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Reason and remedies for Farmer Displacement in the Cauvery Delta Zone of Tamil Nadu

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Abstract

Agriculture remains the cornerstone of India's economy, providing employment to nearly half of the population, with small and marginal farmers constituting the majority. However, systemic vulnerabilities, including erratic rainfall, rising input costs and market inefficiencies, have led to increasing displacement of farmers, especially in the Cauvery delta zone of Tamil Nadu. This study investigates the factors influencing farmer displacement and explores strategies to mitigate this trend in the study area. The research was conducted in Thiruvarur district during 2023-24, employing a multistage stratified random sampling technique. A total of 180 farmer households were surveyed, with 60 households each selected from three agronomically homogeneous clusters, representing mainstream and tail- end regions of the Cauvery River. To address the objectives, logistic regression analysis were employed that education, indebtedness, farm size, labour scarcity and water scarcity significantly influenced displacement, while variables such as age, earners in family, the number of agricultural extension meetings attended, ratio to non-farm income to farm income and ratio of annual to perennial showed minimal impact. The study further applied the Response Priority Index (RPI) to rank mitigation strategies across clusters. In Cluster I, priorities include labour-saving technologies and crop diversification. Cluster II emphasizes drainage systems, financial support, and improved market linkages, while Cluster III focuses on promoting drought-resistant crops and addressing salinity issues through desalination systems. The findings underscore the need for

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cluster-specific interventions, including mechanization, financial relief, resource management and skill development, to address farmer displacement. These strategies aim to stabilize agricultural livelihoods and curb displacement, ensuring sustainable rural development in the Cauvery delta zone.

Key words : Farmer Displacement, Cauvery Delta Zone, Indebtedness, Labour Scarcity, Strategies

Agriculture has been the backbone of Indian economy, providing livelihoods to over half of the total population and contributing significantly to the nation's GDP. Agriculture remains the largest employer in India, engaging about 44 percent of the workforce as of recent estimates. This includes small and marginal farmers, who make up nearly 85 percent of the farming community (Government of India, 2020). Despite the sector's employment potential, productivity and income disparities have left many farmers vulnerable to poverty and exploitation. The younger generation, attracted to better educational and employment opportunities, often moves away from traditional farming, leaving behind an aging farming population (Rao, 2015). The farmers are responsible for managing land, cultivating crops and raising livestock, all of which are essential for sustaining agricultural productivity. However, their livelihoods are fraught with numerous challenges, many of which stem from systemic and environmental vulnerabilities. One of the primary challenges faced by farmers is their dependence on erratic monsoons for irrigation. In Tamil Nadu, where agriculture is heavily reliant on monsoon rains, any disruption in rainfall patterns can have devastating effects on crop yield and income. Moreover, the rising input costs including seeds, fertilizers, pesticides and labour further strain farmers' resources. Market uncertainties such as price fluctuations, exploitation by middlemen, and inadequate access to fair pricing mechanisms, often make farming a high-risk and low-reward occupation. Over time, these persistent challenges have driven many farmers to seek alternatives. The phenomenon of farmer displacement has become increasingly prominent, with individuals abandoning farming altogether or displace to urban areas in search of more stable and lucrative opportunities. Displacement not only affects agricultural productivity but also disrupts rural communities, leading to a decline in traditional knowledge and practices. This trend highlights the urgent need for interventions to address the structural and economic issues faced by farmers. Under this background, an attempt was made to investigate the factors influencing labour displacement and to identify the strategies to check the farmer displacement in the Cauvery delta zone, with the following specific objective. For the preparation of the manuscript relevant literature[1-10] has been consulted.

The specific objectives are :

- To analyse the factors influencing farmer displacement in Cauvery delta zone.

- To analyse the strategies to check farmer displacement in Cauvery delta zone.

Sampling procedure :

The study was undertaken in the Thiruvarur district of Tamil Nadu during the agricultural year 2023-24. The study adopted the Multistage stratified random sampling technique for selection of respondents. As the first stage of sampling, Thiruvarur district was purposively selected as sample district, since this is a delta district which accommodates regions representing both the main stream and tail end region of Cauvery river.

As the second stage of sampling, all the 10 blocks of Thiruvarur district which were reclassified into three major agronomically homogeneous Clusters viz., Cluster I (Kodavasal, Mannargudi, Needamangalam and Valangaiman), Cluster II (Koradacherry, Nannilam and Thiruvarur) and Cluster III (Kottur, Muthupettai and Thiruthuraipoondi.) were considered for the study.

