EPRA International Journal of Agriculture and Rural Economic Research (ARER)- Peer-Reviewed Journal
Volume: 13 | Issue: 6 | June 2025 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2025): 8.733| ISSN: 2321 – 7847

ECONOMICS OF CABBAGE CULTIVATION AND FACTOR INFLUENCING IN CABBAGE CULTIVATION IN GARHBETA-2 BLOCK OF PASCHIM MEDINIPUR DISTRICT

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ABSTRACT----------
The present investigation was undertaken to study the cost and returns of cabbage cultivation in Garhbeta-ll Block of Paschim Medinipur district by using primary data. The study covered in Garhbeta-ll block, 4 villages and 104 cabbage cultivators. The tabular analysis and cost concept (Cost A, Cost B and Cost C) was used. The average total cost of cabbage cultivation per acre during the early winter season was ₹67,098.00. This cost was highest on marginal farms, followed by small and medium farms. In contrast, the total cost during the late winter season was ₹57,967.66 per acre. Among the components of Cost A, human labor emerged as the largest expense due to the labor-intensive nature of cabbage cultivation particularly for tasks such as harvesting, weeding, and irrigation. Per quintal average, the farm harvest price received by the cabbage growers was Rs 1921 in early winter season and Rs 1005/- per quintal in late winter season. The overall cost-output ratio indicated that an investment worth Rs 1 on all the inputs used in the cultivation of cabbage yielded an output worth Rs 1.77 in early winter season. Similarly cost-output ratio was 1: 1.51 in late winter season. Net profit overall is ₹51,735.10 in early winter and ₹29,589.60 in late winter, early winter cultivation is more profitable than late winter cultivation due to higher gross returns and market prices. The empirical results relating to the household participation in cabbage cultivation are presented in this paper. The Family Labour is positively and significantly associated in cabbage cultivation. It is significant (1 % level) for cabbage cultivation. In Probit model there exists a positive relationship between Family Income (FI) and household participation in cabbage cultivation. This positive relationship is statistically significant at 1% level. Participation of the household in cabbage cultivation is positively influenced by Farmer's Education Level (FEL). Irrigation Facility (IF) also negatively and significantly influences household participation in cabbage cultivation. Crop Loan availability may influence an individual's level of participation in cabbage cultivation.
KEYWORDS: *Cost Of Cultivation, Variable Cost, Fixed Cost,, Net Return, Input-Output Ratio----------*

1. INTRODUCTION

Among Indian states, West Bengal ranked first in production as well as consumption of cabbage where it produced 2087.8 thousand tonnes in an area of 75.3 thousand hectares during 2010-11 constituting 27.86 percentage of total India's production (NHB, 2012). The productivity of cabbage was also recorded to be highest in West Bengal (27.7 tonnes/ ha) as compared to national average (21.5 tonnes/ ha).Orissa and Bihar are other important states that produced significantly by contributing 14.49 percent and 8.94 percent) in India's cabbage production. In West Bengal, the major cabbage producing districts that produced more than 100 thousand tonnes during the year 2010-11 are Murshidabad, Nadia, North and South 24 Parganas, Jalpaiguri, Coochbehar and Bankura. Among these all districts, Bankura recorded a significant productivity 30.43 tonnes/ha, with the acreage of 4750 hectares during 2011-12 (www.indiastat.com)

Among Indian states, West Bengal leads both in cabbage production and consumption. During the 2024-25 period, the state produced 2393.84 thousand tonnes of cabbage across 75.3 thousand hectares, accounting for 27.86% of India's total cabbage production (NHB, 2012). West Bengal also recorded the highest productivity, with 27.7 tonnes per hectare, surpassing the national average of 21.5 tonnes per hectare. Orissa and Bihar are also significant contributors to India's cabbage production, contributing 14.49% and 8.94%, respectively. In West Bengal, the major cabbage-producing districts that each produced over 100 thousand tonnes in 2010-11 include Murshidabad, Nadia, North and South 24 Parganas, Jalpaiguri, Coochbehar, and Bankura. Among these, Bankura stood out with an impressive productivity rate of 30.43 tonnes per hectare from 4,750 hectares in 2011-12 (www.indiastat.com).

