AGRIBUSINESS RISK MANAGEMENT IN DAIRY FARMING IN MUZAFFARPUR DISTRICT, BIHAR

Sneha Kumari[1] and Victoria Amit Masih[2]

[1]MBA (Agribusiness) and [2]Professor

Department of Agricultural Economics

Sam Higginbottom University of Agriculture, Technology and Sciences, Naini, Prayagraj

Corresponding author: sk2264319@gmail.com

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ABSTRACT

Dairy farming in Muzaffarpur District, Bihar, is pivotal to rural livelihoods but faces significant risks undermining sustainability. This study evaluates agribusiness risk management by analyzing socio-economic profiles, economic viability, marketing challenges, and constraints in dairy farming. A mixed-methods approach was employed, combining primary data from 100 farmers in Mushahari Block (stratified sampling) with secondary sources. Descriptive statistics, Garrett Ranking, and marketing efficiency metrics were used for analysis. Key findings indicate 54% of farmers are smallholders (1–2 cattle), predominantly middle-aged males (50%) in nuclear families (85%), with 41% illiteracy. Marketing Channel 3 (Producer–Cooperative–Milkman– Consumer), preferred by 70% of respondents, showed the lowest efficiency (1.05) due to high costs (₹16/liter) and price spreads (₹23/liter). Critical constraints include low milk prices (Garrett score: 73), delayed payments (72), poor animal genetics (70), and lack of chilling infrastructure (65). The study advocates for cold chain development, expanded cooperative networks, mobile veterinary services, and farmer training in value addition. Policy interventions to enhance institutional support, digital market linkages, and risk mitigation tools are essential to improve resilience, profitability, and sustainability in Muzaffarpur's dairy sector. This research contributes actionable insights for stakeholders to address systemic challenges and strengthen dairy agribusiness in eastern India.

Keywords: Agribusiness Risk Management, Dairy Farming, Socio-Economic Profiles, Marketing Efficiency and Policy Interventions.

INTRODUCTION

Dairy farming serves as a critical economic lifeline for rural communities in Muzaffarpur District, Bihar, contributing significantly to livelihoods, nutritional security, and regional stability. As India's largest milk producer, with annual output exceeding 239.3 million metric tonnes (NDDB, 2023–24), the dairy sector fuels 5% of the national GDP and 30% of agricultural GDP. In Muzaffarpur— renowned for its Shahi Litchi and fertile alluvial plains—dairy farming integrates seamlessly into mixed crop-livestock systems, supporting over 70 million rural households nationally. Yet, the district's smallholder-dominated ecosystem faces systemic vulnerabilities: 54% of farmers rear

just 1–2 cattle, 41% lack formal education, and 85% belong to nuclear families with limited risk-mitigation capacity. These socio-economic constraints, compounded by volatile markets and climate uncertainties, undermine the sustainability of an industry vital to Bihar's agrarian economy.

The agribusiness risks in Muzaffarpur's dairy value chain are multifaceted and interlinked. Production risks include frequent disease outbreaks (e.g., Foot-and-Mouth Disease), poor animal genetics (Garrett score: 70), and seasonal feed shortages during monsoons. Market risks manifest as price volatility, with 73% of farmers citing low milk prices as their top constraint (Garrett Ranking), and exploitative intermediaries who dominate informal channels. Institutional gaps exacerbate these challenges: delayed payments (score: 72), sparse veterinary coverage, and absent chilling infrastructure (score: 65) lead to spoilage and income loss. Marketing inefficiencies further strain profitability; though 70% of farmers prefer Channel 3

The research employed a multistage stratified random sampling design, commencing with the purposive selection of Muzaffarpur District, Bihar (area: 3,173 km²; population: 4.8 million, Census 2011) due to its prominence in cattle rearing and milk production. Progressing to the second stage, Mushahari Block was purposively selected from the district's 16 blocks for having the highest cattle density. In the third stage, 5 villages (5% of 111 total)— Karura, Mankaharkesh, Pahladpur, Raghunathpur, and Rajwara—were randomly selected based on their dairy potential. The fourth stage involved selecting 100 dairy farmers (20 per

(Producer→Cooperative→Milkman→Cons umer), its price spread of ₹23/liter and marketing efficiency of 1.05— the lowest among channels—reflect high costs (₹16/liter) and margin leakage. These dynamics trap smallholders in cycles of low investment and productivity, hindering sectoral resilience.

