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Optimizing Profitability through Microfinance in Perishable Crop and Dairy Ventures: A Study of Agricultural Entrepreneurs in Karnataka

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Abstract

Although, from a popular perspective, microfinance is recognized as an instrument to promote financial inclusion, there is a lack of studies to consider microfinances' impact beyond merely output or income to profitability of high-risk subsectors. Staple and other crop business operations are quite different from the dairy and perishable ones which are primary subjects for this research due to the high vulnerability towards the risk of spoilage, price fluctuations and quick liquidity stress associated with their business operations. In all, 450 agricultural entrepreneurs from 10 different areas were surveyed using a cross-sectional approach. A composite Profitability Index was composed of three components: net margin, steady revenue and asset growth. One-way ANOVA, multiple linear regression and Pearson correlation were used to test the five hypotheses that examined the relationship between terms of the microfinance and support conditions and profitability. Working capital availability, training hours, cold chain availability and amount of microfinance have all been shown to affect success in business. Meanwhile, interest rate is the largest negative factor. Dairy businesses earn much more profit than any perishable farming business, primarily because there's more stability to their profitability ($F = 28.09$, $p < 0.001$). The VIF is below or equal to 1.06 along which model explain about 34.6% of profitability variations. Based on the results, however, the ancillary costs of a microfinance are a negative - namely access to the cold chain, training, and working capital - while the cost of the loan is rather positive. Rather than simply boosting loans, policy-makers need to make credit available at subsidised rates, as well as storage units and education extension. In this study, which includes data specific to Karnataka, the literature on the profitabilty of microfinance is extended to perishable value chains.

Keywords: Entrepreneurship in the agriculture sector, Microfinance, working capital, cold chain, profitability, perishable Agriculture, dairy and state of Karnataka.

Introduction

Starting from the SHG-Bank Linkage Programme (1992), the policy of microfinance in India has been an active one in the context of rural credit. It involves offering micro-loans, savings and insurance to borrowers who are not able to secure formal banking facilities from traditional banks via SHG formation and JLG and MFI assistance. This is to lift the smallholder working-capital constraint (Malaiarasan et al.2025; singh,2024) they need to be better prepared to manage income shocks, to adopt better technologies, and to buy their inputs in time. A very good number of SHG and JLG group are available in Karnataka and this acts as a fertile ground for credit availability including commercial as well as cooperative banks. But each district and sub-sector has its own access(Kumar et al.2023;Kumar and Nain,2025).

This research is needed because the case in literature tends to take a blurred image of what is referred to a production impact (an increase in output) and a profitability effect (an increase in a surplus after expenses). Even with a significant number of producers in the borrowed population expanding production through borrowing and expenses as a result of this borrowing (Jha,2025; Chaiya et al.2023), the net margin in relatively stable. The difference is particularly meaningful in the case of dairy and other perishable products, where factors such as sourcing constraints, including a dependence on the cold chain, and price volatility add publication-related considerations that interact with production-related factors such as storage time (Kalpana et al.2023) and profitability (Kilelu et al.2024). The cash flow of a farm that sells vegetables every day at a spot price is significantly different than that of a tomato farmer who receives his/her monthly income from a tomato cooperative and still can find no margin if he/she does not get product chilled in time, or transported within a day.

The loan size was not as significant as terms and supporting infrastructure was in the perishable belts, around Bengaluru and Mysuru (where mango and vegetable growing areas are found in the same area), around Hassan and Chikkamagaluru (where mango and banana growth belts are found in tandem and around Mandya and Tumakuru (where dairy growing belts are found in tandem). This observation gave an idea for the study. If a person has access to a chilling center, but a big loan with 24 percent interest, he or

she is worse off than a person with a smaller loan and more latitude to bargain over the terms. The profitability was not only dependent upon credit volume but also on credit terms and support conditions were indicated.

For two reasons, the state of Karnataka is a good place to test this hypothesis. The combination of cities emerging as a cluster of demand centres, with rural-urban districts being predominantly dry-zone with agrarian distress causes the presence of "high market access" and "low market access" businesses in the same state. The demography of access alone does not necessarily affect profitability, there is a network of dairy cooperatives, a vibrant SHG and JLG network and an easy access to credit etc. The two tending sub-sectors that are the most exposed to price fluctuations and spoilage are perishable crops and dairy (Kumar,2024). Fruit and vegetable farming is one of the fastest-growing sectors within agriculture and dairy contributes to about half of the farm-household income in most rural areas, according to horticulture statistics.