The vegetable consumption has been found to accelerate at a higher rate among the poor (Kumar *et al.*, 2004). Though, West Bengal ranked first in cabbage production but the average price of cabbage was around Rs. 4 to 6 per kg which is comparatively lower than the other states which was around Rs. 8 to10 per kg during the same time (Nandeshwar *et al.*,

Volume: 13 | Issue: 6 | June 2025 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2025): 8.733| ISSN: 2321 – 7847

2013). Winter cultivation is popular in temperate and subtropical regions, but the choice between early winter and late winter planting influences the outcome of the crop due to variations in temperature, sunlight, and pest pressure. This paper explores agronomic recommendations for both planting periods and provides a comparative analysis.

2. OBJECTIVES OF THE STUDY

i)To estimate the cost of cultivation of cabbage in Garhbeta-ll Block of Paschim Medinipur district.
(ii) To estimate the value of yield and profitability of cabbage cultivation in Garhbeta-ll Block of Paschim Medinipur district.
iii) To estimate the cost of production per quintal and the input-output ratio of cabbage.
iv)To present the Probit Estimates of household participation in cabbage cultivation in Garhbeta-ll Block.

3. DATABASE AND METHODOLOGY

The study utilizes both primary and secondary data sources. Primary data were collected from households selected through a random sampling method. The Paschim Medinipur district in West Bengal was purposively chosen as the study area for conducting the field survey. Within this district, the Garhbeta-II block was selected for detailed investigation.Recognizing that not all villages within the block share similar socio-economic characteristics, four villages were carefully chosen from the village list of the Garhbeta-II block. These four villages were selected to capture the diversity in socio-economic conditions, soil types, and agricultural practices. A total of 26 households were randomly selected from each village, resulting in a sample of 104 households for the comprehensive survey. The reference period for the study is the financial year 2024–25.

Cost and Profit Measurement

Several inputs have been included in the calculation of a crop cost of production. Broadly these costs are classified into two categories such as:

Cost-A:(Variable cost/Operational cost): it includes the cost of human labour, Bullock labour, Machine labour cost of seeds/plants (included farm produced and purchased), insecticides and pesticides, manure (owned and purchased), fertilizers, Irrigation charges, (owned and purchased) Interest on working capital, and Miscellaneous cost— which have not come under main category.

Cost-B: (Fixed cost): Rental value of owned land, Land revenue, Depreciation on implements, Managerial cost and farm buildings, Interest on fixed capital.

Cost-C: Total cost of Production (Cost A+ Cost B).
The profitability may be calculated by using various economic formulas:
Value of Yield = (Main Product × Price per unit) + (By Product × Price) per hectare
Gross Profit per hectare = Value of yield - Cost C + Rental value of owned land + value of owned labour
Net Profit per hectare = Value of yield – Total cost of production, Input-Output Ratio or Cost-Output ratio = Value of Yield/ Cost C

4.RESULTS AND DISCUSSION

4.1 Cabbage Cultivation in Early Winter Period ((November–December): During this period, temperatures are moderately cool and daylight hours progressively shorten. These conditions are favorable for steady cabbage growth and uniform head formation. However, the risk of light to moderate frost increases toward December, particularly in Garhbeta-ll block of Paschim Medinipur district. While frost can damage young plants, the use of frost-tolerant varieties and protective measures such as mulching or low tunnels can mitigate this risk effectively.Produces compact, dense heads with excellent shelf life.Early winter cabbage cultivation are faces a higher risk of frost injury during seedling and early vegetative stages.Yields may be slightly lower due to slower growth rates, but market value is often higher due to early availability.

