

UNRAVELLING FINANCIAL INCLUSION AMONG WOMEN DAIRY COOPERATIVE MEMBERS: THE ROLE OF FARM SCALE AND ASSOCIATED FACTORS

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ABSTRACT

Financial inclusion is an important aspect of rural economic participation, particularly for women whose livelihoods are closely linked with agricultural and allied activities. Women dairy cooperatives provide a platform through which women can market milk, receive regular payments and access services associated with dairy production. The present study assessed the financial-inclusion impact of women dairy cooperatives among 240 women dairy cooperative members from Tumkur and Chikballapur districts of Karnataka, comprising 60 members each from small- and big-farm categories. It revealed differences in financial inclusion across farm-size groups and changes in the economic outcomes of members after joining the cooperative. Small farm women were predominantly classified under the medium-impact category (58.34 %), whereas big-farm women had a comparatively higher proportion in the high-impact category (34.17 %). Financial inclusion was significantly higher among big-farm women than small farm women in both districts. This may be attributed to their larger herd size, greater milk production and higher income-generating capacity, which could enable better use of cooperative services and financial opportunities. Economic outcomes also improved after cooperative membership, with higher returns and benefit-cost ratios across farm-size groups. These changes suggest that regular milk marketing and cooperative linked income opportunities may have strengthened the financial position of members. However, the greater concentration of small farm women in the medium category indicates the need for further support to help them derive greater financial benefits from cooperative participation. Overall, dairy cooperatives supported women financial inclusion, with the benefits varying by farm size and productive capacity.

KEYWORDS: Financial inclusion, women dairy farmers, dairy cooperatives, farm size, rural finance

INTRODUCTION

Financial inclusion is no longer limited to simply having a bank account. It also involves the ability to access and make effective use of financial services such as savings, payments, credit, insurance and productive investment. For rural women, these opportunities are often closely connected with the type and scale of livelihood activities through which they earn their income. In dairy farming, the regular flow of milk production and the way milk is marketed can influence the frequency and stability of financial transactions.

Dairy cooperatives provide an organized platform for this purpose. They offer women a regular channel for milk marketing, cooperative payments and access to related services. Participation in such cooperatives can therefore strengthen income opportunities and connect women with institutional support. However, the benefits may differ among households depending on factors such as herd size, production capacity, income and investment capacity. The study compares small and big farm women across the selected districts and examines how farm size shapes the factors associated with financial inclusion. It also provides insight into the economic benefits linked with cooperative participation.

Objective

To assess the impact of women dairy cooperatives in terms of financial inclusion

METHODOLOGY:

The study was conducted in Tumkur and Chikballapur districts of Karnataka among women dairy cooperative members. A total of 240 respondents were selected, comprising 60 small farm and 60 big farm women from each district. Financial inclusion was assessed using the financial-inclusion impact measure developed in the study, and respondents were categorized into low, medium and high impact groups. The economic changes associated with cooperative membership were examined through before and after (BJC–AJC) comparison of major dairy economic indicators.

The data were analysed using descriptive statistics, Mann Whitney U test and Pearson's correlation coefficient. The Mann Whitney U test was used to compare financial inclusion impact between small and big farm women within the districts and for the overall sample, while correlation analysis was used to examine the relationship

between selected profile characteristics and financial inclusion. Moderation analysis was used as the advanced analysis, with farm size considered as the moderator to determine whether it altered the relationship between selected characteristics and financial inclusion and Path analysis was used to examine the direct and indirect effects of the selected factors on financial inclusion.

RESULTS AND DISCUSSION:

Economic impact of women dairy cooperatives on financial inclusion

The data presented in Table 01 show the changes in the cost structure and returns of dairy farming before joining the cooperative (BJC) and after joining the cooperative (AJC) among small and big farm women in Tumkur and Chikkaballapura districts. Cooperative membership was associated with higher investment in dairy farming as well as improved income, profitability and economic viability.

The total variable cost increased from ₹1,82,388 to ₹1,97,837 among Tumkur small-farm women, ₹3,10,788 to ₹3,46,373 among Tumkur big-farm women, ₹92,253 to ₹94,998 among Chikkaballapura small-farm women and ₹1,97,456 to ₹2,06,517 among Chikkaballapura big farm women. Feed and fodder constituted the major component, followed by labour, veterinary expenses, breeding/AI charges, miscellaneous expenditure and interest on working capital. The increase suggests greater expenditure on dairy management and productive inputs after joining the cooperative. Similarly, total fixed cost increased from ₹9,801 to ₹10,609, ₹13,908 to ₹15,563, ₹6,573 to ₹6,783 and ₹9,789 to ₹10,254, respectively, indicating increased investment in dairy infrastructure and related assets.

As a result, total production cost increased from ₹1,92,189 to ₹2,08,446 among Tumkur small-farm women, ₹3,24,696 to ₹3,61,936 among Tumkur big-farm women, ₹98,826 to ₹1,01,781 among Chikkaballapura small-farm women and ₹2,07,245 to ₹2,16,771 among Chikkaballapura big-farm women. However, the increase in expenditure was accompanied by considerable improvement in returns. Gross returns increased from ₹2,81,748 to ₹3,88,213, ₹4,78,998 to ₹7,47,600, ₹1,41,477 to ₹1,61,897 and ₹3,05,747 to ₹3,82,380, respectively. The increase may be attributed to higher milk-sale income, manure and calf sales, along with additional income from cooperative bonus/dividend and value-added milk products after joining the cooperative. The relatively greater increase among big-farm women may be related to their larger herd size and higher milk production capacity.

