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An Analysis of Rural Livelihood Systems in Rainfed Rice-based Farming Systems of Coastal Orissa*

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Abstract

The livelihood systems of farm households in coastal Orissa have been analysed based on a sample of 193 farmers. It is found that the incomes of these households were quite diversified. As against the general impression that crop income dominates household income, it is observed that the non-farm income has emerged important in the coastal Orissa. Rice, which has been traditionally the main source of income in this area, has slipped to the third position, next to remittances and income from non-farm activities. The income from non-farm works and rice has accounted for 71 per cent and 20 per cent of the total income, respectively. The non-farm sources have contributed more than 90 per cent towards income inequality. The source-wise income share has also shown a similar trend at the disaggregated level of farm-size categories. The income share for livestock has been comparatively high for large farmers. In general, the non-farm income was 3-times higher than that of the on-farm income for the small farmers and two-times in case of the larger category. The analysis of employment pattern shows that the male workers have dominated the labour market participation. A sizeable proportion of it has been in the non-farm sector. Creation of more non-farm employment opportunities, increase in investment on human resource development, more of R&D on development of rice varieties and tubewell irrigation will be needed to increase and stabilize household income in the coastal Orissa.

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Introduction

During the pre-independence era, agriculture was the main source of livelihood for majority of the rural households in India. With the rising population, declining land-man ratio and increasing mechanization in farm operations, agriculture alone is not able to provide adequate income and employment to meet the needs of these households. An increase in the non-farm employment has become essential for improving the income and standard of living of rural population (Chadha, 1993 and Kumar *et al.*, 2003). A landmark village-level study has clearly showed the unique role of rice-based systems in the farming economy (Hayami and Kikuchi, 2000). These households have often devised their own adjustment mechanisms in response to the emerging situations. A diversification in the pattern of economic activities pursued by the rural households has been a key element in this process.

In the eastern India, rice production has been the major source of income since long. The crop is adapted to diverse ecological situations in the state. During the *kharif* season, the lowlands are covered entirely with the rice only since no other crop can be grown in the standing waters in these fields. However, of late, some shift in the occupational structure of rural workforce has been noticed from farm to non-farm activities, although this should have occurred much earlier as in the other regions of India (Verma and Verma, 1995).

The increase in non-farm employment of the rural workforce has been due to both developmental (pull) and distress (push) factors (Shylendra and Thomas, 1995; Vaidyanathan, 1986). The distress factors like poverty, unemployment and frequent natural calamities dominate the livelihood pattern in the rainfed areas, which also forced the rural youths to migrate in search of non-farm activities so as to supplement their farm income. However, there is a wide regional variation in the nature and composition of such labour force (Elumalai and Sharma, 2003). It is important to conduct micro level studies to identify the pattern of employment and income, so that appropriate policy support may be provided as per regional needs (Visaria, 1995; Vaidynathan, 1986).

Rice covers 53 per cent of the gross cropped area in Orissa, that support the rural population, which accounts for as high as 85 per cent of total population of the state. But, the productivity of rice is barely 1.4 t/ha, which is well below the national average (2 t/ha). The agricultural production in Orissa has been risky and unstable over the years, primarily due to frequent natural calamities (Reserve Bank of India, 1984; Samal, 2004). The coastal Orissa accounts for 48 per cent of the total population and 26 per cent of

the total geographical area of the state. Rice occupied 38 per cent in this region while the total vegetables and fruits had about 40 per cent of the total area of the state. The region harbours 40 per cent of the total animal population and 75 per cent of total fish production. The present study has analyzed the nature and extent in occupational diversification and sources of household income in the rainfed coastal Orissa. The study assumes additional significance, because such an area is not only characterized by uncertain rainfall and low crop productivity but also is inhabited by a bulk of the poor and unemployed population. The specific objectives of the study were to (i) analyse the pattern of diversification of employment and income among the farmers of coastal Orissa and (ii) identify the factors of income inequality among the farming households. It has been hypothesized that rice contributes a major chunk of income of the farm households in the area.

Data and Methodology

A multistage sampling procedure was followed. Two rainfed districts (Balasore and Kendrapara) were selected in the first stage using the criteria of less than 40 per cent irrigated area in the district. In the second stage, the irrigated blocks were first eliminated from the district and two blocks were selected from the remaining blocks in each district with the help of simple random sampling technique. In the third stage, two villages from each block were selected. The farmers were then classified into 4 groups according to the landholding size, viz. marginal (up to 1 ha), small (>1-2 ha), medium (>2-4 ha), and large (more than 4 ha). In the last stage, 25 farmers from each village were selected using the technique of stratified random sampling. Data were collected from each village with the help of a structured questionnaire. Thus, the sample consisted of 98 marginal, 53 small, 28 medium and 14 large farmers making a total sample of 193 farmers.