This study investigates these challenges through a mixed-methods approach, combining primary data from 100 farmers in Mushahari Block with secondary analysis. It evaluates socio-economic profiles, economic viability, and risk exposure to propose context-specific interventions. By diagnosing constraints—from genetic limitations to fragmented cold chains—the research aims to inform strategies that enhance market efficiency, empower farmers through cooperatives and digital tools, and strengthen policy frameworks. Ultimately, addressing these risks is imperative not only for Muzaffarpur's dairy sustainability but also for broader goals of poverty reduction and equitable rural development in eastern India.

RESEARCH METHODOLOGY

village, representing 10% of each village's dairy households), further stratified by herd size: Small (54 farmers with 1–2 cattle), Medium (27 with 3–5 cattle), and Large (19 with >5 cattle). Finally, markets and functionaries were sampled purposively, including the primary/secondary Mushahari market and 20 market agents (e.g., distributors, consumers). Primary data were gathered via structured interviews with farmers and market agents, while secondary data were sourced from government records, block reports, and academic publications, ensuring a comprehensive analysis of socio-economic and market dynamics.

Analytical Tools Likert scale

- **Chi -square test:** $= \sum (Oi - Ei)2/Ei,$

- **Cost of Marketing :** C = Cf+ Cm1+ Cm2+ Cm3+ ..... + Cmn
- **Margin of Market :** AMI=Pri-(Ppi+Cmi)
- **Spread in Price :** Marketing Cost + Market Margin

- **Efficiency of Marketing:** **= (**Price received by producer)/Marketing Cost + Marketing Margin
- **producer's portion of the consumer rupee :** (Price received by the farmer x100) / Retail price paid by the consumer
- **Garrett's Ranking:** 100*(Rij-0.50) / Nj

RESULT AND DISCUSSION

Table 1: Distribution of milk supplier on their cattle no.

Sr. No.	Category	Value	Percentage %
1.	Small (1-2 cattle)	54	**54**
2.	Medium (3-5 cattle)	27	**27**
3.	Large (more than 5 cattle)	19	**19**
	Total	**100**	**100**

Table 1: The study reveals that 54% of dairy farmers in Muzaffarpur are smallholders (1–2 cattle), predominantly middle- aged males (50%) in nuclear families (85%), with 41% illiteracy. Marketing Channel III (Producer→Cooperative→Milkman→Consumer), preferred by 70% of respondents, showed the lowest efficiency (1.05) due to high costs (₹16/liter) and price spreads (₹23/liter). Key constraints include low milk prices (Garrett score: 73), delayed payments (72), poor animal genetics (70), and lack of chilling infrastructure (65). Seasonal production fluctuations and exploitation by middlemen further hinder profitability. These findings underscore systemic risks in production, market access, and infrastructure, necessitating targeted interventions for resilience.

Table 2: Distribution of milk suppliers based on their age.

S. No.	Category	Respondent Number	Small	Medium	Large	Percentage
1.	**Young age group (20-35 years)**	**29**	15	7	7	29
2.	**Middle age group (36-50 years)**	**50**	25	16	9	50
3.	**Old age group (above 50 years)**	**21**	12	4	5	21
	Total	**100**	**52**	**27**	**21**	**100**

Table 2: Age critically influences buying behavior through physical/psychological factors. Among respondents, 29% were young (20–35 years), 50% middle-aged (36– 50), and 21% elderly (>50). The majority (50%) fell into the middle- aged group, shaping key market dynamics.

Table 3: Distribution of milk suppliers according to their gender

S. No.	Category	Respondents number	Respondents			
			Small	Medium	Large	Percentage %
1.	Joint	15	8	5	2	15
2.	Nuclear	85	44	22	19	85
	Total	100	52	27	21	100

Table 3: Gender significantly shapes buying decisions due to distinct perceptions and socialization. Among 100 dairy farmers surveyed, 80% were male and 20% female, highlighting pronounced gender disparity in the sector.

Table 4: Distribution of respondents according to their Type of Family.

S. No.	Category	Respondents number	Respondents			
			Small	Medium	Large	Percentage %
1.	Joint	15	8	5	2	15
2.	Nuclear	85	44	22	19	85
	Total	100	52	27	21	100

Table 4: Family type significantly influences buying decisions due to distinct socialization and perceptions. Among 100 dairy farmers, nuclear families dominated (85%), while joint families comprised only 15%. This disparity highlights how household structure shapes market engagement in the study area

Table 5: Distribution of respondents according to their educational level.