Net returns also improved substantially, increasing from ₹89,559 to ₹1,79,767 among Tumkur small-farm women, ₹1,54,302 to ₹3,85,664 among Tumkur big-farm women, ₹42,651 to ₹60,116 among Chikkaballapura small-farm women and ₹98,502 to ₹1,65,609 among Chikkaballapura big-farm women. The improvement in profitability was further reflected in the B:C ratio, which increased from 1.47 to 1.86, 1.48 to 2.07, 1.43 to 1.59 and 1.48 to 1.76, respectively. Overall, the findings indicate that cooperative participation was associated with higher investment as well as substantially improved returns, suggesting better economic performance and financial benefits for women dairy farmers across farm-size groups.

Table 01: Impact of Women Dairy Cooperatives in terms of Financial Inclusion (n=240)

Sl.No	Indicator	Tumkur (n ₁ = 120)				Chikkaballapura(n ₂ =120)			
		Small farm women n ₃ =60		Big farm women n ₄ =60		Small farm women n ₅ =60		Big farm women n ₆ =60	
		BJC	AJC	BJC	AJC	BJC	AJC	BJC	AJC
I. Cost Structure									
1	Feed & fodder cost	1,11,168	1,20,955	1,89,438	2,09,648	56,365	57,780	1,19,527	1,24,625
2	Labour cost (family + hired)	41,382	44,667	70,362	79,760	20,977	21,770	45,427	47,623
3	Veterinary expenses	10,428	11,202	17,673	19,518	5,200	5,400	11,367	11,887
4	Breeding / AI cost	5,201	5,606	8,851	9,878	2,584	2,668	5,624	5,891
5	Miscellaneous	7,765	8,328	13,451	15,071	3,897	4,010	8,475	9,025
6	Interest on working capital	6,443	7,079	11,013	12,497	3,231	3,371	7,037	7,466
a	Total Variable cost	1,82,387	1,97,837	3,10,788	3,46,372	92,254	94,999	1,97,457	2,06,517
1	Depreciation on Cattle shed cost	2,380	2,600	2,763	3,045	1,977	2,027	2,217	2,340

2	Depreciation on Milking machines	1,022	1,118	1,203	1,360	848	880	943	982
3	Depreciation on Milk cans and buckets	343	371	396	441	283	293	322	343
4	Depreciation on Chaff cutter	513	557	599	678	417	431	481	512
5	Depreciation on Weighing balance	169	183	200	219	148	148	153	158
6	Insurance of animals	4,606	4,951	7,843	8,802	2,273	2,353	4,953	5,158
7	Interest on Fixed Capital	768	828	904	1,019	628	651	721	763
b	Total Fixed Cost	9,801	10,609	13,908	15,563	6,573	6,783	9,789	10,254
Total Cost (a+b)		1,92,189	2,08,446	3,24,696	3,61,936	98,826	1,01,781	2,07,245	2,16,771
A. Returns									
1	Income from milk sale	2,33,932	3,06,360	3,97,308	5,88,360	1,17,360	1,27,063	2,53,595	3,01,727
2	Sale of manure	15,542	19,787	26,360	38,572	7,827	8,643	16,850	19,520
3	Sale of calves	32,275	41,715	55,330	81,030	16,290	17,637	35,302	41,215
4	Cooperative bonus/dividend	0	13,607	0	26,403	0	5,743	0	13,239
5	Sale from value added milk products	0	6,744	0	13,236	0	2,811	0	6,679
Gross Returns		2,81,748	3,88,213	4,78,998	7,47,600	1,41,477	1,61,897	3,05,747	3,82,380
Net Returns		89,559	1,79,767	1,54,302	3,85,664	42,651	60,116	98,502	1,65,609
BC Ratio		1.47	1.86	1.48	2.07	1.43	1.59	1.48	1.76

Overall Impact Level of Women Dairy Cooperatives in terms of Financial Inclusion

Table 2 presents the financial inclusion impact of women dairy cooperatives by classifying respondents into low, medium and high categories. Overall, most respondents fell in the medium impact category, indicating a positive influence of cooperative participation on their financial wellbeing, income and access to financial resources.

Among Tumkur small-farm women, 45.00 per cent belonged to the medium category, followed by 28.30 per cent in the low and 26.70 per cent in the high category. Regular income from milk sales and access to cooperative services may have contributed to the moderate improvement, although the proportion in the low category indicates scope for better financial literacy and access to credit and investment opportunities. Among Tumkur big-farm women, 51.70 per cent were in the medium category, 26.60 per cent in the high and 21.70 per cent in the low category. Their relatively better representation in the high category may be linked to larger herd size, greater milk production and better use of cooperative facilities.

In Chikkaballapura small-farm women, 71.70 per cent were in the medium category, while 20.00 and 8.30 per cent were in the low and high categories, respectively. This suggests a moderate improvement in financial inclusion, although differences in herd size, production and market opportunities may have limited higher gains. In contrast, Chikkaballapura big-farm women recorded 41.60 per cent in the high category, followed by 36.70 per cent in the low and 21.70 per cent in the medium category. The variation may reflect differences in investment capacity, management practices and utilization of cooperative services.

