Does Size of Landholding Contributing Highest Share to Consumption Expenditure Inequalities among Agricultural Households?

M. Areef[1*], Y. Radha[1], V. S. Rao[1], P. V. S. Gopal[1], K. S. R. Paul[1], K. Suseela[1] and S. Rajeswari[1]

[1]*Agricultural College, Acharya N. G. Ranga Agricultural University, Bapatla –522101, India.*

Authors' contributions

This work was carried out in collaboration among all authors. Authors MA and YR managed the analysis of study, edited the draft of the manuscript. Authors VSR, PVSG, KSRP, KS and SR performed the statistical analysis and managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

This study aims to identify factors that contribute to consumption expenditure inequality and employed the regression based inequality decomposition (RBID) method. Used primary data on agricultural households' consumption expenditure for the agricultural year 2018-19 in the south coastal region of Andhra Pradesh. The results compared across the landholding size wise category and concluded that monthly income, dependency ratio, non-farm income-earning members and size of household contributed highest percentage share to total inequality for food, non-food and total consumption expenditure. At the aggregate (overall farmers) level highest percentage of inequality share contributed by monthly income and followed by the size of landholding. There is a need to focus on control the size of households by narrowing the dependency ratio and enhance the monthly income of agricultural households by providing employment opportunities in both farm and non-farm income-earning activities.

Keywords: Dependency ratio; monthly income; size of landholding; regression-based inequality decomposition and consumption expenditure.

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Corresponding author: E-mail: areefmulla009@gmail.com;

1. INTRODUCTION

Many factors are responsible for the consumption expenditure inequality among agricultural households. Few of the researcher highlighted that Tripathi [1] showed that household size was responsible for the maximum share of inequality in the total inequality of the average MPCE and predicted MPCE in both urban and rural areas and Ayyash and Sek [2] reported that the size of households, education of household heads and regional variations were the major contributing factors to consumption expenditure inequality in Malaysia. This study is an attempt to know the consumption inequalities nexus of landholding size in south coastal region of Andhra Pradesh. The average landholding size in Andhra Pradesh state was decreased from 1.27 ha during 1995-96 to 0.94 ha during 2015-16 with a 1.30 per cent reduction of landholding per annum. As per the agricultural census (2015-16), 69.26 per cent of the farmers in the state were marginal with 0.40 hectares average landholding and 0.17 per cent of farmers were large with 18.71 hectares average landholding. The south coastal region of Andhra Pradesh consists of six districts (viz., East Godavari, West Godavari, Krishna, Guntur, Prakasam and S.P.S.R. Nellore) with 41.27 lakh land holdings and 34.77 lakh ha of operated area accounting to 0.84 ha of average landholding, which is less than the state average land holding size. Guntur district was reported with the highest number of operational holdings that is 20.37 per cent (8.40 lakh holdings) and covered 19.21 per cent of the total operated area (6.68 lakh hectares) with 0.79 hectares of average landholding. The consumption expenditure on food and non-food items were one of the indicators to know the livelihood standard of a household.

The present study has been taken up to identify factors that contribute to consumption expenditure inequality by focusing on the distinction between food and non-food items across landholding categories of agricultural households in the south coastal region of Andhra Pradesh state. The hypothesis of the present study was size of landholding is a major factor component to increase consumption expenditure inequality among agricultural households in the south coastal region of Andhra Pradesh state.

2. DATA AND METHODOLOGY

The primary data on agricultural households' consumption expenditure on various food and non-food items were collected through a personal interview method using well-designed schedules with the structured questionnaire for the agricultural year 2018-19. Guntur district was selected among six districts of the South Coastal region, based on highest percentage of operational holdings (20.38 per cent). Based on the highest number of operational holdings criteria top two mandals (namely Bapatla and Sattenapalli) of Guntur district were selected (Agriculture census, 2015-16). A proportionate stratified random sampling procedure was used to select 100 agricultural households with 51 from Bapatla mandal and 49 from Sattenapalli mandal of Guntur district of Andhra Pradesh. For ease of analysis each stratum sample size is equalized to 50 agricultural households. For the annual income estimation, agricultural households were further categorized into marginal (Less than 1 ha), small (1 to 2 ha), semi-medium (2 to 4 ha), medium (4 to 10 ha) and large farmers (10 ha and above) based on landholding size (owned land). In each category 10 agricultural households from each stratum (Mandal) and thus finally 100 agricultural households at district level were selected. The analysis has been carried out in R software using ineq and dineq packages.

