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Income inequalities of farmer producer organizations registered as Mutually Aided Co-Operative Society (MACS) in Anantapur district of Andhra Pradesh

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Abstract
According to the millennium development goals, addressing poverty is the biggest challenge of this millennium. The livelihoods of approximately 70% of India's rural people depend on agriculture and related activities. However, small holding-based agriculture has steadily lost its viability due to highly scattered, diverse, and fragmented landholding, growing cultivation costs, and limited access of small/marginal farmers (SF/MF) to public resources and markets. Small and marginal farmers make up the major members of FPOs, which are collectives of farmers. The Andhra Pradesh Mutually Aided Co-operative Societies Act, 1995 (APMACS) was started in Andhra Pradesh (A.P) state has updated certain restrictive clauses in the former co-operative legislation. Study was carried out in Rapthadu Mandal of Anantapur district. 10 random villages were selected for the study from a list of 30 villages in Rapthadu Mandal that were covered by the MACS. Data was collected from 60 MACS farmers and a control sample of 40 non-MACS farmers from the randomly chosen villages. Gini coefficient ratio and Lorenz curve were employed to assess the income inequalities in the selected sample. Nearly 72% of the farm families was between the income limit of Rs. 45,000 and their share in total income was 24.7 per cent while 70% of the non-MACS farm families was between the income limit of Rs. 45,000 and their share in the total income was 23.32%. Gini index for the households of MACS and non-MACS were 0.451 and 0.465 respectively.

1. Introduction
Agriculture is a significant sector of Indian economy, which is involved in creating employment. Addressing to the poverty is the major constraint in this millennium, as clearly reflected in the millennium development goals. India has a populace of 1.40 billion while 29.8% of were living below poverty (Planning Commission, 2012) [13]. India's farming is dominantly a production oriented with small fragmented smallholdings that plays a major role in Indian economy. Agriculture and allied activities support livelihoods of nearly 70% of India's rural population and gives employment to 56% of Indian workforce that reduce the poverty, provides food security and holistic growth of the country. However, small holding-based cultivation has lost its viability because of highly dispersed, heterogeneous, and fragmented landholding, rising cultivation costs, and restricted availability of small & marginal farmers to public resources and markets. Group approach to farming and bottom-up agricultural production collectives had offered substantial scope for enhancing agricultural productivity and income of farmers (Agarwal 2010) [1].
Credit is important for development and poverty alleviation. It enables farmers and entrepreneurs to undertake new investments or to adopt new technology (Khandker and Faruquee 2003) [10]. Microcredit in India has had a substantial positive influence on eliminating income distribution disparities and eradicating poverty (Mishra 2006) [11]. Farmers as collective can avail credit/loans from banks without collateral and able to increase their production, output and income (Asante *et al*. 2011) [2]. Group membership of farmers positively associates with farm income (Emmanuel *et al.* 2015) [8].

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Because of the small production volumes, farmers' limited access to public resources, high-quality inputs, credit facilities, advances in technology, frequent crop failures, lack of guaranteed markets, income security, and a poorly functioning supply chain made farmers highly dependent on intermediaries and local moneylenders.

Small and marginal farmers own approximately 85% of all landholdings. Farmer Organisations (FOs) are vital institutions for the advancement of farmers and the rural poor for empowering and reducing their level of poverty. Farmer organisations have the potential to boost farmer's income economically by assisting them to develop their skills, acquire resources, establish businesses, process, and market their products more efficiently. Farmers' organizations contributed significantly towards higher income, and thereby welfare among small-scale farmers (Bachke 2009) [3]. Farmer organizations increased the access of new technology, market information and business services in villages and contributed to productivity growth, intensification and commercialization of smallholder agriculture (Shiferaw et al. 2016) [17]. Linking farmers through FPOs at the base level for crop aggregation, processing and linkages with retail chains eliminated several players in the market channel that increased the share of farmer in the consumer's rupee (Murray 2009) [12]. Group approach of farmers as FPOs has strengthened the market linkages and increased the income levels among the farmers of Telangana (Devi et al. 2020) [6].

FPOs are collectives of farmers, with a majority of their members being small or marginal and tenant farmers (70 to 80%). Farmer Co-operatives managed to secure a higher price for the output marketed (Bernard et al. 2008) [5]. Collective marketing approach had shown the significant increase in farmer income (Elisabeth et al. 2011) [7]. In India, currently 7059 FPOs were formed over the course of 8–10 years under various promoting institutes/ agencies/ departments/ organizations like SFAC, NABARD, NCDC, NFSM, state government etc. (Table-1). Out of these, about 5200 FPOs are registered as Producer Companies, with the remaining FPOs falling under the umbrella of cooperatives, societies, etc. The Andhra Pradesh Mutually Aided Co-operative Societies Act 1995 has amended various restrictive elements of the preceding co-operative laws in Andhra Pradesh (APMACS), which was initiated in the state.