The cost of cultivating cabbage plays a critical role in determining the net income of farmers and, consequently, their overall economic status. For many agricultural households, especially those engaged in vegetable farming, understanding these costs is essential for assessing profitability and making informed production decisions. Table 1 provides a comprehensive component-wise breakdown of cabbage cultivation costs per hectare, categorized by different farm sizes: Marginal, Small, Medium, and an Overall Average. The costs are presented in rupees per acre, accompanied by the

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percentage contribution of each cost component such as seeds, fertilizers, human labour, irrigation, plant protection, and machinery to the total cost. This breakdown helps to identify the major cost drivers across farm types and offers insights into areas where cost efficiency can be improved.

During the early winter season, which is considered the optimal period for cabbage cultivation due to favorable agro-climatic conditions, marginal farms reported the highest cost of cultivation at Rs. 68,753 per acre. This was closely followed by small farms with Rs. 67,649 per acre, while medium farms incurred a slightly lower cost of Rs. 64,892 per acre. The overall average cost of cultivation across all farm sizes stood at Rs. 67,098 per acre.The relatively higher costs on marginal farms can be attributed to less mechanization, dependence on hired labour, and lower economies of scale. In contrast, medium-sized farms often benefit from better resource allocation and cost management practices, resulting in marginally lower per-acre expenditures.

Overall, within the category of paid-out costs (Cost A), human labour accounted for the largest share, comprising 22.79% of the total cost under Cost C. This high proportion is primarily due to the labour-intensive nature of cabbage cultivation, which demands significant human effort for tasks such as transplanting, weeding, irrigation, and especially harvesting or picking. Following human labour, a substantial portion of operational expenditure was allocated to manures and oil cakes, contributing 10.83% to the total cost. Expenditure on seedlings also formed a significant component, representing 10.45%, reflecting the importance of quality planting material in ensuring healthy crop growth and yield.

Managerial costs stood at 8.00%, accounting for the time and effort required in supervision, planning, and decision-making throughout the cultivation process. Fertilizers, essential for promoting vegetative growth and head formation in cabbage, comprised 7.94% of the total cost. Irrigation costs were slightly lower at 7.75%, underscoring the crop's regular water requirement, particularly during dry spells.

Pesticides, used to protect the crop from pests and diseases, made up 5.40% of the cost structure. Expenditure on mechanical and animal labour such as bullock labour and tractor charges was 5.14%, Depreciation on farm machinery and tools contributed 2.73%, reflecting the wear and tear of capital assets over time. Lastly, miscellaneous expenses, which include various minor but necessary expenditures, accounted for 1.29% of the total cost.

Table 1: Cost of cultivation for cabbage per acre in early winter season

Item	Category of farm							
A. Operational Cost (Cost-A)	Marginal		Small		Medium		Overall	
	Rupees	% Share	Rupees	% Share	Rupees	% Share	Rupees	% Share
1.Family Labour	8552.87	12.44	6663.43	9.85	5944.11	9.16	7053.47	10.51
2.Hired Labour	5885.26	8.56	9227.32	13.64	9610.51	14.81	8241.03	12.28
3.Bullock labour and Tractor charges	3609.53	5.25	3456.86	5.11	3270.56	5.04	3445.65	5.14
4.Seedlings	7390.95	10.75	6981.38	10.32	6670.90	10.28	7014.41	10.45
5.Manures and cakes	7700.34	11.2	7292.56	10.78	6807.17	10.49	7266.69	10.83
6.Irrigation charges	5397.11	7.85	5114.26	7.56	5087.53	7.84	5199.64	7.75
7.Fertilizer	5575.87	8.11	5425.45	8.02	4983.71	7.68	5328.34	7.94
8.Pesticides	3932.67	5.72	3578.63	5.29	3361.41	5.18	3624.24	5.40
9.Depreciation	1952.59	2.84	1745.34	2.58	1804.00	2.78	1833.98	2.73
10.Interest on working capital	1086.30	1.58	1068.85	1.58	1083.70	1.67	1079.62	1.61
Fixed Cost(Cost-B)								
11.Rental value of owned land	9790.43	14.24	9572.33	14.15	9221.15	14.21	9527.97	14.20
12.Interest on fixed capital	1340.68	1.95	1231.21	1.82	1181.03	1.82	1250.98	1.86
13.Managerial cost	5610.24	8.16	5438.98	8.04	5048.60	7.78	5365.94	8.00
14.Miscellaneous	928.17	1.35	852.38	1.26	817.64	1.26	866.06	1.29
Total Cost	68753.00	100	67649.00	100	64892.00	100	67098.00	100.00

