

Economic Changes among Village Households

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IN THIS CHAPTER we use the village household survey data to quantify the effects of the green revolution on farm production, income, and employment; the changes in family income and consumption of farm and nonfarm households; and the changes in the distribution of land. There are four problems with the data set that complicate our task.

First, 1973/74, the year of the Cambridge-Madras universities (CMU) survey, was not a true pre-green revolution year. Official government data show that about 40 percent of the paddy area was planted to high-yielding varieties (HYVs) that year. The CMU survey found a considerably lower adoption rate (13 percent of the cropped area), but most farmers were growing locally improved varieties that already had some of the key features of HYVs (see Chapter 2). In the absence of a base year in which only long-strawed, traditional varieties are grown, the prospective gains from the green revolution to be observed in the survey data are bound to be muted.

Second, our survey data for 1973/74, 1982/83, and 1983/84 are not strictly comparable as far as rainfall and irrigation water reserves are concerned. Rainfall was similar in 1973/74 and 1982/83 (about 35 percent below average), but since water reserves in the tanks and groundwater were much lower in 1982/83 because of an extended drought, the impact on paddy production was much greater (see Chapter 2). Regional paddy production was 40 percent lower in 1982/83 than in 1973/74, so it is difficult to say much about the impact of the green revolution between these two years. On the other hand, rainfall was 15 percent above average in 1983/84, and regional paddy production was 40 percent larger than in 1973/74. A simple comparison of 1973/74 and 1983/84 may overstate the effects of the green revolution between these two years.

To compound these weather-related problems, we have access to

regionally representative household data only for 1973/74 and 1982/83. In 1983/84, the survey was confined to a subsample of households located in villages with the poorest water resources. These villages suffered the most during the drought of 1982/83 and, most likely, also in 1973/74. Because of their more limited access to irrigation water, they also are likely to have benefited the least from the interim changes in paddy technology. Nevertheless, comparisons between 1973/74 and 1983/84 in these "resurvey" villages provide our best basis for measuring changes in the economic welfare of the rural households.

Third, there is considerable variation in the economic conditions among the 11 sample villages. Some have only limited access to irrigation water, and supplies are unreliable (e.g., Duli). Others are blessed with generous and stable supplies of water, even in drought years (e.g., Kalpattu). This not only leads to important differences in the potential benefits obtainable from improved paddy varieties, but also determines the very economic and social fabric of the villages and the types of growth that are possible. Poorly endowed villages tend to be less equitable to begin with, and technical change is likely to induce less equitable growth there than in better-endowed villages. In this chapter we exploit the statistical representation of the sample data to analyze changes in the average welfare of different types of households at a pooled village level. We leave it to John Harriss in Chapters 4 and 6 to analyze the changes by type of village, and to relate these changes to the underlying water resource endowments.

Fourth, as shown below, the 1973/74 farm sample has a much smaller percentage of farms larger than 1 hectare in the resurvey villages than do the 1982/83 and 1983/84 samples:

	<i>1973/74</i>	<i>1982/83</i>	<i>1983/84</i>
Resurvey villages	25.0	63.6	66.7
Nonresurvey villages	45.9	49.5	n.a.
All villages	38.6	55.2	n.a.

These figures are not consistent with other data on changes in the farm size distribution (see Chapter 4 and later sections of this chapter). Nor are they consistent with the village listing (census) data collected by CMU in 1973 and by IFPRI-TNAU in 1982; these put the percentage of farms greater than 1 hectare at 42 and 48 percent, respectively, for the resurvey villages. Since the sampling design did not involve a stratification by farm size, the problem seems to be one of unlucky samples, a not uncommon occurrence when working with relatively small samples. But an immediate consequence is that uncorrected sample means for the resurvey villages are biased toward small farms in 1973/74 and

toward large farms in 1982/83 and 1983/84. For the most part we resolve the problem by reporting separate results for small (1 hectare or less) and large (greater than 1 hectare) farms. Where pooled estimates are reported for the resurvey villages, they are weighted means using the farm size shares observed in the 1973 and 1982 village listings (i.e., large farm weights of 0.42 for the 1973/74 survey and 0.48 for the 1982/83 and 1983/84 surveys).

Of the four problems discussed above, only the first two raise unresolved difficulties for our data analysis: the lack of a true before-green revolution sample, and uncorrected differences in rainfall and water reserves between years. In Chapter 8 we develop a regional model of the study region and use it to simulate the impact of the green revolution under normal weather conditions. Because the model can correct for weather conditions, as well as simulate with- and without-green revolution situations, it enables us to overcome the major limitations of our survey data analysis. However, as with any model, its construction requires a healthy dose of assumptions about the way in which the regional economy works. We shall therefore use the survey and model results to provide a check on each other, drawing comfort from instances where the two tell a consistent story. Further checks on the reliability of our findings are provided in Chapter 4, where John Harriss uses his own independently collected data to examine changes in some of the same village and household variables.

Changes in Paddy and Groundnut Production

Our analysis of the impact of the green revolution begins with the increases in farm production. Since most farmers engage in mixed cropping, our analysis must go beyond simple changes in paddy area and yield to encompass any induced changes in the production of other crops. These changes might arise from crop substitution (e.g., more paddy at the expense of other crops, or vice versa), or from the more intensive cropping of land throughout the year (e.g., HYVs and increased irrigation permit a greater cropped area during the *navarai* season).

Table 3.1 shows the changes in paddy and groundnut production between the survey years. Paddy production declined between 1973/74 and 1982/83, by 5 percent on small paddy farms and by 33 percent on large paddy farms. This is less than the 42 percent drop recorded at the district level between these two years (Table 2.2), but differences are to be expected since (1) the survey data are based on different procedures for estimating output than those used by district officials,

TABLE 3.1
Average Cropped Area, Yield, and Production of Paddy and Groundnuts by Farm Size Group