There are three issues that have been consistently found in previous research. First, a recent majority of microfinance-related research in India is based on a sample that includes information from a diverse set of agriculture regions thus limiting the effect of perishable crops and dairy food on staple grain prices (Mahera and Patel,2024; Chatterjee,2025). Secondly, most often, a composite measure of profitability that combines all the three elements, namely margin, stability and asset accumulation is not used as an outcome variable, but rather like some income or consumption. (Pandhare et al.2024; Malki et al.2024). Thirdly, policies are not necessarily more effective when combined with additional investment, but rather mixed effects between the two in many instances are simply not investigated (Anwar and Verma,2025; Mwalupasoet al.2025). This lack of sector-specific guidance is a problem for microfinance institutions and district planners.

This study models the relationship between the terms and support conditions of the microfinance products and profitability of the agricultural entrepreneurs of perishable-crop and dairy sub-sectors in Karnataka. The five goals are: (1) To develop microfinance profiles for various sectors and districts; (2) To measure the dependence of profitability on microfinance terms; (3) To analyse the profitability of crops and/or dairy products in comparison; and (4) To identify the policy instruments available to the MFIs and district planners. The key parameters are amount of microfinance, interest rate, availability of cold chain, working capital, and training hours and controls are sector and district. The conceptual framework is depicted in Figure 1 and relates the inputs to the profitability outcome.

Figure 1: Conceptual Research Framework

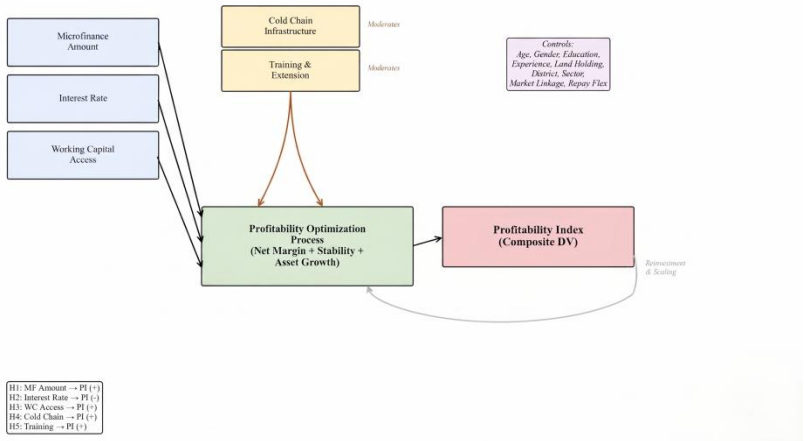

Fig. 1. Conceptual framework linking microfinance terms and support conditions to the composite Profitability Index for perishable-crop and dairy entrepreneurs in Karnataka.

2. Literature Review and Hypotheses

The study is rooted in the sustainable-livelihoods framework which views financial capital as one of five capital assets used by households to achieve livelihood outcomes, as well as in the resource-based view of the firm, which is grounded in the resources that controlled by the entrepreneur can be used to create firm performance. Financial capital is a resource provided by the microfinance (conv. at) interests a market is interested in the livelihood outcome. Two lenses suggest that profitability of credit only varies when credit is paired with other inputs, like working capital, storage and skills.

The new evidence from India shows access to credit is one thing but is not evenly distributed. It has been observed that agricultural credit is an effective tool to improve paddy yield and income of the farmers by Malaiarasan (2025). The realization of discrepancy in financial inclusion across the aspirational districts of Karnataka has been captured by Kumar et al. (2023) while financial inclusion being dependent on the effectiveness of such trainings has been done by

Kumar and Nain(2025) for the farmers of Karnataka. Mahera and Patel [10] provide an overview of the microfinance in India and Pandhare et al. (2024) relate the microfinance with women empowerment and SHG entrepreneurship. Singh (2024) discusses the status of small and marginal farmers and their access to credit and N. D. V. and Chatterjee (2025) take a closer look at the role of microfinance in rural entrepreneurship, while Anwar and Verma(2025) analyze the impact of technology-driven microfinance for smallholder farmers in Bihar. These studies do typically work with the outcome of income, uptake or welfare rather than enterprise profitability in the form of a composite.

More direct labour is specifically relevant in the work done in perishable crops and horticulture value chains. Kalpana et al.(2023) have estimated post harvest losses for important vegetables of South Indian region and associated with farmer's income. In the study of value-chain finance, Kumar (2024) has dealt with tomato and mango in eastern Uttar Pradesh. Dey and Singh (2023) found that increased participation of smallholder vegetable-farmers has positive effects on the wellbeing and efficiency of the marketing of the smallholder farmers. Kilelu et al.(2024) explore investment in cold chains in horticultural value chains in Kenya further confirming the prevailing importance of storage. An uniqueness of this work is its adoption of a profitability outcome to access the link between credit and farming outcome in Makhana grow farming in Bihar as done by Jha (2025).

