

## **Livelihood diversification and household economic security: Evidence from small-scale fisher households in Kerala state, India**

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DOI: <https://doi.org/10.33545/26180723.2025.v8.i2b.1624>

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### **Abstract**

Rural households dependent on natural resource-based livelihoods are particularly vulnerable to external shocks such as natural disasters, diseases, market fluctuations, and climate change. These external shocks can severely impact a household's income, wealth, and consumption. The COVID-19 pandemic disproportionately affected various economic sectors, with the poor and marginalized sections of the population suffering the most during the pandemic. This study analysed the economic security of small-scale fisher households during the COVID-19 pandemic, focusing on the role of livelihood diversification in mitigating its impact. Small-scale fisher households in Alappuzha and Ernakulam districts of Kerala were selected for the study. The analysis explored the pandemic's effects on household income, expenditure, and indebtedness. Economic security was assessed by developing an Economic Security Index (ESI), and livelihood diversification was assessed using Simpson Index of Diversity. A multiple linear regression model was employed to determine the relationship between household income and selected predictors. The results indicated that households in Alappuzha exhibited higher economic security (ESI: 0.46) compared to that in Ernakulam (ESI: 0.41). Annual household income during the pandemic ranged from ₹102,710 in Ernakulam to ₹132,638 in Alappuzha. Monthly household expenditure saw a 30% reduction in Ernakulam households, compared to a 21% reduction in Alappuzha. The pandemic exacerbated the debt burden of small-scale fisher households, with over 75% resorting to informal borrowing to cope with the economic crisis. Average borrowing during the pandemic was significantly higher in Ernakulam (₹41,025) compared to Alappuzha (₹15,565). The study revealed that livelihood diversification significantly influenced household income, highlighting the critical need for diversification programs to enhance the resilience of small-scale fisher households to external shocks.

**Keywords:** Livelihood diversification, economic security, small-scale fisheries, marine fisheries, COVID-19, Kerala

### **1. Introduction**

Natural disasters such as droughts, floods along with pests and diseases, climate change and market fluctuations are among the major external risks faced by rural households that depend on natural resource-based livelihoods. COVID-19 pandemic caused disproportionate impacts on different sections of the population (Khan *et al.*, 2023) <sup>[16]</sup>. The poor and marginalized sections of the population suffered most during the pandemic (Jimenez, 2021; Siimsen *et al.*, 2023) <sup>[14, 24]</sup>. The marine fisheries sector in India was affected by the nationwide and state wide lockdowns, regional restrictions in fishing and supply chain disruptions during the pandemic. Small-scale fishers in the marine sector with limited opportunities for livelihood diversification suffered severe setbacks during the pandemic with reduction in fishing days and income owing to restrictions in fishing and marketing.

Kerala state has a coastline of 590 kms and a continental shelf of 39,139 sq. kms and is located at the most productive

area of Arabian sea. It is one of the major maritime states in the country. The fishery-related livelihoods in the state are very complex and dynamic. There are 1,21,637 marine fishermen families in Kerala with a total population of 5,63,903. Out of the total 2,11,667 people occupied in the marine fisher households, active fishers account for 34% followed by allied workers (16%). The Alappuzha district has an active fishermen population of 23,709, compared to 4,446 active fisherfolk in Ernakulam district (CMFRI-DOF, 2020) <sup>[7]</sup>.