Table 1: List of FPOs Registered by Various Agencies

S. No	State/UTs	Number of FPOs registered			
		SFAC	NABARD	FPOs registered	Total
1	India	898	3904	2257	7059
2	Andhra Pradesh	16	295	88	399

(Source: Ministry of Agriculture & Farmers Welfare)

FPO is typically a society/ company that consists of farmers who are actual producers formed under the MACS Act 1995 or Farmers Producer Company (FPC) under the Companies Act 2013. These collectives operate as a cluster at block/district/state level based on needs of the producers, demand potential that increase the producer share in consumer rupee. Mast of the FPOs is in nascent/developing stage with member shareholder of 300 to 800 farmers. Govt. of Andhra Pradesh aspires to bring together 10 lakh farmers through 1,000 FPOs with an objective to maintain a leadership position in India across the primary sector. NGOs and other reputed institutes acting as CBBOs are involved in formation of co-operatives and farmer producer organizations. FPOs had higher risk bearing capacity, greater economic motivation and more innovativeness that helps them to grow socially, economically and managerially (Singh et al. 2021) [18]. In the recent years, some of them have graduated to facilitate formation of MACS and producer companies on behalf of state governments and developing funding agencies. In this backdrop, research has been taken up to estimate the income inequalities between the households of MACS in Anantapur district of A.P.

2. Materials and Methods

Anantapur region was selected purposively for the study, as it is the leading district in Rayalaseema region, where 3472 mutually aided cooperative societies exist. Purposive-cum-random sampling method was used for this study. Mandal wise list of number of MACS members was prepared. One mandal named Rapthadu with higher number of MACS members was selected purposively. List of 30 villages covered by the MACS in Rapthadu was listed and 10 villages were selected randomly. From the selected villages 60 MACS farmers were randomly selected. Another sample of 40 non-MACS farmers from the listed villages was selected to serve as a control group. The data required for this paper was collected from the selected farmers using a pre-tested schedule.

2.1 Tools used for Analysis
Gini coefficient ratio and Lorenz curve was used to study the income inequalities of selected sample.

Measure of Inequality
The easiest approach to measure inequality is dividing the populace into quintiles from poor to rich, and documenting the income levels that accrue to each level (Bathla et al. (2017) [4], Severini et al. (2019) [16]

Gini coefficient of inequality
The portion of area under diagonal line is known as the Lorenz curve, whose value follows from 0 to 1, which helps to define the Gini coefficient of inequality. The ratio is closer to 1 means the income is allocated evenly, and the ratio is closer to zero the more unequally the income is distributed. A Gini ratio of one implies that one person received overall income, and when the ratio is zero indicate that each person earned the exact same amount of money. To determine the Gini - coefficient ratio, the formula below was used.

$$GCR = 1 - \Sigma P_j (Q_j + Q_j - 1)$$

Where
GCR = Gini concentration ratio
P_j = Proportion of families in the jth group
$Q_j + Q_j - 1$ = Cumulative proportion of incomes in the jth and $j-1^{th}$ farm households.

Lorenz curve

The magnitude of income distribution is graphically represented by the Lorenz curve (Fig 1). The curve connects the population's cumulative share to the income recipients' cumulative share. Cumulative percentage of beneficiaries (from low-income to high-income) was chosen for the horizontal axis and the cumulative income percentage was taken for the vertical axis to create the Lorenz curve graph. The Lorenz curve and curve of absolute equality would meet if every member of the populace received an equal share of wealth or income. This would be below the diagonal if not. The diagonal line was represented by the curve of equal distribution. The degree of inequalities is indicated by the real curve's deviation from the actual line of perfect equality.

3. Results and discussions

Rainfed agriculture poses many challenges to the farming community. Farmers struggle year after year under the uncertainties, which plague rainfed agriculture. These poor farmers need some sort of assistance to circumcumvent the effects of uncertain agriculture. MACS operating in research area were expected to pull out the farmers from the poverty at least to some extent.

Fig 1: Area under Lorenz curve

The present paper finds the impact of intervention of MACS on the disposable income allocation of beneficiaries vis-à-vis non-MACS members.

Measures of Income Inequality

Particulars of incomes distribution among farm families of MACS are shown in (Table-2). The lowest income earning of MACS families accounted for 20% of the total farm families but the share in total income earned by all the selected families was 0.8%. The percentage of families in the highest income group was 5% and they earned 18.59% of total income. Around 72% of the farm families was between the income limit of Rs. 45,000 against the total income share of 24.7 percent. Particulars in (Table-3) revealed that, the least income earning families of non-MACS accounted for 12.5% of the total farm families with the total income share earned by 1.12 per cent. Families with highest income group was 17.5% and they earned 22.6% of total income. Majorly (70 percent) of the households was between the income limit of Rs. 45,000 with a share of 23.2% in total income.