As the third and ultimate unit of sampling, 180 farmer households @ 60 households from each cluster were selected at random. The ultimate sample size was 180.

Cluster description :

Cluster I is the major Cluster, consisting of 4 blocks located in the main stream region of Cauvery river. Cropping Pattern: Paddy+Paddy+Paddy/Pulse; Source of Irrigation: Borewell, Canal; Soil Type: Clay Loam and sandy coastal alluvium.

Cluster II consists 3 blocks situated between the prominent main stream belt and tail end region. Cropping Pattern: Paddy+ Paddy+Pulse/Gingelly; Source of Irrigation: Borewell, Canal; Soil Type: Sandy coastal alluvium and Clay loam.

Cluster III consists remaining 3 blocks, located in tail end region of Cauvery river. Cropping Pattern: Paddy+Paddy/Cotton; Source of Irrigation: Borewell, Canal; Soil Type: Red sandy and Red loam

Analytical tools :

Logistic Regression analysis :

This study utilized the logistic regression model to empirically quantify the relative influence of various factors influencing farmer displacement in the study area

The logit model in this study postulates that, Pi, the probability of the i[th] respondent's decision on displacement is a function of an index variable Zi, summarizing a set of the individual attributes. Hence, let us consider the following representation of respondent's decision on displacement.

Pi =E(Y=1/X_i) =1/(1+ e^(-(β_1+β_2 X_i))) (1)

Where, e is the familiar base of the natural logarithm. Now, let equation (1) be rewritten as

Pi = 1/(1+e^[(-Z)] _i)) (2)

where,

Zi = β1+β2Xi

Equation (2) represents the (cumulative) logistic distribution function (Gujarati, 1998).

It could be verified that as Zi ranges from - ∞ to + ∞, Pi ranges between 0 and 1 and that Pi is nonlinearly related to Zi (i.e., Xi). However, we would encounter an estimation problem, because Pi is not only nonlinear in X but in the β's as well, as can be seen clearly from (1). This means that the familiar OLS procedure could not be made to estimate the parameters. But this problem is more apparent than real because (1) is intrinsically linear, which can be shown as follows:

If Pi, the probability of the respondents' being displaced is as given by (2), then, (1-Pi), the probability of not being displaced is

$$1-P_i = 1/(1+e^{Z_i}) \quad (3)$$

$$P_i/(1-P_i) = (1+e^{Z_i})/(1+e^{-Z_i}) = e^{Z_i} \quad (4)$$

Now, $P_i/(1-P_i)$ is simply the odds ratio in favour of the respondent being displaced,

Now, by taking the natural log of (4), we would obtain:

$$L_i = \ln (P_i/(1-P_i)) = Z_i = \beta_1+\beta_2 X_i \quad (5)$$

That is, L, the log of the odds ratio, is not linear in X, but (from the estimation view point) linear in the parameters. It might be noted that the linearity assumption of OLS does not require that the X variables be necessarily linear. So we can have X2, X3, etc., as regressors in the model. For our purpose, it is the linearity in the parameters that is crucial. L is called the logit, and hence the name logit model for equation (5).

Features of the Logit model

1. As P goes from 0 to 1 (*i.e.*, as Z varies from $-\infty$ to $+\infty$), the logit L goes from $-\infty$ to $+\infty$. That is, although the probabilities (of necessity) lie between 0 and 1, the logits are not so bounded.

2. Although L is linear in X, the probabilities themselves are not.

3. The interpretation of the logit model is as follows: β2, the slope, measures the change in L for a unit change in X.

Estimation of the Logit Model :

For estimation purposes, equation (5) can be written as follows:

$$L_i = \ln [P_i/(1-P_i)] = \beta_1+\beta_2 X_i + u_i \quad (6)$$

To estimate the model, we need, apart from Xi, the values of the logit Li, but now we run into some difficulties. If we have data on individual respondents, Pi = 1 if farm labour is displaced and Pi = 0 for otherwise, and if we put these values directly into the logit Li, we obtain:

Li = ln(1/0) for the respondent being displaced Li =
ln(0/1) if otherwise

Obviously, these expressions are meaningless. Therefore, if we have data at the micro or individual level, we cannot estimate (6) by the standard OLS routine. In this situation, one may have to resort to the maximum likelihood method to estimate the parameters.