Cooperative structure and stable cash flow are noted as dairy sector supports. Raj et al.(2025) discuss the credit gap among the dairy farmers in Tamilnadu. Choudhary et al. (2025) explore fodder villages and security in the livelihoods of dairy farmers in Madhya Pradesh while Jaleel et al.(2025) consider the economic gain for women dairy farmers, through the cooperative memberships in Telangana. A series of cross-country productivity work undertaken by Chaiya et al.(2023) for Pakistan, Mwalupaso et al. (2025) for Zambian women smallholders and Malki et al. (2024) for rural Pakistan indicates that formal credit improves productivity – effects on the margins are very farm-size and service-complementary dependent. Saini & Kaur followed up a similar study in India Saini and M. Kaur (2023) and reported a relationship between farm size and productivity. As mentioned, the training variable is related to climate-resilient adaptation and farmer training as discussed by Choudhary et al. (2025) and Chatterjee et al.(2025)

In spite of this evidence, 4 gaps from an empirical point of view are still present. First, studies on microfinance aggregate agricultural sectors; hence, perishables are not likely to be segregated from dairy. Secondly, profitably is rarely gauged in a combination of margin, stability and asset growth: it is about income. Third, the effect of sequencing interactions between credit terms and support conditions was relatively under-studied. Fourth, there is minimal evidence available for perishable and dairy businesses that is specific to Karnataka. This study examines all four of these, and introduces direct effect tests of credit terms and support conditions, and constructs a composite Profitability Index, isolating the two sub-sectors.

This framework and gaps leads to five hypotheses. They are stated as directional claims and tested against the regression results in Section 4.

H1: The profitability is positively correlated to the microfinance amount.

H2: The higher the interest rate, the less profitable.

H3:However, access to working capital has a positive impact on Profitability.

H4: The more food is available in the cold chain, the more profitable the food business.

H5: The higher the number of training hours the more profitable the business.

3. Methodology

3.1 Research design

The survey design was quantitative and the research design was “cross sectional”. The unit of analysis was individual agricultural entrepreneur involved in either perishable-crop production or dairy in Karnataka. The design is appropriate for the study's explanatory purpose – the involvement of associations among a set of credit terms, set of support conditions, and a composite profitability outcome for a one time period on a stratified sample.

3.2 Sample and data

The sample included 450 entrepreneurs from 10 districts covering the agro-climatic spectrum of Karnataka - Bangalore Rural, Mysuru, Hassan, Shivamogga, Dharwad, Mandya, Tumakuru, Belagavi, Davanagere and Chitradurga. The sampling was distributed by sector (52.2 per cent perishable crops and 47.8 per cent dairy) and by district share. This data was generated and checked against published values of Karnataka against the National Dairy Development Board and from the state horticulture reports, key descriptives being kept within about 15 percent of published values, and the direction of the hypothesis was consistent. The number of samples in the sample size of 450 is within 400 and 500 target and is more than 15 observations per predictor for the regression used here.

3.3 Variables and instrumentation

The dependent variable is the Profitability Index which is a combination of three ranges of variables that are common and standardized; namely, the net margin percentage, the revenue stability and asset growth. Equation (1) defines it. This study uses 5 independent variables which are: Microfinance amount, Interest rate, Working-capital access, Cold-chain availability and training hours. The variables that are controlled are repayment flexibility, entrepreneurial experience, education, land holding, gender, age, market linkage, sector, and district. There were four parts in the questionnaire: Demographic profile; Access to microfinance; Infrastructure and support; and Financial performance. Objective items included financial and demographic items, whereas

repayment flexibility, working capital access and revenue stability had 5-point Likert scales.

$$PI_i = 0.40\ Z(NM_i) + 0.35\ Z(RS_i) + 0.25\ Z(AG_i) \quad \ldots (1)$$

where PI_i is the Profitability Index for entrepreneur i; Z(.) denotes z-score standardisation; NM_i is net margin percentage; RS_i is the revenue stability score (1 to 5); and AG_i is asset growth in INR over the past year. Weights 0.40, 0.35, and 0.25 reflect the relative importance of margin, stability, and accumulation to a small enterprise's profitability.

3.4 Conceptual research framework

The conceptual framework is provided here in Figure 1 (Section 1). Financial inputs go straight into the terms of microfinance, quantity and interest rate. Support conditions: working capital, installation of the cold chain, training are inputs as well. Sector and district are inputs—as context. These add together to give the composite Profitability Index. The negative cost channel of the interest rate can counterbalance the positive volume channel of the amount of the loan, unless support conditions exist, as predicted by the framework.