The relationship between fishing, livelihood diversification and poverty were investigated by authors in different countries (Oluwatayo, 2009; Amevenku *et al.*, 2019; Torell *et al.*, 2019) <sup>[20, 3, 26]</sup>. Agyeman *et al.* (2014) <sup>[4]</sup> and Kassie *et al.* (2017) <sup>[15]</sup> studied the determinant factors of livelihood diversification. Loison (2019) <sup>[18]</sup> analysed the relation between household livelihood diversification and gender in Kenya. Loison and Bignebat (2017) <sup>[19]</sup> analysed the determinants of household income diversification in rural

Senegal and Kenya. Roscher *et al.* (2022) [22] analyzed the sustainable development outcomes of livelihood diversification in small-scale fisheries. Similarly, Gebreyesus (2016) [10] studied the effect of livelihood diversification on household income. Reardon *et al.* (2001) [21] studied rural non-farm employment and incomes in Latin America. A study conducted by Brugere *et al.* (2008) [6] examined the livelihood diversification in fishing communities and its link to economic security. The study conducted by IFPRI (2012) [12] analysed the factors influencing household income in the rural contexts. The study of the determinants of rural livelihood diversification in developing countries by Ellis (2000) [8] focused on livelihood diversification as a strategy for household economic security.

Women in small-scale fisher households in India contribute to household food and economic security through their active involvement in various income generating activities including fishing, fish processing, marketing, and employment in various other sectors. The livelihood strategies of women varied with the opportunities available at local level as well as socio-demographic and cultural factors. However, the economic contributions of women in the small-scale fisher households are often unrecognized. Studies focussed on the economic security and livelihood diversification of marine fisher households are very limited

in the Indian context. In this backdrop, a study was conducted in Alappuzha and Ernakulam districts of Kerala state to analyse the economic security of small-scale fisher households and the role of livelihood diversification and livelihood strategies of women in mitigating the economic impacts of COVID-19.

## 2. Methodology

Data were collected during Jan-March, 2022 from the small-scale fisher households in Alappuzha and Ernakulam districts of Kerala state. Purposive sampling was adopted to select 120 small-scale fisher households where women actively involved in income generating activities. Structured data collection schedules were developed to collect data on socio-demographic particulars, household income, livelihood diversification, savings, indebtedness, ownership of livelihood assets, relief and support measures during the pandemic. The heads of the households were either full time or part time fishers operating small-scale motorized fishing units or workers in the mechanized fishing units. The economic security of the households was assessed by developing an economic security index. The extent of livelihood diversification in the fisher households was analyzed using Simpson Index of Diversity. Multiple regression analysis was employed to assess the determinants of household income of the small-scale fisher households.



**Fig 1:** Study area

### 2.1. Simpson Index of Diversity

Diversification is a process by which households engage in multiple income generating activities (Ellis, 2000) [9]. Saha and Bahal (2014) [23] and Alemu (2023) [1] used Simpson index of diversity (SID) to analyse the livelihood diversification of households. Alemu (2023) [1] reported Simpson index of diversity (SID) as the best to show the share of non-farm income in total household income. The SID considers both the number of income sources and how evenly the distributions of income are made between the

various sources. In this study, the Simpsons Index of Diversity (SID) was used to estimate the livelihood diversification in the fisher households.

$$\text{Simpson Index of Diversity (SID)} = 1 - \sum_{i=1}^n P_i^2$$

where SID is Simpsons Index of Diversity, n is number of income sources,  $P_i$  is proportion of income coming from the  $i^{th}$  income source. The value of Simpsons Index of

Diversity (SID) ranges from zero (0) to one (1). Thus, value zero represents perfect specialization and value one represents perfect livelihood diversification. In the present study classification of households were done based on SID values. SID values of 0-0.38 implied low diversification, 0.39-0.63, medium diversification, and higher than 0.64 implied high diversification (Amevenku *et al.*, 2019) [3].

**2.2. Economic security index**

Economic security is defined as the ability of individuals, households and communities to meet their basic and essential needs including food, shelter, clothing, health care, education information, and social protection consistently in a sustainable manner (ICRC, 2013) [11]. Kumar *et al.* (2025) [17] described economic security in the farming context as the degree to which farmers have a monetary stability between income, expenditure, debt and savings at a given point of time. The economic security index in this study was developed from household income, savings, indebtedness, borrowings during COVID-19, access to health insurance, amount of social security pensions received, land area owned by the household and housing type of the respondents. For developing the economic security index, the original values of the indicators were normalized by min-max transformation and square root method was adopted for assigning weights to the indicators.