Source: Field Level Survey

4.2 Late Winter Cabbage Cultivation(January–February) In late winter, temperatures begin to rise gradually, accompanied by an increase in daylight hours. These conditions support rapid vegetative growth and head development, especially in medium- to short-duration varieties. However, the transition toward spring also brings a higher risk of

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premature bolting, particularly in early-maturing cultivars if not sown at the appropriate time. Additionally, warmer conditions often lead to increased pressure from insect pests such as aphids and diamondback moths, necessitating vigilant monitoring and timely intervention. Late winter cabbage cultivation promotes faster growth and potential for higher yields due to increasing temperature and solar radiation. Faces elevated risks of bolting, especially under sudden temperature spikes. It requires enhanced pest and disease management, particularly against sucking pests and foliar diseases.

The major costs involved in cabbage production are summarized in Table 2. Among these, the most significant expense is wage payments for hired labor, which is required at various stages of cultivation. On average, farmers spend approximately Rs. 12,430.19 per acre on both owned and hired labor. Following labor costs, expenditures on manures and fertilizers are the next highest, averaging Rs. 10,835.96 per acre. Other major cost components include spending on plant protection chemicals (pesticides), irrigation, and the imputed rental value of owned land.

The details about component-wise costs for cabbage cultivation on different sizes of farms per hectare are computed and the results are shown in Table 2, this table Provides a detailed breakdown of the cost components involved in cultivating cabbage, segmented by different categories of farms**:** Marginal**,** Small**,** Medium**,** and an Overall average. Costs are presented in rupees per acre, along with the percentage share of each cost item in the total. The marginal farms total cost of cultivation (Late winter season) per acre of cabbage was Rs. 59831.00-. It was highest in among the all farms. Cost of cabbage cultivation in small farms is Rs 57673.00 followed by medium farms (Rs 56396.00) and overall (Rs 57966.67) Overall, among paid out (Cost A), the cost of human labour ranked first with 21.45 per cent of the total Cost C and this is because cabbage requires more labour particularly for picking, weeding and irrigation activities. The other operational expenditure was on seedlings (11.13 per cent), manures and cakes (10.66 per cent), Managerial cost(9.63 per cent) fertilizer cost (8.03 per cent), irrigation cost (7.59 per cent), .Pesticides(5.54 per cent), bullock labour and tractor charges (4.92 per cent), depreciation (2.61 per cent) and miscellaneous (1.38 per cent).

Table 2: Cost of cultivation for cabbage per acre in late winter season

Item	Category of farm							
A. Operational Cost (Cost-A)	Marginal		Small		Medium		Overall	
	Rupees	% Share	Rupees	% Share	Rupees	% Share	Rupees	% Share
1.Family Labour	7018.18	11.73	5323.21	9.23	4748.54	8.42	5696.65	9.83
2.Hired Labour	4666.82	7.8	7237.96	12.55	8295.85	14.71	6733.54	11.62
3.Bullock labour and Tractor charges	3033.42	5.07	2802.90	4.86	2712.65	4.81	2849.66	4.92
4.Seedlings	6916.46	11.56	6424.77	11.14	6017.45	10.67	6452.90	11.13
5.Manures and cakes	6545.51	10.94	6067.2	10.52	5932.86	10.52	6181.86	10.66
6.Irrigation charges	4714.68	7.88	4273.56	7.41	4218.42	7.48	4402.22	7.59
7.Fertilizer	4852.29	8.11	4677.28	8.11	4432.73	7.86	4654.10	8.03
8.Pesticides	3362.50	5.62	3241.22	5.62	3034.10	5.38	3212.61	5.54
9.Depreciation	1699.20	2.84	1499.49	2.6	1336.59	2.37	1511.76	2.61
10.Interest on working capital	945.33	1.58	911.23	1.58	891.06	1.58	915.87	1.58
Fixed Cost(Cost-B)	0.00	0	0	0	0.00	0	0.00	0.00
11.Rental value of owned land	8268.64	13.82	7808.92	13.54	7607.82	13.49	7895.13	13.62
12.Interest on fixed capital	1166.70	1.95	1055.41	1.83	1015.13	1.8	1079.08	1.86
13.Managerial cost	5833.52	9.75	5525.07	9.58	5385.82	9.55	5581.47	9.63
14.Miscellaneous	807.72	1.35	824.72	1.43	766.99	1.36	799.81	1.38
Total Cost	59831.00	100	57673.00	100	56396.00	100	57966.67	100.00

