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Diversification Strategy for Small Farmers and Landless: Some Evidence from Tamil Nadu

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I

INTRODUCTION

The Eighth Plan has adopted agricultural diversification as a strategy for income augmentation and employment generation (Government of India, 1992). This strategy is highly relevant for enhancing the economic options among smaller farms displaying a deteriorating performance inevitable due to a variety of reasons. Not only their productivity level is too low but also their farm size is too small to realise scale economies. While all farm groups suffer from cost escalation (Nadkarni, 1988; Acharya, 1992), small farms with a precarious net return are more vulnerable to the cost spiral. Besides, their cereal-based specialisation and self-sufficiency-centred production also lead to low value addition (Vyas, 1994).

While the rationality for agricultural diversification as a strategy for promoting small farms is clear, the issue as to how the strategy is to be framed and implemented warrants careful considerations. Should diversification be conceived in the limited sense of mere crop diversification? Or, should it be contemplated in a broader sense to include also the livestock and occupational diversifications? What are the income and employment linkages among different aspects of diversification? Can we exploit the potential synergy emerging from such linkages to promote an all-round diversification? Adopting a broader conception of diversification and using a recent household survey carried out in Tiruchirapalli district, Tamil Nadu, this paper attempts to provide empirical answers to these and related questions.

II

SCOPE AND OBJECTIVES

While crop diversification is certainly an important component of the overall strategy for small farm development, other dimensions such as livestock diversification and occupational diversification are also equally important.[1] A broader conception of diversification not only makes it relevant even for those without land but also permits the gainful exploitation of the potential synergy among different aspects of diversification especially in terms of employment and income linkages.

From an analytical viewpoint, two facets of diversification can be distinguished, i.e., diversification *within* each of the enterprises (crop and livestock) and diversification *across* enterprises and activities (crop, livestock, wage labour, and non-farm work). While the former helps us to evaluate the effects of crop and livestock composition on the economic performance of the respective enterprise, the latter enables us to evaluate the income and

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employment significance of occupational diversification. Another analytical aspect central to our analysis here is the group-specific approach (i.e., diversification is evaluated at the group rather than at the individual level) wherein the diversification potential of small farmers and the landless is evaluated relative to that of other rural groups for identifying their comparative advantage in different aspects of diversification.[2]

Within the conceptual and analytical framework noted above, this paper aims (i) to identify the economic and non-economic factors behind group-specific variations in crop and livestock diversifications, (ii) to assess the effects of diversification on the overall performance of enterprises, (iii) to evaluate the relative occupational diversification of farm groups both in the employment and income domains, and (iv) to indicate certain design and policy requirements for an effective diversification strategy for the small farmers and the landless.

III

EMPIRICAL CONTEXT

Tiruchirapalli district in Tamil Nadu provides the empirical context for this study. Four villages representing each of the four agro-climatically distinct regions of the district[3] were selected to reflect different irrigation/farming systems evident in the study district and a sample of 218 households were selected so as to capture different socio-economic configurations present in the study villages. The sample represents 8 per cent of the households, 10 per cent of population and 20 per cent of the farm area found in the four study villages. Table 1 gives the farm sizewise distribution of the sample and its socio-economic characteristics. Of the sample households, 18 per cent are landless, 30 per cent are small farmers with less than 3 acres of land, 32 per cent are medium farmers with a farm size of 3 to 6 acres and the rest are large farmers with a farm size exceeding 6 acres.

TABLE 1. SOCIO-ECONOMIC CHARACTERISTICS OF THE SAMPLE

Farm size (acres) (1)	Sample house-holds (2)	Sample popul-ation (3)	Active population (per cent) (4)	Total farm area (acres) (5)	Total animals (CEUs) (6)	Mean income per capita (Rs.) (7)	Mean assets per capita (Rs.) (8)	Mean age of head (years) (9)
0	39	193	65.28	0.00	36.28	2,422.04	324.17	41
0 - 1	30	151	78.81	21.20	37.19	2,443.48	1,019.64	48
1 - 2	36	202	77.23	62.10	69.84	2,750.79	629.82	48
2 - 4	46	254	77.56	142.43	122.54	3,498.99	1,695.63	50
4 - 6	24	132	74.24	125.15	60.94	6,183.03	2,811.82	51
6 - 8	14	86	80.23	102.25	65.51	7,338.72	5,362.85	50
8 - 10	11	69	68.12	104.50	41.19	5,916.81	5,291.52	47
> 10	18	147	64.63	308.40	169.29	10,018.56	10,103.64	56
Total	218	1,234	73.50	866.03	602.78	4,545.46	2,801.59	48

The sample covers 866 acres of farm area and 603 cattle equivalent units (CEUs).[4] While land ownership is skewed in favour of larger farms, cattle ownership is concentrated in two farm groups (2-4 and > 10 acres) that together account for about 50 per cent of the total CEUs. Notably, 14 per cent of the sample households do not own any livestock asset at all. Almost 80 per cent of the households have a per capita income and household asset value of less than Rs. 6,000. While 49 per cent of the sample farm area is rainfed, wells, canal,

and tank provide irrigation to 28, 13 and 10 per cent of the area respectively. To the extent our sample is representative of the conditions prevalent in most parts of rural India, the results reported here have relevance well beyond our study area.