The normalized values of the indicators were obtained as follows;

$$Y_{ij} = (X_{ij} - \text{Min } X_{ij}) / (\text{Max } X_{ij} - \text{Min } X_{ij}) \text{ Eq(2)}$$

Where  $X_{ij}$  - is the observed value of  $i$ th parameter and  $j$ th household ( $i = 1,2,3 \dots m, j = 1,2,3 \dots n$ ).

Where,  $\text{Min } X_{ij}$  and  $\text{Max } X_{ij}$  are the minimum and maximum of ( $X_{i1}, X_{i2}, \dots, X_{in}$ ) respectively.

$Y_{ij} = (\text{Max } X_{ij} - X_{ij}) / (\text{Max } X_{ij} - \text{Min } X_{ij})$  if the indicator has a negative relationship with economic security

The economic security index of household  $Y_{ij} = \sum W_i Y_{ij}$

Where  $W_i$  ( $0 < W < 1$ ) are the weights

$$W_i = \frac{k}{\sqrt{\text{Variance}(Y_i)}}$$

$$k = \left( \sum \frac{1}{\sqrt{\text{Variance}(Y_i)}} \right)^{-1}$$

Categorization of households done based on the economic security indices using mean and standard deviation (Balaganesh *et al.*, 2020) [5].

High = Index > (Mean + 0.5 SD)

Moderate = (Mean - 0.5 SD) < Index < (Mean + 0.5 SD)

Low = Index < (Mean - 0.5 SD)

**2.3. Factors affecting household income: Multiple regression analysis**

A multiple linear regression model was employed to examine the relationship between household income and the selected predictors. The regression model is specified as

follows:

$$\text{Household income}_i = \beta_0 + \beta_1 \text{ Education level of household head}_i + \beta_2 \text{ Societal Membership}_i + \beta_3 \text{ Livelihood Diversification Index}_i + \epsilon_i \text{ Eq(4)}$$

where:

Household income<sub>*i*</sub> (HHINC<sub>*i*</sub>)- Household income of the  $i^{\text{th}}$  respondent (Box-Cox transformed)

$\beta_0$  is the Intercept

$\beta_1, \beta_2, \beta_3$  are the coefficients to be estimated

$\epsilon_i$  is the error term, assumed to be normally distributed with mean zero and constant variance.

**Diagnostic Tests and Data Transformation:** Diagnostic tests using visual inspection based on histogram of residuals, Q-Q normal plots of residuals, and statistical test using Shapiro-Wilk test for normality of residuals revealed the presence of outliers and deviations from normality. To ensure the robustness of the analysis, influential outliers were identified using Cook's distance and subsequently removed from the dataset. Additionally, a Box-Cox transformation was applied to the outcome variable to enhance the normality of the residuals further.

$$HHINC_i(\lambda) = \{ (HHINC_i^\lambda - 1) / \lambda, \quad \text{if } \lambda \neq 0$$

$$(HHINC_i), \quad \text{if } \lambda = 0 \}$$

where  $\lambda$  is selected based on maximum likelihood estimation. The Generalized Variance Inflation Factor (GVIF) was used to assess multicollinearity among predictor variables.

**2.4. Variable Selection and Justification**

**Education of household head:** This variable is included in the model based on the premise that household head education significantly influences income levels. Higher education is typically associated with better employment opportunities and increased earnings. This variable is treated as a categorical factor with multiple levels and is expected to have a positive effect on income.

**Membership in societies:** Participation in cooperative societies and other social organizations can enhance economic outcomes by providing access to financial resources, knowledge-sharing, and market linkages.

