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Livelihood Diversification in Rainfed Areas of Telangana State: Evidence from Household Level Survey

G. Nirmala[1]*, A. Amarender Reddy[2], P. K. Pankaj[1], R. Nagarjuna Kumar[1], K. Ravi Shankar[1], C. N. Anshida Beevi [3], Jagriti Rohit[3] and V. K. Singh[4]

[1]Principal Scientist, [3]Scientist, [4]Director, ICAR-Central Research Institute for Dryland Agriculture, Santhoshnagar, Hyderabad, India
[2]Joint Director, ICAR–National Institute for Biotic Stress Management, Raipur, Chhattisgarh, India
*Corresponding author email id: nirmalatadiparty@gmail.com

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ABSTRACT

Farmers in rainfed agriculture participate in both on-farm and off-farm activities to reduce risks from weather shocks, low farm fragmentation, low soil productivity, and frequent droughts and floods. Dependence on farm revenue alone proved difficult and risky. The study was conducted in 2022 to determine patterns and a livelihood diversification index at the household level for various farm sizes producing the chickpea crop. Primary data were acquired from 80 randomly selected farmer respondents in four mandals of Kamareddy district in Telangana State. Descriptive statistics were applied to characterize the sample households' demographic, social, and economic factors. The livelihood diversification index was estimated using the Simpson diversity index at the household level. The data revealed that small and marginal farmers have very high diversification levels, while medium and large farmers have high diversification levels. The percentage share of on-farm income stands highest for large farmers and lowest for marginal farmers and *vice-versa* about non-farm activity. Regression analysis indicated education, farm size, total on-farm income, and net returns from pulse crops were significant determinants for diversification. The study further suggests that government support needs to focus on the provision of incentives for diversification at both on-farm and non-farm levels.

INTRODUCTION

In recent times, the field of livelihood diversification has grown in significance within rural studies primarily because of the efforts of scholars and policymakers. Rural livelihoods are changing and getting better across all regions as a result of a sectoral shift from on-farm to non-farm activities (Ellis, 1998; Ellis, 2000). According to Ellis (2000), diversification as a strategy that offers many advantages which are categorised into push and pull factors. Push factors indicate the coping mechanisms for risk reduction from crop failures and environmental shocks whereas pull factors specify a household's voluntary action to take up additional income-generating activities in a risk-free environment. Many scholars, Himanshu et al., (2013); Fan & Rue (2020), have stated that non-farm activities play predominant role in economic growth and well-being in most rural farm households. In developing countries, smallholders showcased livelihood diversity through non-farm activities to generate supplemental income which was more than 40 per cent of total income Reardon (1997).

In India, 68 per cent of the rural population depend on agriculture for livelihood (GOI, 2011). Rainfed agriculture accounts for 55 per cent of net cropped area contributing to 60 per cent of food production with 80 per cent of farm households being marginal and small farmers. Similarly, under rainfed conditions chickpea (*Cicer arietinum*) holds a remarkable dominant position over other pulse crops in India, accounting for 36.77 per cent of

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the country's total land and 45.72 per cent of its total production (GOI, 2020). The chickpea area and yield levels increased with the introduction and development of short-duration high-yielding resistant to wilt and drought varieties, however, Reddy (2015) & Nain et al., (2015) reported the decreased technical and economic efficiency of the chickpea farms was mostly due to poor management practises and the lack of institutional support for chickpea growing farmers. Also, the livelihood of rainfed farmers faces threat due to fragmentation of land ownership, less productive soils and unpredictive weather conditions which makes livelihood difficult and vulnerable. With the expansion of chickpea crop in the non-traditional area (Telangana and Andhra Pradesh in India), the study intends to investigate household diversification in rainfed areas where 80 per cent of pulses being produced. The research study has been carried out in Telangana State with the objective of identifying all types of economic activities and income sources for household diversification available with rainfed farmers cultivating chickpea pulse crop and also estimating the diversification index and determining significant factors that impact livelihood diversification strategies.