The information about employment pattern in the on-farm, off-farm (working as agricultural labourers in others farm) and non-farm activities was collected. The income from crops was computed as net of paid-out costs from the gross income of a particular crop. The pattern of rural employment was also examined. The data of the farm survey pertained to the cropping years 1999-2000 and 2000-2001.

The Gini coefficient is a measure of income inequality, which has been computed using the formula as illustrated below (Nagar and Das, 1983):

$$G = 1 + \frac{1}{n} - \left\{\frac{2}{n^2 z}\right\}\left[ny_1 + (n-1)y_2 + \ldots\ldots\ldots + 2y_{n-1} + y_n\right]$$

where,

G = The Gini coefficient

n = Number of households

z = Mean income

y_1 = The lowest income

y_2 = The second lowest income, and

y_n = The highest income.

The decomposition of the Gini coefficients provides the contributions of different income sources and gives the relative contribution of each of the sources of overall inequality (Pyatt *et al*., 1980). The pseudo-Gini coefficient was also computed using the ranks of total income of the individual farmers. The head-count ratio of poverty was calculated using the annual income level of Rs 3887 per capita as fixed by the Planning Commission, Government of India, for the rural Orissa for the year 1999-2000.

Results and Discussion

The farm and family size of different categories of households are reported in Table 1. On the whole, the average family size in the coastal villages was 8, which varied with the farm size, varying from 7 in the case of marginal farmers to 9 for large farmers. The average number of males, females and children was 3.0, 2.3 and 2.5, respectively. The number in each category increased with the increase in farm size. The average farm size (owned farm area) of marginal, small, medium and large farmers was 0.45 ha, 1.36 ha, 2.63 ha and 6.29 ha, respectively with an overall average of 1.44 ha.

Table 1. Average family size and farm size of different categories of households in the coastal Orissa

Farm category		Male	Female	Children	Total
Marginal	Family size (No.)	2.51	2.00	2.37	6.88
	Farm size (ha)				0.45
Small	Family size (No.)	3.32	2.57	2.53	8.42
	Farm size (ha)				1.36
Medium	Family size (No.)	3.46	2.71	2.79	8.96
	Farm size (ha)				2.63
Large	Family size (No.)	3.71	2.86	2.57	9.14
	Farm size (ha)				6.29
All farms	Family size (No.)	2.96	2.32	2.49	7.77
	Farm size (ha)				1.44

Table 2. Area under different crops by season

(in per cent)

Crop	1999-2000		2000-2001	
	Kharif	*Rabi*/Summer	*Kharif*	*Rabi*/Summer
Rice	99.7	8.9	98.4	2.9
Pulses	0	0.6	0	0.1
Oilseeds	0	0.2	0	0.1
Vegetables	0	0.2	0	0.1
Fallow lands	0.3	90.1	1.6	96.8

Table 2 shows the area under crops in different seasons. It reveals that rice was the single most important crop during both the seasons. During the *kharif* season, the rice covered the entire cropped area as no other crop was suitable due to excess water in the fields. However, during the *rabi*/ summer season, some farmers grew pulses, oilseeds and vegetables, but to a very limited extent. In general, the fallow lands were more during *rabi*/ summer season. The prevalence of drought conditions also increased the fallow lands.

The adoption of modern varieties of rice was only 30 per cent in the study area. The lack of varieties for lowland ecosystems (water depth more than 50 cm) and some socio-economic constraints appeared to cause low adoption. The most modern varieties were grown in shallow low lowlands having favourable water regime.

Table 3 gives the years of occurrence of natural calamities like droughts, floods, and cyclones in the state. During the past 40 years (1965-2004), droughts have occurred in 17 years, floods in 13 years, and cyclones in 5 years. It was also observed that in many cases, one natural calamity was followed by another in the same year. Therefore, agriculture has become a risky proposition in this part of the country. Hence, income from other non-farm activities is essential to increase the livelihood.