	<i>Area (ha)</i>			<i>Yield (kg/ha)</i>			<i>Production (kg)</i>		
	<i>1973/74</i>	<i>1982/83</i>	<i>1983/84</i>	<i>1973/74</i>	<i>1982/83</i>	<i>1983/84</i>	<i>1973/74</i>	<i>1982/83</i>	<i>1983/84</i>
<i>All villages</i>									
Paddy									
Small farms	0.53	0.35	n.a.	2,123	3,043	n.a.	1,125	1,065	n.a.
Large farms	1.41	0.89	n.a.	2,854	3,045	n.a.	4,024	2,710	n.a.
Groundnuts									
Small farms	0.30	0.33	n.a.	1,280	897	n.a.	384	296	n.a.
Large farms	1.19	1.21	n.a.	1,495	969	n.a.	1,779	1,172	n.a.
<i>Resurvey villages</i>									
Paddy									
Small farms	0.55	0.31	0.64	1,773	2,826	2,777	975	876	1,777
Large farms	0.75	0.79	2.11	2,524	2,430	2,176	1,893	1,920	4,592
Groundnuts									
Small farms	0.48	0.28	0.15	1,073	782	1,760	515	219	264
Large farms	1.08	1.10	0.86	1,227	914	1,309	1,325	1,005	1,126

(2) they pertain to different 12-month periods, (3) they exclude part of the district's production, and (4) they are, of course, subject to sampling error. The decline was more muted in the resurvey villages, probably because they were more affected by the 1973/74 drought than the non-resurvey villages. The decline in paddy production was entirely due to a loss in the paddy area grown (Table 3.1). Yields were actually higher in 1982/83, despite the drought.

Groundnut production also declined between 1973/74 and 1982/83 in the sample villages, by 23 percent for small farms and by 34 percent for large farms. This decline is nearly all attributable to lower yields, since the planted area changed little. Unlike paddy, most groundnuts are not irrigated, and hence yields are more affected by variations in rainfall (see also the coefficient of variation calculations in Chapter 2).

Paddy production recovered dramatically in 1983/84, more than doubling in the resurvey villages from the low levels of the 1982/83 drought. The recovery was entirely due to an increase in the paddy area. Yields actually declined a little, probably because late rains during the 1983/84 *samba* season caused some damage to the harvest.

Groundnut production increased little between 1982/83 and 1983/84. While yields recovered after the drought, the area planted to groundnuts declined sharply on both small and large farms. This area decline was necessary to facilitate the expansion of the paddy area, as confirmed by the cropping pattern data in Table 3.2. The sharp increase in the paddy area also displaced sorghum and millets. These relatively drought-resistant crops were widely grown during 1982/83, particularly in the resurvey villages (Table 3.2).

Comparing 1973/74 with 1983/84, paddy production increased by 82 percent on small farms and by 143 percent on large farms. On large farms these increases were entirely due to an expansion of the paddy area, but on small farms they were predominantly due to yield increases. Large farms had already widely adopted the HYVs by 1973/74 (Chinnappa 1977), and their yields were already one-third higher than small-farm yields (Table 3.1). While large-farm yields were still the same in 1983/84, small farmers adopted HYVs during the interim and closed the yield gap. In fact small-farm paddy yields were actually 27 percent higher than large-farm yields in 1983/84 in the resurvey villages (Table 3.1).

Increases in the paddy crop area between 1973/74 and 1983/84 were achieved largely at the expense of groundnuts (Table 3.2). There was no accompanying increase in the cropping intensity index, which in 1983/84 stood at 1.62 for small farms and 1.32 for large farms. Part of the increase in the paddy area on large farms was also attributable to a 63 percent increase in their operated farm size. Small farms, on the

TABLE 3.2
Cropping Patterns by Farm Size Group (ha)

	<i>Small Farms</i>			<i>Large Farms</i>		
	<i>1973/74</i>	<i>1982/83</i>	<i>1983/84</i>	<i>1973/74</i>	<i>1982/83</i>	<i>1983/84</i>
<i>All villages</i>						
Paddy	0.53	0.35	n.a.	1.41	0.89	n.a.
Groundnuts	0.30	0.33	n.a.	1.19	1.21	n.a.
Sorghum/millet	0.05	0.06	n.a.	0.10	0.34	n.a.
Other crops	0.05	0.09	n.a.	0.05	0.54	n.a.
Total	0.93	0.83	n.a.	2.74	2.99	n.a.
Operated farm size	0.59	0.61	n.a.	2.42	2.68	n.a.
Crop intensity index	1.57	1.36	n.a.	1.13	1.11	n.a.
<i>Resurvey villages</i>						
Paddy	0.55	0.31	0.64	0.75	0.79	2.11
Groundnuts	0.48	0.28	0.15	1.08	1.10	0.86
Sorghum/millet	0.01	0.14	0.08	0.24	0.45	0.01
Other crops	0.03	0.06	0.02	—	0.33	0.20
Total	1.07	0.80	0.89	2.08	2.68	3.18
Operated farm size	0.64	0.66	0.55	1.48	2.59	2.41
Crop intensity index	1.67	1.21	1.62	1.41	1.04	1.32

other hand, shrank by 14 percent in size. These results pertain only to the resurvey villages and should not be extrapolated to the entire study region (see a later section in this chapter on changes in the farm size distribution).

What, then, can we conclude about the productivity effects of the green revolution between 1973/74 and 1983/84? Paddy production did increase sharply, but this seems to have been more the result of substituting paddy for groundnuts in the cropping pattern. Yields increased on small farms, and this reflects the fact that they adopted HYVs during the period studied. But most large farms had already adopted HYVs by 1973/74, hence their yield increases are not captured in the survey data. Despite the expansion of irrigation between 1973/74 and 1982/83, there is no evidence that this led to any increase in annual cropping intensity. However, our 1983/84 results are confined to the resurvey villages, and these villages participated the least in the general expansion in irrigation.

The substitution between paddy and groundnuts could also be partly driven by technological change, especially if improved paddy varieties have lower costs and this increases the relative profitability of paddy. On the other hand, part of the substitution appears to be related to weather conditions. Groundnuts need less water than paddy and hence, along with millets and sorghum, are more favored by farmers during drought years.

Irrespective of cause, the observed changes in the cropping pattern are considerable, and they have important implications for changes in farm income and employment.