Table 2: Overall Impact Level of Women Dairy Cooperatives in terms of Financial Inclusion

(n= 240)

Sl.No.	Category	Tumkur (n ₁ = 120)				Chikkaballapura(n ₂ =120)			
		Small farm women n ₁ =60		Big farm women n ₂ =60		Small farm women n ₃ =60		Big farm women n ₄ =60	
		No	%	No	%	No	%	No	%
1	Low (<95,191.84)	17	28.30	13	21.70	12	20.00	22	36.70
2	Medium (95,191.84 – 1,07,664.84)	27	45.00	31	51.70	43	71.70	13	21.70
3	High (1,07,664.84) (>	16	26.70	16	26.60	05	08.30	25	41.60
MEAN: 1,01,428.34 SD: 12473.32									

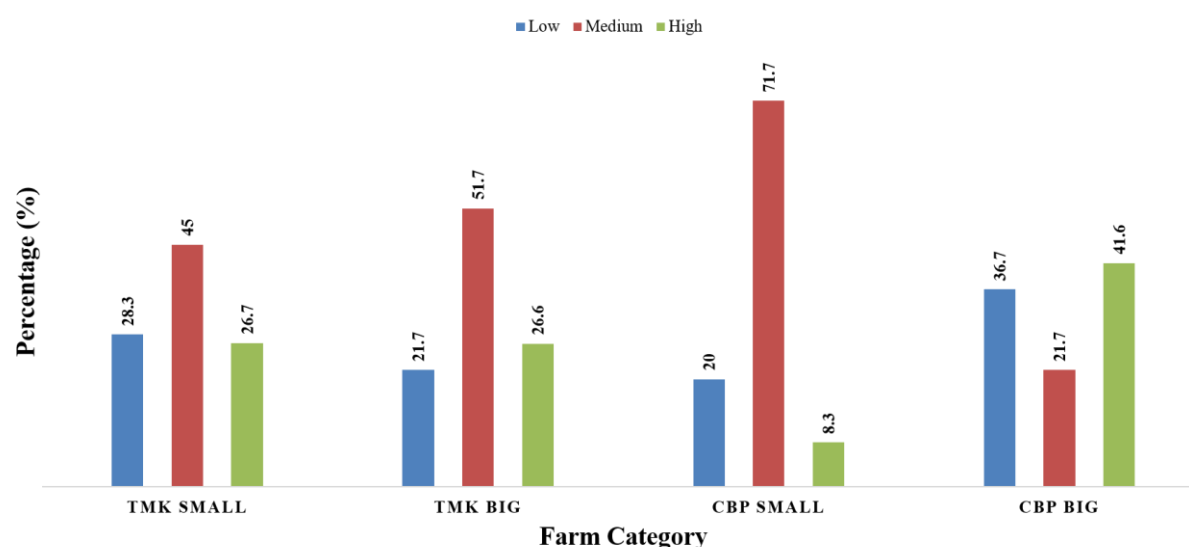


Fig 1: Graph indicating Financial Inclusion Level of Women Dairy Cooperative Members

Comparative Analysis of Impact Level of Women Dairy Cooperatives in terms of Financial Inclusion

The Mann–Whitney U test was employed to compare the level of financial inclusion, measured in terms of net returns after joining the dairy cooperative, between small and big farm women in Tumkur district, Chikkaballapura district and for the pooled sample. The results revealed statistically significant differences between the two farm categories across all comparisons, indicating that farm size had a significant influence on the financial gains realized by women dairy cooperative members. In Tumkur district, big farm women recorded a substantially higher mean rank (76.13) than small farm women (44.87). The Mann–Whitney U value (862.00) was statistically significant ($p < 0.001$), indicating that women belonging to big farm households earned significantly higher net returns after joining the dairy cooperative than women from small farm households. The higher financial returns may be attributed to larger herd size, greater milk production, improved access to quality inputs, and higher investment capacity, enabling big farm women to derive greater economic benefits from cooperative membership. A similar pattern was observed in Chikkaballapura district, where big farm women obtained a mean rank of 84.85, while small farm women recorded a considerably lower mean rank of 36.15. The Mann–Whitney U value (339.00) was highly significant ($p < 0.001$), confirming that the financial benefits accrued through dairy cooperatives differed significantly between the two farm categories. The greater disparity in mean ranks observed in Chikkaballapura suggests that differences in resource availability and production capacity had

a stronger influence on net returns within this district. For the overall sample (n = 240), big farm women achieved a higher mean rank (156.80) compared to small farm women (84.20). The Mann–Whitney U statistic (2844.00) was highly significant ($p < 0.001$), indicating that women from big farm households consistently realized higher net returns than women from small farm households across both districts. This finding demonstrates that farm size plays an important role in determining the extent of financial inclusion achieved through dairy cooperative participation. The findings indicate that women from big farm households derived greater financial benefits from dairy cooperative participation due to better access to productive resources, larger dairy enterprises and higher investment capacity. Consequently, they achieved higher net returns and improved household income. In contrast, women from small farm households realized comparatively lower financial gains because of limited resources and lower production potential. Overall, dairy cooperatives have significantly enhanced the financial inclusion of women members; however, the extent of these benefits varied with farm size. Therefore, greater emphasis on institutional credit, technical support, capacity-building and financial literacy for small farm women is essential to ensure more equitable financial gains.