Table 3. Occurrence of natural calamities in different years in Orissa

Natural calamity	Years of occurrence
Drought	1965, 1966, 1972, 1974, 1976, 1979, 1980, 1981, 1982, 1984, 1987, 1989, 1992, 1996, 1998, 2000, 2002
Flood	1967, 1968, 1970, 1971, 1973, 1975, 1977, 1982, 1985, 1990, 1999, 2001, 2003
Cyclone	1967, 1968, 1971, 1982, 1999

Table 4. Employment pattern of different categories of households in broad activities in coastal Orissa

(in man-days)

Activities	Marginal		Small		Medium		Large		All	
	M	F	M	F	M	F	M	F	M	F
					1999-2000					
Non-farm	225	4	325	15	362	58	408	0	286	14
	(58)		(63)		(66)		(68)		(62)	
On-farm	122	33	168	31	184	28	195	8	149	30
	(31)		(33)		(34)		(32)		(32)	
Off-farm	43	0	21	0	0	0	0	0	27	0
	(11)		(4)						(6)	
Total	390	37	514	46	546	86	603	8	462	44
	(100)		(100)		(100)		(100)		(100)	
Potential*	753	996	1039	1114	888					
					2000-2001					
Non-farm	264	4	325	20	369	58	388	0	305	16
	(60)		(62)		(67)		(66)		(62)	
On-farm	128	34	171	32	183	33	204	8	154	31
	(29)		(33)		(33)		(34)		(32)	
Off-farm	47	0	26	0	0	0	0	0	31	0
	(11)		(5)						(6)	
Total	439	38	522	52	552	91	592	8	490	47
	(100)		(100)		(100)		(100)		(100)	

M: Adult male; F: Adult female

Figures inside the parentheses indicate percentages of total male labour employment.

* Potential labour employment of male workers @ 300 man-days per year.

Employment Analysis

The pattern of employment of the farmers engaged in broad activities like non-farm, on-farm and off-farm activities, was analyzed (Table 4). The table revealed that the employment was less of female than male workers. Due to the prevailing social customs and traditions, the women were usually engaged in household works (indoor). There was also lack of the most preferred salaried jobs. On an average, the female workers were engaged for about a month in the on-farm works and 15 days in the non-farm works in a year during the survey period. On the whole, the average male worker in a family was engaged for 462 days and 490 days during 1999-2000 and 2000-01, respectively. Out of the total male labour employment, 62 per cent was in non-farm works during both the years. The non-farm activities included construction work (roads, buildings, etc.), transportation operations, small-scale industry works, repairing activities, shop-keeping, salaried employment

and fishing in the sea. On-farm works absorbed only 32 per cent and the remaining 6 per cent was devoted to off-farm works. The non-farm and on-farm employment increased for small, marginal and medium farmers (Table 4). However, the survey data indicates the extent of underemployment in the area under consideration.

Income Analysis

The source-wise income shares for the rural households in the coastal Orissa are presented in Table 5 under 9 broad heads, viz. income from rice cultivation, other crops including perennials, livestock, agricultural labour, salaried job, remittances, fishing in the sea, and other non-farm activities (NFA) in the sectors like construction, transportation, small-scale industries, repairing and shop-keeping, etc. On an average, the annual income of the farm family was Rs 37,170 during 1999-2000 and Rs 39,004 during 2000-01. The non-farm incomes under the heads salaried job, remittances, fishing in the sea and other NFA accounted for 71 per cent of the total income during both the years. This source contributed the maximum to the total family income, followed by remittances. Labour migration to other districts and urban areas of the neighboring states was reportedly common, mainly due to distress factors like poverty, unemployment and frequent occurrence of natural calamities. The migrant workers remitted around one-fourth of the total income of farm households during both the years. Rice, which was traditionally the main source of income of the farmers, has slipped to the third position. The salaried jobs contributed about 11 per cent, and fishing in the sea, 5 per cent to the total income and agricultural labourers accounted for 4 per cent of the total income of the farm households. Income from livestock and other crops accounted for 2 per cent of the total income. Relief due to super cyclone in the year 1999 accounted for 3 per cent of the total income. Ironically, the hypothesis that rice contributes maximum share to household income was not found valid in the coastal area of Orissa.

The trend in source-wise income share was similar at the disaggregated level of farm-size categories, except that from agricultural labour and livestock. The earnings from agricultural labour contributed 8-9 per cent of the total income of the marginal farmers and 3 per cent of total income of small farmers. The income share for livestock was comparatively high for large farmers. On an average, the total income of large farmers was double than that of marginal farmers during both the years. In general, the non-farm income was 3-times higher than that of the on-farm income for the small farmers and 2-times in case of the larger category.

