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Inequality of income, asset and debt of inland fishers in the Theni District of Tamil Nadu, India

KALIDOSS RADHAKRISHNAN, R. MARIMUTHU*, M. RAJAKUMAR* AND NEHA W. QURESHI
ICAR-Central Institute of Fisheries Education, Versova, Mumbai - 400 061, Maharashtra, India
**Fisheries College and Research Insitute, Tamil Nadu Fisheries University, Thoothukudi - 628 008, Tamil Nadu, India*
e-mail: marimuthu.kombai@gmail.com

ABSTRACT

In the present study, an attempt was made to measure the impact of inequality on income, asset and debt of inland fishers in the Theni District of Tamil Nadu, India. A total of 140 respondents were surveyed for this work. Gini index (GI) was applied to measure the income inequality and multiple regression was done to identify the influencing variable of asset and debt. Higher income was observed in non-fishing activities than those of the fishing and fishing related works while higher income equality was recorded in fishing. Among assets, fishing gear, craft, television and land had lesser inequality (GI 0.06 to 0.41) while furniture and livestock had higher inequality (GI 0.0 to 0.80). Average debt was found to be higher among institutional sources than that of the non-institutional ones, whereas, a minimum GI (0.59) was recorded in Vagai and the maximum GI (0.76) in Kullapuram. Results of the study indicate that there is a need for curtailing the credit from non-institutional sources, which burden fishers and affects their economic status. Also, the fishing sector in Tamil Nadu needs proper policy attention regarding education and well-designed market policies and institutions to minimise the inequality that is plaguing the sector.

Keywords: Gini coefficient, Income inequality, Inland fishers, Regression

Introduction

With the increasing population and their subsequent nutritional requirement, inland fisheries have to play a lead role, because fish production from marine sources has reached the plateau and has remained stagnant during recent past. The inland fish production has grown from 2.18 lakh t in 1950-51 into 57.19 lakh t in 2012-13 (HBFS, 2014). This huge growth was achieved from the inland capture (area) and culture fisheries (total aquaculture area of 2.388 lakh ha). Therefore, the contribution of inland fishers to fish production is indispensable and studies have been done around the world to assess their social and economic status (Baran *et al.,* 2007; Nath, 2015; Lynch *et al.,* 2016). However, the distribution of income was not even all over the world; it was majorly influenced by the type of fish farming practices, the area of operation and type of species cultured. High income makes higher assets along with low debt. The inequality affects the growth and economics at the national level (Forbes, 2000; Fredriksen, 2012). Income inequality had the upshot on the household debt (Iacoviello, 2008), consumption (Krueger and Perri, 2006) and its dimension (Ahluwalia, 1974) and trend (Cingano, 2014). The income in asset inequality has an event on poverty reduction (Birdsall and Londono, 1997). However, few studies were performed about inequality in inland fisheries; therefore, there exists paucity in information about the present status. This study has addressed the income inequality of inland fishers of Theni District, Tamil Nadu together with the determinants of the assets and debt.

Materials and methods

The present investigation was conducted in Theni District, Tamil Nadu. The primary data was collected from 20 respondents each from 7 cooperative societies *viz*., Andipatti, Bodi, Cumbum, Kullapuram, Periyakulam, Theni and Vaigai) by adopting two-stage random sampling between August 2014 and May 2015. Secondary information was sourced from the Department of Fisheries, Government of Tamil Nadu. Income of the selected respondents was categorised based on the nature and source of income into: fishing, fishing-related activities and non-fishing activities (including agriculture activities and small business). The assets were categorised into basic assets such as the value of land, house, fridge, television (TV), furniture, motorcycle, livestock, crafts and gears. The debt was classified based on the source such as institutional and non-institutional. Estimated income, asset and debt were represented in tabular form and their inequality was measured by Gini coefficient Index (GI) whcih is the most popular method to assess the

inequality in many fields (Maio, 2007) including fisheries. GI was calculated using the formula (Arora *et al.,* 1990):

Let the income be ordered as E1 < E2 < E3 <E3……<En

Then the Gini Coefficient (GI) is given by

$$G\,I=\frac{1}{(n-1)}\sum_{i=n}^{n} ei\,[2i-(n+1)]$$

where, E' = mean income of groups En, I = 1, 2, 3, n respondents and n is the number of individuals (respondents)

Higher the value of GI, the greater is the degree of inequality between upper and lower income groups of fishermen households which means the coefficient value of 0 represents the equal distribution of income and coefficient 1 represents unequal distribution of income among the society.