Source: Field Level Survey

Table 3: presents the costs involved in cabbage farming for different categories of farms (Marginal, Small, Medium, and Overall average), further divided by season (Early winter and Late winter), and cost types, Cost of production are generally higher in early winter than in late winter, across all farm categories. For example, marginal farms spend Rs. 68753/- in early winter on the other hand Rs.59831/- in late winter. Variable costs from the major component of total costs these are higher in all category firm in both winter season. Fixed costs (Cost-B) are relatively stable across seasons but decrease slightly with larger farm sizes, indicating better resource allocation on medium farms. Total cost of cultivation in Marginal farms is highest (Rs. 68753/- in early winter and Rs.59831/- in late winter per acre) followed by small (Rs. 67649/- in early

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winter and Rs.57673/- in late winter per acre)and medium farms (Rs. 64892/- in early winter and Rs.56396/- in late winter per acre)

Table 3: Costs of cabbage production in Garhbeta-ll block

Category of farm	Cost-A (Variable Cost)		Cost-B (Fixed Cost)		Cost-C (Total Cost)	
	Early winter	Late winter	Early winter	Late winter	Early winter	Late winter
Marginal	51083.49	43754.41	17669.52	16076.59	68753	59831
Small	50554.08	42458.82	17094.91	15214.14	67649	57673
Medium	48623.60	41620.25	16268.42	14775.75	64892	56396
Over All	50087.07	42611.17	17010.95	15355.49	67098	57966

Source: Field Level Survey

Table 4: shows that data on cabbage production performance and market returns for different farm sizes Marginal, Small, Medium, and an Overall Average during early winter and late winter seasons. Marginal farms report the highest yields in both seasons, particularly during the late winter, with a remarkable 8,856 kg per acre, compared to 6,357 kg per acre in early winter. This trend of increased yield in the late winter season is consistent across all farm sizes, suggesting favorable climatic conditions, extended growing periods, or better crop management practices during this time. However, the average market price per kilogram of cabbage is significantly higher in the early winter season. This price discrepancy is largely due to higher market demand and limited supply during early winter, leading to better price realization for farmers. For instance, marginal farmers received Rs. 19.50 per kg in early winter, but only Rs. 10.25 per kg in late winter. Similarly, the overall average market price was Rs. 19.21 per kg in early winter, compared to just Rs. 10.05 per kg in the late winter season.

When analyzing total revenue per acre (calculated as Yield × Price), early winter clearly outperforms late winter across all categories despite slightly lower yields. The higher market prices during early winter more than compensate for the lower production volumes. For example, marginal farmers earned Rs. 1,23,961.50 per acre in early winter, compared to Rs. 90,774.00 per acre in late winter. On average, farmers across all sizes earned Rs. 1,18,833.10 per acre in early winter, while late winter earnings dropped to Rs. 87,555.60 per acre.

This comparison highlights a crucial insight: market timing plays a more significant role than yield in determining farm income. Despite better yield outcomes in late winter, the reduced price levels undermine overall profitability. Therefore, strategic planning to align harvesting with high-demand periods especially during early winter can significantly enhance farm income. This suggests the need for improved storage, early sowing practices, and better market linkages to help farmers take advantage of the higher price windows in early winter.