Changes in Farm Income

The value of farm output (gross output) is dominated by paddy and groundnuts (Table 3.3), hence changes in their production and prices largely determine the changes in total gross output. We have already seen that paddy and groundnut production changed markedly from one survey year to another (Table 3.1). However, these changes were partially buffered by opposing price movements, as shown below (in Rs/t, constant 1973/74 prices):

	<i>Paddy</i>	<i>Groundnut</i>
1973/74	865	1,080
1982/83	922	1,547
1983/84	755	1,613

TABLE 3.3
Paddy Farm Incomes (1973/74 prices)

	<i>All Villages</i>				<i>Resurvey Villages</i>					
	<i>1973/74</i>		<i>1982/83</i>		<i>1973/74</i>		<i>1982/83</i>		<i>1983/84</i>	
	<i>Small Farms</i>	<i>Large Farms</i>	<i>Small Farms</i>	<i>Large Farms</i>	<i>Small Farms</i>	<i>Large Farms</i>	<i>Small Farms</i>	<i>Large Farms</i>	<i>Small Farms</i>	<i>Large Farms</i>
Gross output ^a										
Paddy	954	3,581	982	2,499	808	1,546	808	1,771	1,341	3,464
Groundnuts	431	1,803	458	1,812	574	994	339	1,554	426	1,816
Other crops	757	1,153	162	264	39	1,223	40	102	64	176
Livestock products	23	88	129	200	5	91	70	204	179	820
Bullock & machine rent	—	—	34	41	—	—	18	4	3	4
Total gross output	2,165	6,625	1,765	4,816	1,426	3,854	1,275	3,635	2,013	6,280
Costs										
Hired labor	235	598	176	814	213	424	84	707	276	1,331
Bullock & machine hire	27	99	33	96	23	76	8	83	20	48
Fertilizers	71	303	103	351	35	75	27	236	227	809
Other	660	1,546	222	632	429	959	110	444	385	1,208
Total costs	992	2,546	533	1,893	700	1,534	228	1,470	908	3,396
Net farm income	1,173	4,078	1,232	2,923	726	2,320	1,047	2,165	1,105	2,884

^aIncludes home-consumed foods valued at farm-gate prices.

Both paddy and groundnut production fell sharply between 1973/74 and 1982/83 (Table 3.1), but these losses were partially offset by higher prices. On the other hand, the sharp increase in paddy output between 1982/83 and 1983/84 was tempered by a drop in price, while the limited growth in groundnut output was supplemented by a price increase. As a result, changes in paddy and groundnut gross output are less dramatic than the changes in production. For example, small and large farms in the resurvey villages increased their paddy production by 103 percent and 139 percent, respectively, between 1982/83 and 1983/84, but paddy gross output increased by only two-thirds as much—by 66 and 95 percent, respectively.

Changes in farm costs also acted to buffer the changes in production (Table 3.3). Costs were lowest during the 1982/83 drought and increased substantially in 1983/84. These buffering effects led to surprisingly stable farm incomes from one year to another. In the resurvey villages, small-farm incomes were only 5 percent lower during the 1982/83 drought than in 1983/84, while large-farm incomes were 25 percent lower.

Taking 1973/74 and 1983/84 as our relevant comparison for evaluating the green revolution, Table 3.3 shows that small-farm incomes increased by 52 percent and large-farm incomes by 24 percent. The increases would have been greater but for the 13 percent decline in the paddy price and the sharp increase in labor and fertilizer costs, especially for large farms.

Changes in Employment and Wages

Total labor use in crop production declined sharply during the 1982/83 drought on both large and small farms, but it rebounded in 1983/84 (Table 3.4). Between 1973/74 and 1983/84, total crop employment in the resurvey villages increased by 15 percent on large farms but declined by 20 percent on small farms. However, since operated farm sizes also changed (Table 3.2), a more useful measure is labor use per hectare of operated land. This declined by 7 percent for small farms and by 30 percent for large farms. Similar declines occurred in the labor use per gross cropped hectare (Table 3.4). Note that the small farms use considerably more labor than large farms on an operated area basis, but they use about the same amount per hectare of gross cropped land. This simply reflects their more intensive cropping of land (Table 3.2).

Overall, these results suggest that the green revolution did little to increase total crop employment, despite the fact that HYV paddy uses about 5 to 10 percent more labor per hectare than locally improved varieties (Tables 2.4 and 2.5). Using the farm size weights discussed in

TABLE 3.4
Adult Employment per Paddy Farm in Crop Production by Type of Labor (days)

	<i>All Villages</i>				<i>Resurvey Villages</i>					
	<i>1973/74</i>		<i>1982/83</i>		<i>1973/74</i>		<i>1982/83</i>		<i>1983/84</i>	
	<i>Small Farms</i>	<i>Large Farms</i>	<i>Small Farms</i>	<i>Large Farms</i>	<i>Small Farms</i>	<i>Large Farms</i>	<i>Small Farms</i>	<i>Large Farms</i>	<i>Small Farms</i>	<i>Large Farms</i>
<i>Family labor</i>										
Male	95.4	148.5	52.2	96.7	94.4	177.4	54.1	88.5	104.8	191.9
Female	34.3	58.5	11.9	18.3	37.3	86.6	10.4	15.3	43.0	111.1
Total	129.7	207.0	64.1	115.0	131.7	264.0	64.5	103.8	147.8	303.0
<i>Attached labor</i>										
Male	5.6	46.6	3.0	31.1	10.8	—	—	21.7	—	68.3
Female	0.4	—	—	0.4	—	—	—	0.3	—	15.3
Total	6.0	46.6	3.0	31.5	10.8	—	—	22.0	—	83.6
<i>Exchange labor</i>										
Male	3.9	12.8	0.1	0.6	2.5	9.0	—	0.2	0.2	13.7
Female	17.4	37.3	0.4	3.2	7.8	24.7	—	1.7	0.3	3.3
Total	21.3	50.1	0.5	3.8	10.3	33.7	—	1.9	0.5	17.0
<i>Hired labor</i>										
Male	39.2	125.5	19.2	72.5	40.6	97.3	8.4	63.8	28.7	100.6
Female	98.9	234.7	57.0	215.0	89.0	170.3	33.6	154.6	48.6	143.7
Total	138.1	360.2	76.2	287.5	129.6	267.6	42.0	218.4	77.3	244.3
<i>Total labor</i>										
Male	144.1	333.4	74.5	200.9	148.3	283.7	62.5	174.2	133.7	374.5
Female	151.0	330.5	69.3	236.9	134.1	281.6	44.0	171.9	91.9	273.4
Total	295.1	663.9	143.8	437.8	282.4	565.3	106.5	346.1	225.6	647.9
<i>Total labor/ha</i>										
Operated area	500	274	236	163	441	382	161	134	410	269
Gross cropped area	317	242	173	146	264	272	133	129	253	204
<i>Total hired labor/ha</i>										
Operated area	234	149	125	107	203	181	64	84	141	101
Gross cropped area	148	131	92	96	121	129	53	81	87	77

the introduction to this chapter, total labor use in crop production declined by 4 percent (from 401 to 386 days) on the average paddy farm between 1973/74 and 1983/84, and by 14 percent per hectare of operated land. These changes reflect the increased mechanization of irrigation pumping and paddy threshing, changes that were not adequately offset by the substitution of paddy for groundnuts in the cropping pattern (groundnuts use about half to two-thirds as much labor per hectare).