The regression approach was adopted to know the significant variables influencing asset, debt and income.

$Y = a + bX$

where, Y is the dependent variable, a is the intercept and x is the independent variable. The entire analysis was performed in Microsoft Office, 2010 (Windows 8.0) and Statistical Package for the Social Science (SPSS), version 20.

Results and discussion

Income of the cooperative society respondents is presented in Table 1. Non-fishing activities were seen to generate greater income than that of the fishing and fishing allied activities. The highest income earned in fishing (₹3275) and fishing allied activities (₹1200) by Andipatti Society and in non-fishing (₹6272) by Vaigai Society. A congruent picture was observed in Theni by Marimuthu *et al.* (2015) with an average income of ₹ 2800 earned in fishing, ₹ 617 in fishing allied works and ₹5096 in non-fishing activities. A similar study in western Tripura stated that 77, 12 and 7.5% of fishers' generated income more than ₹ 3000, 2000 - 3000 and 1000 - 2000, respectively from aquaculture only (Pandey and Upadhayay, 2012). The economics of fish farmers of Jammu studied by Kumar *et al.* (2015) revealed that, nearly about 66% of fishers had lower income (₹3000) and that 36% of fishers' fall under medium level income group. However, a disputed statement was reported by Kumari and Patra (2014) that, about 34% of inland fishers had income range of 5000 to 10000 per month, 48% of fishers' income ranged from 10000 to 15000 per month, 15% of fishers earned 15000 to 20000 per month and the remaining 3% had income of 20000 to 25000 per month in Angul District of Odisha. Moreover, the fishing income was reported to be directly proportional to fish caught (Kundu, 2011). For better livelihood, state fisheries department stocked 14.04 lakhs fingerlings in Vaigai, 0.74 lakhs in Manjalar and 0.22 lakhs in Shanmuganathi during 2011-12 and in turn harvested 24.67 tons, 13.26 t and 1.49 t of fishes from the water bodies respectively. The inland fish production in 2011-12 was estimated at 3422.26 t with an annual growth rate of 1.85%. The stocked (catla, roghu, mrigal) and un-stocked (tilapia) species also contributed (TNSFD, 2014). The average fish catch of 44.57, 47.83 and 7.60% of fishers were 3-5, 6-8 and 9-10 kg day^{-1} respectively in Beki River and maximum landing was recorded in gillnet (33%), followed by cast net (27%), scoop net (24%), line (10%) and traps (6%) (Kalita *et al.,* 2015). The highest income of about 72% was accounted in fisheries at Kerala, by those who were involved in multiple occupations.

Income from fishing allied works was found to be lower and this may be due to seasonal nature of the work. Hence, the minimum income of ₹ 225 was recorded in Theni and highest of ₹1200 in Andipatti cooperative fishers' society. In non-fishing activities, higher income generated has been ascribed to natural endowment including Vaigai dam. The dam irrigates more than 2.25 lakh ha areas of agricultural land in Tamil Nadu with canal length of 32.30 km (DSHB, 2014).

Gini coefficient indicates the deviation of income from the mean. It is the area between the perfect equality and the line of perfect inequality. The income GI result is presented in Fig. 1. In fishing activities, GI was found to be lower for Theni (0.081) and Cumbum compared to Periyakulam (0.085), Kullapuram (0.096), Vaigai (0.106),

Table 1. Mean income of the respondents (₹ per month)

Name of the cooperative society	Fishing activities (₹)	Fishing allied activities (₹)	Non-fishing activities (₹)
Andipatti	3275.00	1200.00	3975.00
Bodi	2950.00	700.00	4075.00
Cumbum	2650.00	650.00	5150.00
Kullapuram	2575.00	450.00	5275.00
Periyakulam	3066.67	555.56	5527.78
Theni	2575.00	225.00	5325.00
Vaigai	2659.09	545.45	6272.73