IV

CROP DIVERSIFICATION

The major premise behind crop diversification strategy is that the economic performance of crop sector is intimately linked to the underlying cropping pattern. Therefore, to explain the differential performance of crop enterprises across farm groups and resource regions, it is necessary to look into the reasons for the variations in their crop composition. For analytical convenience, crop composition is evaluated in terms of seven broader crop groups, i.e., foodgrains (paddy, *cholam* (jowar), *cumbu* (bajra), and ragi), oilseeds (groundnut, gingelly, sunflower and soybean), commercial crops (banana, sugarcane, cotton, and *korai*),[5] pulses (red gram, black gram, green gram and horse gram), vegetables (brinjal, tomato, sweet potato, ladies finger, and gourd); horticultural crops (coconut, tamarind, mango, guava, lemon, and flowers), and spices (chilly, onion, and coriander). Table 2 depicts the crop pattern observed across farm sizes and irrigation types.

TABLE 2. CROP COMPOSITION ACROSS FARM GROUPS AND IRRIGATION TYPES

Farm size/ Irrigation types	Gross cropped area (acres)	GCA as per cent of total crop-acre months	Percentage of gross cropped area under								
			Irrigation	Seasonal crops	Cereals	Commercial crops	Oilseeds	Pulses	Vegetables	Horticultural crops	Spices
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Farm size (acres)											
0 - 1	36.14	59.64	80.11	72.94	57.44	26.23	15.50	0.00	0.00	0.00	0.83
1 - 2	93.50	50.19	54.92	70.59	51.76	17.86	22.19	2.83	0.53	0.00	4.81
2 - 4	221.85	50.24	62.02	63.42	38.45	17.20	24.75	11.95	2.82	0.32	4.53
4 - 6	192.35	51.03	72.34	57.19	33.45	37.82	22.69	1.04	0.42	1.46	3.12
6 - 8	194.04	63.26	66.37	52.47	28.09	35.04	21.88	9.66	1.20	0.00	1.03
8 -10	144.50	46.09	77.51	77.16	50.52	8.65	24.22	3.46	0.69	8.30	4.15
> 10	444.60	48.53	48.92	57.71	39.23	13.16	24.52	15.63	2.29	0.79	4.39
Irrigation types											
Canal	302.62	91.64	100.00	30.78	29.06	69.22	1.72	0.00	0.00	0.00	0.00
Tank	90.01	62.70	100.00	46.12	31.95	42.77	14.17	0.00	4.44	0.00	6.67
Wells	371.81	50.95	100.00	75.71	44.41	5.65	32.34	2.29	4.06	4.57	6.68
Canal+ wells	9.30	100.00	100.00	23.66	11.83	76.34	11.83	0.00	0.00	0.00	0.00
Tank+ wells	41.60	37.43	100.00	66.35	39.18	0.00	41.59	0.00	2.40	4.81	12.02
Rain-fed	511.64	40.04	0.00	71.74	43.29	0.00	30.25	22.65	0.20	0.00	2.44
Total	1,326.98	53.08	58.45	65.96	40.55	15.68	26.92	8.81	1.56	1.30	4.58

(a) *Crop Composition Across Farm Groups*

For the sample as a whole, foodgrains account for 41 per cent of the gross cultivated area (GCA), followed by oilseeds (27 per cent) and commercial crops (16 per cent). Notably, vegetable and horticultural crops have the least area share (less than 3 per cent), that too,

confined mostly to larger farms. Although seasonal crops dominate over trans-seasonal crops irrespective of farm size, the area share of seasonal crops is higher (over 70 per cent) among small farms and those in the size-group of 8-10 acres. Regarding group-specific crop composition, small farms devote well over 50 per cent of their GCA to foodgrains while medium farms devote over 50 per cent of their GCA to non-foodgrains mainly commercial crops and oilseeds. Large farms tend more towards foodgrains, oilseeds, and pulses.

As to the role that irrigation plays in shaping regional crop pattern, while trans-seasonal crops account for a major share of GCA in canal and tank areas, seasonal crops have that distinction in groundwater and rainfed areas. Specifically, commercial crops (especially banana and sugarcane) occur mostly in canal and tank areas whereas coarse cereals, oilseeds, cotton and pulses dominate the water scarce regimes. Vegetables, horticultural crops and spices which are almost absent in canal and rainfed areas, confine mostly to groundwater and tank areas. We also note the following aspects of crop pattern.

First, although smaller farms do display their characteristic tendency of cereal-based specialisation, large rainfed farms also share this feature. Under this condition, efforts to diversify these groups towards vegetable and horticultural crops, though can enhance their income, could reduce food output and undermine self-consumption imperatives.