Table 4: Yield (Acre/Kg) and Price per kg of cabbage in Garhbeta-ll block

Category of farm	Yield(Ac/Kg)		Average harvest price per Kg		Value of Product per Acare	
	Early winter	Late winter	Early winter	Late winter	Early winter	Late winter
Marginal	6357	8856	19.5	10.25	123961.50	90774.00
Small	6146	8623	19.22	10.1	118126.10	87092.30
Medium	6008	8546	18.75	9.8	112650.00	83750.80
Over All	6186	8712	19.21	10.05	118833.10	87555.60

Source: Field Level Survey

Table 5 presents the economic outcomes of cabbage farming for different categories of farms like Marginal, Small, Medium, and Overall Average during early winter and late winter seasons. It includes three key financial indicators Gross Return, Net Return, and Net Profit per acre, Returns are consistently higher in the early winter than in the late winter across all farm categories. Like Marginal farms earn ₹123,961.50 in early winter and ₹90,774.00 in late winter (Gross Return). The trend likely reflects higher market prices and possibly better-quality produce in early winter.

Marginal farms have the highest returns in both seasons, followed by Small and then Medium farms. This suggests that Marginal farmers may be using land more intensively or benefiting from better crop management or soil fertility. Net Profit per Acre of Marginal farms is highest ₹55,208.50 early winter and ₹30,943 late winter season. Followed by Small farms ₹50,477.10 in early winter (₹29,419.30 in late winter) and Medium farms ₹47,758.00 in early winter (₹27,354.80 in late winter). The overall average gross return is ₹1, 18,833.10 in early winter and ₹87,555.60 in late winter. Net profit overall

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is ₹51,735.10 in early winter and ₹29,589.60 in late winter, early winter cultivation is more profitable than late winter cultivation due to higher gross returns and market prices.

Table 5: Gross & Net returns per Acre of cabbage Cultivation in Garhbeta-ll block

Category of farm	Gross Return per Acre		Net Return per Acre		Net Profit per Acre	
	Early winter	Late winter	Early winter	Late winter	Early winter	Late winter
Marginal	123961.50	90774.00	100007.96	69653.66	55208.50	30943
Small	118126.10	87092.30	96451.36	68435.08	50477.10	29419.3
Medium	112650.00	83750.80	92436.14	66008.62	47758.00	27354.8
Over All	118833.10	87555.60	96885.72	68382.35	51735.10	29589.6

Source: Field Level Survey

The cost of production of cabbage per quintal is estimated and presented in Table 6. It is evident from the study that farmers with small production unit have greater cost over the other group of farmers. It indicates their intensive cultivation practices with use of higher doses of input as compared to the other group of farmers. The average cost of production per quintal is Rs. 1084.68 in early winter season and the farmers earn a net profit of Rs. 836.32/- per quintal. On the other hand the average cost of production per quintal is Rs. 665.36/- in late winter season and the farmers earn a net profit of Rs. 339.64/- per quintal

The return is almost double of the cost indicating the early winter cabbage production is a highly remunerative farming occupation

Table 6: Cost and Profit per quintal cabbage Production in Garhbeta-ll block

Category of farm	Cost of production per Quintal		Harvest price per Quintal		Profit per Quintal		Cost –Output Ratio	
	Early winter Period	Late winter Period	Early Winter Period	Late winter Period	Early winter Period	Late winter Period	Early winter Period	Late winter Period
Marginal	1081.53	675.60	1950	1025	868.47	349.4	1 : 1.80	1 : 1.52
Small	1100.70	668.83	1922	1010	821.3	341.17	1: 1.75	1 : 1.51
Medium	1080.09	659.91	1875	980	794.91	320.09	1 : 1.74	1 : 1.49
Over All	1084.68	665.36	1921	1005	836.32	339.64	1 : 1.77	1 : 1.51

Source: Field Level Survey

4.3 Prbit Estimates of Household Participation

We first present theoretical framework of the estimate of household participation in cabbage cultivation to be followed by the empirical results.