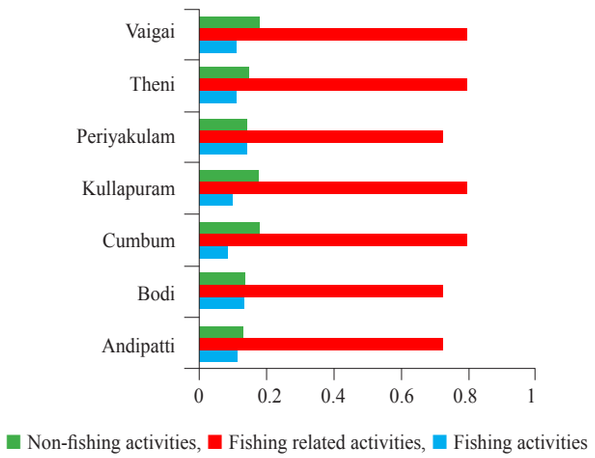


Fig. 1. Income Gini coefficient index for the selected cooperative societies in Theni District

Andipatti (0.108) and Bodi (0.129) cooperative societies. A higher inequality was recorded in fishing allied works even though it generated lower income. In fishing allied works, fishers of the cooperative societies *viz*., Andipatti, Bodi and Periyakulam had homogenous income with GI of 0.73 while fishers of Cumbum, Kullapuram and Vaigai had GI of 0.80. In non-fishing activities too, Andipatti society fishers had a lower GI of 0.126 and a high GI of 0.179 was recorded for Cumbum. However, high homogenous income was observed in fishing activities than in non-fishing activities and fisheries allied works. Fishing GI was found to be lower in the present study than that reported by Mohd *et al.* (1993) and Wamukota *et al.* (2014). Mohd *et al.* (1993) calculated the GI for fishing income and total income (include non-fishing activities) as 0.3387 and 0.3456 respectively in Malacca, Malaysia. Wamukota *et al.* (2014) found higher income equalities in sea cucumber fishery with a GI of 0.37 than octopus fishery with a GI of 0.63. Aghazadeh (1994) reported that income was uneven within the fish farmer's community and a huge difference was perceived.

Table 2 shows the asset value of inland cooperative society fishers, including movable and immovable. The highest average level of assets was observed in Vagai followed by Kullapuram, Theni, Bodi, Periyakulam, Cumbum and Andipatti. However, no livestock was recorded in Kullapuram. Basavakumar *et al.* (2012) studied the assets of fishers household including home, fishing gears and craft, lands, livestock and others. Around 56% of fishermen families had assets value of less than ₹30,000, 13% had assets of ₹30,001 to 45,000, 9% had ₹45,001 to 60,000 and 12% of fishers had an asset value of more than ₹ 60,000. However, as compared to the above study (Basavakumar *et al.,* 2012), in the present study area, fishers had higher value of asset. Kupo (2009) documented that, when the asset holding of the respondent was high (above ₹ 2,50,000), land contributed around 73% of the total assets. Table 2 clearly shows that fishers holding higher land asset value had a lower asset value of livestock and house. Kupo (2009) also supported this. But, the total asset value of inland fishers of Theni Ddistrict was less than the average household value of ₹ 306967 in India as reported by Subramanian and Jayaraj (2006).

The asset inequality is depicted in Fig. 2 which reveals that fridge and livestock inequality was higher for all cooperative societies except Kullapuram. Homogenous equality was noticed among fishing crafts and gears which proved that the economic value of the crafts and gears was more or less similar as confirmed by the GI range of 0.06 to 0.08. A coefficient of 0.15 to 0.43 reflects the partial equality of household. A coefficient of 0 represents the perfectly equal distribution of fridge for Cumbum and Kullapuram and livestock for Kullapuram. Belton *et al.* (2015) reported that with increasing aquaculture farming practices, the land inequality of leased land decreased as compared to own land.

Debt of inland cooperative society fisherman is presented in Table 3 which r shows that highest debt of ₹43600 of institutional and ₹ 3750 of non-institutional was recorded in Vaigai Society. The lowest debt (₹12250) was noticed in Cumbum Society fishers with an amount of Institutional debt was found to be highest compared to the non-institutional counterpart and this could be attributed to the lower interest rate of 10 to 14%. Non-institutional

Table 2. Assets of the inland cooperative society fishermen

Name of the cooperative society	Land (₹)	House (₹)	Fridge (₹)	TV (₹)	Furniture (₹)	Motorcycle (₹)	Craft and gear (₹)	Livestock (₹)
Andipatti	50000	33750	2000	2600	2400	7000	64950	5500
Bodi	71000	57500	3500	3475	5150	25000	63500	3750
Cumbum	55500	30750	0	2600	325	35000	63250	5750
Kullapuram	64500	109000	0	3300	2950	27000	61750	0
Periyakulam	64000	57000	2500	3550	5882	3525	65000	2000
Theni	65500	58250	4750	3150	3350	52000	63850	4000
Vaigai	73000	175000	7000	3475	4500	18750	64350	8500