METHODOLOGY

The research was carried out in Kamareddy district of Telangana state in 2022-23. Kamareddy district had reported the highest chickpea net sown area in the year 2022 and was selected purposively for the study. Chickpea crop growing area, representative of leguminous rainfed crop was selected as the location of study. The selected district comprised of two agricultural divisions namely Kamareddy and Bichukunda, where crops cultivated under rainfed conditions and being highly suitable for short duration crops like chickpea and oilseeds were selected purposively. Systematic random sampling was followed for the selection of mandals and villages. Two mandals from each division and two villages from each mandal were selected randomly. Ten farmer respondents were selected randomly from each village accounting to total sample size of 80. The respondents were presented with interview schedule. In three datasets of respondents' a few outliers were identified and hence excluded resulting in final total sample size of 77 considered for analysis. Relevant parameters computed where SID scores considered equivalent to livelihood diversification index scores (LDI), frequency and percentage, besides demographic profile of the respondents estimated on selected Socio-economic (SE) variables. Relationship of SE variables with LDI was estimated using multiple regression analysis and ANOVA. LDI was computed for the farmers cultivating chickpea crop, using the Generalised Simpson Index of diversification (SID), which was considered robust and precise to study diversity.

$$SID = 1 - \sum_{i=1}^{n} (p_i)^2$$

Where P = proportion of income of i^{th} activity
Accordingly, LDI was estimated using equation as follows:

$$LDI = 1 - \sum_{i=1}^{N} \{\left(\frac{A}{T_i}\right)^2 + \left(\frac{B}{T_i}\right)^2 + \left(\frac{C}{T_i}\right)^2 + \ldots . + \left(\frac{I}{T_i}\right)^2\}$$

Where, T_i = Total household income, A = Agricultural Income from other crops, B = Income from chickpea crop, C = Income from Horticulture, D = Income from Agriculture labour, E = Income from non-agricultural labour, F = Income from Livestock, G = Income from business, H = Income from Regular service, I = Income from Government schemes (MGNERGA etc.,)

LDI scores range between 0 and 1. Based on LDI scores the respondents were then categorised into distinct levels of diversification: 1) LDI score obtained zero termed as No diversification 2) LDI score obtained between 0-0.25 termed as Low diversification 3) LDI score obtained between 0.25-0.5 termed as medium diversification 4) LDI score obtained between 0.5-0.75 termed as High diversification. 5) LDI score obtained of more than 0.75 termed as Very High diversification.

RESULTS

The majority of farmer respondents belonged to middle age group (43.6%), possessed Intermediate (10+2) education (33.3%), 32.5 per cent owned small farms while almost 80 per cent belonged to other backward communities. The majority of respondents (30%) had elderly dependents in their family, and 58.4 per cent of farm households had at least two members involved in farming.

Extent of livelihood diversification of rainfed farmers cultivating chickpea legume crop

Livelihood diversification levels under varied farm sizes were presented under Table 1. According to the table, the majority of marginal (60%) and small farmers (52%) were classified as having a very high diversification index, while medium (70.8%) and large farmers (64.2%) were classified as having a high diversification index. It was inferred from the foregoing an inversely proportional relationship prevalent between farm size and diversification. The most likely explanation is that as farm size increased, farm households reduced non-farm activities as large farmers prioritised cultivating high-value crops over non-farm activities. However, on account of limited land, the marginal and small farmers involvement in non-farm activities was comparatively high. The average diversity index across the farmer groups ranged between 0.5863 to 0.7374

Table 1. Distribution of respondents based on Farm size and LDI values

Farmer category	Livelihood diversification classification (%)					Mean LDI and diversification level
	No diversification (< = 0.00)	Low (0-0.25)	Medium (0.25-0.50)	High (0.50-0.75)	Very high (0.75-1.00)	
Marginal (n=15)	-	-	6.66	33.33	60	0.7219 (High)
Small (n=25)	-	-	8	40	52	0.7374 (High)
Medium (n=24)	-	-	12.5	70.83	16.66	0.6561 (High)
Large (n=13)	-	-	35.72	64.28	-	0.5863 (High)

Table 2. Analysis from One-way ANOVA among farmer category and LDI

	SS	df	MS	F	Sig
Between groups	0.235	3	.078	7.529	0.001
Within Groups	0.761	73	.010		
Total	0.996	76			

which was indicative of high livelihood diversity at the household level in legume cultivating areas. The finding was in accordance with Kumari & Ramanamurthy (2021) study that reported marginal and small farmers have larger diversification value when compared to medium and large farmers.

Results from one-way ANOVA analysis showed that the farmer groups significantly differed in livelihood diversification levels in rainfed areas at 1 per cent level of significance (Table 2). Access and resource availability in the household might have influenced the household's choice between on- and off-farm activities.