Within the logit framework discussed above, the study has postulated that the probability of a farmer being displaced (Li) has been depended upon the attributes like Age, Education, Size of the Farm, Number of earners in the family, Number of agri extension meetings attended, Labour scarcity, Water Scarcity, Indebtedness, Ratio of non-farm income to farm income and Ratio of annual to perennial.

The index variable Pi indicating, whether a farmer would decide to get displaced or not has been expressed as a linear function of the independent variables. Thus the logistic regression model has been specified as follows.

$$L_i = \alpha_i + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \mu i \quad (7)$$

where,

α_i = Constant
X1 = Age of the respondents, in years
X2 = Education, in years of study
X3 = Size of the farm, in acres
X4 = Earners in the family, in numbers
X5 = Agri extension meetings attended, in numbers
X6 = Labour scarcity (1 for yes, 0 for otherwise)
X7 = Water scarcity (1 for yes, 0 for otherwise)
X8 = Indebtedness in Rs.
X9 = Ratio of non-farm income to farm income
X10 = Ratio of annual to perennial crop
βi's = Parameters to be estimated
μi = Error term

With the above said econometric constructions and assumptions the logistic regression analyses were undertaken for the study area, to identify and analyse the various factors influencing the farmer' decision on displacement to an alternative employment.

Responses-priority Index (RPI) :

In this study, Response priority index was used to rank the remedial strategies to be implemented to check farmer displacement in Cauvery Delta Zone.

Normally, in the quantification of opinions expressed by the respondents, the problem encountered in general was whether emphasis should be given for the number of responses to a particular priority or to the highest number of responses to a strategy in the first priority. But, both lead to different conclusions.

A Responses-Priority Index (RPI) was constructed as a product of Proportion of Responses (PR) and Priority Estimate (PE), where PR for the i^{th} strategy gives the ratio of number of responses for a particular strategy to the total responses as per equation

$$\text{RPI} = \frac{\sum_{j=1}^{k} f_{ij} X|(k+1)-j|}{\sum_{i=1}^{1}\sum_{j=1}^{k} f_{ij}} \quad 0 \leq RPI \geq 5$$

Where,

RPI_i = Response Priority Index for i^{th} strategy
f_{ij} = Number of responses for the j_{th} priority of the i_{th} strategy (i=1,2……l, j= 1,2,3……k)
$\sum_{j=1}^{k} f_{ij}$ = Total number of responses for the i_{th} strategy
k = Number of priorities (1. Strongly agree; 2. Agree; 3. Moderate; 4. Disagree; 5. Strongly disagree)
$X_{|(k+1)-j|}$ = Scores for the j_{th} priority
$\sum_{i=1}^{1}\sum_{j=1}^{k} f_{ij}$ = Total number of responses to all strategies

Factors influencing Displacement of farmer by using Logit model :

The Logit model was employed to

quantify the degree of influence of various factors involved in displacement of farmers. The model was employed separately for three Clusters, viz., Cluster I, Cluster II and Cluster III, and results are presented in Table-1. The ten independent variables considered for the analysis were viz., Age, Education, Size of farm, Earners in family, Number of agri extension meetings attended, Labour scarcity, Water scarcity, Indebtedness, Ratio of non-farm income to farm income and Ratio of annual to perennial crop. In all three clusters, the lower -2 log likelihood values indicated that the goodness of fit of the logit model specified were better. The estimated Negelkerke R^2 for three Clusters indicated that, a reasonable amount of variation in the dependent variable was accounted for, by the considered independent variables of the model.

Cluster I :

With regard to 'Education' the MLE co-efficient was significant and positively influencing the dependent variable. The odds ratio was 2.012. Hence it could be interpreted that, in Cluster I, when 'Education' increased by one unit, the odds of farmer displacement would increase by 2.012 times. It is evident from the results that, this variable was one among the influencing factors enhancing displacement of farmers. As far as the variable 'Size of farm' is concerned the MLE co-efficient was significant and positively influencing in this Cluster. When 'Size of farm' increased by one unit, the odds of being displaced increased by 1.630 times. The results confirmed that the 'Size of farms' definitely had an impact on displacement of farmers. This paradoxical trend needs to be noted with utmost attention. It would be much detrimental if large farmers who are relatively more empowered also decide to move out of farming, opting for other lucrative employments. For the variable 'Labour Scarcity' also, the MLE co-efficient of the model was significant in Cluster I. In the referred farming scenario, the odds of being displaced was more by 1.867 times if the farmer had experienced 'Labour scarcity'. It seems the phenomenon of labour scarcity tend to play a damaging role with regard to sustainability of agriculture, in Cauvery Delta Zone.