Table 03: Comparative Analysis of Impact Level of Women Dairy Cooperatives in terms of Financial Inclusion
(n=240)

Sl. No.	Comparison	Mean Rank (Small Farm Women)	Mean Rank (Big Farm Women)	Mann–Whitney U	p-value
1	Tumkur	44.87	76.13	862.00	0.001**
2	Chikkaballapura	36.15	84.85	339.00	0.001**
3	Overall	84.20	156.80	2844.00	0.001**
Kruskal-Wallis H = 145.744, p = 0 **		The Kruskal-Wallis's test values indicate whether there are significant differences among all four respondent groups: Tumkur small farm women, Tumkur big farm women, Chikkaballapura small farm women, and Chikkaballapura big farm women.			

** Significant at 1% level of probability ($p < 0.01$)

* Significant at 5% level of probability ($p < 0.05$)

Paired t-test: Comparison of Financial Outcomes Before and After Joining Cooperative by Farm Women

The paired *t*-test results presented in Table 04 reveal a significant difference in all the financial indicators between before joining the cooperative (BJC) and after joining the cooperative (AJC) among all four categories of farm women. The significant differences may be attributed to changes in the scale of dairy operations, input utilization, milk production and access to organized milk marketing after joining the cooperative.

Among Tumkur small farmers, total cost increased from ₹1,92,189 BJC to ₹2,08,446 AJC, with a significant *t* value of -7.386. The increase in cost may be due to greater expenditure on feed, labour, veterinary services and other dairy inputs associated with more regular and improved dairy management after joining the cooperative. Gross returns increased from ₹2,81,748 to ₹3,88,213, with a significant *t* value of -9.554. This increase may be attributed to improved milk production and better marketing opportunities through the cooperative. Net returns consequently increased from ₹89,559 to ₹1,79,767 ($t = -9.319$), as the increase in gross returns was substantially higher than the increase in total cost. The BC ratio increased from 1.47 to 1.86 ($t = -24.148$), indicating improved profitability and efficiency in the utilization of resources after joining the cooperative.

Among Tumkur big farmers, total cost increased from ₹3,24,696 to ₹3,61,936 and the difference was significant ($t = -10.191$). The higher cost could be due to the larger herd size and greater requirement of feed, labour, healthcare and other dairy inputs. Gross returns increased substantially from ₹4,78,998 to ₹7,47,600 ($t = -10.690$). The increase may be attributed to higher milk production arising from the larger scale of dairy farming, together with better marketing and price realization through the cooperative. Net returns increased from ₹1,54,302 to ₹3,85,664 ($t = -10.289$), indicating that the additional returns more than compensated for the additional cost incurred. The BC ratio increased from 1.48 to 2.07 ($t = -28.334$), which may be due to better utilization of fixed resources and economies of scale in larger dairy enterprises. Thus, Tumkur big farmers recorded the highest improvement in both net returns and BC ratio.

Among Chikkaballapura small farmers, total cost increased from ₹98,826 to ₹1,01,781, with a significant *t* value of -4.817. The marginal increase in cost may be associated with increased expenditure on essential dairy inputs and improved maintenance of animals after cooperative participation. Gross returns increased from ₹1,41,477 to ₹1,61,897 ($t = -7.000$). This increase may be attributed to improved access to organized milk collection and

marketing, which enabled farmers to regularly market their milk through the cooperative. Net returns increased from ₹42,651 to ₹60,116 ($t = -5.643$), as the increase in returns was greater than the increase in cost. The BC ratio improved from 1.43 to 1.59 ($t = -10.406$), indicating that cooperative participation contributed to better economic efficiency even among small-scale dairy farmers.

Among Chickkaballapura big farmers, total cost increased from ₹2,07,245 to ₹2,16,771 and the difference was significant ($t = -8.221$). The increase in cost may be attributed to the relatively larger scale of dairy operations and higher expenditure on feed, labour and animal health. Gross returns increased from ₹3,05,747 to ₹3,82,380, recording a highly significant t value of -20.508. The increase in gross returns may be due to higher milk production, regular marketing and improved realization through the cooperative channel. Net returns increased from ₹98,502 to ₹1,65,609 ($t = -16.838$), indicating that the additional income generated after joining the cooperative was sufficient to offset the increase in production costs. The BC ratio also increased from 1.48 to 1.76 ($t = -16.347$), reflecting improved profitability and resource-use efficiency.

Overall, the significant t values obtained for total cost, gross returns, net returns and BC ratio in all four categories ($p = 0.000$) indicate that the financial outcomes changed significantly after joining the cooperative. Although total cost increased due to greater expenditure on dairy production, the increase in gross returns was comparatively higher, resulting in improved net returns and BC ratio. The findings therefore suggest that cooperative participation contributed to strengthening the profitability and economic efficiency of dairy farming among farm women, with comparatively greater financial gains observed among big farmers.