Pattern of livelihood diversification of rainfed farmers cultivating chickpea legume crop

The percentage share of income generated by various farm and non-farm activities adapted across farmer groups revealed information about the prevalent pattern of livelihood diversification in the study region (Table 3). Farmer respondents relied primarily on two sources of income for a living: on-farm and non-farm. A perusal of the Table 3 revealed that among various on-farm sources crop production activity cumulative of 'income from other crops' and 'income from chickpea legume crop', reported the highest per cent share in increasing order for marginal farmer (37%), small farmer (58.08%), medium farmer (66.03%), and large farmer (76.34%). On the contrary, the per cent share of non-farm income was found to have decreased in the order of marginal farmer (48.52%), small farmer (32%), medium (25.75%) and large farmer at 19.3 per cent. The percentage share of livestock income was larger than the horticulture component across all farm categories. Agriculture labor appeared to be an important source of income for marginal (12.41%) and small (9.38%), and lowest and less significant for large farmer (1.09%) in the study region. Figure 1 clearly depicted percentage share of on-farm and non-farm activities across different farm size. There was well observed trend observed from marginal to large farmer with regard to on-farm and non-farm income. According to Reardon (1997); Gecko (2017), such trends

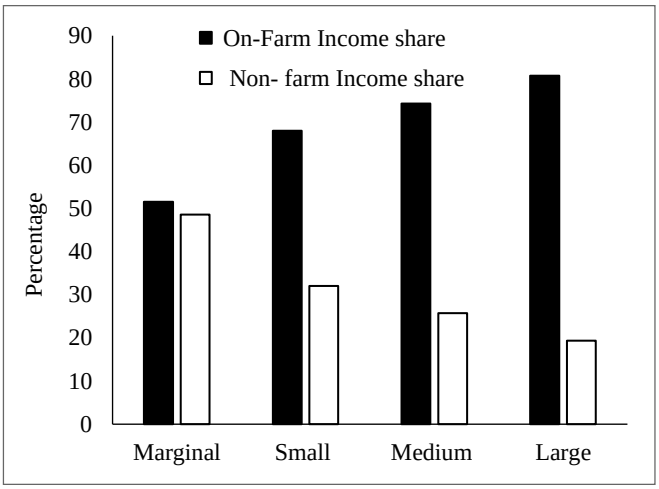

Figure 1. Share of Income sources among farm household's category

underscore the fewer barriers experienced by poor households to access non-farm activities through government support.

Determinants of livelihood diversification in rainfed areas

The variation observed from the regression results presented in Table 4 indicated that the relationship between the livelihood diversification index with explanatory variables and income sources was found to be 45.24 per cent which seemed reasonable. The F statistic also seems to be significant. Results of the regression analysis showed that a few explanatory variables have a significant influence on livelihood diversification in rainfed areas, including education, farm size, total on-farm income, and net returns from chickpea crop. Factors which were found to be non-significant and have no influence on diversification were age, social group, dependency ratio, land-man ratio, farm experience, and non-farm income. In the research area, the coefficient of Education found negative relationship but significantly associated with livelihood diversification at a 5 per cent level of significance. It implied that farm households with less formal education engaged in a variety of income-generating activities; however, wages earned from labour accounted for the majority of earnings, rather than any skilled and remunerative jobs. The finding was consistent with the research conducted by Pal et al., (2017 & Ahmed et al., (2018). One of the findings coincidentally indicated that farm size and total on-farm income coefficients had a significant and negative impact on diversification. With larger farms households attempts to enhance

Table 3. Pattern of livelihood diversification and income sources for different farmer groups in legume cultivating area of Telangana State

Farmer category	Percent share of on-farm income						Percent share of non-farm income					
	Percent income from other crops	Percent income from chickpea crop	Percent income from Horti-culture	Percent income from Agri labour	Percent income from livestock	Percent income from non-agri labour	Percent income from business	Percent income from regular service	Percent income from MGNREGA scheme	Percent income from pension	Percent income from Rythubandu	Percent income from PM Kisan
Marginal	22.17	14.80	0.00	12.41	2.10	5.70	0.00	16.02	7.86	6.42	10.20	2.32
Small	37.14	20.94	0.24	9.38	0.29	1.32	0.00	3.89	7.70	2.94	14.64	1.52
Medium	47.23	18.80	0.28	4.96	2.98	0.00	2.65	2.54	2.45	1.78	15.42	0.91
Large	53.43	22.91	1.15	1.09	2.11	0.00	0.00	4.47	0.52	0.00	13.55	0.77

Table 4. Determinants of Livelihood Diversification in chickpea growing area of Telangana State