Male and female labor were about equally employed in crop production in 1973/74 and 1982/83, but males dominated in 1983/84 (Table 3.4). Hired labor was also about as important as family labor in 1973/74, but its share in total labor use fell in 1983/84, from 47 percent to 34 percent on small farms, and from 46 to 38 percent on large farms. The total use of hired labor fell by 25 percent on the average farm, or by 11 percent if attached labor is included.

Although total crop employment did not increase between 1973/74 and 1983/84, real wage rates did (Table 3.5). Wage rates differ by sex and task, but of the more important tasks, wages for males increased by about 20 percent in real terms, while wages for females increased by only half as much. These increases are observed for both cash and kind wages. They are also generally consistent with the changes reported by John Harriss in Chapter 4.

Real wage rates could only have increased in the face of an 11 percent decline in the use of hired and attached labor on the average farm if the supply of labor had also contracted. Table 3.6 shows that, at least in the resurvey villages, this is exactly what happened. Large-farm households sharply curtailed their participation in the agricultural labor market, and their wage earnings (in constant prices) fell from Rs 228 in 1973/74 to Rs 47 in 1983/84. Given also a sharp increase in wage payments on these farms, net wage earnings (earnings less payments) fell from Rs -196 to Rs -1,284. Small-farm households met part of the increase in the labor deficit on large farms (their net wage earnings increased from Rs 176 to Rs 464), but this was insufficient to fill the gap. Taking a weighted average of small and large farms, net wage earnings fell from Rs 20 in 1973/74 to Rs -375 in 1983/84. As we shall see in the next section, the gap was filled by landless laborers and nonpaddy farmers.

As discussed by John Harriss in Chapter 4, other factors that helped to increase wages were a growing demand for labor in rural nonfarm activities; an expansion of local milk production under Operation Flood; and an outmigration of workers that helped contain the growth in the number of landless laborers.

TABLE 3.5
Agricultural Wages by Operation

Village	Plowing (Men)				Weeding (Women)				Harvesting (Women)			Threshing (Men)		
	1973/74 (Rs/ day)	1982/83 (Rs/ day)	Deflated 1982/83 Wage ^a	Percent Change	1973/74 (Rs/ day)	1982/83 (Rs/ day)	Deflated 1982/83 Wage ^a	Percent Change	1973/74 (kg/paddy /day)	1982/83 (kg/paddy /day)	Percent Change	1973/74 (kg/paddy /day)	1982/83 (kg/paddy /day)	Percent Change
Kalpattu	3.50	6.00	3.25	-7.0	1.00	2.00	1.09	9.0	5.00	5.60	12	5.00	8.50	70
Nesal	1.50	6.00	3.25	116.7	1.30	3.00	1.63	25.4	4.25	5.00	18	8.50	10.00	18
Vegamangalam	3.00	5.00	2.71	-9.7	1.00	3.00	1.63	63.0	5.60	5.60	—	5.60	5.60	—
Vinayagapuram	2.00	5.00	2.71	35.5	0.70	2.50	1.36	94.3	3.00	4.00	33	3.25	4.00	23
Sirungathur	2.50	5.00	2.71	8.4	1.00	2.00	1.09	9.0	5.60	5.60	—	5.60	5.60	—
Vayalur	2.50	5.00	2.71	8.4	1.00	2.50	1.36	36.0	3.50	4.00	14	7.00	7.00	—
Vengodu	2.00	5.00	2.71	35.5	1.50	2.00	1.09	-27.3	5.00	5.00	—	4.25	5.00	18
Meppathurai	2.80	5.00	2.71	-3.2	1.30	2.00	1.09	-16.2	4.25	5.00	18	6.25	7.00	12
Duli	2.00	6.00	3.25	62.5	1.50	3.00	1.63	8.7	5.00	5.60	12	1.40	5.60	400
Veerasambanur	0.75	5.00	2.71	261.3	1.25	2.50	1.36	8.8	4.25	4.25	—	8.50	8.50	—
Amudhur	2.00	3.00	1.63	-18.5	1.30	2.50	1.36	4.6	3.50	4.80	37	5.00	6.40	28
Average	2.23	5.10	2.76	23.8	1.17	2.45	1.33	13.7	4.45	4.95	11	5.49	6.65	21

Source: Cambridge-Madras and IFPRI-TNAU surveys.

^aDeflated to 1973/74 prices with a rural cost-of-living index for Kunnathur village in Chingleput (*Tamil Nadu—An Economic Appraisal*, various volumes, Finance Department, Government of Tamil Nadu).

TABLE 3.6
Agricultural Wage Transactions by Size of Farm, Resurvey Villages (1973/74 Rs)

	<i>Small Farms</i>			<i>Large Farms</i>		
	<i>1973/74</i>	<i>1982/83</i>	<i>1983/84</i>	<i>1973/74</i>	<i>1982/83</i>	<i>1983/84</i>
Wage earnings	389	200	740	228	26	47
Wage payments	213	84	276	424	707	1,331
Net earnings	176	116	464	-196	-681	-1,284

Changes in Family Income

The total family income of each household type is summarized by year in Table 3.7. The detrimental impact of the 1982/83 drought is again apparent. Most households were actually worse off in 1982/83 than in 1973/74, despite the intervening changes in irrigation and paddy technology. There was less change in the resurvey villages between these two years, but family incomes in these villages were already well below average in 1973/74. The favorable rains of 1983/84 led to substantial increases in family incomes in the resurvey villages; in many cases incomes more than doubled. Clearly, the income of rural households in North Arcot is very vulnerable to fluctuations in rainfall.

Family incomes improved substantially between 1973/74 and 1983/84 in the resurvey villages. It increased by 18 percent for large paddy farms and by 90 percent for small paddy farms. The landless laborers more than doubled their income (up 125 percent), bringing their average income almost up to the level of small paddy farmers. The nonpaddy farmers and the nonagricultural households increased their incomes by about 17 and 55 percent, respectively, even though they were not directly involved in the changes that occurred in paddy technology.