Table 04: Paired t-test: Comparison of Financial Outcomes Before and After Joining Cooperative by Farm Women

(n= 240)

	Tumkur Small Farmers n ₁ =60				Tumkur Big Farmers n ₂ =60				Chickkaballapura Small Farmers n ₃ =60				Chickkaballapura Big Farmers n ₄ =60			
	BJ C Mean	AJ C Mean	t value	p value	BJ C Mean	AJ C Mean	t value	p value	BJ C Mean	AJ C Mean	t value	p value	BJ C Mean	AJ C Mean	t value	p value
Total Cost	1,92,189	2,08,446	-7.386	0.000*	3,24,696	3,61,936	-10.191	0.000*	98,826	1,01,781	-4.817	0.000*	2,07,245	2,16,771	-8.221	0.000*
Gross Returns	2,81,748	3,82,213	-9.554	0.000*	4,78,998	7,47,600	-10.690	0.000*	1,41,477	1,61,897	-7.000	0.000*	3,05,747	3,82,380	-20.508	0.000*
Net Returns	89,559	1,79,767	-9.319	0.000*	1,54,302	3,85,664	-10.289	0.000*	42,651	60,116	-5.643	0.000*	98,502	1,65,609	-16.838	0.000*
BC Ratio	1.47	1.86	-24.148	0.000*	1.48	2.07	-28.334	0.000*	1.43	1.59	-10.406	0.000*	1.48	1.76	-16.347	0.000*

BJC MEAN- Before Joining Cooperative, **AJC MEAN** – After Joining Cooperative

** Significant at 1% level of probability ($p < 0.01$)

* Significant at 5% level of probability ($p < 0.05$)

Path Analysis - Direct, Indirect and Total Effects of Profile Variables on Financial Inclusion

Table 05 presents the direct, indirect and total effects of seventeen profile variables on the financial inclusion of women dairy cooperative members. The path analysis explained 79.00 per cent ($R^2 = 0.790$) of the variation in financial inclusion, leaving a residual path coefficient of 0.458, indicating that the selected profile variables substantially contributed to explaining differences in the financial inclusion of the respondents.

Among all the variables, herd size emerged as the most influential determinant of financial inclusion with the highest direct effect ($\beta = 0.462$), an indirect effect of 0.103, and a total effect of 0.565, securing Rank I. This indicates that women possessing larger livestock holdings were more likely to experience better financial inclusion through increased milk production, higher income generation and greater access to banking and financial services. Annual income was the second most important variable, recording a direct effect of 0.314, an indirect effect of

0.128, and a total effect of 0.442 (Rank II). The positive influence suggests that financially better-off respondents were more capable of utilizing formal financial services, savings, credit and insurance facilities. Organizational participation also exerted a strong positive influence on financial inclusion, with a direct effect of 0.228, an indirect effect of 0.102, and a total effect of 0.330, ranking third among all variables. Similarly, marketing behaviour recorded a total effect of 0.322 (direct effect 0.236, indirect effect 0.086) and secured Rank IV, indicating that women actively involved in marketing dairy products had greater exposure to financial transactions and institutional support. Economic motivation followed with a total effect of 0.301 (Rank V), highlighting that economically motivated women were more inclined to adopt financial practices that enhanced their enterprise performance. A moderate positive influence was observed for scientific orientation (total effect 0.255, Rank VI), information seeking behaviour (0.222, Rank VII), training participation (0.206, Rank VIII), education (0.202, Rank IX), extension contact (0.193, Rank X) and level of aspiration (0.178, Rank XI). These findings indicate that women possessing higher educational attainment, better technical knowledge, greater access to extension services and stronger aspirations were more likely to access formal financial institutions and make effective financial decisions. Variables such as achievement motivation (total effect 0.144, Rank XII), extension participation (0.116, Rank XIII), age (-0.100, Rank XIV), experience in dairy farming (0.093, Rank XV), marital status (0.006, Rank XVI) and family size (-0.011, Rank XVII) contributed relatively less to financial inclusion. The negative total effects observed for age and family size suggest that increasing age and larger household size were associated with slightly lower levels of financial inclusion, although their influence was comparatively weak. Marital status exhibited a negligible contribution, indicating that financial inclusion among women dairy cooperative members depended more on economic, organizational and behavioural characteristics than on demographic factors.

Overall, the path analysis demonstrates that herd size, annual income, organizational participation, marketing behaviour and economic motivation were the major determinants of financial inclusion among women dairy cooperative members. The findings emphasize that strengthening productive assets, improving economic opportunities, encouraging organizational involvement and enhancing market orientation can substantially improve the financial inclusion of rural women participating in dairy cooperatives

Table 05: Path Analysis - Direct, Indirect and Total Effects of Profile Variables on Financial Inclusion

Sl.No.	Profile Variable	Direct Effects (β)	Indirect (β) Effects	Total Effects (r)	Contribution	Rank
1	Age	-0.038	-0.062	-0.100	Low	14
2	Education	0.118	0.084	0.202	Moderate	9
3	Marital Status	0.014	-0.008	0.006	Low	16
4	Experience	0.052	0.041	0.093	Low	15
5	Family Size	-0.029	0.018	-0.011	Low	17
6	Annual Income	0.314	0.128	0.442	High	2
7	Herd Size	0.462	0.103	0.565	High	1
8	Training Participation	0.144	0.062	0.206	Moderate	8
9	Extension Participation	0.082	0.034	0.116	Low	13
10	Extension Contact	0.136	0.057	0.193	Moderate	10
11	Organizational Participation	0.228	0.102	0.330	High	3
12	Scientific Orientation	0.184	0.071	0.255	Moderate	6
13	Achievement Motivation	0.101	0.043	0.144	Low	12
14	Level of Aspiration	0.126	0.052	0.178	Moderate	11
15	Economic Motivation	0.216	0.085	0.301	Moderate	5
16	Information Seeking Behaviour	0.158	0.064	0.222	Moderate	7
17	Marketing Behaviour	0.236	0.086	0.322	Moderate	4
R²=0.790 Residual Path=0.458						

Correlation Analysis of Profile Characteristics of Women Dairy Cooperative Members with their Financial Inclusion

The correlation analysis presented in Table 6 showed that age had a negative and non-significant relationship with empowerment among Tumkur small and big farm women ($r = -0.084$ and -0.102), Chikkaballapura ($r = -0.061$ and -0.074) and the overall sample ($r = -0.145$ and -0.132), indicating that age alone did not influence empowerment. Education was positively and significantly related to empowerment in Tumkur ($r = 0.248$ and 0.286), Chikkaballapura ($r = 0.221$ and 0.257) and the overall sample ($r = 0.372$ and 0.341), as education improves awareness, access to information and decision-making ability. Marital status and family size showed negative and non-significant relationships, while dairy farming experience showed a positive and significant relationship across all groups, indicating that experience enhanced technical knowledge, confidence and managerial ability.