Theoretical Framework: To provide Probit estimates of household participation in cabbage cultivation**,** you typically run a Probit regression model using survey or household-level data. This model is suitable when your dependent variable is binary—in this case, whether a household participates in cabbage cultivation (1 = Yes, 0 = No)**.**

- Y_i =1 if household participates in cabbage cultivation,
- Y_i=0 otherwise.

Then, the Probit model estimates the probability:

$P(Y_i=1|X_i)=\Phi(X_i'\beta)$

Where:

- Φ is the cumulative distribution function (CDF) of the standard normal distribution,

X_i is a vector of household characteristics (e.g., land size, education, access to credit, etc.),

- β are the parameters to be estimated.

The empirical analysis of household's participation in cabbage cultivation(HPCC)

. $HPCC = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + U$

X_1 = Family Labour(FL), X_2 = Local Market Facility(LMF), X_3 = Irrigation Facility(IF), X_4 = Family Income(FI), X_5 = Crop Loan Availability(CLA), X_6 = Farmer's Education Level(FEL*)*

The Empirical Results

The empirical results relating to the household participation incabbage cultivation (HPCC) (Dummy variable) are presented in Table 7. The Family Labour is positively and significantly associated in cabbage cultivation. It is significant (1 % level) for cabbage cultivation. In Probit model there exists a positive relationship between *Family Income* (FI) and household

participation in cabbage cultivation. This positive relationship is statistically significant at 1% level. Participation of the household in cabbage cultivation is positively influenced by *Farmer's Education Level(FEL)*. *Irrigation Facility(IF)* also negatively and significantly influences household participation in cabbage cultivation.Crop Loan availability may influence an individual's level of participation in cabbage cultivation. Crop Loan availability is a dummy variable. It takes on the value of 1 if household enjoy Crop Loan facilities and 0 if not.

Table 7: Probit Estimates of Household Participation in cabbage Cultivation (HPCC)

Variable	Coefficient	t-Value/ Z-Value	P>lZl	
Intercept	-0.3576	-3.54**	0.001	Pearson Goodness of fit Chi-quare = 57.64
Family Labour(FL)	0.0888	3.41**	0.001	No. of observation= 104 P= 0.000
Local Market Facility(LMF)	0.1967	3.64**	0.000	R^2= 0.78
Irrigation Facility(IF)	0.1893	3.62**	0.000	
Family Income(FI)	0.0001	2.98**	0.004	
Crop Loan Availability(CLA)	0.4445	7.48**	0.000	
Farmer's Education Level(FEL)	0.0165	1.76*	0.082	

** and * Indicates coefficient significant at 1% and 5% level

5.CONCLUSION

The present study was undertaken to assess the cost structure and returns associated with cabbage cultivation in the Garhbeta-II Block of Paschim Medinipur district, West Bengal. Primary data were collected from 104 cabbage cultivators across four villages within the block. Analytical methods employed included tabular analysis along with standard cost concepts—namely Cost A, Cost B, and Cost C. The findings reveal that the overall average cost of cabbage cultivation per acre during the early winter season was ₹67,098.00. This cost was observed to be highest among marginal farmers, followed by small and medium farmers. In contrast, the average cost during the late winter season stood at ₹57,967.66 per acre, indicating a seasonal variation in input requirements and operational efficiency. Among the various components of Cost A, human labour emerged as the most significant cost driver. This can be attributed to the labour-intensive nature of cabbage farming, particularly for operations such as transplanting, weeding, irrigation, and harvesting.

In terms of productivity, the average yield of cabbage in the early winter season was 6,186 kg per acre, while it increased significantly to 8,712 kg per acre in the late winter season. Despite the higher yield in the late season, the average farm harvest price received by growers was ₹1,921 per quintal in early winter and ₹1,005 per quintal in the late winter season, reflecting seasonal fluctuations in market prices. The cost-output ratio further highlights the economic viability of cabbage cultivation. In the early winter season, an investment of ₹1.00 on inputs yielded a return of ₹1.77, whereas in the late winter season, the return was ₹1.51 per rupee invested. These figures underscore the profitability of cabbage farming, especially during the early winter months. The overall average gross return is ₹1, 18,833.10 in early winter and ₹87,555.60 in late winter. Net profit overall is ₹51,735.10 in early winter and ₹29,589.60 in late winter, early winter cultivation is more profitable than late winter cultivation due to higher gross returns and market prices.