Model	Coefficients	Standard error	t stat	p-value
Intercept	0.7455	0.0785	9.4965	1.4211E-07
Age	-0.0003	0.0009	-0.3622	0.7184
Education	-0.0075**	0.0085	0.8877	0.0480
Social group	0.0083	0.0224	0.3710	0.7119
Dependency ratio	0.0197	0.0149	1.3176	0.1923
Land-man ratio	-0.0007	0.0341	-0.0194	0.9846
Farm experience	-0.0006	0.0015	-0.3719	0.7112
Farm size	-0.0018 *	0.0048	-0.3846	0.0018
Total on-farm income	- 4.54778E-07 *	1.13662E-07	-4.0221	0.0002
Total non-farm income	1.71741E-07	1.31419E-07	1.2259	0.2247
Net returns from chickpea	7.7924E-07 *	2.78188E-07	2.8211	0.0064

R^2 = 0. 4524 F = 5.2881 (p-value- 0.0001)
No of observations – 77 *1 percent level; **5 percent level

on-farm income by aggregating resources to further develop the farm resulting in low diversification. On the other hand, marginal farms showed equal percentage share of on- farm (51%) and non-farm (48%) income values. The results aligned with the findings of Khatun & Roy (2012); Reardon (1997).

The coefficient of 'net returns from chickpea crop' had impacted diversification positively and significantly across all farms. High returns from legume crop usually should facilitate high investments and savings for household to reinvest in non-farm business operations.

Finding supported by Singh et al., (2023) underscored reinvestment in non- farm activities could increase capacity to earn better living. Similarly, Patindar & Chothodi (2021) finding affirmed that albeit high diversification ultimately it was on-farm income essential for well-being of a family. Nain et al., (2019) also affirmed that the entrepreneurial and technical trainings led to income generating activities. However, the Total non-farm income had a positive influence on diversification but found statistically non-significant. The logical explanation presumed that the non-farm income derived from economic activities constituting non-agricultural labour as well as other government-sponsored initiatives (MGNREGA), depended upon the number of employment days generated by the farm household. Similarly, Singh et al., (2023) confirmed that dairy farmers gained immensely from government donations which showed a positive relationship with diversification.

DISCUSSION

In rainfed areas of Telangana State farmers pursue diversification as a strategy for rainfed farmers to mitigate risk from environmental and institutional stresses such as weather aberrations, low productivity, low market prices for produce and low farm income. The majority of rural farm households in the study region have diversified, with non-farm income ranging from 19 to 48 per cent of total income. Diversification levels ranged from very high to high for marginal and large farmers, respectively, but were found to be statistically non-significant. The lack of diversification among large farm category farmers can be attributed to large farm holders having some capital to invest in irrigation and storage infrastructure, boost on-farm income through high value crops, build assets derived from crop income, and expand into other enterprises such as livestock and horticulture. However, rural areas lack the necessary demand and supporting infrastructure for job creation, such as food parks, agri-market infrastructure, and improved transportation links to urban centres. Developing these aspects is critical to increasing diversification options for farmers with large farm sizes.

While small and marginal farmers make fewer investments in infrastructure and also experience crop losses, which encourages them to diversify. According to Priscilla et al., (2021), reported crop losses likely to promote diversification; but, adoption of best management practices could prevent crop failures (Mishra et al., 2023). The findings confirmed that efforts to sustain on-farm income stemmed primarily from the fact that non-farm income activities adopted in the region are government-supported activities such as MGNERGA, as well as other unstable petty business and services. The majority of farm households cultivate chickpea legume crops at a guaranteed remunerative price, all farm households are inclined towards crop income. However, merely increasing productivity in the crop sector is insufficient to achieve the national objective of doubling farmers' incomes. Farm households need to diversify their income sources within agriculture by exploring opportunities such as livestock rearing. Additionally, engagement in off-farm and non-farm activities, such as moving-up in agri-food value chain, primary food processing, and marketing, found essential. To enhance on-farm income, the extension department must facilitate the supply of suitable resistant varieties for horticultural crops where demand is growing and improve marketing infrastructure like collection and aggregation centres through Farmer Producer Organisations.

CONCLUSION

Diversification with on-farm and non- farm income considered panacea in rainfed regions, which are marked by extreme unpredictability and income inequalites, particularly for rainfed farmers whose farming carries a significant risk. There is further scope for enhancement of the livelihood diversification index particularly with legume cultivation farmers through government support in terms of provision of irrigation, insurance against crop failures, extension skill training and post-harvest infrastructure at the village level. Small and marginal farmers' farms should have

their technical efficiency increased through relevant on-farm and non-farm development initiatives. A large number of academics have argued that agriculture by itself is insufficient to support a farm household in general. However, the study concludes by emphasizing both on-farm and non-farm activities as equally important for mitigation of risk and inequalities in rainfed areas.

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