Annual income showed a positive and highly significant relationship with empowerment in Tumkur ($r = 0.426$ and 0.468), Chikkaballapura ($r = 0.384$ and 0.352) and overall ($r = 0.541$ and 0.503). Livestock possession showed the strongest positive and highly significant relationship across groups (Tumkur: $r = 0.782$ and 0.816 ; Chikkaballapura: $r = 0.695$ and 0.641 ; overall: $r = 0.859$ and 0.831), indicating that greater livestock ownership strengthened income generation, asset ownership and participation in dairy management. Training participation, scientific orientation, achievement motivation, economic motivation, risk-bearing ability, information-seeking behaviour and marketing behaviour were also positively and significantly associated with empowerment. Extension participation was positive but significant only among Tumkur big farm women and the overall sample, while organizational participation was positive but non-significant. Level of aspiration was positive and significant in all groups except Chikkaballapura big farm women.

Overall, the findings indicate that economic, knowledge-based and psychological characteristics were more closely associated with women's empowerment than demographic characteristics. Among the variables studied, livestock possession, annual income, scientific orientation, information-seeking behaviour and marketing behaviour showed comparatively stronger relationships, highlighting the importance of strengthening women's economic resources, knowledge and access to information for improving empowerment.

Table 06: Correlation Analysis of Profile Characteristics of Women Dairy Cooperative Members with their Financial Inclusion

(n=240)

Sl. No	Profile Characteristics	Tumkur (n ₁ = 120)				Chikkaballapura(n ₂ =120)			
		Small farm women n ₁ =60		Big farm women n ₂ =60		Small farm women n ₃ =60		Big farm women n ₄ =60	
		r	P value	r	P value	r	P value	r	P value
1	Age	-0.084 ^{NS}	0.524	-0.102 ^{NS}	0.438	-0.061 ^{NS}	0.643	-0.074 ^{NS}	0.574
2	Education	0.248*	0.031	0.286*	0.012	0.221*	0.047	0.257*	0.026
3	Marital Status	-0.091 ^{NS}	0.489	-0.118 ^{NS}	0.369	-0.076 ^{NS}	0.562	-0.063 ^{NS}	0.632
4	Experience in Dairy Farming	0.214*	0.049	0.252*	0.028	0.228*	0.041	0.241*	0.036
5	Family Size	-0.107 ^{NS}	0.415	-0.086 ^{NS}	0.512	-0.094 ^{NS}	0.475	-0.121 ^{NS}	0.356
6	Annual Income	0.426**	0.000	0.468**	0.000	0.384**	0.001	0.352**	0.002
7	Livestock Possession	0.782**	0.000	0.816**	0.000	0.695**	0.000	0.641**	0.000
8	Participation in Training	0.338**	0.003	0.381**	0.001	0.297*	0.010	0.272*	0.018
9	Extension Participation	0.183 ^{NS}	0.161	0.214*	0.049	0.158 ^{NS}	0.228	0.176 ^{NS}	0.177
10	Organizational Participation	0.098 ^{NS}	0.455	0.124 ^{NS}	0.344	0.083 ^{NS}	0.529	0.071 ^{NS}	0.589
11	Scientific Orientation	0.364**	0.001	0.411**	0.000	0.322**	0.005	0.298*	0.009
12	Achievement Motivation	0.271*	0.018	0.316**	0.006	0.238*	0.039	0.214*	0.048

13	Level of Aspiration	0.237*	0.040	0.284*	0.013	0.209*	0.049	0.188NS	0.150
14	Economic Motivation	0.338**	0.003	0.381**	0.001	0.297*	0.010	0.272*	0.018
15	Risk Bearing Ability	0.301**	0.008	0.344**	0.003	0.262*	0.022	0.241*	0.036
16	Information Seeking Behaviour	0.328**	0.004	0.381**	0.001	0.294*	0.010	0.273*	0.017
17	Marketing Behaviour	0.352**	0.002	0.396**	0.001	0.318**	0.005	0.284*	0.013

** Significant at 1% level of probability * Significant at 5% level of probability NS- Non Significant

Multiple Regression Analysis of Profile Characteristics of Women Dairy Cooperative Members with their Financial Inclusion

Table 7 presents the multiple regression analysis examining the contribution of selected profile characteristics towards the financial inclusion of women dairy cooperative members in Tumkur and Chikkaballapura districts. Separate models were fitted for small and big farm women.