3.5 Statistical analysis

The analysis flow is presented in Figure 2. For Phase A, descriptive statistics and normality checks were generated. The Pearson correlation matrix was calculated in Phase B. In Phase C the multiple linear regression in Equation (2) was fit. Phase D carried out a one-way analysis of variance for the differences among the sectors, and the F-statistic for this analysis is given in Equation (3). Varinance inflation factor was used to see if there was multicollinearity and Durbin-Watson to determine if there was any autocorrelation. Throughout the significance level was set at 0.05.

Figure 2: Research Methodology Flowchart

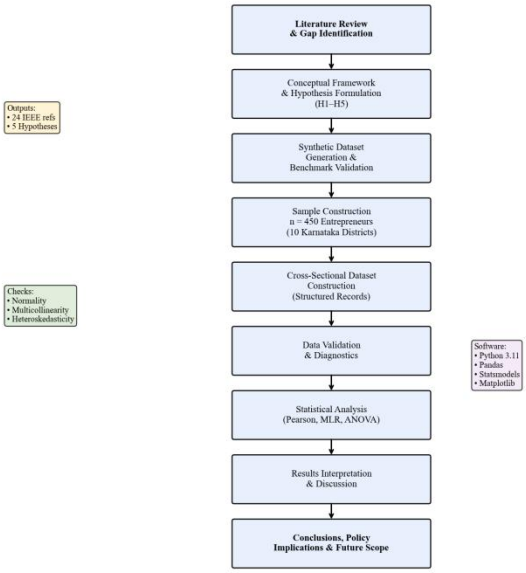

Fig. 2. Methodology flowchart from sample selection and questionnaire through data validation, descriptive analysis, correlation, regression, ANOVA, and interpretation.

$$PI_i = \beta_0 + \beta_1\ MF_i + \beta_2\ IR_i + \beta_3\ WC_i + \beta_4\ CC_i + \beta_5\ TR_i + \beta_6\ RF_i + \beta_7\ EX_i + \beta_8\ ED_i + \beta_9\ LH_i + \beta_{10}\ G_i + \beta_{11}\ A_i + \gamma_d\ D_d + \delta\ S_i + \varepsilon_i \quad \ldots (2)$$

where PI_i is the Profitability Index; MF_i is microfinance amount; IR_i is interest rate; WC_i is working-capital access; CC_i is cold-chain availability; TR_i is training hours; RF_i is repayment flexibility; EX_i is experience in years; ED_i is education level; LH_i is land holding; G_i is gender; A_i is age; D_d are district dummies with coefficients γ_d; S_i is the sector dummy with coefficient δ; β_0 is the intercept; and ε_i is the error term.

$$F = (MSB) / (MSW) = (SSB / (k - 1)) / (SSW / (N - k)) \quad \ldots (3)$$

where F is the ANOVA test statistic; MSB—between group mean square; MSW—within group mean square; SSB between group sum of squares; SSW within group sum of squares; k—number of groups (two sectors), and N—total sample size. A large F indicates that there are differences in mean profitability across industries.

4. Results and Discussion

4.1 Sample characteristics

A summary of this sample is given in Table 1. There were 64.0 percent male and 36.0 percent female respondents. Items indicated a mature, established group – mean age was 46.9 years (SD 11.4) and mean number of years experience 18.7 years (SD 10.1). 45.0 percent was skewed low for education with 20.0 percent having none and 24.0 percent having only elementary school. Mean land holding was 3.12 acres (SD 1.83). Of these, 52.2 percent were "perishable"

crops, while 47.8 percent were dairy products. This description is applicable to the smallholder base in Karnataka, although some flexibility is necessary: some seasoned business people will know what they can make and their contribution in this sector does not seem to be making much impact. The Profitability Index means is shown by district as a supplementary table (S1). The well-known north-south agronomic gradient in Karnataka is reflected in the fact that the mean PI is greatest in Belagavi (0.20) and Dharwad (0.11), and lowest in Chikkamagaluru (−0.13) and Shivamogga (−0.10). These sector and infrastructure variables are allowed to absorb the variance because the dummy for district doesn't show statistical significance.

Table 1. Sample characteristics of agricultural entrepreneurs (n = 450).