Table 5. Income share from different farm and non-farm activities in the coastal Orissa

(in per cent)

Farm type	Rice	Other crops	Livestock	AL*	Salary	Rem*	Fishing	Other NFA*	Relief
				1999-2000					
Marginal	16.98	1.04	0.89	7.78	7.84	17.55	4.38	39.92	3.61 (28577)
Small	14.82	1.56	2.27	2.81	18.08	24.93	5.26	26.32	3.94 (39571)
Medium	21.05	3.52	4.04	0	11.06	29.84	4.22	23.73	2.52 (50742)
Large	19.87	3.07	5.13	0	7.72	26.78	7.46	27.40	2.53 (61064)
Average	17.50	1.93	2.42	3.86	11.46	23.25	4.98	31.25	3.36 (37170)
				2000-2001					
Marginal	19.38	2.13	0.77	9.49	7.74	19.19	6.41	34.90	0 (29039)
Small	19.53	0.80	0.82	3.47	17.43	28.68	4.75	24.52	0 (42984)
Medium	24.77	2.24	2.93	0	11.08	30.29	4.89	23.78	0 (52582)
Large	24.08	2.82	4.33	0	7.08	25.67	7.73	28.28	0 (66543)
Average	21.06	1.83	1.65	4.64	11.25	25.03	5.77	28.77	0 (39004)

*AL: Agricultural labour; NFA: Non-farm activities; Rem : Remittances.
Figures inside the parentheses indicate total income.
NFA include construction, transportation, shop-keeping, small-scale industries, repairing, etc.

Table 6. Income distribution pattern in different income classes in coastal Orissa

Decile group	Per cent share of households	Average income (Rs)
	1999-2000	
Bottom 10%	2.99	11,292
Bottom 20%	6.64	12,536
Middle 40%	31.72	28,798
Top 20%	44.60	84,192
Top 10%	27.50	1,03,832
Incidence of poverty	51.80	-
Range of income (Rs)	-	7,976 - 1,71,745
Ginni-coefficient	0.38	-
	2000-2001	
Bottom 10%	2.78	11,000
Bottom 20%	6.62	13,115
Middle 40%	32.94	31,386
Top 20%	42.85	84,884
Top 10%	26.23	1,03,907
Incidence of poverty	41.50	-
Range of income (Rs)	-	6,038 - 1, 82,378
Ginni-coefficient	0.36	

The income distribution of the farm households was observed to be quite skewed (Table 6). The annual family income varied from Rs 6,038 to Rs 1, 82,378 in the year 2000-01. The income of the top 10 per cent farmers (rich) in the income decile was 9-times higher than that of the bottom 10 per cent farmers (poor) during both the years. Interestingly, the income of top 20 per cent rich farmers was more than 6-times of the poor 20 per cent farmers, while the middle 40 per cent earned about 32 per cent of the total income. The incidence of poverty was estimated at 52 per cent during 1999-2000 and 42 per cent during 2000-01. The figure was higher in the former year because of the occurrence of super cyclone, which caused large-scale damage to the standing crops.

Gini Coefficients and Sources of Inequality

Table 6 presents the values of the Gini-coefficients of income inequality. These coefficients were 0.38 and 0.36 during 1999-2000 and 2000-01, respectively, when all the farmers were considered.

The Gini coefficients were further decomposed to find out the sources of inequality in income (Table 7). Out of the 9 sources studied, the four of them were the major sources of income inequalities. They were: rice,

Table 7. Contribution of various sources to income inequality

(in per cent)

Sources	Marginal	Small	Medium	Large	All
		1999-2000			
Rice	6	6	10	27	11
Remittances	31	24	54	31	35
Salary	15	37	20	11	20
Other NFA*	47	32	10	25	31
Total	99	99	94	94	97
		2000-2001			
Rice	9	2	8	22	12
Remittances	39	36	59	32	41
Salary	15	37	17	11	20
Other NFA*	33	24	9	20	22
Total	96	99	93	85	95

*Other NFA include construction, transportation, shop-keeping, small-scale industries, repairing, etc.

remittances, salaried jobs and other non-farm activities. These four sources accounted for 95-97 per cent of income inequality during both the years. Amongst them, remittances contributed maximum to inequality in income, followed by other non-farm activities. The salary contributed one-fifth of the total income inequality. Rice contributed only 11-12 per cent to the income inequality during the survey period. Considering different farm categories, non-farm activities, remittances and salary contributed maximum to the inequality of marginal and small farmers. Remittances and other non-farm activities contributed maximum amongst the medium and large farmers, whereas remittances alone accounted for more than 50 per cent of inequality in income of medium farmers.