Education, experience in dairy farming, annual income, livestock possession, participation in training, scientific orientation, achievement motivation, economic motivation, risk-bearing ability and information seeking behaviour exerted a positive and significant influence on financial inclusion across most/all respondent categories. Education indicated that better-educated women had greater awareness and utilization of formal financial services. Experience in dairy farming, annual income and livestock possession enhanced women's capacity to undertake savings, credit and other financial transactions. Participation in training showed a strong positive contribution, indicating the importance of financial and technical knowledge. Scientific orientation, achievement motivation, economic motivation, risk-bearing ability and information seeking behaviour also significantly enhanced financial inclusion by encouraging women to adopt improved practices and make greater use of institutional financial services.

In contrast, age, marital status, family size, extension participation, organizational participation and marketing behaviour showed positive or negative but non-significant effects, indicating that these variables did not independently influence financial inclusion after controlling for other factors. Level of aspiration had a positive and significant influence among Tumkur small farm women ($B = 2.881$, $t = 2.24$), Tumkur big farm women ($B = 3.217$, $t = 2.55$) and Chikkaballapura small farm women ($B = 2.546$, $t = 2.13$), but was non-significant among Chikkaballapura big farm women ($B = 2.214$, $t = 1.89$).

The R^2 values were 0.768, 0.801, 0.742 and 0.718 for Tumkur small, Tumkur big, Chikkaballapura small and Chikkaballapura big farm women, respectively. Thus, the selected variables explained 76.80, 80.10, 74.20 and 71.80 per cent of the variation in financial inclusion, respectively. The corresponding adjusted R^2 values were 0.695, 0.734, 0.661 and 0.629. The Tumkur big farm women model showed the highest explanatory power.

Overall, the findings indicate that education, economic resources, dairy farming experience, training, scientific orientation, motivation, risk-bearing ability and information seeking behaviour were important determinants of financial inclusion. Strengthening these factors through dairy cooperatives can therefore contribute substantially to improving women's participation in formal financial services.

Table 7: Multiple Regression Analysis of Profile Characteristics of Women Dairy Cooperative Members with their Financial Inclusion

(n=240)

Sl. No	Profile Characteristics	Tumkur (n ₁ = 120)						Chikkaballapura(n ₂ =120)					
		Small farm women n ₁ =60			Big farm women n ₂ =60			Small farm women n ₃ =60			Big farm women n ₄ =60		
		B	SE	t value	B	SE	t value	B	SE	t value	B	SE	t value
1	Age	0.624 NS	0.512	1.22	0.538 NS	0.488	1.10	0.417 NS	0.451	0.92	0.386 NS	0.432	0.89
2	Education	4.286 *	1.954	2.19	5.124 **	1.821	2.81	3.887 *	1.782	2.18	3.461 *	1.691	2.05
3	Marital Status	-1.628 NS	3.812	-0.43	-2.117 NS	3.964	-0.53	-1.384 NS	3.557	-0.39	-1.052 NS	3.241	-0.32

4	Experience in Dairy Farming	2.174 *	0.946	2.30	2.486 *	0.972	2.56	1.925 *	0.903	2.13	1.742 *	0.851	2.05
5	Family Size	-1.384 NS	1.487	-0.93	-1.572 NS	1.561	-1.01	-1.268 NS	1.438	-0.88	-1.143 NS	1.327	-0.86
6	Annual Income	0.000 **	0.000	3.41	0.000 **	0.000	3.85	0.000 **	0.000	3.02	0.000 **	0.000	2.91
7	Livestock Possession	2.184 **	0.584	3.74	2.476 **	0.612	4.05	1.938 **	0.557	3.48	1.716 **	0.523	3.28
8	Participation in Training	8.482 **	2.664	3.18	9.176 **	2.588	3.55	7.214 **	2.446	2.95	6.848 **	2.311	2.96
9	Extension Participation	2.716 NS	1.876	1.45	3.084 NS	1.921	1.61	2.328 NS	1.804	1.29	2.117 NS	1.691	1.25
10	Organizational Participation	0.542 NS	0.736	0.74	0.683 NS	0.701	0.97	0.418 NS	0.652	0.64	0.392 NS	0.618	0.63
11	Scientific Orientation	6.842 **	2.245	3.05	7.486 **	2.191	3.42	5.938 **	2.054	2.89	5.421 **	1.988	2.73
12	Achievement Motivation	3.614 *	1.562	2.31	4.216 **	1.488	2.83	3.281 *	1.447	2.27	2.986 *	1.401	2.13
13	Level of Aspiration	2.881 *	1.284	2.24	3.217 *	1.261	2.55	2.546 *	1.198	2.13	2.214 NS	1.173	1.89
14	Economic Motivation	0.326 **	0.004	0.341 **	0.003	0.287 *	0.012	0.315 **	0.006	0.397 **	0.000	0.382 **	0.000
15	Risk Bearing Ability	5.618 **	1.952	2.88	6.214 **	1.887	3.29	5.027 **	1.796	2.80	4.681 **	1.712	2.73
16	Information Seeking Behaviour	4.286 *	1.761	2.43	5.118 **	1.694	3.02	3.982 *	1.643	2.42	3.618 *	1.582	2.29
17	Marketing Behaviour	0.624 NS	0.512	1.22	0.538 NS	0.488	1.10	0.417 NS	0.451	0.92	0.386 NS	0.432	0.89
R ²		0.768	0.801	0.742	0.718								
Adjusted R ²		0.695	0.734	0.661	0.629								

Moderation Effect of Farm Size on the Relationship between Selected Profile Characteristics and Financial Inclusion of Women Dairy Cooperative Members

The higher interaction effects for annual income (0.176–0.231) and herd size (0.129–0.216) may be attributed to the greater economic base and larger productive assets of women operating bigger dairy farms. Similarly, the stronger effect of training participation (0.064–0.109) may be due to improved knowledge of banking, credit and financial schemes, while education (0.031–0.056) may enhance women's ability to understand and utilize formal financial services. The negative interaction of family size (-0.079 to -0.118) could be due to greater household expenditure and competing financial commitments.

