependent on formal and informal sources of information, non- availability of more numbers of regional language specific dairy information in ICTs added to these challenges. Multiple networking sources providing misleading information for the same content confusing the dairy farmers with the authenticity of the information.

Similar study on SWOC analysis was carried out by Keshavkattel (2011), Mukundarao (2011), Ravindernaik

et al. (2012), Jogender (2013), Senthilkumar (2015), Amirthalingam *et al.* (2017), Asha (2018), Sharma *et al.* (2018) and Vidya (2022); Bharath *et al.* (2024); Zade *et al.* (2024); Samadder *et al.* (2024).

CONCLUSION

The study highlights the significant relationship between dairy farmers' profiles and their utilization of ICT tools, emphasizing the role of education, consultancy patterns, ICT tool possession, extension contact and motivational factors in shaping technology adoption. The findings suggest that younger, more educated farmers with greater access to information and extension services are more likely to integrate ICT tools into their dairy farming practices. The SWOC analysis provided valuable insights into the strengths, weaknesses, opportunities and challenges associated with ICT utilization in dairy farming. The SWOC analysis identified key strengths, including ICT availability, but also pointed out weaknesses like technological fear and limited skills. Opportunities such as digital literacy programs and government support can drive ICT adoption. To enhance ICT utilization, targeted interventions such as capacity-building programs, the development of region-specific dairy apps and policy support are essential. Strengthening extension services and increasing digital awareness can help bridge the digital divide and improve the efficiency and sustainability of dairy farming.

POLICY IMPLICATIONS

Government and extension agencies should implement digital literacy programs tailored for dairy farmers, especially targeting older and less-educated individuals to bridge the digital divide. Extension systems must incorporate hands-on ICT training, ensuring farmers gain practical skills to effectively use digital tools for dairy management. Furthermore, ICT tools should be made cost effective and more user- friendly, the dairy related information needs to be published and popularized in regional languages.

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CONFLICT OF INTEREST

This is to declare that there is "No conflict of interest" among the researcher.

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