Second, while groups differ widely in terms of their relative orientation towards cereals and commercial crops, they differ the least in terms of their focus on oilseeds. It means that oilseeds - with substantial forward linkages in processing and lateral linkages with livestock sector - can be profitably grown by farms of varying sizes and agronomic features.

Third, even though farm groups devote either no or only a marginal share of their area to vegetable/horticultural crops, one cannot ignore the vast, though unrealised, potential for promoting both vegetables/irrigated horticulture (e.g., guava and flowers) in groundwater and tank areas as well as rainfed horticulture (e.g., lemon and tamarind) in rainfed regions.

Fourth, despite their greater focus on commercial crops, the medium farms, unlike the small and large farms, display a crop pattern which is both diversified and balanced. Such a crop pattern is good for risk management so crucial for commercialised agriculture.

Finally, crop pattern is determined not only by group-specific socio-economic factors but also by area-specific resource endowment factors especially irrigation. While the scope and need for crop diversification is vast among small farms and larger farms especially in groundwater and rainfed regions, the same is limited among most groups in canal areas.

(b) *Crop Diversification: A Quantitative Analysis*

So far, our observations on the crop diversification potential of groups and areas were based on the relative area share of *crop groups*. To enhance their validity, we perform two exercises. First, we quantify diversification using few indices (i.e., the number of crops grown, maximum proportion, entropy index and ogive index) based on *each crop's share* both in area and output value.[6] And, second, to capture the interactive effects of farm size and resource endowment, we evaluate crop diversification by cross-tabulating (a) irrigation type with farm size, (b) village with farm size, and (c) village with irrigation types.

While the results of the first exercise is reported in Table 3, those pertaining to the second one are reported elsewhere (see Saleth, 1995). Both results suggest that irrespective of the

measure, domain and context of evaluation, the directional relationship that crop diversification has with farm size and water scarcity remains, more or less, invariant. Thus the larger farms especially in water scarce regimes are more diversified as compared to either the smaller farms there or those larger farms in other regions. Better irrigation seems to impose a kind of forced specialisation centred either on paddy or on banana/sugarcane especially among small and medium farms in canal areas. The ogive indices suggest that more diversified groups/regions also have a more unbalanced crop pattern.

TABLE 3. INDICES OF CROP DIVERSIFICATION ACROSS FARM GROUPS AND IRRIGATION TYPES

Farm size/ Irrigation types	Number of crops grown	Maximum proportion				Diversification indices			
		Area domain		Value domain		Area domain		Value domain	
(1)	(2)	Crop (3)	Value (4)	Crop (5)	Value (6)	Entropy (7)	Ogive (8)	Entropy (9)	Ogive (10)
Farm size (acres)									
0 - 1	8	Paddy	0.493	Paddy	0.684	0.669	1.409	0.511	2.898
1 - 2	13	Paddy	0.268	Paddy	0.299	0.920	0.934	0.942	0.945
2 - 4	18	Paddy	0.184	Paddy	0.282	1.047	0.981	0.985	1.517
4 - 6	15	Banana	0.186	Banana	0.266	0.974	0.941	0.861	1.810
6 - 8	17	Banana	0.184	Banana	0.235	1.012	1.024	1.028	1.110
8 - 10	17	*Cholam*	0.201	Tamarind	0.157	1.008	1.140	1.074	0.736
> 10	23	Groundnut	0.172	Paddy	0.156	1.012	1.728	1.121	1.255
Irrigation types									
Canal	6	Banana	0.375	Banana	0.460	0.616	0.647	0.454	1.479
Tank	9	Sugarcane	0.324	Paddy	0.299	0.780	0.921	0.756	0.898
Wells	26	Paddy	0.278	Paddy	0.262	1.015	2.735	1.085	2.197
Canal+ wells	4	*Korai*	0.612	Paddy	0.415	0.473	0.707	0.539	0.267
Tank+ wells	8	Groundnut	0.403	Paddy	0.396	0.689	1.110	0.591	1.579
Rainfed	15	*Cholam*	0.239	Groundnut	0.239	0.788	1.927	0.849	1.606

(c) *Crop Diversification and Enterprise Performance*

While resource endowments especially irrigation explain crop composition both in group and regional contexts, it is the relative economic return and food/fodder self-sufficiency significance of crops that influence crop choice at a given resource and socio-economic context. In evaluating the linkages between crop diversification and enterprise performance, it is important to know how crop composition affects the relative market orientation (as shown by the market share of output). This also enables us to gauge how responsive are farm groups to market forces in so far as the crop choice is concerned.

(i) Comparative advantage in crop enterprise

The issue of comparative advantage in crop cultivation can be addressed by considering Table 4 that provides information on farm and crop group-specific net return and income-cost ratio.[7] Since the income-cost ratio indicating the return per each rupee spent is a better measure of enterprise performance,[8] the comparative advantage issue is evaluated mainly in terms of the income-cost ratio, though net return is also considered.