2.1 Tools for Measurement of Income Inequality

Gini index and Theil index were employed to measure consumption expenditure inequality among agricultural households. Gini index is the most widely cited measure of inequality because of its certain desirable properties, such as Pigou-Dalton transfer sensitivity, mean-independence, symmetry, population homogeneity and decomposability and allows direct comparison of two populations income distribution, regardless of their sizes. The Gini index is a summary statistic and is bound by zero and one. The higher is the value of the Gini index, the higher is the inequality in distribution. The Gini coefficient G, of total income is calculated by

$$G = 2 \, cov[y, F(y)] / \bar{y}$$

Where,

y = Food/non-food/total consumption expenditure,
F(y) = Cumulative distribution and
$\bar{y}$ = Mean consumption expenditure of the sample.

Theil index measure was labelled to the family of generalized entropy (GE) inequality measure [3]. The formula is written as:

$$GE(\alpha) = \frac{1}{\alpha(\alpha-1)}\left[\frac{1}{N}\sum_{i=1}^{N}\left(\frac{y_i}{\bar{y}}\right)^{\alpha} - 1\right]$$

GE (1) is Theil's T index, represented as

$$GE(1) = \frac{1}{N}\sum_{i=1}^{N}\frac{y_i}{\bar{y}}\ln\left(\frac{y_i}{\bar{y}}\right)$$

Where, $\bar{y}$ is the mean consumption expenditure and i is the number of households (i=1,2,…,100/20, *i.e.,* 100 for overall farmer households and 20 for landholding size categories). The values of GE(1) vary between 0 and one, with zero representing an equal distribution and higher value representing a higher level of inequality.

2.2 Income Inequality Decomposition by Sources and Factor Components

To identify factors that contribute to consumption expenditure inequality, regression-based inequality decomposition method was employed [4,5]. The regression-based approach was preferable to the other decomposition methods of inequality, as it provides an efficient, flexible way to quantify the conditional roles of variables [6,7,8,9]. The logarithmic form of the income equation is given as:

$$\ln y = a + \sum_{i=1}^{11} x_i + \varepsilon \qquad (1)$$

Where,

y = Food/non-food/total consumption expenditure
x = Explanatory variables viz., monthly income, size of household, size of landholding, age of household head, education of household head, farming experience, dependency ratio, number of animals, farm assets, non-farm income-earning members and non-farm employment opportunities
ε = Error term represents stochastic shocks to consumption expenditure.

The next step is to decompose the variance of y to estimate the inequality coefficient and quantify the contribution of each variable to inequality as follows:

$$\sigma 2(y) = \sum_{i=1}^{11} \beta_i \, cov(y, x_i) + \sigma 2(\varepsilon) \qquad (2)$$

Where,

$\sigma^2(y)$ = Variance of y (standard inequality measure)

cov(y, x_i) = Covariance of y with other variables (x_i)
Studies posit that the covariance term on the right-hand side of equation (1) can be considered as factor component contributions to total inequality.

3. RESULTS AND DISCUSSION

The descriptive statistics of the variables are presented in Table 1, which were subsequently used in determining the contribution of the factors to consumption expenditure inequality among agricultural households.