With regard to 'Indebtedness' MLE co-efficient was significant and positively influencing in Cluster I. When Indebtedness increased by one unit, the odds of being displaced increased by 2.235 times. The results confirmed that the variable indebtedness was a strong causative factor for displacement of farmers. The variable 'Ratio of annual to perennial crop' was also significant and positively influencing farmer displacement. The results indicated that when the proportion of annual crop increased in a farm the chances for displacement of the farmer also increased. This might be due to the nature of annual crops, demanding more labour and water compared to perennials. The MLE co-efficient pertaining to the variables 'Age', 'Family size', 'No. of agri extension meetings attended', 'Water scarcity' and 'Ratio of non-farm income to farm income' were not statistically significant in Cluster I.

Cluster II :

The variable 'Age' was significant and the positive values of MLE co-efficient indicated that the variable 'Age' positively influenced the displacement. The odds ratio

Table-1. Logistic Regression Estimates on the Factors Influencing Farmer Displacement in Different Clusters of the Study Area

Sl. no.	Variables	Cluster I			Cluster II			Cluster II		
		MLE Co - efficient	Odds Ratio	P Values	MLE Co - efficient	Odds Ratio	P Values	MLE Co - efficient	Odds Ratio	P Values
1.	Age (Years)	0.231	1.632	0.176	0.036*	1.433	0.073	0.391	1.152	0.117
2.	Education (Years of Study)	0.614***	2.012	0.006	0.461**	1.898	0.074	0.704*	1.166	0.056
3.	Size of Farm (Acres)	0.612*	1.630	0.081	0.233	1.814	0.118	0.510*	1.158	0.082
4.	Earners in the Family (Nos.)	-0.417	0.566	0.142	- 0.312	0.821	0.112	- 0.374	0.522	0.488
5.	Agri Extension Meetings Attended (Numbers)	0.857	1.798	0.155	0.984	3.011	0.199	-0.532*	1.243	0.093
6.	Labour Scarcity (Yes or No)	0.715**	1.867	0.048	1.204*	1.883	0.096	0.710	1.258	0.324
7.	Water Scarcity (Yes or No)	0.302	1.628	0.193	0.191**	2.831	0.062	0.464**	1.134	0.045
8.	Indebtedness ('000 Rs.)	0.552***	2.235	0.009	0.363***	2.162	0.017	0.032*	1.822	0.092
9.	Ratio of Non-farm Incomexxx									
10.	Ratio of Annual to Perennial Crop	0.264*	1.014	0.088	0.636**	1.652	0.581	-0.492	1.105	0.372
	Constant/Intercept	4.455	566.454	0.098	4.867	733.011	0.011	5.128	684.562	0.124
	Nagelkerke R^2	0.811			0.766			0.832		
	-2 Log likelihood	58.46			62.88			40.864		

Note: *** Significant at 1 % level of Probability, ** Significant at 5 % level of Probability, * Significant at 10 % level of Probability.

1.433 indicated that if 'Age' increased by one unit the odds of being displaced increased by 1.38 times. It is also to be noted that the variable 'Age' was not significant in other two Clusters. With regard to 'Education' the MLE co-efficient was significant and positively influencing in the model pertaining to Cluster II. The odds ratio was 1.898 and hence it could be interpreted that, in Cluster II, when 'Education' increased by one unit, the odds of being displaced increased by 1.898 times. The variable 'Labour scarcity' was significant and found to be capable of influencing positively the displacement of farmers. The odd ratio 1.883 indicated that, if the farmer had felt the pinch of 'Labour scarcity', the odds of being displaced was more by 1.883 times. With regard to the variable 'Water scarcity', the MLE co-efficient was significant, with odds ratio 2.831. The variable is capable of positively influencing the displacement of farmers. If a farmer had encountered with the problem of water scarcity, the odds of being displaced was more by 2.831 times in Cluster II.