TABLE 4. NET RETURN AND INCOME-COST RATIO IN CROP ENTERPRISE

Crop groups (1)	Per acre net return (Rs.)					Income-cost ratio				
	0-2 (2)	2-4 (3)	4-6 (4)	6-10 (5)	>10 (6)	0-2 (7)	2-4 (8)	4-6 (9)	6-10 (10	>10 (11)
Foodgrains	1,220.70	2,027.19	3,368.49	4,627.72	1,838.40	1.413	2.656	4.693	6.317	3.646
Oilseeds	1,709.17	-427.71	2,160.82	338.48	1,843.82	3.013	0.819	2.631	1.110	3.092
Pulses	154.14	1,444.94	34.70	1,356.42	5,703.12	2.175	5.590	1.107	4.931	16.908
Commercial crops	3,894.95	6,917.29	6,953.16	8,180.56	4,598.61	2.752	5.185	3.077	4.600	3.397
Vegetables	258.10	2,475.24	7,316.50	6,200.94	3,044.08	1.584	2.073	26.785	4.031	3.156
Horticultural crops	-	11,909.45	-622.50	8,949.12	21,995.06	-	7.980	0.674	19.157	12.752
Spices	527.11	4,020.19	932.73	8,585.38	9,849.70	1.079	2.362	2.248	5.204	5.880
All	1,109.17	4,052.37	2,877.70	5,462.66	6,981.83	1.717	3.809	5.888	6.478	6.976

For small farms (0-2 acres), the comparative advantage lies in the cultivation of oilseeds especially groundnut (if we go by the income-cost ratio) and commercial crops especially *korai* (if we go by net return). Among the two farm groups, i.e., 2-4 and 6-10 acres, horticultural crops such as lemon, flowers, and mango have a comparative advantage over other crops irrespective of the performance measure being used. For medium farms (4-6 acres), the comparative advantage lies in vegetables showing the highest income-cost ratio of 26.79. Among larger sized farms, the crops having a comparative advantage are pulses (if we go by income-cost ratio) and horticultural crops (if we go by net return).

As to the comparative advantage that farm groups have in each crop group, the farms in the size-group of 6-10 acres have a comparative advantage over their cohorts in the cultivation of foodgrains and commercial crops (if we go by net return) and horticultural crops (if we go by income-cost ratio). In vegetable cultivation, however, medium farms have a comparative advantage over others. Since most large farms are rainfed or groundwater dependent, their comparative advantage in crops normally grown in scarce water regimes such as pulses, oilseeds, spices and horticultural crops is not surprising. Table 4 also prompts us to make a few policywise relevant observations.

First, the direct association between farm size and income-cost ratio suggests the presence of scale economies in crop cultivation which seem to originate as much from crop composition as from enterprise size. But, as we move along the farm size scale, the scale-related benefits appear to taper off possibly due to the fact that resource constraints (especially irrigation) tend to become binding after a while.

Second, although small farms have a positive net return as well as an income-cost ratio greater than one, their cereal-based specialisation seems to undermine their crop enterprise performance. In contrast, a relatively well diversified and balanced crop pattern appears to be a major factor behind the better enterprise performance of medium farms.

And, finally, in almost all contexts, area allocation across crops seems to be largely independent of comparative advantage calculus. The area shares of vegetable and horticultural crops best illustrate this point. It means that crop choice is based less on economic factors but more on other factors like irrigation, self-consumption, tenancy, etc.

(ii) Crop choice: Role of non-economic factors

The role that certain non-economic factors play in influencing crop choice can be illustrated best by noting a few field level observations gathered during the course of survey. First, in the canal region, farmers having tiny waterlogged plots in the low-lying areas around drainage canals have very little choice except growing *korai* that can better withstand waterlogging/salinity. Fortunately, this low-cost perennial crop has good income and employment prospects both in its production and processing. Second, among farmers operating rented land in the canal region, crop choice is invariably towards paddy as the rental arrangement may itself require rent payment in terms of paddy. In contrast, the lease arrangement which is long-term in nature (3 to 5 years) and involves cash payment offers considerable freedom in crop choice. Third, in groundwater areas, the large farmers going for horticultural crops like lemon, mango, etc., do so as an attempt more to cope with water shortage than to exploit the better income potential of these crops. It means that the condition of water scarcity could itself be advantageously utilised for promoting high-value crops among farms with such a scarcity. And, finally, all vegetables except sweet potato are cultivated mainly in tiny pockets in farm corners or as inter-crops in scarce water areas. While a substantial share of vegetable output is sold, the motive for their choice comes from home rather than from market. In all contexts similar to these, resource endowment (irrigation and land quality) and self-consumption imperatives seem to outplay strict economic calculus.

(d) *Market Orientation and Self-Sufficiency*

Crop choice is also affected by the relative ability of crops in meeting food/fodder self-sufficiency requirements. While the relative food self-sufficiency significance of crops can be captured by the share of their output held for self-consumption, the fodder significance of crops can be indicated by the share of crop residues used as fodder. Table 5 shows the relative food/fodder significance of crop groups across farm size-groups.