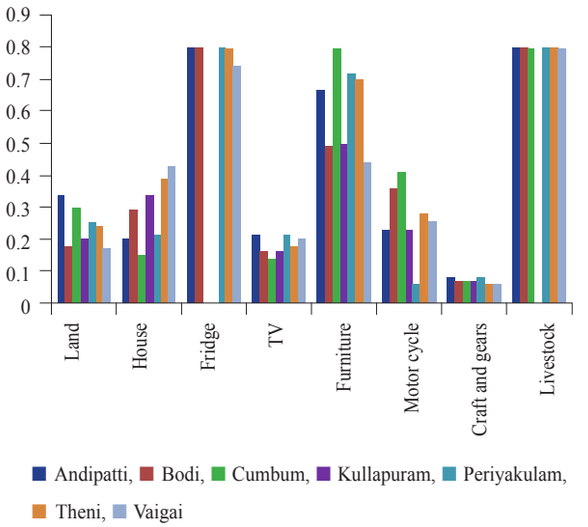


Fig. 2. Asset Gini coefficient

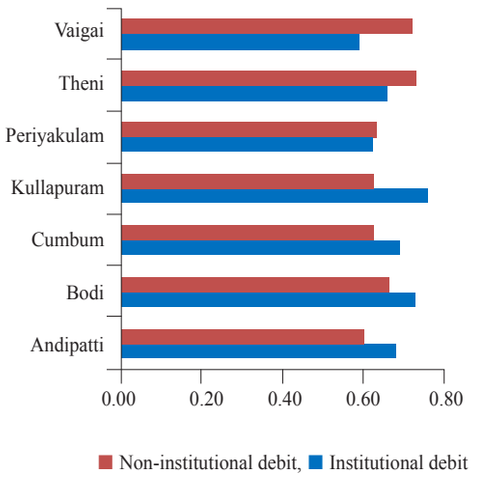


Fig. 3. Debt Gini coefficient

finance has been charged 3 to 5 times higher interest rate than institutional; exerting a heavy burden on fishers and it affects the economic status too. Cumbum Society fishers had better performance in terms of less debt as compared to other cooperative societies (Table 3). Srivastava *et al.* (1986) stated that mechanised fishing crafts have lower income indebtedness due to sustained potential income. Fishers' were ready to link with cooperative society, as financial source as well as for marketing. Besides, small amounts of loans are aslo obtained from the institution.

A higher debt inequality was observed in both the institutional and non-institutional debts. At the institutional level, a minimum GI of 0.59 was observed in Vaigai and maximum of 0.76 in Kullapuram. But in non-institutional debt, minimum GI was found in Andipatti (0.60) and maximum at Theni (0.73). Nevertheless, Fig. 3, indicates that only a few were having debt. The same was evidenced from unequal debt distribution within the society.

Regression approach

The beta coefficient value of the multiple regression approach for asset and debt is given in Table 4 and 5. Debt was negatively influenced by the asset of Andipatti (0.002), Cumbum (0.180) and Vaigai (-0.180) cooperative society fishers which was statistically significant ($p<0.05$) for Vaigai.

Table 3. Debt of inland cooperative society fishermen

Name of the cooperative society	Institutional debt (₹)	Non-institutional debt (₹)
Andipatti	16250	7450
Bodi	14500	5200
Cumbum	12250	4600
Kullapuram	24225	1500
periyakulam	35750	5350
Theni	30150	6950
Vaigai	43600	3750

A multiple regression was run to predict the income of fishing, fishing-related and non-fishing activities from the debt sources (commercial banks, private banks, moneylenders, merchants, cooperative societies, friends and relatives) and asset (land, house, fridge, television, furniture, motorcycle, craft and gears livestock) (Table 6a,b). In fishing activities, private bank and television were statistically significant ($p<0.05$, $R^2=0.869$) with a beta coefficient of -0.133 and -0.501 respectively for the Andipatti cooperative society. This implied that for each increase of 1% private bank loan, there was a decrease in gross revenue of -0.133 from fishing activities. Similarly, land (0.633) was statistically significant ($p<0.05$, $R^2=0.856$) for fishing activities and the cooperative societies (0.009) were statistically significant ($p<0.05$, $R^2=0.709$) for fishing related activities in Cumbum cooperative society. This showed that, for every 1% increase of loan, the income increased by 0.009 in fishing related activities. In Periyakulam, commercial banks, private banks and land, negatively influenced the mean income of fishing related activities with a beta coefficient of -0.009, -0.026, -0.02 respectively, while furniture, motorcycle, fishing craft and gears positively influenced the same by a beta coefficient of 0.124, 2.302, 0.837 ($p<0.05$, $R^2=0.969$). The Durbin-Watson measures the autocorrelation and signified negative correlation between the adjacent residual in income from fishing, fishing-related and non-fishing activities for Periyakulam, Theni and Vaigai cooperative societies. Other societies had positive and negative autocorrelations. Field (2009) represented that if the value was less than 1 or more than 3, it undoubtedly attracts concern. But, in the present study, this doesn't