With regard to the variable 'Indebtedness', the MLE co-efficient was significant and positively influencing. In this scenario, when one unit of Indebtedness increased, the odds of being displaced increased by 2.162 times. The results revealed that the variable Indebtedness had strongly impacted displacement of farmers. As far as the variable 'Ratio of annual to perennial crop' is concerned, for this variable also, the MLE co-efficient was significant and positively influencing the scenario. When one unit of ratio increased, the odds of being displaced increased by 1.652 times. The trend seemed to be as similar as Cluster I. The MLE co-efficients pertaining to the variables 'Size of Farm', 'Family size', 'No. of agri meetings attended' and 'Ratio of non-farm income to farm income' were not statistically significant in this Cluster.

Cluster III :

As like in Cluster I and II, ten independent variables were considered in the model. As far as the variable 'Education' was concerned, the MLE co-efficient was significant and positively influencing in the model. The odds ratio was 1.166 and hence it could be interpreted that, in Cluster III, when 'Education' increased by one unit, the odds of farmer being displaced increased by 1.166 times. For the variable 'Size of farm' the MLE co-efficient was significant, influencing positively the dependent variable. When 'Size of farm' increased by one unit, the odds of farmer being displaced increased by 1.158 times. As discussed already under Cluster I, this trend needs to be considered as a warning bell to Indian farming scenario. With regard to 'Number of Agri meeting attended', the estimated MLE co-efficient was significant. The variable negatively influenced the displacement of farmers in this Cluster. One unit increase in the 'Number of agri - related meetings attended' decreased the odds of farmer displacement by 1.243 times.

As like in Cluster II, in this Cluster also the variable 'Indebtedness' was significant and positively influencing displacement of farmers. In this scenario, when one unit of Indebtedness increased, the odds of being displaced increased by 1.822 times. The results revealed that the variable 'Indebtedness' had strongly impacted displacement of farmers. The MLE co-efficient pertaining to the variable 'Age', 'Family size', 'Labour scarcity', Indebtedness', 'Ratio of non-farm income to farm income' and 'Ratio of annual to perennial crop', were not statistically significant in this Cluster.

Major Inferences derived out of Logit analyses for farmer Displacement :

- The variable 'Education' emerged as a significant predictor of displacement in all clusters. This suggests that educated farmers are more likely to seek alternative livelihoods outside of agriculture.
- Indebtedness was another equally important key factor, which increased the chances of displacement significantly in the study area.
- On studying the variable 'Size of farm', the parameters estimated had delivered out, probably a paradoxical inference that large farmers who are in general presumed to be socially and economically safer intend to move out of farming more intensively than small farmers. This trend needs to be attended with utmost seriousness.
- Labour scarcity, Ratio of annual to perennial crop and Water scarcity also played a prominent role in influencing displacement, driving farmers to seek more stable and profitable opportunities outside of farming.
- However, the variable viz., Age, Earners in family, Number of agricultural extension meetings attended and Ratio of non-farm income to farm income did not show significant influence across the clusters, indicating that these factors have less impact on the decision to leave farming.

Strategies to mitigate farmer Displacement:

The Response Priority Index (RPI) analysis highlights strategies tailored to address farmer displacement across the three clusters in the Cauvery delta zone and is presented in Table-2. These strategies prioritized by farmers based on their perception and preferences aimed to tackle challenges like water scarcity, labour shortages, financial constraints, and market inefficiencies, providing solutions for sustainable agriculture and livelihood stability.

Cluster I :

In Cluster I, introduction and promotion of 'Labour-saving technologies' was identified as the top priority to mitigate farmer displacement. Farmers in this region face significant labour shortages, especially during peak seasons. By adopting mechanized solutions such as transplanters, harvesters, and weeders, farmers can reduce their dependency on manual labour while improving operational efficiency. 'Crop diversification' was ranked second, indicating the need to shift to less water/labour-intensive crops such as horticulture and perennials to ensure sustainable farming, balancing water/labour requirements and income security. 'Market linkages and price stabilization' was ranked third which emphasized that market inefficiencies and price fluctuations often push farmers into debt and displacement. Strengthening market linkages, establishing farmer-producer organizations (FPOs) and leveraging digital marketing platforms can help farmers to secure better prices for their produce. 'Crop insurance and risk mitigation' was ranked fourth since farmers often face significant risks due to natural calamities and market uncertainties. Crop insurance schemes, such as Pradhan Mantri Fasal Bima Yojana (PMFBY), can help to mitigate these risks by compensating for crop losses.