TABLE 5. RELATIVE SELF-SUFFICIENCY SIGNIFICANCE OF CROP GROUPS ACROSS FARM GROUPS

Crop groups	Crop output sold (per cent)					Crop residues used as feed (per cent)				
	0-2	2-4	4-6	6-10	>10	0-2	2-4	4-6	6-10	>10
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Foodgrains	23.68	25.43	23.78	58.43	55.03	69.43	83.77	83.78	75.02	88.46
Oilseeds	78.67	91.31	88.15	79.83	93.50	51.70	56.22	57.30	62.20	61.05
Pulses	20.00	28.78	0.00	49.96	56.76	6.52	17.65	0.00	3.26	48.24
Commercial crops	100.00	100.00	100.00	100.00	100.00	0.00	11.07	19.23	0.00	0.00
Vegetables	0.00	66.70	100.00	95.32	99.19	50.00	44.94	0.00	0.00	89.54
Horticultural crops	0.00	100.00	100.00	45.97	86.30	0.00	0.00	0.00	0.00	0.00
Spices	97.76	97.65	74.20	96.08	87.79	0.00	0.00	0.00	0.00	0.00
All	45.73	72.84	69.45	75.08	82.65	25.38	30.52	22.90	20.07	41.04

While commercial crops are completely oriented towards the market irrespective of farm size, about 90 per cent of spice output and 86 per cent of oilseed output are destined to the market. On the contrary, only a third of the total output of both foodgrains and pulses is sold suggesting their self-sufficiency significance. In the case of these two crop groups, farms greater than 6 acres retain only 45 per cent of the output for home consumption as against the tendency among small farms to retain about 70 per cent of their output for self-consumption. Despite their negligible area share, vegetable and horticultural crops evince a greater market orientation as 66 to 72 per cent of their outputs are being marketed.

The relative fodder potential of crops is also crucial for crop choice especially among farmers relying on livestock enterprise for supplementing the limited income from their crop enterprise. Since fodder supply is a major factor determining livestock sector performance, own fodder supply forms a crucial aspect of both self-sufficiency and inter-enterprise linkage. As to the relative fodder potential of crop groups, while spices and horticultural crops do not have any fodder significance at all, the fodder supply potential of pulses is somewhat important. On the other hand, cereals and oilseeds (especially groundnut) are very important for feed/fodder supply. Given their small holdings and pressing food/fodder requirements, the scope for diversifying small farms into vegetable/horticultural crops is rather limited especially under current institutional conditions. Even an improved credit-/marketing/extension system is less likely to encourage high-value crops among small farms as it relaxes only few external constraints for crop diversification but not the internal constraints emanating from the lack of a strong income and employment cushion for them.

V

LIVESTOCK DIVERSIFICATION

Livestock composition influences the performance of livestock enterprise in the same way as the crop composition affects the performance of crop enterprise. The size and composition of livestock enterprise at the household level are determined by an interplay of income needs, investment capacity, fodder supply potential, household labour time and public credit support. To see how livestock diversification affects enterprise performance, we need to consider first the livestock distribution and composition across groups as shown in Table 6.

TABLE 6. LIVESTOCK DISTRIBUTION AND COMPOSITION ACROSS FARM GROUPS

Livestock category	Total animals (CEUs)	Share of farm size-groups (per cent)					Livestock composition (per cent)				
		0-2	2-4	4-6	6-10	>10	0-2	2-4	4-6	6-10	>10
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Bulls	145	13.91	28.69	8.70	20.87	27.83	9.41	33.93	20.68	28.34	23.82
Buffaloes	166	30.48	20.51	13.92	16.04	19.05	34.21	27.82	37.97	24.99	18.70
Cows	135	21.50	9.34	9.34	19.63	40.19	22.72	10.28	20.67	24.80	32.00
Young animals	86	19.63	17.75	11.59	20.56	30.47	11.20	12.40	16.28	16.49	15.41
Goats/ Sheep	67	37.48	27.74	3.60	6.90	24.29	21.24	15.10	3.94	4.31	9.57
Poultry	5	37.56	12.65	6.16	25.05	18.59	1.22	0.47	0.46	1.07	0.50
Total	603	23.78	20.33	10.11	17.70	28.08	100.00	100.00	100.00	100.00	100.00

(a) *Livestock Distribution*

The two farm groups having a dominant share in total CEUs found in our sample are those with 2-4 acres (20 per cent) and >10 acres (28 per cent). The combined share of landless groups and small farmers is only about 24 per cent which is still lower than the combined share of the remaining two farm groups: 4-6 acres and 6-10 acres (28 per cent). As to the relative share of rural groups in each animal category, 69 per cent of cows, 57 per cent of bullocks and 63 per cent of the young animals are with households owning more than 4 acres whereas 51 per cent of buffaloes and 65 per cent of goats/sheep are with the landless and small farm households. We also note the following main features of livestock distribution.

First, most part of the incomewise significant animal categories are owned by households with medium to large farms better placed in terms of both own funds for livestock investment and own fodder for livestock maintenance.