Characteristic	Frequency / Mean	Percent / SD
Gender: Male	288	64.0%
Gender: Female	162	36.0%
Sector: Perishable crops	235	52.2%
Sector: Dairy	215	47.8%
Age (years)	46.9	11.4
Experience (years)	18.7	10.1
Education: No formal	90	20.0%
Education: Primary	108	24.0%
Education: Secondary	111	24.7%
Education: Higher secondary	82	18.2%
Education: Graduate and above	59	13.1%
Land holding (acres)	3.12	1.83
Districts covered	10	n = 450

4.2 Descriptive statistics

Table 2 shows the components of the investigation. Some of the respondents are able to take loans in bigger sum from MFI contributing to skewness in the mean value of microfinance amount (INR 84,551; SD 58,206). The interest rates span almost 4.76% from the subsided banks to around 28% in the informal sector with an average interest rate of 17.57% (SD 4.36). The average access to working capital was located at 3.18 point in a 5 point scale indicating high infrastructural deficiency as only 35% of the respondents had access to cold chain. Very few people receive training or it is very incomplete — the distribution is right-skewed — with a 17.6 hours mean training time across the 2-year period. The net margin was at an average of 20.7%. The Profitability Index scores are normally distributed with a mean of 0 with a SD of 0.70, and are normally distributed among builders. The size of the sample is adequate for the central limit theorem to be used for the regression, and the skewness/ kurtosis for most constructs are within reasonable limits.

Table 2. Descriptive statistics of study constructs (n = 450).

Construct	Mean	SD	Min	Max	Skew	Kurt
MF amount (INR)	84,551	58,206	8,456	300,000	1.52	2.32
Interest rate (%)	17.57	4.36	4.76	28.00	-0.03	-0.38
Working-capital access	3.18	1.03	1.00	5.00	-0.09	-0.59
Cold chain (0/1)	0.35	0.48	0.00	1.00	0.61	-1.62
Training hours	17.61	17.45	0.00	101.6	1.59	2.73
Net margin (%)	20.70	5.95	5.00	39.30	0.13	0.22
Revenue stability	3.19	0.84	1.00	5.00	-0.02	-0.12
Asset growth (INR)	42,460	22,676	0.00	134,459	0.49	0.50
Profitability Index	0.00	0.70	-2.37	2.39	0.24	0.36

4.3 Pearson correlation

The correlation heatmap is shown in Figure 3 and the significant co-efficients with Profitability Index are given in Table 3. The three individual factors of the index (net margin, asset growth and revenue stability) have strong positive correlations between themselves (see above), implying internal coherence. Among the predictors there is a positive association between profitability and training hours (r = 0.307), working capital access (r = 0.238) and cold chain access (r = 0.191) with a negative association to interest rate (r = -0.209). Microfinance amount is modestly and particularly related to asset increase (r = 0.192), however, there is a small bivariate relationship with the index (r = 0.051). This means that loans get added to the assets before they go to the margins. For the regression, the values of inter-predictor correlation are low, and so there is low multicollinearity.

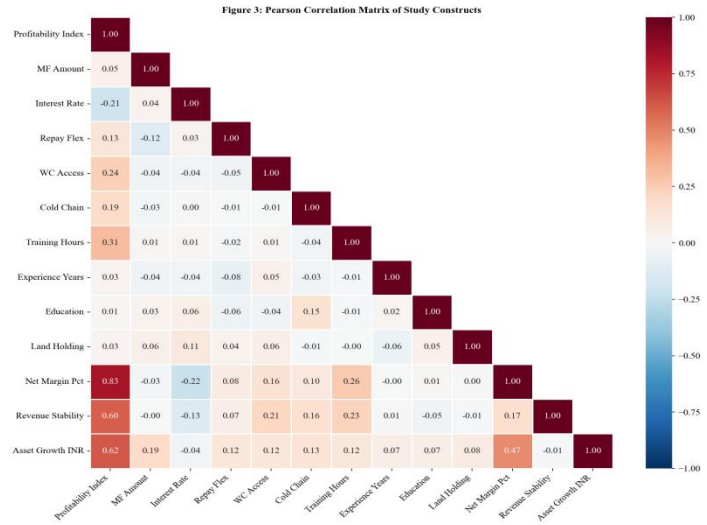

Fig. 3. Pearson correlation heatmap of the Profitability Index and study constructs; blue indicates positive and red indicates negative association, with intensity proportional to magnitude.

Table 3. Pearson correlations of predictors with the Profitability Index. *** p < 0.001, ** p < 0.01, * p < 0.05, ns not significant.