Gini coefficient income inequalities

Gini coefficient values and area under Lorenz curve are tabulated in (Table-4). Gini coefficient for MACS and non-MACS were 0.451 and 0.465 respectively. The Gini ratio value was relatively less for members of MACS against the households of non-MACS. The relatively low Gini coefficient ratio states that there were relatively less imbalances in income distribution of MACS members over those in non-MACS. Therefore, it is a boosting sign of the intervention of MACS on the allocation of disposable incomes of the MACS members. These outcomes were in line with (Kalaimathi *et al.* 2010) [9]. Income distribution was highly skewed among farm households with a Gini ratio of 0.48 and most of the marginal and small farm households were in lower-income strata (Saini and Kaur 2022) [14].

Lorenz curve approach

Lorenz curve was calculated to identify the inequality indicated by the Gini coefficient, *i.e.,* deviation from the ideal case of perfect equality. The diagonal line in (Fig 2 and 3) is an equi-distribution line, which is a curve of equal distribution that represents the greatest egalitarian distribution. The Lorenz curve has a convex form. Less pronounced convexity in the Lorenz curve results from less distributional inequality. More convex Lorenz curves are implied by greater economic disparity. Therefore, the Lorenz curve's shapes serve as an effective visual gauge of the degree of income inequality. It was clear from (Fig 2 and 3) that non-MACS had more pronounced inequalities than MACS. Based on the outcomes obtained the member participation in MACS had helped them in reducing their income inequalities distribution and the outcomes are in relation with results of (Mishra 2006 and Sarkar 2007) [11, 15].
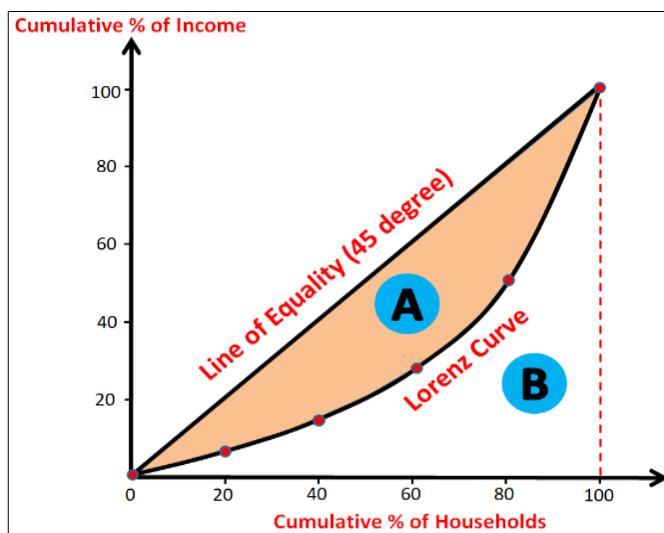
Table 2: Disposal Income Distribution of MACS households

Income	No of farmers	Percentage of Farmers	Cumulative percentage of Farmers	Average income	Percentage of income	Cumulative% of income
0 -9000	12.00	20.00	20.00	3608.08	0.80	0.80
9000-18000	9.00	15.00	35.00	13795.89	3.07	3.87
18000-27000	9.00	15.00	50.00	23183.11	5.15	9.02
27000-36000	7.00	11.67	61.67	30395.10	6.75	15.77
36000-45000	6.00	10.00	71.67	40183.83	8.93	24.70
45000-54000	3.00	5.00	76.67	49641.33	11.03	35.73
54000-63000	3.00	5.00	81.67	59223.00	13.16	48.89
63000-72000	5.00	8.33	90.00	68591.00	15.24	64.12
72000-81000	3.00	5.00	95.00	77778.33	17.28	81.41
81000-90000	3.00	5.00	100.00	83695.00	18.59	100.00
Total	60.00	100.00		450094.67	100.00	

Table 3: Disposal Income Distribution of non-MACS households

Income	No of farmers	Percentage of Farmers	Cumulative percentage of Farmers	Average income	Percentage of income	Cumulative% of income
0 -9000	5.00	12.50	12.50	5241.00	1.12	1.12
9000-18000	6.00	15.00	27.50	12103.80	2.58	3.70
18000-27000	7.00	17.50	45.00	21620.21	4.61	8.32
27000-36000	6.00	15.00	60.00	31271.12	6.67	14.99
36000-45000	4.00	10.00	70.00	38992.00	8.32	23.32
45000-54000	2.00	5.00	75.00	49186.50	10.50	33.81
54000-63000	1.00	2.50	77.50	57894.00	12.36	46.17
63000-72000	1.00	2.50	80.00	67845.00	14.48	60.65
72000-81000	1.00	2.50	82.50	78454.00	16.75	77.40
81000-90000	7.00	17.50	100.00	105889.00	22.60	100.00
Total	40.00	100.00		468496.00	100.00	