Second, the dominant share of poor groups in fodder and labour-intensive buffaloes is due partly to their ability for substituting labour for fodder (i.e., using labour in fodder collection/open grazing) and partly to credit support under rural development programmes.

Third, while the share of larger farms (especially those in rainfed areas) in goats/sheep category consists almost entirely of sheep usually maintained in large numbers, that of poor groups consists mainly of goats normally kept in one or few units.

And, finally, there is a distinct pattern among groups regarding the main motive for rearing young animals. For instance, poor households rear young stocks mainly for gaining from value appreciation rather than for using them in breeding as is the case with others.

(b) *Livestock Composition*

The livestock composition especially its dairy orientation is important for enterprise performance. Although the livestock composition of all groups is uniformly dominated by dairy animals (50 to 60 per cent), it does show certain notable group-specific patterns.

First, while buffaloes requiring relatively more labour inputs in their maintenance dominate the composition of dairy animals among poor groups, cows with a relatively lower labour requirement have that distinction among groups with larger farms.

Second, valuewise highly significant bullocks and young animals have a higher share among larger farm groups whereas valuewise less important goats/sheep and poultry have a relatively higher share among poor groups.

And, third, while groups with a farm size in the range of 4-10 acres have a relatively well diversified livestock enterprise focused on all income and valuewise important animal categories, others evince an excessive reliance on one or two categories.

(c) *Livestock Diversification and Enterprise Performance*

The effects of livestock diversification on enterprise performance can be evaluated using Table 7 giving the structure of livestock income and cost across farm size-groups. Although the income share of milk is dominant for all farm groups, dairy income is relatively more significant for households with farms larger than 4 acres. In contrast, the income share from

value appreciation, poultry and manure is higher for households with no or less land. Regarding the cost structure, the feed cost with over 69 per cent share of total cost dominates over the labour cost among all farm groups. While there is no systematic pattern in the average income per animal unit, the average cost per animal unit shows a gradual decline as farm size increases. Since farm size and cattle stock size are directly related, the declining cost per animal unit is due as much to scale economies in animal husbandry as to fodder-related linkage between crop and livestock enterprises.

TABLE 7. NET RETURN AND INCOME-COST RATIO IN LIVESTOCK ENTERPRISE

Farm size (acres)	Average income per animal unit (Rs.)	Percentage of income from					Average cost per animal unit (Rs.)	Percentage of cost due to		Net return (Rs.)	Income-cost ratio
		Milk[a]	Value appre-ciation[b]	Draught power[c]	Poultry	Wastes		Feed	Labour		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
0	1,543.34	47.58	18.31	10.72	10.80	12.60	1,177.26	80.24	19.76	366.09	1.31
0 - 2	1,696.67	57.44	19.54	6.85	3.73	12.46	544.94	69.40	30.60	1,151.72	3.11
2 - 4	1,547.43	47.95	20.82	16.94	2.28	12.00	458.91	77.51	22.49	1,088.52	3.37
4 - 6	3,087.66	69.90	16.37	7.69	0.65	5.39	540.19	77.03	22.97	2,547.47	5.72
6 - 10	2,244.96	68.24	8.36	16.24	1.61	5.56	472.65	74.06	25.94	1,772.32	5.73
>10	1,242.90	61.58	8.72	13.98	4.95	10.76	372.68	83.65	16.35	870.23	3.34
Total	1,694.37	59.60	14.93	13.07	2.64	9.77	501.87	77.94	22.06	1,192.50	3.38

Notes: a. Value of milk output - both sold and consumed.

b. The annual income from value appreciation is obtained as: (Current market value - Purchase price)/Number of years reared.

c. It includes the income from animals used both in ploughing and transport, i.e., [(Annual days in Ploughing * Income rate in Ploughing)+(Annual days in Transport * Income rate in Transport)]. The income rates used in the calculation were obtained by subtracting the average wage rate for human labour from the applicable per day income rates in ploughing and transport operations.

As to the group-specific pattern in livestock enterprise performance, the groups having a farm size of 4-6 and 6-10 acres show an impressive performance with an income-cost ratio of 5.72. Notably, since these best performing groups are not the ones with the highest share in total animals, enterprise performance seems to depend more on the structure than on the size of livestock enterprise. Irrespective of the performance criteria used, the livestock enterprise of groups with no or less land performs rather poorly. Such a poor showing of groups for whom livestock income is very crucial is much to do with their livestock composition. Since there is a positive association between income-cost ratio (or net return) and the income share of milk, dairy orientation plays a major role in determining the overall enterprises performance. Hence, to improve the livestock income prospects of poor rural groups, there is a need for both enhancing their share in total animals and diversifying their livestock assets towards incomewise more significant categories.

VI

OCCUPATIONAL DIVERSIFICATION

Occupational diversification is evaluated in terms of the relative share of the four activities, i.e., farming, livestock, wage labour and non-farm work, both in household level

employment and income. To evaluate how diversified are the occupational patterns of rural groups, let us use Table 8 depicting the share of the four activities in active members, man-days and income across farm size groups.