**Livelihood Diversification Index:** This variable is included in the model based on the assumption that the diversity of income sources can positively impact the household income stability. A higher index in general suggests a greater economic resilience

The final model was selected based on its statistical significance, model fit (Adjusted R<sup>2</sup>), and diagnostic tests. The refined model presented here ensures robust inference while maintaining parsimony by excluding non-significant predictors.

**3. Results and Discussion**

Fishing was the primary occupation of the household heads

and the family members were engaged in fishing allied activities, daily wage workers as well as in the services sector. The heads of the households were either full time or part time fishers operating small-scale motorised fishing units or workers in the mechanised fishing units. The women in the selected small-scale fisher households were employed as workers in shrimp peeling sheds, small-scale fishing, employees under the Mahatma Gandhi National Rural Employment Guarantee Scheme and also as housemaids. The COVID-19 pandemic caused employment loss to all categories of workers due to lock down restrictions during the nation-wide lock down in March-April, 2020 during the first wave of the pandemic and the state wide lock down in May, 2021 during the second wave of the pandemic as well as restrictions during regional lockdowns. Besides the lock down restrictions, inadequate transport facilities and COVID infection of respondents and family members also affected employment and income of the households.

**3.1. Socio-demographic particulars of the respondents**

Socio-demographic particulars of the respondents indicated that the average age of the respondents as 51 years and 52 years in Alappuzha and Ernakulam districts respectively.

Dependency ratio was higher in Ernakulam district compared to Alappuzha district. The average family size was four in both districts. More than 95% of the households had land ownership and more than 90% households owned houses.

**Table 1:** Socio-demographic particulars of the respondents

Particulars	Alappuzha	Ernakulam
Age	51	52
Dependency ratio (%)	24	33
Family size	4	4
Households with land ownership (%)	95	96.67
Households with ownership of house (%)	90	91.67

The COVID-19 pandemic led to significant decrease in monthly household expenditure, with Ernakulam experiencing a 30% reduction compared to a 21% decline in Alappuzha. The economic crisis exacerbated the debt burden of small-scale fisher households. The average borrowing during the pandemic was significantly higher in Ernakulam (₹41,025) compared to Alappuzha (₹15,565). Over 75% of households in Alappuzha and Ernakulam availed credit from informal sources to manage the financial burdens during the pandemic (Table 2).

**Table 2:** Income, consumption, savings and indebtedness of respondent households

Particulars	Alappuzha	Ernakulam
Annual household income (₹)	132638	102710
Households having monthly savings (%)	53	12
Households with indebtedness (%)	85	62
Household expenditure (pre-COVID) (₹)	16493	10393
Household expenditure (COVID) (₹)	12765	7304
Reduction in household expenditure during the pandemic (%)	21	30
Borrowings during the pandemic (₹)	15565	41025

**3.2. Livelihood diversification**

Livelihood diversification analysed based on LDI indicated that the fisher households in Alappuzha had more diversified income sources as compared to fishers in Ernakulam. Majority of households belonged to medium level of diversification in both the districts. 13.33% and 25% of households were in the low diversification category while 18.33% and 16.67% were in the high diversification category in Alappuzha and Ernakulam districts respectively (Table 3).

**Table 3:** Livelihood diversification in fisher households

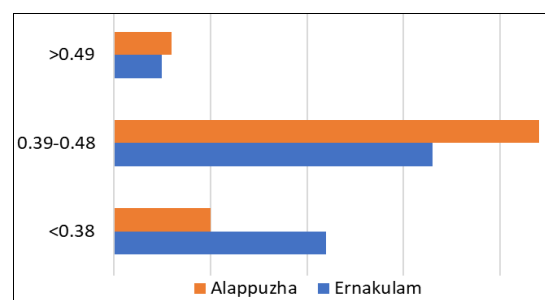
Category	LDI	Alappuzha		Ernakulam	
		No of households	%	No of households	%
Low	<0.38	8	13.33	15	25.00
Medium	0.39-0.63	41	68.33	35	58.33
High	>0.64	11	18.33	10	16.67

The shrimp peeling sheds (pre-processing centres) provided an alternate livelihood source to the women in the small-scale fisher households in Alappuzha. The average working days for women in small-scale fisher households declined during the pandemic, from 155 to 140 days in Alappuzha district. Since the majority of shrimp peeling sheds are located in Alappuzha district, women workers in this region had greater opportunities to get employed in these facilities.