Conclusions

The study has revealed an interesting shift in the structure of rural labour market. The transition from on-farm to non-farm employment is a newer change in Orissa. Of the total male labour, 62 per cent was employed in non-farm and 32 per cent in on-farm sector. The employment of female labour, excluding the household work, was found much less than that of the male workers. In general, on account of the widespread unemployment prevalent in the coastal Orissa, the male workers get employment only for 55 per cent of the days in a year. Non-farm income has accounted for 71 per cent of the total household income. Rice, which was traditionally the main source of income, has slipped to the third position, next to remittances

and income from other non-farm activities like construction, transportation and shop-keeping. This pattern, however, indicates that the employment and income of the farm households are quite diversified. Ironically, a general hypothesis that rice contributes the maximum share to the household income has not been found valid in the coastal Orissa.

In general, the non-farm income is 3-times higher than the on-farm income of the small farmers and 2-times in case of large farmers. Four sources of income, viz. remittances, salary, other non-farm activities and rice combinely contribute more than 95 per cent of the income inequalities, while the non-farm sources contribute more than 90 per cent in the case of marginal and small farmers.

As non-farm income and employment contribute maximum to the rural livelihood systems, there is a need for policy strategies to promote this sector, including small-scale industries in the coastal Orissa. More public work programs should be initiated to create durable infrastructure such as roads, tanks, etc. under 'food for work' programs, which improve the income and alleviate poverty. In the long-run, investment in human capital such skill and knowledge development and vocational education potentially helps in raising income of the poor households and reduce income inequality. As rice is important to ensure food security, there is a need for enhancing its productivity through the development of varieties tolerant to abiotic stresses like salinity, submergence, flood and drought and other means of income stabilization. The effective policy for the development of groundwater resources and installation of deep tubewells in saline areas and shallow tubewells in other rainfed coastal areas is necessary to provide irrigation at critical crop-growth stages and mitigate the impact of droughts.

References

Chadha, G.K., (1993) Non-farm employment for the rural households: Evidence and prognosis*, Indian Journal of Labour Economics*, **38(3):** 296-327.

Elumalai, K. and R.K. Sharma, (2003) Non-farm employment for rural households in India, *Agricultural Economics Research Review,* **16**(Conference Issue)**:** 1-19.

Hayami, Y. and M. Kikuchi, (2000) *A Rice Village Saga: Three Decades of Green Revolution in the Philippines*, New York: Barne and Noble, and Philippines: International Rice Research Institute.

Kumar, R., N.P. Singh and R.P. Singh, (2003) Non-farm employment for rural India: An analysis of shifting paradigm, *Agricultural Economics Research Review,***16** (Conference Issue): 20-30.

Nagar, A.L. and R.K. Das, (1983) Measurement of economic inequality. In: *Basic Statistics*, 2nd Edition, New Delhi: Oxford University Press. pp. 362-393.

Pyatt, G., C. Chen and J. Fei, (1980) The distribution of income by factor components, *Quarterly Journal of Economics*, **95:** 451-473.

Reserve Bank of India, (1984) *Report of the Committee of Agricultural Productivity in Eastern India*. Vol. 2, Part III, Bombay: Reserve Bank of India. pp. 139-40.

Samal, P., (2004) Rice production in Orissa: Achievements and challenges, In: *Reviving Orissa Economy – Opportunity and Areas of Action*, Ed: R.K. Panda. New Delhi: A.P.H. Publishing Corporation. pp. 5-15.

Shylendra, H.S. and P. Thomas, (1995) Non-farm employment: Nature, magnitude and determinants in a semi-arid village of western India, *India Journal of Agricultural Economics,* **50(3)**: 410-416.

Vaidyanathan, A., (1986) Labour use in rural India: A study of spatial and temporal variations, *Economic and Political Weekly*, **21(52)**: A130-A146.

Verma, B.N. and N. Verma, (1995) Distress diversification from farm to non-farm rural employment sector in the eastern region, *Indian Journal of Agricultural Economics*, **50(3)**: 422-429.

Visaria, Pravin, (1995) Rural non-farm employment in India: Trends and issues for research, *Indian Journal of Agricultural Economics*, **50(3)**: 398-409.