TABLE 8. OCCUPATIONAL DIVERSIFICATION ACROSS FARM GROUPS

Farm size (acres)	Share in active members (per cent)				Share in total man-days (per cent)				Share in total income (per cent)			
	Farming	Livestock	Wage labour	Non-farm sector	Farming	Livestock	Wage labour	Non-farm sector	Farming	Livestock	Wage labour	Non-farm sector
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
0	0.00	15.46	47.24	37.30	0.00	10.09	54.41	35.50	0.00	8.65	45.34	46.01
0 - 1	31.10	10.92	23.53	34.45	3.48	12.46	48.92	35.14	33.28	4.90	26.45	35.37
1 - 2	37.18	8.97	30.13	23.72	7.32	11.92	40.52	40.24	37.97	12.08	23.47	26.48
2 - 4	56.85	9.14	15.23	18.78	10.72	17.73	33.87	37.68	56.71	10.13	10.61	22.55
4 - 6	45.92	12.24	15.31	26.53	11.70	25.74	15.02	47.54	55.00	11.60	5.33	28.07
6 - 10	50.51	20.49	6.43	22.57	23.16	25.51	9.45	41.88	60.22	17.66	1.90	20.23
>10	51.58	20.00	2.11	26.32	26.09	28.51	0.00	45.40	57.89	15.21	0.00	26.90
Total	40.24	13.27	20.34	26.16	9.36	16.72	34.91	39.01	45.33	12.24	14.21	28.23

(a) *Focus on the Employment Domain*

In the employment domain, attention is focused on both the rate of participation (i.e., number of active members involved) and the intensity of participation (i.e., actual man-days spent).[9] For the sample as a whole, the occupational structure in terms of the rate of participation is dominated by farming with 40 per cent of the active population, followed by non-farm sector (26 per cent), wage labour (20 per cent) and animal husbandry (13 per cent). As to the group-specific pattern, while the proportion of active members involved in farming increases, that in wage labour declines with farm size. Wage labour participation, though confined mostly to poor groups, occurs even among larger farmers particularly in rainfed areas where wage employment is sought either as a supplementary income source or as a way of bartering human/animal labour for fodder. It is exactly these groups which also tend to focus more on livestock thanks to their fodder-oriented crop pattern. Notably, non-farm participation is relatively higher among the landless and small farmers.

The pattern of occupational diversification presents a different picture altogether when we consider it in terms of the intensity of participation. From an overall perspective, non-farm sector accounts for the highest share in total man-days (39 per cent), followed closely by wage labour (35 per cent) but only distantly by livestock sector (17 per cent). Surprisingly, crop sector with the highest share in active members (40 per cent) accounts only for the least share in man-days (9 per cent).[10] Although the share of man-days spent in own farms is rather small, if we include also the share spent in wage employment (i.e., hired labour), then the employment potential of crop sector stands as the highest. Still, the share of non-farm sector in man-days is very close even to the combined share of both farming and wage labour. As to the activitywise share of man-days across farm groups, the share of wage

labour is declining whereas the shares of farming, livestock and non-farm sector show an increasing trend. While wage labour accounts for the highest share of total family labour time among poor groups, non-farm sector has that distinction among others.

(b) *Focus on the Income Domain*

For the sample as a whole, farming accounts for the highest share (45 per cent) of total household income, followed by non-farm sector (28 per cent), wage labour (14 per cent) and animal husbandry (12 per cent). As to the income structure across rural groups, the share of farm income increases steadily up to 4 acres only to stabilise around 60 per cent thereafter. While the income share of wage labour declines dramatically, that of non-farm sector declines only gradually with farm size. In contrast, the income share of animal husbandry displays an increasing, though less pronounced, trend across farm size-groups. In terms of income contribution, while wage labour and non-farm sector are more important for poor rural groups, farming, non-farm sector and livestock are more important for others. While poor groups do participate more in non-farm activities, their lower education and skill lead them more towards non-farm pursuits with lower and less regular income potential.

(c) *Diversification Linkages*

As a final stage of our analysis, we not only quantify the relative employment (i.e., man-days) and income diversifications of farm groups but also try to indicate the potential linkages between different aspects of diversification by relating their diversification indices. Table 9 giving the entropy index for employment, income, crop and livestock diversifications across farm groups shows the nature of links among them. There is a direct diversification linkage between employment and income as well as between crop and livestock. But unlike crop diversification and livestock diversification that vary directly with farm size, employment diversification and income diversification decline with farm size. That is, the landless and small farmers with a lesser capacity for crop/livestock diversification have a relatively greater potential for employment/income diversification as compared to other rural groups.