Table 4. Regression coefficient for asset

	Andipatti	Bodi	Cumbum	Kullapuram	Periyakulam	Theni	Vaigai
Constant	147443.7*	120554.9	139815.4	128550.8	100997.8	245096.9*	26349.74
Fishing	-5.367	-13.851	4.907	-3.841	5.516	8.772	93.603
Fishing allied	4.526	-8.938	5.930	44.999	1.603	-0.578	27.519
Non-fishing	-6.066	23.533	-4.960	15.088	5.798	-14.310	11.535
Debt	-0.005	0.168	0.305	0.167	-0.184	0.284	-1.456*
R	0.292	0.533	0.277	0.491	0.263	0.413	0.682
R Square	0.086	0.284	0.077	0.241	0.069	0.171	0.464

*Statistically significant at 0.005 level

Table 5. Regression coefficient for debt

	Andipatti	Bodi	Cumbum	Kullapuram	Periyakulam	Theni	Vaigai
Constant	11920.6	39674.6	1853.2	-23445.0	89984.7	-93611.4	140675.3
Fishing	1.862	-4.893	0.880	23.165	1.821	11.109	-16.915
Fishing allied	-2.788	-3.803	1.559	-6.388	-2.764	-5.860	0.017
Non-fishing	2.099	-2.210	0.943	-3.920	-4.707	12.661	0.761
Asset	-0.002	0.035	0.053	0.050	-0.180	0.165	-0.180*
R	0.229	0.267	0.199	0.299	0.253	0.481	0.635
R Square	0.052	0.071	0.040	0.089	0.064	0.232	0.403

Table 6a. Regression coefficient value for income from fishing, fishing-related and non-fishing works

	Andipatti cooperative society			Bodi cooperative society			Cumbum cooperative society			Kullapuram cooperative society		
	Fishing	Fishing related	Non-fishing	Fishing	Fishing related	Non-fishing	Fishing	Fishing related	Non-fishing	Fishing	Fishing related	Non-fishing
(Constant)	6261.57*	2499.37	9209.43	3021.22	5817.48	1545.72	3536.81*	-2661.02	4181.42	1901.44	-3258.43	-59.24
Commercial banks	0.009	-0.013	0.004	-0.016	-0.037	0.003	-0.02	0.07	-0.005	-0.002	-0.01	-0.007
Private banks	-0.133*	-0.083	0.028	0.006	-0.038	-0.012	-0.002	0.025	-0.025	0.05	-0.06	-0.041
Moneylenders	-0.002	0.08	0.027	0.049	-0.163	0.033	-0.038	0.081	0.003	0.02	0.143	0.035
Merchants	-0.14	-0.133	0.057	0.082	0.011	0.642	-0.043	0.255	-0.606	0.259	0.188	0.218
Cooperatives societies	-0.016	-0.122	-0.037	-0.06	-0.588	0.293	-0.086	0.633*	0.009	-0.022	-0.033	0.056
Friends and relatives	-0.007	-0.109	-0.107	0.083	-0.203	0.336	-0.034	0.025	-0.057	-0.167	-0.137	0.267
Land	0.009	0.037	0.002	-0.011	-0.013	-0.024	0.009*	-0.004	0.006	-0.004	-0.001	-0.005
House	-0.004	0.015	0.01	-0.007	0.012	0.003	0.026	-0.002	-0.003	-0.003	-0.006	0.003
Fridge	0.003	0.155	0.078	-0.038	-0.055	-0.058	-0.12	0.337	-0.269	-	-	-
TV	-0.501*	-0.204	-0.252	0.342	0.181	0.79	-0.012	0.027	-0.758	0.71	1.479	0.836
Furniture	-0.025	0.067	-0.184	-0.091	-0.242	-0.035	-0.005	0.01	-0.024	-0.251	-0.291	-0.102
Motorcycle	-0.015	-0.219	-0.152	0.012	0.035	0.035	-0.226	0.098	0.451	-0.011	0.034	0.017
Craft and gear	-0.24	-0.344	-0.573	-0.01	-0.464	0.053	0.008	0.04	0	0.006	-0.04	0.282
Livestock	0.022	0.012	-0.051	-0.023	-0.069	-0.03	-	-	-	-	-	-
R	0.932	0.91	0.646	0.815	0.703	.903a	0.925	0.842	0.758	0.773	0.771	.700a
R Square	0.869	0.827	0.417	0.664	0.494	0.816	0.856	0.709	0.575	0.598	0.595	0.49
Durbin-Watson	2.417	1.684	2.125	2.809	3.005	1.886	1.891	2.925	2.389	3.018	1.399	2.198