The results showed that the average size of marginal, small, semi-medium, medium and large farmers were 0.61 hectares, 1.44 hectares, 2.75 hectares, 5.36 hectares and 11.66 hectares respectively. The size of landholding and monthly income showed a linear relation from marginal farmer households to large farmer households. The marginal farmers reported with a highest average age of the household head *i.e.,* 48 years. The semi-medium farmers observed with the highest average number of members in the household *i.e.,* 3.39 members and further reported with 90 per cent of non-farm employment opportunities. The marginal farmer household head reported with lowest years of education (*i.e.,* 8.20 years), while observed with the highest years of farming experience (*i.e.,* 36.85 years) and further indicated the highest number of animals (*i.e.,* 1.60 numbers). The average monthly income of overall farmer households was ☐ 34,321 with 4.36 hectares of the average size of landholding.

3.1 Decomposition of Consumption Expenditure Inequality by Factor Components

This study quantified the contribution of each explanatory variable to the consumption expenditure inequality across the size of landholding using the regression-based inequality decomposition method and results given in Table 2 to Table 4.

The results for inequality indices and decomposition of consumption expenditure on food items are presented in Table 2. The results concluded that comparatively marginal farmer households reported the highest consumption expenditure inequality indices viz., Gini with 20.60 per cent and Theil with 6.78 per cent followed by semi-medium farmer households. It

Table 1. Descriptive statistics of the explanatory variables

Characteristics and description	Marginal farmers	Small farmers	Semi-medium farmers	Medium farmers	Large farmers	Overall
Size of landholding	0.61	1.44	2.75	5.36	11.66	4.36
(hectare)	(0.19)	(0.24)	(0.48)	(1.46)	(1.54)	(4.12)
Monthly income	12419.94	18412.23	34166.15	43175.09	63429.15	34320.51
($\square$ per annum)	(6255.74)	(7044.86)	(15163.50)	(15929.68)	(16178.17)	(22251.65)
Size of household	3.03	2.97	3.39	3.33	3.03	3.15
(number)	(1.10)	(0.90)	(1.13)	(0.86)	(1.01)	(1.00)
Age of household head	54.65	47.70	48.60	43.05	49.70	48.74
(years)	(7.92)	(10.56)	(10.22)	(8.56)	(10.21)	(10.08)
Education of household head	8.20	10.60	9.90	11.10	13.60	10.68
(years)	(6.12)	(8.97)	(6.00)	(2.20)	(3.87)	(6.04)
Farming experience	36.85	25.05	25.30	20.70	26.95	26.97
(years)	(11.44)	(14.14)	(11.97)	(10.45)	(8.06)	(12.38)
Dependency ratio	0.10	0.26	0.21	0.42	0.15	0.23
(number)	(0.26)	(0.37)	(0.39)	(0.47)	(0.29)	(0.37)
Number of animals	1.60	1.35	0.60	0.50	0.45	0.90
(number)	(1.79)	(1.27)	(0.82)	(0.89)	(0.83)	(1.25)
Farm assets	31887.50	90737.50	154630.00	223167.50	322695.00	164623.50
(value in $\square$)	(43711.84)	(108243.51)	(104348.26)	(89916. 21)	(92572.01)	(135366.15)
Non-farm income earning members	1.45	1.40	2.05	1.65	0.65	1.44
(number)	(1.36)	(1.10)	(0.94)	(0.75)	(1.04)	(1.13)
Non-farm employment opportunities	0.75	0.75	0.90	0.80	0.65	0.77
(yes=1, otherwise=0)	(0.44)	(0.44)	(0.31)	(0.41)	(0.49)	(0.42)

Note: The numbers in parentheses are standard deviation

Table 2. Inequality indices and factor wise decomposition of food consumption expenditure inequality (Percentages)