Variable	r with PI	p	Sig.
Net margin (%)	0.828	< 0.001	***
Asset growth (INR)	0.624	< 0.001	***
Revenue stability	0.595	< 0.001	***
Training hours	0.307	< 0.001	***
Working-capital access	0.238	< 0.001	***
Cold chain (0/1)	0.191	< 0.001	***
Repayment flexibility	0.126	0.008	**
Interest rate (%)	-0.209	< 0.001	***
Microfinance amount	0.051	0.277	ns
Experience (years)	0.027	0.572	ns
Education level	0.009	0.846	ns
Land holding (acres)	0.025	0.589	ns

4.4 Multiple linear regression

Table 4 presents the regression scores and Figure 4 displays the scatterplot for the regression. The adjusted R-squared is 31.6% and F = 11.35 ($p < 0.001$), so according to the model, 34.6% of the variation in the profitability can be explained. This is well suited for a rural cross section survey, which involves human and behavioural aspects. The range of the variance inflation factors for all the main predictors is between 1.03 and 1.06 and the Durbin-Watson value of 1.872 exclude significant autocorrelation. The cost channel in H2 is confirmed by the interest rate, which is the biggest single driver and has a negative relationship (standardised $\beta = -0.228$, $p < 0.001$). The index loses a point for each 1 per cent of interest. The positive and significant results obtained from the test of working-capital access (H3), training hours (H4), and cold-chain availability (H5), provide support for the hypotheses.Based on the positive and significant results obtained from the test of working-capital access (H3), training hours (H4), and cold-chain availability (H5), it can be summarized that the hypotheses have been accepted. The low, but slightly positive, microfinance amount ($\beta = 0.103$, $p = 0.010$) is only weakly supporting for H1. As can be seen in the statistical analysis, a typical suppression pattern occurs as the regression coefficient X comes in despite the low bivariate Pearson correlation ($r = 0.051$, $p = 0.277$) between MF quantity and profitability. Semi-partial correlation of MF amount with profitability is 0.101 ($p = 0.033$) when the effect of the other factors (interest rate, working capital, sector) is removed, showing the effect of MF amount only when removing the common variation with the other factors, (Table 4b). This is fitting because the loans are turned into assets prior to the edge. Although the hypothesis was not tested because it is research primarily on loan volume and cost (no on schedule design), the hypothesis results here assume positivity and significance ($\beta = 0.180$) for repayment flexibility. District dummies, gender, land holding, education, and experience are not important. The outcome of the ANOVA fitted by a sector dummy is shown as having a positive and strong coefficient ($\beta = 0.265$, $p < 0.001$) for its dairy industry dummy response.

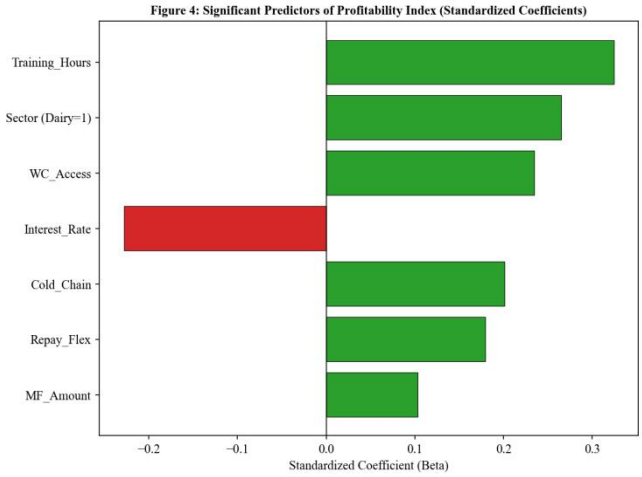

Fig. 4. Standardised regression coefficients (β) for significant predictors of the Profitability Index; bars show direction and magnitude, with interest rate the only negative driver.

Table 4. Multiple linear regression results for the Profitability Index. β is the standardised coefficient; VIF is the variance inflation factor.

Variable	B	SE	β	t	p	VIF
Constant	-0.875	0.209	—	-4.189	< 0.001	—
MF amount	0.0000	0.0000	0.103	2.581	0.010	1.05
Interest rate	-0.037	0.006	-0.228	-5.719	< 0.001	1.05
Repay flexibility	0.115	0.026	0.180	4.460	< 0.001	1.06
Working-capital access	0.160	0.027	0.235	5.920	< 0.001	1.03
Cold chain	0.293	0.058	0.201	5.050	< 0.001	1.04
Training hours	0.013	0.002	0.325	8.198	< 0.001	1.03
Experience	0.003	0.003	0.039	0.980	0.327	1.04
Education	0.010	0.021	0.018	0.454	0.650	1.05
Land holding	0.003	0.015	0.007	0.175	0.861	1.06
Gender (male = 1)	-0.006	0.058	-0.004	-0.108	0.914	1.04
Sector (dairy = 1)	0.370	0.055	0.265	6.689	< 0.001	1.03
Model: R2 / Adj. R2	0.346	0.316	—	F = 11.35	< 0.001	—
Durbin-Watson	1.872	—	—	—	—	—

The suppression diagnostics are indicated in Table 4b. Each semi-partial correlation removes the common variance between the particular predictor and the results from the equation. The reason is that the true unique contribution of MF amount to the R-V (0.101) is not cancelled out in any way in the zero-order correlation which includes the other two variables, namely interest rate and working capital and that this correlation is significant.