Table 4: Gini Coefficient Ratio and Area for annual households' income distribution among MACS and Non-MACS members

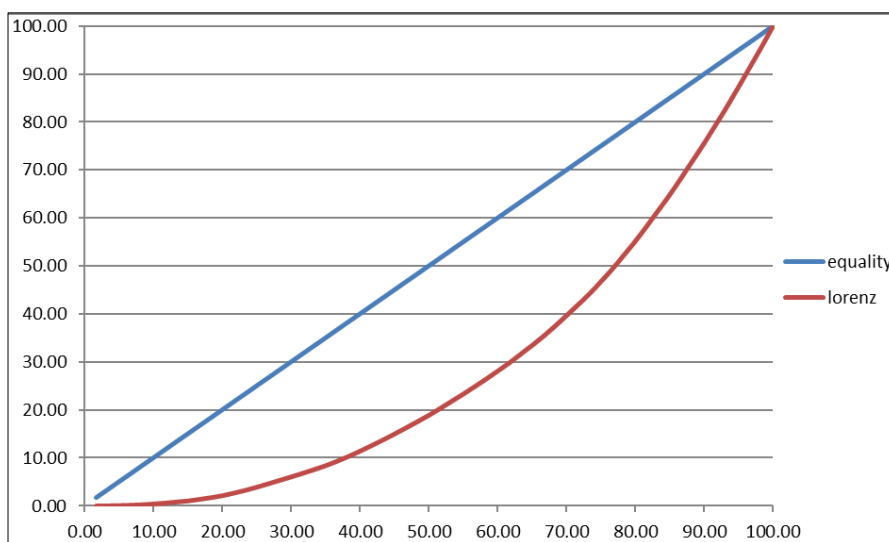| S. No	Category	No of observations	Gini coefficient	Area under Lorenz curve
1	MACS members	60	0.451	23.25
2	Non-MACS members	40	0.465	22.57

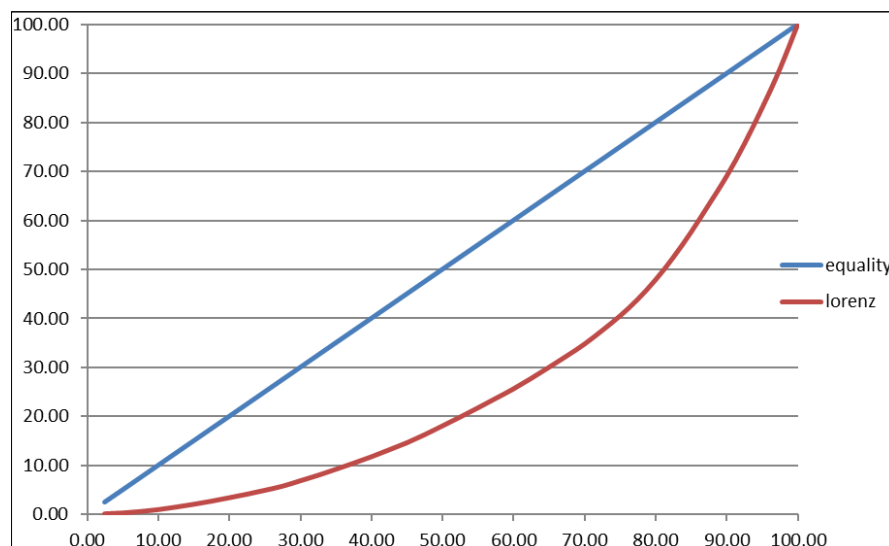**Fig 2:** Lorenz curve for annual income distribution in MACS

Fig 3: Lorenz curve for annual income distribution in non- MACS

4. Conclusions

In India, agriculture is mostly production-oriented confined in a vast number of dispersed small holdings, and is vital to the country's economy. Farmer Producer Organisation (FPO) is a society or company that is formed under the MACS Act 1995 or as Farmers Producer Company (FPC) under the Companies Act 2013 and is made up of only actual farmers who are also practising farming. In MACS the lowest income earning families constituted for 20 per cent of the total farm families and their contribution in the total income earned by all the

selected families was 0.8 per cent. Nearly 72% of the farm families was between the income limit of Rs. 45,000 and their share in the total income was 24.7 per cent while 70 per cent of the non-MACS farm families was between the income limit of Rs. 45,000 and their share in total income was 23.32 per cent. The Gini ratio value was relatively less for members of MACS against the households of non-MACS. The relatively low Gini coefficient ratio states that there were relatively less imbalances in income distributions of MACS members over non-MACS members. Hence it is a boosting sign of the intervention of MACS on the allocation of disposable incomes of the MACS members. Equi-distribution of income among the households is the major goal for policy makers in promoting inequality decreasing sources of income through MACS.

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