Variable	Marginal (N=20)	Small (N=20)	Semi-medium (N=20)	Medium (N=20)	Large (N=20)	Overall (N=100)
Size of landholding	1.22	-0.05	0.58	7.11	7.83	38.09
Monthly income	73.44	47.65	14.53	69.49	4.20	40.37
Size of household	24.46	4.65	46.36	7.25	13.11	2.68
Age of household head	-1.64	36.45	-4.20	-21.48	-17.38	1.79
Education of household head	3.58	-3.83	3.42	3.57	0.43	-1.02
Farming experience	0.44	-18.23	5.61	2.19	26.95	2.91
Dependency ratio	0.65	8.17	0.56	6.72	4.76	-0.05
Number of animals	-7.17	-4.14	-0.48	-1.30	-0.83	-1.01
Farm assets	0.04	5.53	4.15	4.33	4.90	2.80
Non-farm income earning members	-6.97	5.84	-2.50	12.83	29.28	0.34
Non-farm employment opportunities	Not applicable	-6.90	0.53	3.59	-5.60	0.19
Residual	11.96	24.86	31.46	5.70	32.35	12.92
Total	100.00	100.00	100.00	100.00	100.00	100.00
Gini ratio	0.2060	0.1280	0.1466	0.1365	0.0692	0.3104
Theil coefficient	0.0678	0.0259	0.0353	0.0312	0.0078	0.1508

Table 3. Inequality indices and factor wise decomposition of non-food consumption expenditure inequality (Percentages)

Variable	Marginal (N=20)	Small (N=20)	Semi-medium (N=20)	Medium (N=20)	Large (N=20)	Overall (N=100)
Size of landholding	2.59	3.22	5.73	-1.48	-0.14	25.54
Monthly income	90.90	61.84	41.11	67.82	21.39	44.50
Size of household	3.08	-0.47	4.20	0.55	2.70	-0.10
Age of household head	3.49	-7.63	-0.36	-1.76	-3.00	0.48
Education of household head	-1.30	6.28	1.17	4.75	0.06	-1.81
Farming experience	-4.16	3.84	1.49	8.46	6.28	2.77
Dependency ratio	1.18	18.04	27.58	18.54	42.97	4.15
Number of animals	-3.05	-4.10	0.05	0.08	2.07	-2.31
Farm assets	0.12	0.73	0.09	2.38	8.19	10.57
Non-farm income earning members	-4.18	17.00	-2.57	-1.63	-0.09	-0.35
Non-farm employment opportunities	Not applicable	-5.44	2.46	-0.74	-1.48	0.27
Residual	11.34	6.69	19.05	3.01	21.05	16.30
Total	100.00	100.00	100.00	100.00	100.00	100.00
Gini ratio	0.2525	0.1428	0.1226	0.1687	0.0822	0.3096
Theil coefficient	0.1047	0.0316	0.0248	0.0443	0.0115	0.1524

Table 4. Inequality indices and factor wise decomposition of total consumption expenditure inequality (Percentages)

Variable	Marginal (N=20)	Small (N=20)	Semi-medium (N=20)	Medium (N=20)	Large (N=20)	Overall (N=100)
Size of landholding	2.21	1.63	3.36	1.04	0.55	31.44
Monthly income	91.43	64.20	34.67	74.48	20.71	44.66
Size of household	11.44	-1.98	22.57	2.32	8.72	0.72
Age of household head	3.06	7.97	-3.53	-11.72	-19.42	0.92
Education of household head	1.09	2.54	1.79	4.72	0.02	-1.55
Farming experience	-6.53	-7.12	5.81	5.49	18.15	3.11
Dependency ratio	0.94	16.82	12.09	16.11	35.98	2.09
Number of animals	-5.23	-5.00	-1.27	-0.43	0.46	-2.04
Farm assets	0.08	-0.10	0.50	3.43	9.69	7.70
Non-farm income earning members	-7.32	17.05	0.28	1.20	5.87	-0.21
Non-farm employment opportunities	Not applicable	-7.48	-1.37	0.62	0.73	0.26
Residual	8.84	11.46	25.10	2.73	18.55	12.88
Total	100.00	100.00	100.00	100.00	100.00	100.00
Gini ratio	0.2221	0.1278	0.1168	0.1504	0.0678	0.3055
Theil coefficient	0.0797	0.0253	0.0227	0.0357	0.0070	0.1469