Sr. No.	Particulars	Respondents Number	Small	Medium	Large	Percentage
1.	Primary	25	17	5	3	25
2.	High school	21	15	3	3	21
3.	Intermediate	7	3	3	1	7
4.	Graduation & above	5	3	1	1	5
	Total literate	59	38	12	8	59
5.	Illiterate	41	15	15	11	41
	Total	100	53	27	19	100

Table 5: Education levels significantly varied: 41% illiteracy versus 59% literacy. Among literate respondents, primary education dominated (25%), followed by high

school (21%), intermediate (7%), and graduation (5%). This underscore limited formal education access among Muzaffarpur's dairy farmers.

Table 6: Marketing cost, Marketing margin, Marketing Efficiency and Price Spread in marketing of milk in the existing marketing channels

Sr. No.	Particulars	Channel 1	Channel 2	Channel 3
		Value in Rs/Liter	Value in Rs/Liter	Value in Rs/Liter
1	Sellin price of producer	35	40	47
	Transportation cost and others	5		5
	Margin of producer	5	10	17
	Net price received by producer	30	40	42
	Cost incurred by milk cooperatives	--	--	
A	Collection charges	--	--	5
B	Miscellaneous charges	--	--	2
	Total Marketing cost incurred by milk cooperative	--	--	7
	Margin of milk cooperative	--	--	3
	Selling price of Milk cooperative to milkman	--	--	57
	Cost incurred by milk man	--		
A	Transportation and other cost incurred	--	5	4
	Margin of Milk man	--	5	4
	Selling price to consumer	40	50	65
•	Total market margin	5	5	24
•	Total marketing cost	5	5	16
•	Marketing efficiency	3	4	1.05
•	Price spread	10	10	23

Table 6
- CHANNEL 1- Producer – Consumer
- CHANNEL 2- Producer- Milkman- Consumer
- CHANNEL 3- Producer- Milk Cooperative-Milkman-Consumer

In Channel 1, the producer sells directly to consumers at ₹40/liter, netting ₹30 after ₹5 cost. Channel 2 adds a milkman: producer sells at ₹40, milkman adds ₹5 (cost/margin), selling at ₹50. Channel 3 (producer→cooperative→milkman→ consumer) sees the producer net ₹42, cooperative add ₹10, milkman ad ₹8, resulting in a ₹65 consumer price and highest price spread (₹23). Efficiency declines across channels.

Table 7: Constraints on dairy farming restricting against marketing of milk.

Sr. No.	Particulars	Garret Score	Ranking
1	Lack of chilling capacities	65	V
2	Exploitation of farmers	60	VI
3	Delayed payment of dues	72	II
4	Low price of milk	73	I
5	Low genetic potential of animals	70	III
6	Inadequate supply of milk	66	IV
7	Faulty weighing and grading tools	54	VII
8	**Lack of options for cooperative societies**	**52**	**VIII**

Table 7: Garrett Ranking reveals key dairy constraints: low milk price (top, score 73) and delayed payments (72) hurt farmer income. Low animal genetics (70) limits productivity, while inadequate supply (66) and lack of chilling(65) cause spoilage. Exploitation (60), faulty weighing (54), and limited cooperative options (52) further reduce profits and sustainability.

3(Producer→Cooperative→Milkman→Cons umer), used by 70% of respondents, incurs the highest marketing cost (₹16/liter) and price spread (₹23/liter), resulting in critically low marketing efficiency (1.05) that erodes profits despite institutional support. Farmers face multifaceted risks: production risks (disease outbreaks, poor genetics), market risks (price volatility, delayed payments), and infrastructural gaps (absent chilling facilities), with Garrett's ranking highlighting low milk prices (score: 73) and delayed payments (score: 72) as the top constraints, followed by poor animal genetics (score: 70) and

CONCLUSION

Based on a comprehensive analysis revealing significant systemic risks undermining the sustainability and profitability of Muzaffarpur's vital smallholder dairy sector, the socio-economic profile shows a predominance of small-scale farmers (54% owning 1-2 cattle), primarily middle-aged males (50%) from nuclear families (85%), with alarmingly high illiteracy (41%) limiting access to modern risk tools and heightening vulnerability. Economically, the preferred Channel

inadequate chilling infrastructure (score: 65). To enhance resilience, the study advocates for cold chain development (e.g., village-level bulk milk coolers) to reduce spoilage, expanded cooperative networks with digital payment integration for timely income, mobile veterinary services and breed improvement programs, and farmer training in value addition (e.g., branded paneer, probiotic dahi) to capture urban markets. Policy interventions should prioritize institutional support (e.g., Bihar's Start-Up Policy 2023), risk mitigation tools like insurance, and digital market linkages to reduce intermediaries, thereby transforming the sector into a resilient, profitable engine for rural development, mitigating vulnerabilities and aligning with food security goals.
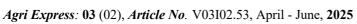
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