The women engaged in peeling received an average wage of ₹591 per day. In contrast, women in small-scale fisher households in Ernakulam district, who often worked as part-time as housemaids, experienced a temporary drop in income due to reduction in working days due the pandemic. The average working days declined from 171 to 79 days in Ernakulam district during the pandemic.

**3.3. Economic security of households**

The households were categorised based on the mean and SD of economic security indices as high (>0.49) moderate (0.40-0.48) and low <0.39. The economic security index values indicated that the 37% of the households in Ernakulam district under low economic security as compared to 17% in Alappuzha district (Fig.2).



**Fig 2:** Economic security index(% households)

### 3.4. Factors affecting household income

The multiple linear regression analysis was done to analyze the factors affecting household income. The analysis reveals key determinants of household income, with significant implications for economic policy and livelihood strategies of marine fisher household in the study area.

The explanatory variables chosen for the analysis included education of head of the household, membership in fishers society and livelihood diversification in the households. The results of the analysis revealed that higher education of the household head and livelihood diversification had a positive and significant impact on household income, while the lack of membership in fishermen's societies negatively impacted the household income (Table 4). Education of the household head plays a crucial role, with upper primary education significantly increasing income, while high school education shows a marginally significant positive effect. Results indicate that fisher households without memberships in fishers' societies or cooperative societies experience lower income levels, though the effect size remains modest. Similar findings were reported for coastal fisher households in other regions. A study to evaluate the impact of cooperative membership on households' income in Indonesia's capture fisheries sector indicated that cooperative membership had a positive and significant impact on the household income (Taniu *et al.*, 2024)<sup>[25]</sup>. A case study conducted in Zanzibar by Ali (2024)<sup>[2]</sup> also reported that cooperative membership improved household income.

Studies conducted in various countries revealed that livelihood diversification in the fisheries sector reduce

fishing pressure and vulnerabilities to external shocks and adverse trends, and also enable people to find pathways out of poverty. Torell *et al.* (2017)<sup>[26]</sup> reported that livelihood diversification can increase the number of income-generating activities and is often adopted as a strategy to reduce vulnerability to risk and provide a pathway out of poverty. Amevenku *et al.* (2019)<sup>[3]</sup> used Simpson's Diversification Index to examine the vulnerability and diversification of fishing households in Ghana. They suggested that policy interventions aimed at enhancing diversification among fishing households are essential to reducing income risks.

In the present study, the Livelihood Diversification Index emerges as the strongest predictor of marine fisher household income, reinforcing the importance of diversifying income sources for economic stability. Kassie *et al.* (2017)<sup>[15]</sup> in the study on determinant factors of livelihood diversification in Ethiopia have also reported that institutional factors such as secured land use rights and membership in cooperatives had significant influence on the probability of farm households' livelihood diversification in non-farm activities.

The results suggest that while education is an important factor in income generation, the diversification of income sources plays a far more critical role in ensuring financial resilience especially during external covariate shocks such as the pandemic. This underscores the need for policies that promote multi-sectoral livelihood opportunities and skill development initiatives for fisher community that enable households to engage in diverse income-generating activities.