TABLE 9. LINKAGES AMONG DIFFERENT ASPECTS OF DIVERSIFICATION

Farm size (acres)	Diversification status (Entropy index)					
	Employment	Income	Crop sector		Livestock sector	
			Area	Value	Number	Value
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0	0.893	0.573	-	-	0.592	0.547
0 - 1	0.760	0.668	0.669	0.511	0.644	0.652
1 - 2	0.755	0.663	0.920	0.942	0.677	0.636
2 - 4	0.670	0.573	1.047	0.985	0.662	0.687
4 - 6	0.711	0.559	0.974	0.861	0.637	0.654
6 - 8	0.593	0.462	1.012	1.028	0.677	0.689
8 - 10	0.711	0.549	1.008	1.074	0.631	0.596
>10	0.589	0.496	1.012	1.121	0.677	0.670

VII

CONCLUSIONS AND POLICY IMPLICATIONS

The linkage between crop composition and economic performance of crop enterprise does justify the rationale for crop diversification as a strategy for improving the economic prospects of small farmers. Since crop composition among small farms is strongly influenced by non-economic factors like farm-specific resource endowment and household-specific consumption needs, crop diversification schemes have to necessarily face serious economic, resource-related and institutional obstacles. While the programmes could certainly be designed to overcome these problems, they are not only numerous but also take longer time to yield results. Meanwhile, the potential for developing poor rural groups by diversifying their livestock assets and occupational structure should be fully explored both as an immediate and long-term strategy.

Our results do suggest that the income and employment prospects of poor rural groups can be considerably enhanced by changing the size and composition of livestock enterprises to favour incomewise more important dairy animals. The policy instruments for doing this are more targeted and tied livestock credit and fodder development including the promotion of feed industries and inter-regional fodder transfer. Obviously, besides the livestock sector, rural non-farm sector holds the key for promoting greater employment and income diversification among the landless and small farmers.

Since a more diversified occupational structure can add value to labour time and provide a stronger employment and income support, it has a strategic role in promoting not only crop diversification but also local skill formation. Occupational diversification providing a strong employment and income cushion removes one of the basic obstacles for crop diversification among small farms. Besides, small farmers with an assured off-farm income cover and a higher opportunity cost for their time are more likely to go for high-value crops as the value addition potential of these crops fits well with the current value of their time. Finally, since farm groups and resource regions vary widely in terms of their relative performance in different dimensions of diversification, diversification schemes conceived broadly and implemented within an area and group-specific context have a greater chance for success. For, while a broader conception enables us to exploit the synergy among diversification aspects, the area and group-specific focus helps us to minimise the conflicts between economic efficiency, self-sufficiency and employment and income.

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NOTES

1. Although a broader conception of 'rural diversification' is often suggested (e.g., Barghouti *et al.*, 1990 and World Bank, 1990), most empirical studies on this subject (e.g., Singh and Jain, 1979; Pope and Prescott, 1980; Singh *et al.*, 1984; Gupta and Tewari, 1984; Saini and Singh, 1984) are not based on such a broader conception.

2. Apart from its analytical advantage, the group-specific approach also has considerable practical utility both in designing and implementing diversification schemes.

3. For a detailed description of the four agro-climatic regions of Tiruchirapalli district, see Tamil Nadu Agricultural University (1991).

4. For aggregation and comparison purpose, different animal categories are converted into a standard unit known as Cattle Equivalent Unit (CEU) using the following conversion factors: 1 for local cow, 1.19 for improved cow, 1.26 for bull and buffalo, 0.4 for young animal, 0.1 for each unit of goat/sheep, and 0.005 for each unit of poultry.

5. *Korai*, a perennial weed-like crop whose stalks provide material for making mats, is normally grown in waterlogged

and saline lands in low-lying canal areas.

6. With P_i as the area or value share of crop/activity, i and N as total crops/activities, we can define the Entropy Index (EI) and Ogive Index (OI) as follows:

$$EI = \sum_{i=1}^{N} P_i^* [\log(1/P_i)] \text{ and } EI = \sum_{i=1}^{N} [\{P_i-(1/N)\}^2/(1/N)]$$

While EI is a weighted sum of proportions [weights being $\log(1/P_i)$], OI is a measure of deviation of a given distribution from an equal distribution benchmark. EI attains 0 with complete specialisation and log(N) with perfect diversification whereas OI attains 0 with complete diversification and a maximum value (as set by N) for complete specialisation. While EI is good for capturing the 'diversity' aspect of diversification as N varies, OI is good for reflecting the 'deviation' aspect when N is fixed. Thus EI shows how diversified is a distribution and OI shows how unbalanced is the same (see Saleth, 1995, pp. 394-395).

7. While total income covers the income from main crops, inter-crops, and crop residues, total cost covers all cultivation expenses except the rental value of own land.

8. Since income-cost ratio, unlike net return, captures well the effects of both input use efficiency and scale economies on enterprise performance, it can isolate the low cost-high return enterprises from both the low cost-low return and high cost-low return ones.

9. Since the rate of participation based on the reported main occupations could bias the real employment potential of activities, it is essential to consider also the intensity of participation indicating the relative share of activities in actually spent total man-days.

10. The share of farming in total man-days includes only labour time spent in own farms. It does not cover the time spent in supervision, watch and ward, etc. Even if we account for these activities, the relative employment share of farming will not change much.

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