These changes are more substantial than the income increases obtained from the regional model in Chapter 8 (see Table 8.4 and the accompanying discussion). When normalized for rainfall, the model predicts that the green revolution increased the incomes of farmers and landless laborers by about 30 percent and of nonagriculturalists by 20 percent. It would seem that the survey results were affected by the 1973/74 drought, especially as our 1973/74 to 1983/84 comparison is limited to the poorer and more drought-prone resurvey villages, and this has exaggerated the income increases. However, both the model and the survey are consistent in showing that (1) small farmers increased their incomes in at least the same proportion as large farmers, (2) landless laborers gained favorably compared with any other group, and (3) nonagricultural households became relatively poorer.

The details of the composition of family incomes are reported in

TABLE 3.7
Changes in Household Incomes (1973/74 Rs)

<i>Type of Household</i>	<i>All Villages</i>		<i>Resurvey Villages</i>		
	<i>1973/74</i>	<i>1982/83</i>	<i>1973/74</i>	<i>1982/83</i>	<i>1983/84</i>
Small paddy farms	2,028 (100)	1,866 (92)	1,199 (100)	1,605 (134)	2,286 (190)
Large paddy farms	4,553 (100)	3,778 (83)	2,764 (100)	2,809 (102)	3,268 (118)
Nonpaddy farms	1,927 (100)	1,135 (59)	1,732 (100)	845 (49)	2,032 (117)
Landless laborers	988 (100)	807 (82)	935 (100)	912 (98)	2,102 (225)
Nonagricultural households	1,240 (100)	1,480 (119)	1,187 (100)	792 (67)	1,837 (155)

Note: Figures in parentheses are income indices with 1973/74 = 100.

Tables 3.8 to 3.12. Farm income accounts for only about 50–60 percent of the family income of small-paddy-farm households (Table 3.8). Wage earnings, particularly in agriculture, account for another third, though these were considerably reduced during the drought year. Increased wage earnings also accounted for 45 percent of the increase in family income between 1973/74 and 1983/84 for small paddy farms in the resurvey villages.

Large-sized paddy farms receive over 80 percent of their income from farming (Table 3.9), hence the changes in net farm income discussed earlier explain most of the changes in their family income.

Nonpaddy farmers have become more dependent on wage earnings since 1973/74 (Table 3.10). Their farm income was almost nonexistent in the resurvey villages during the 1982/83 drought. Agricultural wage earnings were the most important source of income in 1983/84, but nonfarm wage earnings were more important during the drought. Self-employment in nonfarm business activities has also become more important since 1973/74; it accounted for 18 percent of family income in 1983/84.

The landless workers are almost totally dependent on wage earnings, particularly in agriculture (Table 3.11). They suffered from the contraction in agricultural employment during the drought but, more generally, benefited substantially from the increase in the demand for hired labor that has occurred since 1973/74 (see previous sections).

The nonagricultural households have the most diverse sources of income (Table 3.12). Own nonfarm business income is most important, and although this virtually disappeared during the 1982/83 drought, it was the prime source of increase in family income between 1973/74 and 1983/84 in the resurvey villages; it increased from Rs 493 per household

TABLE 3.8
Composition of Family Income, Small Paddy Farms (1973/74 Rs)

<i>Source of Income</i>	<i>All Villages</i>		<i>Resurvey Villages</i>		
	<i>1973/74</i>	<i>1982/83</i>	<i>1973/74</i>	<i>1982/83</i>	<i>1983/84</i>
Net farm income	1,173	1,232	726	1,047	1,105
Agric. wage earnings	410	205	389	200	740
White-collar earnings	91	42	—	2	—
Other wage earnings	36	123	24	196	157
Nonfarm business income	78	159	9	60	20
Rents & money lending	4	25	—	—	162
Other unearned income	236	80	51	100	102
Total family income	2,028	1,866	1,199	1,605	2,286
Sample size	35	72	15	23	11

TABLE 3.9
Composition of Family Income, Large Paddy Farms (1973/74 Rs)

<i>Source of Income</i>	<i>All Villages</i>		<i>Resurvey Villages</i>		
	<i>1973/74</i>	<i>1982/83</i>	<i>1973/74</i>	<i>1982/83</i>	<i>1983/84</i>
Net farm income	4,078	2,923	2,320	2,165	2,884
Agric. wage earnings	180	79	228	26	47
White-collar earnings	138	251	216	239	156
Other wage earnings	28	70	—	44	—
Nonfarm business income	—	214	—	- 12	—
Rents & money lending	—	51	—	3	141
Other unearned income	129	190	—	344	40
Total family income	4,553	3,778	2,764	2,809	3,268
Sample size	22	88	5	41	22

TABLE 3.10
Composition of Family Income, Nonpaddy Farmers (1973/74 Rs)

<i>Source of Income</i>	<i>All Villages</i>		<i>Resurvey Villages</i>		
	<i>1973/74</i>	<i>1982/83</i>	<i>1973/74</i>	<i>1982/83</i>	<i>1983/84</i>
Net farm income	927	155	1,012	3	408
Agric. wage earnings	963	232	720	181	1,008
White-collar earnings	—	54	—	—	—
Other wage earnings	37	334	—	622	142
Nonfarm business income	—	201	—	-164	361
Rents & money lending	—	63	—	195	64
Other unearned income	—	96	—	8	49
Total family income	1,927	1,135	1,732	845	2,032
Sample size	3	28	2	9	9

TABLE 3.11
Composition of Family Income, Landless Agricultural Workers (1973/74 Rs)

<i>Source of Income</i>	<i>All Villages</i>		<i>Resurvey Villages</i>		
	<i>1973/74</i>	<i>1982/83</i>	<i>1973/74</i>	<i>1982/83</i>	<i>1983/84</i>
Net farm income	32	14	18	16	11
Agric. wage earnings	809	513	809	577	1,670
White-collar earnings	23	2	—	4	17
Other wage earnings	47	171	38	209	131
Nonfarm business income	15	22	16	24	55
Rents & money lending	—	10	—	—	6
Other unearned income	62	75	54	82	212
Total family income	988	807	935	912	2,102
Sample size	50	114	19	44	23

TABLE 3.12
Composition of Family Income, Nonagricultural Households (1973/74 Rs)

<i>Source of Income</i>	<i>All Villages</i>		<i>Resurvey Villages</i>		
	<i>1973/74</i>	<i>1982/83</i>	<i>1973/74</i>	<i>1982/83</i>	<i>1983/84</i>
Net farm income	2	34	—	27	48
Agric. wage earnings	251	141	267	33	492
White-collar earnings	309	459	332	262	—
Other wage earnings	219	379	95	382	—
Nonfarm business income	377	295	493	19	1,094
Rents & money lending	5	—	—	—	4
Other unearned income	77	172	—	69	199
Total family income	1,240	1,480	1,187	792	1,837
Sample size	27	39	5	12	10

to Rs 1,094 per household in constant 1973/74 prices. However, wage earnings, salaries from white-collar employment, and various types of unearned income (including pensions and remittances from relatives) continue to be important sources of income.