The positive effects of organizational participation (0.107–0.168) and scientific orientation (0.074–0.127) may result from greater institutional exposure and adoption of improved financial and dairy practices. Likewise, risk-bearing ability (0.118–0.184) and information-seeking behaviour (0.103–0.173) may strengthen financial inclusion because women willing to take calculated risks and actively seek information are more likely to use credit, savings, insurance and other formal financial services. Achievement motivation (0.051–0.091) and level of aspiration (0.056–0.082) may encourage women to pursue better economic opportunities and make greater use of available financial resources.

The relatively higher interaction coefficients among big farm women, particularly for annual income (0.231), herd size (0.216), risk-bearing ability (0.184) and information-seeking behaviour (0.173), may be attributed to their larger scale of dairy operations, higher financial requirements and greater exposure to institutional transactions. In contrast, the comparatively lower coefficients among small farm women may reflect their limited asset base

and smaller financial surplus. The negative interaction of economic motivation (-0.068 to -0.126) may indicate that economically motivated women tend to prioritize direct investment in dairy activities rather than formal financial services.

Table 08: Moderation Effect of Farm Size on the Relationship between Selected Profile Characteristics and Financial Inclusion of Women Dairy Cooperative Members

(n=240)

Sl.No.	Profile Variable	TMK Small	TMK Big	CBP Small	CBP Big
		β_{int}	β_{int}	β_{int}	β_{int}
1	Age	-0.041 NS	-0.067 NS	-0.052 NS	-0.073 NS
2	Education	0.038 *	0.056 **	0.031 *	0.049 *
3	Marital Status	-0.029 NS	-0.041 NS	-0.036 NS	-0.048 NS
4	Experience in Dairy Farming	0.044 *	0.061 **	0.039 *	0.052 *
5	Family Size	-0.086 *	-0.118 **	-0.079 *	-0.105 *
6	Annual Income	0.176 **	0.231 **	0.158 **	0.207 **
7	Herd Size	0.142 **	0.216 **	0.129 *	0.194 **
8	Training Participation	0.071 *	0.109 **	0.064 *	0.096 **
9	Extension Participation	0.028 NS	0.046 *	0.031 NS	0.052 *
10	Organizational Participation	0.119 *	0.168 **	0.107 *	0.151 **
11	Scientific Orientation	0.082 *	0.127 **	0.074 *	0.115 **
12	Achievement Motivation	0.059 *	0.091 *	0.051 *	0.083 *
13	Level of Aspiration	0.064 *	0.082 *	0.056 *	0.074 *
14	Economic Motivation	-0.073 *	-0.126 **	-0.068 *	-0.109 **
15	Risk-Bearing Ability	0.131 **	0.184 **	0.118 *	0.169 **
16	Information Seeking Behaviour	0.116 **	0.173 **	0.103 *	0.158 **
17	Marketing Behaviour	0.047 NS	0.069 *	0.041 NS	0.062 *

Note: Farm size was used as a moderator and coded as Small farm women = 0 and Big farm women = 1. β_{int} denotes the interaction coefficient representing the differential effect of predictor variables across farm-size categories. Positive significant β_{int} values indicate a relatively stronger association among big farm women, while negative significant β_{int} values indicate a relatively weaker association among big farm women, relative to small farm women. NS indicates that the relationship did not differ significantly by farm size. The absolute effect within each group should be interpreted in conjunction with the respective main-effect coefficient. *Significant at 5 per cent level; **Significant at 1 per cent level

CONCLUSION:

Overall, the study concluded that women dairy cooperatives played an important role in enhancing the financial inclusion of women dairy farmers by improving their access to savings, credit, insurance, banking services and financial information. The level of financial inclusion was predominantly medium, with big farm women generally showing better financial inclusion than small farm women. The significant improvement in financial outcomes after joining the cooperative further indicated the positive economic contribution of cooperative membership. Financial inclusion was influenced by important factors such as education, annual income, livestock possession, dairy farming experience, training, scientific orientation, motivation, risk-bearing ability and information-seeking behaviour, while the moderation analysis indicated that farm size influenced several of these relationships. The findings therefore emphasize the need to strengthen dairy cooperatives as platforms for financial literacy, institutional credit, insurance, training and dissemination of financial information, with special attention to small farm women to reduce disparities and enable greater participation in formal financial services.

Policy Recommendations:

- Financial literacy and practical training should be provided regularly to improve women's knowledge of savings, credit, insurance, digital banking and financial management.
- Special support should be provided to small farm women, particularly through easier access to institutional credit, livestock development programmes and income-generating opportunities.
- Policies should promote livestock asset creation and income enhancement, since herd size and annual income were important contributors to financial inclusion.
- Extension and cooperative agencies should strengthen financial information dissemination, enabling women to identify and effectively utilize available banking, credit, insurance and government schemes.
- Greater emphasis should be placed on women participation in cooperative organizations and decision-making, so that they can better access financial and economic opportunities available through the cooperative system.

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