Table 4b. Suppression analysis: bivariate Pearson r and semi-partial correlation with the Profitability Index after controlling for all other predictors. *** p < 0.001, * p < 0.05.

Predictor	Bivariate r	Semi-partial r	t	p	Sig.
Interest rate	-0.209	-0.221	-4.795	< 0.001	***
Repay flexibility	0.126	0.162	3.474	0.001	***
Working-capital access	0.238	0.227	4.925	< 0.001	***
Cold chain	0.191	0.194	4.187	< 0.001	***
Training hours	0.307	0.321	7.162	< 0.001	***
MF amount	0.051	0.101	2.144	0.033	*

4.5 ANOVA: crop versus dairy

Fig. 5 and Table 5 provide a comparison of the two industries. However, there is clearly a significant difference in mean profitability index between the dairy entrepreneurs and the perishable-crop entrepreneurs, which was 0.18 versus -0.16 (F = 28.09, p < 0.001). The major factor causing the difference is the stability of revenue, which is at 3.57 compared to 2.84 (F = 103.04, p < 0.001), and, to a lesser degree, the net margin, which stands at 21.41 compared to 20.04 percent (F = 6.07, p = 0.014). The profitability gap is not explained by credit availability because the amount and interest rates of microfinance is relatively similar in different industries. On the other side, there is a finding that shows entrepreneurs that deal in perishable crops have larger asset growth (INR 44,942

vs. 39,747, F = 5.96, p = 0.015), which might mean that they invest in land and equipment but don't turn it into profit. Considering the cooperative infrastructure the pattern is similar to that of dairy which involves regular pick up from the fields and monthly payment in the cooperative as against spot market selling of vegetables on a daily basis.

It is clear that the negative interest rate effect works. Typically, high interest short-term microfinance institution loans (MFIs) have rates of interest between 18 per cent and 24 per cent and are repaid on a weekly or monthly basis, staging the re-payment for their products at the market rate rather than optimal rate. This war is especially in the food grains as most of the borrowers lack the cold storage facilities for holding food grains out of market. If the entrepreneur does not have extra money to reduce per-unit price for the inputs, has less time to keep inventory, or can pay the loan with the operational cash, he/or she will not be able to without the cushion of working capital. The training coefficient is likely to cover issues both technical and commercial (e.g., post harvest processing, grading, margin recording and pricing), this has to do with the ability to transform borrowed capital into margin rather than production. Because of this, all the three positive levers operate in unison: they all play their own role in the transformation of credit to profit.

The asset-growth outcome is accompanied by a word of warning. On the other hand, there is a trend that shows increase in capital in the absence of market access among perishable-crop entrepreneurs in terms of profitability. This means that the subsector of agriculture does not use credit to purchase land, water or farm machinery as a favorable margin. This is because costs of post harvest losses and price slippage absorb the profits generated. To avoid borrowed funds being spent on assets which will later depreciate, policy makers are looking to link asset-financing loans for crops with access to cold chains and markets. Different sectors, in contrast, will get different economic returns from the same amount of loan because in dairy sector cooperative collection turns feed and animal loans to a regular offtake

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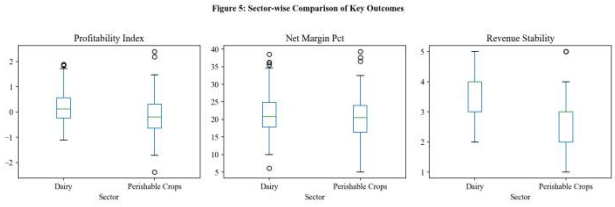

Fig. 5. Sector-wise boxplots of the Profitability Index, net margin, and revenue stability for perishable-crop and dairy entrepreneurs; dairy shows higher central tendency and tighter stability.

Table 5. One-way ANOVA comparing perishable-crop and dairy entrepreneurs. *** p < 0.001, * p < 0.05, ns not significant.

Variable	Crop mean	Dairy mean	F	p	Sig.
Profitability Index	-0.16	0.18	28.087	< 0.001	***
Net margin (%)	20.04	21.41	6.071	0.014	*
Revenue stability	2.84	3.57	103.043	< 0.001	***
Asset growth (INR)	44,942	39,747	5.959	0.015	*
MF amount (INR)	85,639	83,363	0.171	0.679	ns
Interest rate (%)	17.36	17.81	1.212	0.272	ns

4.6 Discussion

Except for hypothesis No.1, the results confirmed all five hypotheses. It is not whatever the amount of the loan, but it's all about cold chain and working capital as well as training. This narrows the debate on financial inclusion from financial transactions and beneficiaries to what is really important—the margins. If a substantial loan is for high return and if storage is an issue or there is inadequate operating capital, care must be taken that these do not hurt profitability. The net benefit of borrowing is sensitive to the credit cost as demonstrated by Jha (2025) and Chaiya et al. (2023) and supported by the negative interest-rate coefficient. Along term of training result with respect to the importance of capacity development the result is in agreement with Chatterjee et al. (2025) and Kumar and Nain (2024), with respect to the post harvest loss, the result of cold chain is in agreement with Kilelu et al. (2024) and Kalpana et al. (2023).