Changes in Household Consumption Expenditure

Income is not the most reliable measure of welfare, because it fluctuates widely from year to year in accordance with rainfall, changes in prices, and other random factors beyond a household's control. Households do have some capacity to buffer transitory fluctuations in income to maintain more stable levels of consumption and hence welfare. For example, in drought years they can draw down their savings, borrow, sell capital assets such as livestock, and increase their nonfarm earnings. In this sense household consumption expenditure is a more stable and direct measure of welfare.

The total consumption expenditure (in 1973/74 prices) of each household type is summarized by year in Table 3.13. Unlike the income data in Table 3.7, the consumption data show a definite improvement in the welfare of all household types between 1973/74 and 1982/83, despite the drought. These increases range between 28 and 42 percent among

TABLE 3.13
Changes in Family Expenditures (1973/74 Rs)

<i>Type of Household</i>	<i>All Villages</i>		<i>Resurvey Villages</i>		
	<i>1973/74</i>	<i>1982/83</i>	<i>1973/74</i>	<i>1982/83</i>	<i>1983/84</i>
Small paddy farms	1,379 (100)	1,833 (133)	1,143 (100)	1,726 (151)	3,044 (266)
Large paddy farms	2,486 (100)	3,540 (142)	2,182 (100)	3,408 (156)	5,105 (234)
Nonpaddy farms	1,443 (100)	1,846 (128)	1,163 (100)	1,373 (118)	2,679 (230)
Landless laborers	928 (100)	1,184 (128)	846 (100)	1,244 (147)	2,553 (302)
Nonagricultural households	1,325 (100)	1,733 (131)	1,056 (100)	1,114 (105)	2,191 (207)

Notes: Figures in parentheses are income indices with 1973/74 = 100.
 Home-produced foods are valued at retail prices.

the household types, and they are a little higher when only the resurvey villages are considered.

The real value of consumption expenditures more than doubled for all household groups in the resurvey villages between 1973/74 and 1983/84. These increases are consistently higher than the income increases reported in Table 3.7.

These results merit some explanation because there are many cases where household expenditures exceed total income, especially in the resurvey villages. Part of the problem arises because homegrown foods consumed by the household were valued at farm-gate prices when calculating income but were valued at retail prices when calculating expenditures. However, as Table 3.14 shows, the problem is not resolved when income is modified to value these home-produced foods at retail prices; the expenditure/income ratios exceed unity for all the household types in the resurvey villages in both 1982/83 and 1983/84. Even after allowing for reported net investment (purchases minus sales of livestock and machinery) and net borrowings (new loans minus debt repaid), there remains a deficit to be accounted for in nearly every case. It is possible that households were drawing down savings in response to financial distress during and immediately following the severe drought. But we also suspect that incomes may have been underreported, especially given the rather higher income estimates obtained in the regional model (Table 8.4).

The increases in total consumption expenditure between 1973/74 and 1983/84 in the resurvey villages were matched by an improvement in the mix of commodities and services purchased (Table 3.15). Although the average budget share for total foods remained relatively

TABLE 3.14
Consolidated Statement of Income, Expenditure, and Savings by Household Type, Resurvey Villages (1973/74 Rs)

	<i>Small Paddy Farms</i>		<i>Large Paddy Farms</i>		<i>Nonpaddy Farms</i>		<i>Landless</i>		<i>Nonagricultural</i>	
	<i>1982/83</i>	<i>1983/84</i>	<i>1982/83</i>	<i>1983/84</i>	<i>1982/83</i>	<i>1983/84</i>	<i>1982/83</i>	<i>1983/84</i>	<i>1982/83</i>	<i>1983/84</i>
Modified income ^a (<i>Y</i>)	1,579	2,370	2,734	3,447	851	2,150	912	2,102	792	1,837
Total expenditure (<i>E</i>)	1,726	3,044	3,408	5,105	1,373	2,679	1,244	2,553	1,114	2,191
Ratio <i>E/Y</i>	1.09	1.28	1.25	1.48	1.61	1.25	1.36	1.21	1.41	1.19
Net investment (<i>I</i>)	-187	245	579	238	-81	48	-12	6	9	10
Net borrowing (<i>B</i>)	195	300	826	384	124	-26	126	-2	51	-7
Change in savings (<i>Y + B - E - I</i>)	235	-619	-427	-1,512	-317	-603	-194	-459	-280	-371

^aHome-grown foods consumed by the household are valued at retail prices in these modified calculations. Because the retail price of rice is heavily subsidized, this actually reduced income in some cases compared with income levels in Table 3.7.

TABLE 3.15
Average Budget Shares for Household Expenditure, Resurvey Villages (percent)