In addition to cost and return analysis, the study also examined household participation in cabbage cultivation using a Probit regression model. The empirical results indicate that family labour plays a crucial role and is positively and significantly associated with participation in cabbage farming at the 1% significance level. Furthermore, household participation was found to be positively influenced by family income (FI) and the farmer's education level (FEL), both of which showed a statistically significant impact at the 1% level. This suggests that economically and educationally empowered households are more likely to engage in cabbage cultivation. Interestingly, the availability of irrigation facilities (IF) was found to have a negative and statistically significant influence on household participation. This could imply that households with more secure irrigation access may diversify into less labour-intensive or more water-dependent crops. Moreover, access to crop loans also emerged as a potentially important factor influencing the degree of participation, indicating the role of institutional support in encouraging commercial vegetable cultivation.

6. REFERENCE

1. *Kumar, P., Kumar, P. and Mittal S. 2004. Vegetable Demand and Production in India: Long-termPerspective. Proc. Nat. Sem. on Impact of Veg. Res.in India. 13, March 2002. NCAP, New Delhi and IIVR, Varanasi, 2002, Pp. 161-78.*
2. *Nandeshwar, N. S, Jagannath, Pritesh, T. and Shashikumar, M. 2013. Economics of production and marketing of vegetables in Akola district. Global J. Biol., Agric. Health Sci.,* **2***: 78-82.*
3. *National Horticulture Board. 2008. National Horticulture Board Data base (http://nhb.gov.in).*

Volume: 13 | Issue: 6 | June 2025 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2025): 8.733| ISSN: 2321 – 7847

4. *Prasad, P.H., Bhunia, P., Naik, A and Thapa, U. 2009. Response of nitrogen and phosphorus levels on the growth and yield of Chinese Cabbage in the gangetic plains of West Bengal. J. Crop Weed.*
5. *Show. S (2018), 'Economics of Vegetables Crops in Paschim Medinipur District of West Bengal' International Journal of Research and Analytical Reviews, Vol. 5, Issue 3, July-Sept 2018, pp 1600-1608*
6. *Show. S (2018), Cost of Cultivation and Profitability of Agriculture in West Bengal: A Study with Special reference to Backward Region of West Bengal 'Economic Affairs Journal, Vol. 63, No. 4, December 2018, pp 1067-1075.*
7. *Guhe, N. 2011. Economics of production and marketing of cabbage in Betul district of Madhya Pradesh (Doctoral dissertation, JNKVV, Jabalpur).*
8. *Jadav, K. S., Leua, A. K. and Darji, V. B. 2011. Economics of supply chain of fresh potato in Middle Gujarat, Indian Journal of Agriculture Research, 45(4):266- 274.*
9. *Kale, N. K., Navadkar, A. V., and Sale, D. L. 2005. Resource use efficiency in chili cultivation in Thane District of Kankan region, Indian Journal of Agricultural Economics, 60(3): 529-530.*
10. *Maurya, O. P. and Pal, S. L. 2012. Economics of production and marketing of okra in district Bijnor (U.P.).Hortflora Research Spectrum, 1(3): 274-277.*
11. *S. DE & S M. RAHAMAN(2014), Economics of production and marketing of cabbage in Bankura district of West Bengal, Journal of Crop and Weed, 10(1):101-106(2014)*
12. *12.Patel, D., Thakar, K. P., Soumya, C. and Modi, D. B. 2018. Cost of Cultivation And Marketable Surplus of Major Vegetables of North Gujarat. International Journal of Agriculture Sciences, 10(10), 6018-6024.*
13. *Rai, A. K., Raj, Kumar and Kanak, Lata (2020) Impact of frontline demonstration on mustard through improved production technology under renfed condition. Guj. J. Ext. Edu. 31(2):5-8.*