**Table 4:** Factors affecting household income: Multiple regression analysis

Variable	Estimate	Std. Error	t-value	p-value
Education of the household head (Base: Lower Primary Education)				
Upper Primary	50.55 **	17.34	2.915	0.004
High School	31.07	18.04	1.722	0.088
Above High School	40.35	42.77	0.943	0.348
Membership in societies (Base: 1=Yes, 0 Otherwise)	-34.5	19.01	-1.815	0.072
Livelihood Diversification Index	202.4***	47.93	4.223	5.02E-05
Constant	175.96 ***	25.84	6.811	5.54E-10
Multiple R- squared	23.45			
Adjusted R- squared	19.90			
F (5, 109)	6.68***			
Residual Standard Error (df=109)	69.64			

**Source:** Author's calculations based on field survey

**Note:** \*\*\*, \*\*, \* presents significance at 1, 5 and 10 percent presents marginal significance

### 4. Conclusion

Livelihood diversification has significant impacts on the economic well-being of rural households. Small-scale fisher households dependent on natural resource-based livelihoods are particularly vulnerable to external shocks. The study revealed that livelihood diversification significantly influenced the household income, and highlighted the critical need for diversification programs to enhance the resilience of small-scale fisher households to external shocks. Livelihood diversification also contribute to improved ecological outcomes by reducing the fishing pressure. The study also suggested the role of membership in fishermen societies on household income and stresses the need for institutional interventions to improve the

livelihoods of small -scale fisherfolk.

### 5. Acknowledgements

The paper is based on the research work done under the institute project "Assessing the livelihood status of marine fisherfolk in India: A sustainable livelihoods approach". The authors express sincere gratitude to the Director, ICAR-CMFRI for providing the facilities for undertaking the research.

### 6. References

1. Alemu FM. Measuring the intensity of rural livelihood diversification strategies and its impacts on rural households' welfare: Evidence from South Gondar