*Statistically significant at 0.05 level

have any say since time series data was not used. The debt had a negative attitude towards the income of fishing allied works for Andipatti and Bodi cooperative societies. It was also found that assets had a negative association with income of non-fishing activities in all the cooperative society fishers except Bodi and Kullapuram.

Income inequality has enlarged noticeably over the epochs. Nevertheless, top earners bagged the higher share of the total income gain, others witnessing only an inconsequential rise in income. Therefore, valuation of an economic performance should not only focus on overall income growth, but also ought to account the income distribution (OECD, 2012). In the present study it was found that, highest income was earned from the non-fishing with lower income inequality than that of the fishing and fishing allied activities. A larger income inequality was noticed in fishing allied works due to irregularity of jobs. A lowest asset inequality was logged in fishing gear and craft, television, and land and highest in furniture and

Table 6b. Regression coefficient value for income from fishing, fishing-related and non-fishing works

	Periyakulam cooperative society			Theni cooperative society			Vaigai cooperative society		
	Fishing	Fishing related	Non-fishing	Fishing	Fishing related	Non-fishing	Fishing	Fishing related	Non-fishing
(Constant)	5462.03	-8858.02*	12414.09	-988.81	-3173.74	19355.07	2372.81	-9189.21	7898.99
Commercial banks	-0.001	-0.009*	0.001	0.003	-0.002	0.007	0.002	0.021	0.022
Private banks	-0.002	-0.026*	0.048	0.006	0.022	0.016	-0.003	0.024	-0.001
Moneylenders	-0.009	-0.077	0.091	0.011	0.008	0.039	-	-	-
Merchants	-0.081	-0.05	0.03	0.136	0.244	-0.076	-0.007	0.065	-0.151
Cooperative societies	0.051	0.087	-0.166	-0.004	0.064	-0.228	0.109	0.9	-1.316
Friends and relatives	-0.216	-0.403	0.314	0.695	1.067	-0.781	0.018	0.113	-0.121
Land	-0.001	-0.02*	0.031	-0.006	0.001	-0.018	0.004	0.007	0.045
House	0.014	-0.022	-0.033	0.003	0.006	0.002	-0.001	-0.012	0.014
Fridge	0.016	-0.101	0.049	-0.002	-0.107	-0.025	0.034	-0.023	-0.071
TV	-0.132	-0.233	0.121	0.389	0.548	-1.004	-0.197	0.72	-0.275
Furniture	-0.036	0.124*	0.007	0.125	0.344	-0.344	0.06	0.312	-0.093
Motorcycle	-0.09	2.302*	-1.009	0.033	0.044	-0.081	-0.021	-0.05	0.026
Craft and gear	-0.31	0.837*	-0.691	0.012	-0.323	-0.683	0.093	1.032	-0.724
Livestock	0.022	0.012	-0.093	-0.01	-0.021	0.044	0.009	0.01	-0.02
R	0.88	0.984	0.832	0.829	0.903	.875a	0.858	0.86	0.867
R Square	0.774	0.969	0.693	0.687	0.815	0.766	0.737	0.739	0.751
Durbin-Watson	2.146	2.452	2.63	2.261	2.064	2.206	2.42	2.568	2.29

*Statistically significannt at 0.05 level

livestock. Besides, the debt was primarily sourced from institutional rather than non-institutional sources, owing to higher interest rate. However, results of the study indicates that fishers had lower income inequality except in fishing related works; no remarkable variation in assets inequality and a greater debt inequality in the study area,

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