Table-2. Strategies Identified to Check Farmer Displacement in Different Clusters

S. no	Cluster I Strategy	RPI Score	Rank	Cluster II Strategy	RPI Score	Rank	Cluster III Strategy	RPI Score	Rank
1.	Labour-Saving Technologies	4.22	**I**	Labour-Saving Technologies	4.67	**I**	Promoting Drought-Resistant Crops	4.87	**I**
2.	Crop Diversification with Less Labour/Water Intensive Crops	4.10	**II**	Market Linkages and Price Stabilization	4.42	**II**	Labour-Saving Technologies	4.44	**II**
3.	Market Linkages and Price Stabilization	2.90	**III**	Crop Diversification with Less Labour/ Water Intensive Crops	2.85	**III**	Off-Farm Employment Programs	2.67	**III**
4.	Crop Insurance and Risk Mitigation	2.66	**IV**	Drainage and Water Management Systems	2.61	**IV**	Crop Diversification with Less Labour/ Water Intensive Crops	2.51	**IV**
5.	Financial Support Programs	2.54	**V**	Crop Insurance and Risk Mitigation	2.46	**V**	Market Linkages and Price Stabilization	2.28	**V**
6.	Drainage and Water Management Systems	2.24	**VI**	Financial Support Programs	2.29	**VI**	Salinity Tolerant Varieties and Fertilizers	2.10	**VI**
7.	Soil Health Management	2.10	**VII**	Improved Crop Varieties	2.08	**VII**	Desalination and Water Reuse Systems	2.05	**VII**
8.	Skill Development Programs	1.77	**VIII**	Farm Cooperatives and Collective Farming	1.89	**VIII**	Community-Based Water Resource Management	1.70	**VIII**
9.	Off-Farm Employment Programs	1.42	**IX**	Better Post Harvest Management Facilities	1.72	**IX**	Skill Development Programs	1.62	**IX**

Note : Cluster I - Kodavasal, Mannargudi, Needamangalam and Valangaiman blocks.
Cluster II - Koradacherry, Nannilam and Thiruvarur blocks.
Cluster III - Kottur, Muthupettai and Thiruthuraipoondi blocks.

'Financial support programs' ranked fifth, indicated the importance of credit access and subsidies to support farm operations. Many farmers face indebtedness, leading to displacement when loans cannot be repaid. Providing low-interest loans, subsidized inputs and emergency credit facilities can address short-term liquidity needs and support long-term investments. 'Drainage and water management systems' was ranked sixth, giving an indication that proper water management is crucial for sustainable farming in this Cluster. Investments in drainage systems and the maintenance of canals can prevent waterlogging and ensure efficient irrigation. Addressing these challenges can enhance productivity and reduce displacement due to poor agricultural performance. 'Soil health management' ranked seventh, emphasized the need to maintain soil fertility through organic practices, bio-fertilizers, and nutrient management programs. Healthy soils improve yield stability, reducing crop failure risks and income losses. This strategy supports long-term sustainability and resilience in agriculture. 'Skill development programs' ranked eighth, indicated the need to train farmers in alternative skills for income diversification. Skills in food processing, dairy farming, and poultry farming can help farmers to create supplementary income sources, reducing dependency on traditional agriculture. 'Off-farm employment programs' provide alternative income opportunities during agricultural off-seasons or crop failures. However, this strategy ranked the lowest, suggesting limited emphasis on non-agricultural employment as a solution for displacement in this cluster.

Cluster II :

In Cluster II, which lies between the mainstream and tail-end regions, the highest priority was assigned to 'Labour-saving technologies' as like in Cluster I, addressing the growing labour scarcity in agriculture. The second ranked strategy was 'Market linkages and price stabilization', emphasizing the need for organized markets and price stabilization mechanisms to counteract exploitation by middlemen. Digital platforms and cooperative marketing can empower farmers and increase their bargaining power. 'Crop diversification' ranked third, indicated a transition to less water/labour-intensive crops. Diversifying into oilseeds, pulses, and horticultural crops reduces labour dependency and offers better market opportunities, enhancing income stability. 'Enhancing drainage and water management systems' was ranked fourth reflecting the importance of managing excess water during floods and ensuring efficient drainage for sustained crop growth. 'Crop insurance programs' ranked fifth, insisted the significance of providing financial security to farmers affected by natural calamities and market fluctuations. The introduction of customized, affordable insurance policies can build resilience among farmers, preventing displacement. The sixth ranked strategy was 'Financial support programs' which could alleviate financial stress for farmers. These programs help to address indebtedness and ensure farmers, the resources to invest in modern agricultural practices. 'Improved crop varieties' ranked seventh, gave an indication that high-yield and drought-resistant varieties can improve productivity and resilience against climatic fluctuations. 'Farm cooperatives and collective farming' was ranked eighth. This could organize farmers into cooperatives, enhance their bargaining power and provide access to shared resources, such as equipment and irrigation systems. The last ranked strategy was 'Better post-harvest management facilities' which could reduce post-harvest losses and improve farmers' market returns.