indicated that food item consumption expenditure was more unequally distributed for both marginal and semi-medium farmer households in the selected study area. The overall farmer households showed that the inequality indices were Gini with 31.04 per cent and Theil with 15.08 per cent. The results indicated that marginal farmer households' monthly income contributed 73.44 per cent of share to total inequality, followed by the size of household (24.46 per cent) and size of landholding contributed only 1.22 per cent share to total inequality. Small farmer households observed with highest consumption expenditure inequality share from monthly income contributed 47.65 per cent of share to total inequality, followed by age of household head (36.45 per cent). Semi-medium farmer households reported with 46.36 per cent share of total inequality from the size of household and landholding contributed only 0.58 per cent share to total inequality. Monthly income contributed a 69.46 per cent share to total inequality for medium farmer households. For large farmer households, 56.23 per cent of inequality share combinedly contributed by non-farm income-earning members (29.28 per cent) and farming experience (26.95 per cent).

For non-food items, inequality indices are calculated, factor-wise consumption expenditure inequality decomposed and results are presented in Table 3. The results showed that both the Gini ratio and Theil coefficient values were high for marginal farmers followed by medium farmers. It means that for non-food consumption expenditure was more unequally distributed for both marginal and medium farmer households in selected study area. The marginal farmer reported with 90.90 per cent of inequality share contributed by monthly income. Both monthly income (61.84 per cent) and dependence ratio (18.04 per cent) combinedly contributed a 79.88 per cent share to total inequality for small farmer households. For semi-medium farmer households, 68.69 per cent of inequality share combinedly contributed by monthly income (41.11 per cent) and dependence ratio (27.58 per cent). For medium farmers also observed with the highest percentage of inequality share contributed by monthly income (67.82 per cent). However, large farmer households reported with the highest percentage of inequality share contributed by dependency ratio (42.97 per cent) followed by monthly income (21.39 per cent).

Table 4. presented the inequality indices and factor-wise decomposition of total consumption expenditure inequality. The results showed that the Gini ratio and Theil coefficient were high for marginal farmer households it means more unequal distribution of total consumption expenditure followed by medium farmer households. For marginal farmer households, monthly income only contributed 91.43 per cent share to total inequality followed by size of household with 11.44 per cent. For small farmer households, monthly income (64.20 per cent) and non-farm income earning members (17.05 per cent) combinedly contributed 81.25 per cent share to total inequality. Monthly income (34.67 per cent) and size of household (22.57 per cent) were observed with the highest share of total inequality for semi-medium farmers. For medium farmer households, monthly income (74.48 per cent) was reported with a very high percentage share to total inequality. Dependency ratio (35.98 per cent), monthly income (20.71 per cent) and farming experience (18.15 per cent) combinedly contributed a 74.84 per cent share to total inequality. For overall farmer households, the highest percentage share to total inequality contributed by monthly income (44.66 per cent) followed by the size of landholding (31.44 per cent).

The hypothesis of the present study was the size of the land is a major factor component to increase consumption expenditure inequality among agricultural households but findings of inequality indices revealed that when compared across landholding size categories monthly income, dependency ratio, non-farm income earning members and size of household contributed highest percentage share to total inequality for food, non-food and total consumption expenditure inequality. However, observed at aggregate (overall farmer) level highest percentage of inequality share contributed by monthly income followed by the size of landholding, hence the present hypothesis is rejected and concluded that size of landholding was not contributed highest percentage share to total inequality among agricultural households.

4. CONCLUSIONS

The findings of the present study concluded that for food items, consumption expenditure among marginal and semi-medium farmer households more unequally distributed and for non-food items, marginal and medium farmer households were observed with the more unequal distribution. Across the landholding size

categories monthly income, dependency ratio, non-farm income earning members and size of household contributed the highest percentage share to total inequality for food, non-food and total consumption expenditure inequality. The results concluded that enhancement of monthly income of agricultural household play key role to equalize the consumption expenditure across the size of landholding. There is a need to encourage the farmers to involve in both farming activities (*viz*., adoption of high value crops and animal husbandry) and non-farm activities (*viz*., labour market and small business activities) to enhance the monthly income and reduces the consumption expenditure inequalities. Further, need to look at the size of households in terms of narrowing the dependency ratio.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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