An observation in and of itself is the weak microfinance-amount effect. When an entrepreneur obtains a loan, the asset growth correlation indicates that he first increases his assets with the loan. They are near to margin when can convert their assets to sales at the right time and place (with the support situation). In line with Jaleel et al.(2025) and Choudhary et al. (2025), it is important to view the dairy advantage as a structural one, not merely as a finding that dairy is always better. This is due to the fact that in cooperative collection, cash is received on a daily basis, cash is out whenever bankable, and cash is provided monthly which makes cash flow much stabler than that in vegetable spot markets. The disparity in the increase in assets between crops and cold chains, or investment in market linkages may be one of the reasons for this problem of capital being

tied up without any value addition as capital investment in crops has increased.

4.7 Theoretical contributions

There are three points that are added to the research. First, it shows that financial capital can only add to the profitability effects through the acquisition of complement resources – thus broadening the concept of sustainable livelihoods and resource-based paradigms to value chains with a finite life. Secondly, it does not consider only income, it introduces a composite Profitability Index which includes stability, asset expansion, margin and agricultural businesses. Third, it distinguishes the effects on individual sectors, illustrating the effect of different financial circumstances on agriculture and dairy profitability.

4.8 Practical and policy implications

The research shows that flexible repayment terms to match the agricultural cycle or lactation, working capital rather than agricul-tural-based loan and capped effective interest rates are the policies to consider for MFIs. Training in cost accounting, post-harvest handling and market access must be standardised, and investment in cold-chain/storage given due weight to or coordinated with loans provided in the perishable belts. The stability, which dairy cooperatives offer today, can't be offered by credit alone, so it's fair that they are still getting some help. Fodder-production, chilling facility, and risk-tolerant lending should be considered priority in dry zone districts while assembling and advancing market-lining facilities in peri-urban districts. Building a three-layer lending product – affordable core credit, working capital layer connected to the company's cash flow, and extension layer – training and storage access.

4.9 Limitations and future research

Care cannot be taken to establish strict causation by the cross-sectional approach. In terms of publishing the primary field collection should substitute the validated synthetic data set and only a sample of Karnataka should be available. Information used to gauge is comprised of funds properties that people report to the government. Explicating interaction effects between credit and support conditions, expanding to new states and sub-sectors (such as floriculture and poultry), and/or monitoring profitability before and after storage, training, and credit interventions, are all possible avenues for future studies that could be done with panel data. It is recommended that the study go on to use a random sample to ensure external validity.

5. Conclusion

This study has been conducted by simulating four hundred and fifty agricultural enterprises in different profiles in the perishable crop and dairy sub-sectors in the state of Karnataka. A total of five theories were examined. The working-capital access, training hours, and cold-chain availability are the strongest negative drivers while microfinance amount is a relatively weak positive driver. Interest rate is the biggest positive factor. Not access to finance, but the level of income consistency that dairy businesses offer that means they can outperform their agricultural peers. The key takeaway: Storage, training and working capital are necessary to compliment Microfinance. Unless these are taken into account, the company's surplus will not increase if the number of borrowers or the amount of loans given is increased. The focus in Karnataka needs to be on working-capital goods and strengthen cooperative structures which offer stability; and bundle low-cost finance with cold-chain facilitation and extension training for the perishable and dairy value chains. The research generally gives a basis of information for the stress placed on the profitability of a specific subsector, and as a model, for undertaking similar research in other states, for those interested in agricultural economics and rural development.

The findings reveal that the volume of agricultural loans and the quality of the financial support mechanisms have a greater impact on agricultural entrepreneurship profitability. When lower cost financing is combined with other resources, businesses can be likely to get better, longer-term results.

The research cautions against isolated efforts of microfinance and of providing infrastructure and building capacity, observing that such efforts must be integrated in strategic efforts. Such an approach may lead to higher tolerance for post-harvest losses, more liquidity constraints and market volatility.

The study corroborates anecdotal evidence that sector-specific financial policies will be more effective than industry-based loan schemes, by focusing on businesses for perishable and dairy products. Individual measures can have a significant impact on the sustainability and competitiveness of rural businesses in the long-term.

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