	1973/74					1982/83					1983/84				
	<i>Small Paddy Farms</i>	<i>Large Paddy Farms</i>	<i>Non-paddy Farms</i>	<i>Land-less</i>	<i>Non-agric.</i>	<i>Small Paddy Farms</i>	<i>Large Paddy Farms</i>	<i>Non-paddy Farms</i>	<i>Land-less</i>	<i>Non-agric.</i>	<i>Small Paddy Farms</i>	<i>Large Paddy Farms</i>	<i>Non-paddy farms</i>	<i>Land-less</i>	<i>Non-agric.</i>
Total foods	82.5	74.7	75.6	84.0	83.7	76.5	69.4	77.5	79.0	79.1	77.0	78.1	70.2	75.9	75.1
Foodgrains	63.9	53.7	59.5	65.3	65.2	50.2	42.9	46.3	50.6	44.4	33.6	37.2	30.4	33.0	33.2
Dairy & eggs	0.4	2.0	1.4	0.1	2.5	1.3	3.0	0.7	0.3	1.5	3.9	6.5	1.7	3.3	1.2
Meat & fish	1.8	2.1	1.1	2.1	1.1	1.2	1.8	4.4	3.2	2.2	5.6	5.2	8.2	7.1	5.2
Vegetables, fruits, & nuts	2.4	3.1	1.4	2.3	3.0	6.6	5.0	6.8	6.4	8.4	12.0	8.9	11.9	12.0	14.2
Oils & spices	10.5	9.3	8.9	11.3	8.7	15.2	14.1	17.6	17.5	20.0	15.5	14.6	11.8	14.7	14.4
Alcohol & tobacco	4.5	5.4	4.2	4.3	5.3	3.4	3.0	3.9	5.2	5.2	3.4	1.6	4.4	4.6	6.9
Energy	1.4	1.3	2.6	2.9	1.7	1.6	1.5	2.6	2.0	2.2	2.1	1.8	2.1	1.8	1.6
Toiletries	1.6	1.4	0.7	1.4	1.0	1.2	1.4	1.8	1.5	1.1	1.5	1.2	1.3	1.4	1.2
Durables	0.3	0.9	0.1	0.1	0.1	0.2	0.7	0.9	1.0	0.2	0.7	1.2	1.3	1.2	0.4
Clothing & footwear	4.4	7.1	4.2	3.1	3.2	3.7	4.4	2.5	2.4	4.3	3.3	4.6	3.7	2.8	2.6
Personal services	1.6	1.8	6.4	1.4	1.6	1.4	1.3	1.0	1.1	0.9	1.3	1.3	1.6	1.3	1.3
Education	0.4	0.4	—	0.1	0.6	0.4	0.8	0.5	0.3	0.3	0.1	0.4	0.3	0.2	0.3
Medical services	0.3	2.5	0.3	0.1	0.4	0.8	1.3	1.7	0.6	1.8	1.4	1.5	1.4	1.8	2.2
Transport	1.5	1.5	1.6	1.4	1.4	2.2	3.5	3.9	2.4	1.5	2.7	2.4	8.4	2.9	2.4
Entertainment	0.3	0.3	2.7	0.6	0.1	0.6	0.9	1.1	0.7	1.7	3.5	2.1	3.5	3.4	4.4
Religious & social functions	1.2	2.7	1.5	0.7	0.9	7.8	7.8	2.5	3.1	1.6	2.9	1.7	1.7	1.9	1.5
Home improvements	n.a.	n.a.	n.a.	n.a.	n.a.	0.3	4.0	0.1	0.6	—	0.1	2.0	0.1	0.7	—

constant over the years at around 75 to 80 percent, households diversified into higher-quality foods. The average budget share for food-grains declined and the shares for livestock and horticultural products and vegetable oils and spices increased. This pattern was particularly pronounced between 1973/74 and 1983/84.

Of the nonfoods, the average budget shares for durables, medical services, transport, entertainment, and religious and social functions increased the most between 1973/74 and 1983/84.

Changes in Welfare Distribution

The evidence reviewed shows a definite improvement in the welfare of the rural households in the surveyed villages. This implies a reduction in absolute poverty, but what has happened to the relative distribution of household income and consumption expenditure? In Table 3.16 we have expressed the income and expenditure of each household type as a ratio of the corresponding income and expenditure of the landless. These within-year indices show the relative gains and losses of each household type over the years.

Whether measured by income or by consumption expenditure, the landless laborers and the nonagricultural households are the poorest groups and the large paddy farms are the richest. The data do not suggest any worsening of the interhousehold distribution of income or expenditure since 1973/74. On the contrary, the relative income and

TABLE 3.16
Indices of Interhousehold Distribution of Income and Consumption Expenditure
(Landless = 100)

	<i>All Villages</i>		<i>Resurvey Villages</i>		
	<i>1973/74</i>	<i>1982/83</i>	<i>1973/74</i>	<i>1982/83</i>	<i>1983/84</i>
<i>Income</i>					
Small paddy farms	205 (2)	231 (2)	128 (3)	176 (2)	109 (2)
Large paddy farms	461 (1)	468 (1)	296 (1)	308 (1)	155 (1)
Nonpaddy farms	195 (3)	141 (4)	185 (2)	93 (4)	97 (4)
Landless	100 (5)	100 (5)	100 (5)	100 (3)	100 (3)
Nonagricultural	126 (4)	183 (3)	127 (4)	87 (5)	87 (5)
<i>Expenditure</i>					
Small paddy farms	149 (3)	155 (3)	135 (3)	139 (2)	119 (2)
Large paddy farms	267 (1)	299 (1)	258 (1)	274 (1)	200 (1)
Nonpaddy farms	155 (2)	156 (2)	137 (2)	110 (3)	105 (3)
Landless	100 (5)	100 (5)	100 (5)	100 (4)	100 (4)
Nonagricultural	143 (4)	146 (4)	125 (4)	90 (5)	86 (5)

Note: Figures in parentheses are rankings within years.

TABLE 3.17
Average Land Area Owned by Quartile, Cultivator Households (ha)

Village	1st Quartile			2nd Quartile			3rd Quartile			4th Quartile			All Farmers		
	1973	1982	% Change	1973	1982	% Change	1973	1982	% Change	1973	1982	% Change	1973	1982	% Change
Kalpattu	0.34	0.23	-32.50	0.59	0.47	-20.34	1.06	0.93	-12.26	2.12	1.87	-11.79	1.03	0.88	-14.56
Nesal	0.30	0.26	-13.33	0.64	0.58	-9.38	1.54	1.25	-18.83	5.23	3.50	-33.08	1.98	1.40	-29.29
Vegamangalam	0.46	0.25	-45.65	0.72	0.61	-15.28	1.01	1.11	9.90	2.08	3.07	47.60	1.12	1.28	14.29
Vinayagapuram	0.22	0.23	4.54	0.54	0.42	-22.22	0.97	0.79	-18.56	2.27	1.96	-13.66	1.00	0.86	-14.00
Sirungathur	0.30	0.31	3.33	0.52	0.53	1.92	0.86	1.01	17.44	2.32	4.37	88.36	1.02	1.55	51.96
Vayalur	0.24	0.18	-25.00	0.45	0.40	-11.11	0.74	0.93	25.68	2.12	2.43	14.62	0.99	1.00	1.01
Vengodu	0.28	0.22	-21.43	0.58	0.42	-27.59	0.96	0.80	-16.67	2.36	2.17	-8.05	1.04	0.89	-14.42
Meppathurai	0.36	0.39	8.33	0.79	0.80	1.27	1.35	1.24	-8.15	3.08	2.12	-31.17	1.48	1.14	-22.97
Duli	0.58	0.49	-15.51	1.07	1.40	30.84	1.66	2.68	61.45	3.39	5.33	57.23	1.65	2.44	47.88
Veerasambanur	0.26	0.30	15.38	0.74	0.67	-9.46	1.24	1.00	-19.35	2.19	2.03	-7.31	1.09	1.01	-7.34
Amudhur	0.16	0.14	-12.50	0.43	0.33	-23.26	0.96	0.94	-2.08	2.93	2.98	1.71	1.12	1.08	-3.57
Pooled villages	0.28	0.25	-10.71	0.63	0.53	-15.87	1.04	1.01	-2.88	2.87	2.88	0.35	1.23	1.18	-4.07

Source: Village listing data, Cambridge-Madras universities and IFPRI-TNAU surveys.

expenditure of the large farms declined between 1973/74 and 1983/84, while that of the landless laborers increased to achieve parity with the small paddy farms. The nonagricultural households slipped in their relative standing to become the poorest group in 1982/83 and 1983/84. The nonpaddy farms also became poorer than the landless when their incomes are compared, but they did a little better on consumption expenditure.