Cluster III :

In Cluster III, located in the tail-end coastal region, the highest priority strategy focuses on 'Promoting drought-resistant crops'. The adoption of drought-resistant crops like millets and pulses is essential to address water scarcity and erratic rainfall. These crops require less water and offer stable yields, reducing displacement risks. 'Labour-saving technologies' was ranked second. Such technologies are crucial in this tail-end coastal cluster, where labour shortages are severe. Mechanization can ensure timely agricultural operations and improve productivity, even in challenging conditions. Ranked third, 'Off-farm employment programs' could offer an alternative source of income generation, especially during non-agricultural seasons or crop failures. Skill development in handicrafts, small-scale industries, and tailoring can diversify livelihoods, reducing reliance on farming alone and controlling displacement risks. 'Crop diversification' was ranked fourth. Diversifying into horticulture and agro-forestry can reduce dependence on water-intensive crops like paddy and stabilize farmers' income. 'Market linkages and price stabilization' ranked fifth, emphasized the fact that strengthening of market infrastructure can enable farmers to secure better prices for their produce and reduce exploitation by intermediaries.

'Salinity tolerant varieties and fertilizers' ranked sixth, could address the saline soil conditions prevalent in this cluster. Developing salt-resistant crops reduces the impact of soil salinity, enabling farmers to sustain agricultural productivity despite soil constraints. Seventh ranked strategy was 'Desalination and water reuse systems'. This could combat saline water intrusion and water scarcity, which are predominant issues in the coastal belt. Desalination plants can provide freshwater resources for irrigation, while wastewater treatment and recycling systems can ensure sustainable water use during dry seasons. Addressing salinity issues directly supports crop sustainability and reduces vulnerability to displacement. 'Community-based water resource management' was ranked eighth. Engaging local communities in water management initiatives can improve irrigation efficiency and ensure equitable water distribution. The last ranked strategy was 'Skill development programs'. Training farmers in poultry farming, honey bee rearing, mushroom cultivation and such activities can create supplementary income opportunities and reduce reliance on agriculture.

The strategies identified for each cluster reflect the unique challenges and priorities of farmers in addressing displacement. While labour-saving technologies emerged as the most critical strategy across all clusters, other interventions such as crop diversification, market linkages and financial support programs address region-specific issues. Tailored approaches integrating these strategies can help to mitigate farmer displacement and ensure agricultural sustainability in the Cauvery delta zone.

Conclusions and Policy Implications :

The findings from the analyses

provide crucial insights into certain dynamics of farmer displacement in the Cauvery Delta Zone, revealing that socio-economic and agronomic challenges are key drivers of this phenomenon. According to logit analysis, Education emerged as a significant predictor, indicating that better-educated farmers tend to move away from agriculture in pursuit of non-farm employment opportunities. Indebtedness also stood out as a major factor, with financial distress compelling farmers to abandon agriculture, highlighting the need for improved credit access and financial support systems. Additionally, labour and water scarcity were critical influences, particularly in Clusters I and II, where securing agricultural labour posed difficulties. Interestingly, larger farms, often perceived as more resilient, exhibited higher odds of displacement in Clusters I and III, suggesting broader structural changes in agriculture and a trend toward diversification.

The RPI analysis underscored the importance of labour-saving technologies, crop diversification, financial support programs and improved market linkages as critical strategies to curb displacement. Tailored strategies for each cluster, such as promoting drought-resistant crops and addressing salinity issues in Cluster III or focusing on water and drainage management in Cluster II, align with the region-specific challenges faced by farmers. These strategies are essential for building resilience and supporting sustainable agricultural practices in the region. Future research should focus on evaluating the long-term impact of these interventions to ensure stability and growth in the agricultural sector of the Cauvery Delta Zone.

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