- Zone, Amhara Regional State, Ethiopia. *MethodsX*. 2023;10:102191.  
<https://doi.org/10.1016/j.mex.2023.102191>.
2. Ali MJ, Qianqian G, Wenguang G. Measuring the impacts of cooperative membership on household income: A case study of Zanzibar. *South Afr J Econ Manag Sci*. 2024;27(1):a5329.  
<https://doi.org/10.4102/sajems.v27i1.5329>.
  3. Amevenku FKY, Kuwornu JKM, Seini AW, Osei-Asare YB, Anim-Somuah H. Livelihood vulnerabilities and diversification of fishing households in Ghana. *Dev Pract*. 2019;29(7):867-881.  
Doi: 10.1080/09614524.2019.1636933.
  4. Agyeman BAS, Asuming-Brempong S, Onumah EE. Determinants of income diversification of farm households in the Western Region of Ghana. *Quart J Int Agric*. 2014;53(1):55-72.
  5. Balaganesh G, Malhotra R, Sendhil R, Sirohi S, Maiti SN, Ponnusamy K, *et al*. Development of composite vulnerability index and district level mapping of climate change induced drought in Tamil Nadu, India. *Ecol Indic*. 2020;113:106197.  
<https://doi.org/10.1016/j.ecolind.2020.106197>.
  6. Brugère C, Holvoet K, Allison E. Livelihood diversification in coastal and inland fishing communities: misconceptions, evidence and implications for fisheries management. Working paper, Sustainable Fisheries Livelihoods Programme (SFLP), FAO/DFID, Rome; c2008.
  7. CMFRI-DOF. Marine Fisheries Census 2016-Kerala. Central Marine Fisheries Research Institute, Indian Council of Agricultural Research, Ministry of Agriculture and Farmers Welfare; Department of Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India. 2020.
  8. Ellis F. Rural livelihoods and diversity in developing countries. Oxford: Oxford University Press; 2000.
  9. Ellis F. The determinants of rural livelihood diversification in developing countries. *J Agric Econ*. 2000;51(2):289-302.
  10. Gebreyesus B. The effect of livelihood diversification on household income: Evidence from rural Ethiopia. *Int J Afr Asian Stud*. 2016;20:2409-6938.
  11. ICRC. International Committee of the Red Cross, 19, avenue de la Paix 1202 Geneva, Switzerland; 2013.
  12. IFPRI (International Food Policy Research Institute). The determinants of income growth: A study of rural household incomes in Africa. Washington, DC: IFPRI; 2012.
  13. Jeeva JC, Menon M, Raju SS, Narayanakumar R, Edward LL, Satishkumar M, *et al*. The impact of COVID-19 pandemic on marine fisheries sector: A case study from Andhra Pradesh, India. *Indian J Fish*. 2023;70(2):116-125.  
Doi: 10.21077/ijf.2023.70.2.120615-15.
  14. Jiménez M. What triggers economic insecurity and who is most at risk? United Nations, New York, NY, USA; 2021.
  15. Kassie GW, Kim S, Fellizar FP Jr. Determinant factors of livelihood diversification: Evidence from Ethiopia. *Cogent Soc Sci*. 2017;3(1):1369490.  
Doi: 10.1080/23311886.2017.1369490.
  16. Khan MA, Hossain ME, Rahman MT, Dey MM. COVID-19's effects and adaptation strategies in fisheries and aquaculture sector: An empirical evidence from Bangladesh. *Aquaculture*. 2023;562:738822. Doi: 10.1016/j.aquaculture.2022.738822.
  17. Kumar TLP, Goudappa SB, Shashidhara KK, Sidram BY, Reddy BS, Umesh MR. Assessing sustainable livelihood security of integrated farming system practicing farmers in Karnataka: Focus on index development. *Int J Agric Ext Soc Dev*. 2025;8(1):490-495.  
<https://doi.org/10.33545/26180723.2025.v8.i1h.1570>.
  18. Loison SA. Household livelihood diversification and gender: Panel evidence from rural Kenya. *J Rural Stud*. 2019;69:156-172.
  19. Loison SA, Bignebat C. Patterns and determinants of household income diversification in rural Senegal and Kenya. *J Poverty Alleviat Int Dev*. 2017;8(1):93-126.
  20. Oluwatayo IB. Poverty and income diversification among households in rural Nigeria: A gender analysis of livelihood patterns. Department of Agricultural Economics and Extension Services, Faculty of Agricultural Sciences, University of Ado-Ekiti, Nigeria; 2009.
  21. Reardon T, Berdegue J, Escobar G. Rural nonfarm employment and incomes in Latin America: Overview and policy implications. *World Dev*. 2001;29(3):395-409. Doi: 10.1016/S0305-750X(00)00112-1.
  22. Roscher MB, Allison EH, Mills DJ, Eriksson H, Hellebrandt D, Andrew NL. Sustainable development outcomes of livelihood diversification in small-scale fisheries. *Fish Fish*. 2022;23:910-925.  
Doi: 10.1111/faf.12662.
  23. Saha B, Bahal R. Livelihood diversification pattern among the farmers of West Bengal. *Econ Aff*. 2014;59(3):321-334. <https://doi.org/10.5958/0976-4666.2014.00001.1>.
  24. Siimsen I, Orru K, Naevestad T-O, Nero K, Olson A, Kaal E, Meyer SF. Socio-economic outcomes of COVID-19 on the marginalised: Who have taken the hardest hit? *Int J Disaster Risk Reduct*. 2023;93:103723.  
<https://doi.org/10.1016/j.ijdr.2023.103723>.
  25. Taniu S, Sari DW, Satria D, Haryanto T, Wardan WW. Impact evaluation of cooperative membership on welfare: Evidence from captured fishery households in Indonesia. *Mar Policy*. 2024;159:105923.  
<https://doi.org/10.1016/j.marpol.2023.105923>.
  26. Torell E, McNally C, Crawford B, Majubwa G. Coastal livelihood diversification as a pathway out of poverty and vulnerability: Experiences from Tanzania. *Coast Manag*. 2017;45(3):199-218.  
<https://doi.org/10.1080/08920753.2017.1303718>.