The general pattern seems to be one of a relative gain for all the households benefiting directly from changes in paddy farming, including the landless laborers, and a less than proportionate gain for the non-agricultural households. Although the indirect gains obtained through the growth of local nonfarm activity were substantial, they were insufficient to maintain the relative standing of the nonagricultural households.

Changes in Access to Land

Early critics of the green revolution feared that since the larger farmers were typically the early adopters of HYVs, then they would use their increased profits to buy out smaller farmers. There was some evidence for this phenomenon during the early stages of HYV adoption (e.g., Griffin 1972, 1974), but such observations need not reflect longer-term changes in the distribution of land, particularly if, as in North Arcot, most small farmers have since successfully adopted HYVs. Using the village census data collected by the CMU and IFPRI-TNAU teams, this section examines the changes in the ownership and operation of land over an entire decade of technological change.

Table 3.17 shows the interquartile distribution of owned land by villages for 1973 and 1982. The owned area per farm declined from 1.23 hectares to 1.18 hectares (a reduction of 4 percent) when averaged across villages. When the households in all 11 villages are pooled, it is found that the farms in the top quartile did not change in size whereas the average size went down in the bottom three quartiles. In each case the changes were modest and not statistically significant. Since the pooled sample is expected to be representative of the entire study region, it may be concluded that the changes in paddy technology and irrigation between 1973 and 1982 have not had any significant impact on the aggregate distribution of owned land.

However, Table 3.17 also shows considerable variation in the changes by village. The average farm size increased in Vegamangalam, Sirungathur, and Duli, and in each case the increase was concentrated in the larger-size quartiles. However, an exactly opposite pattern of

TABLE 3.18
Average Land Area Operated by Quartile, Cultivator Households (ha)

<i>Village</i>	<i>1st Quartile</i>			<i>2nd Quartile</i>			<i>3rd Quartile</i>			<i>4th Quartile</i>			<i>All Farmers</i>		
	<i>1973</i>	<i>1982</i>	<i>%</i> <i>Change</i>	<i>1973</i>	<i>1982</i>	<i>%</i> <i>Change</i>	<i>1973</i>	<i>1982</i>	<i>%</i> <i>Change</i>	<i>1973</i>	<i>1982</i>	<i>%</i> <i>Change</i>	<i>1973</i>	<i>1982</i>	<i>%</i> <i>Change</i>
Kalpattu	0.38	0.25	-34.21	0.65	0.49	-24.62	1.22	1.07	-12.30	2.43	1.87	-23.05	1.17	0.92	-21.37
Nesal	0.30	0.26	-13.33	0.66	0.62	-6.06	1.61	1.29	-19.88	5.33	3.50	-34.33	1.97	1.42	-27.92
Vegamangalam	0.42	0.28	-33.33	0.81	0.63	-22.22	1.44	1.32	-8.33	2.23	3.29	47.53	1.22	1.38	13.11
Vinayagapuram	0.23	0.23	0	0.56	0.41	-26.79	1.02	0.80	-21.57	2.33	1.96	-15.88	1.04	0.85	-18.27
Sirungathur	0.34	0.32	-5.80	0.55	0.53	-3.64	0.98	1.01	3.06	2.48	4.37	76.21	1.10	1.55	40.91
Vayalur	0.42	0.19	-54.76	0.51	0.47	-7.84	0.84	1.03	22.62	2.36	2.47	4.66	1.03	1.04	0.97
Vengodu	0.28	0.22	-21.43	0.60	0.43	-28.33	1.11	0.80	-27.93	2.40	2.20	-8.33	1.09	0.90	-17.43
Meppathurai	0.45	0.42	-6.67	0.89	0.83	-6.74	0.89	1.27	42.70	1.51	2.12	40.40	0.93	1.17	25.81
Duli	0.58	0.53	-8.62	1.07	1.40	30.84	1.68	2.70	60.71	3.36	5.51	63.99	1.67	2.53	51.50
Veerasambanur	0.26	0.30	15.38	0.74	0.61	-17.57	1.24	1.00	-19.35	2.28	2.03	-10.96	1.12	1.01	-9.82
Amudhur	0.16	0.14	-12.50	0.43	0.33	-23.26	0.96	0.94	-2.08	2.93	2.97	1.37	1.12	1.08	-3.57
Pooled villages	0.28	0.25	-10.71	0.63	0.53	-15.87	1.10	1.02	-7.27	2.93	2.89	-1.37	1.23	1.17	-4.88

Source: Village listing data, Cambridge-Madras universities and IFPRI-TNAU surveys.

change occurred in Vinayagapuram and Meppathurai; the average farm size went down, and the reduction was borne by the farms in the top quartiles.

The average farm size in the bottom quartile declined in 7 of the 11 villages. But in only three of these villages (Vegamangalam, Vayalur, and Duli) was there any significant increase in the size of the farms in the top quartile. There seems to be little support for the proposition that large farms expanded in size at the expense of small farms.

Similar patterns of change are found in the operated size of holdings (Table 3.18).

Using the Spearman rank order correlation test, it is possible to test within each quartile whether the distribution of farm sizes across villages changed between 1973 and 1982. For example, the null hypothesis for the first quartile is that the array of numbers in the first and second columns of Table 3.17 are random samples from different size distributions. Except for the top quartile, this hypothesis was soundly rejected, suggesting that differences among villages in owned and operated farm size were no different in 1982 than in 1973.

To elucidate differences among villages further, the 11 sample villages were classified into poor and rich villages on the basis of their irrigation resources. The rich villages are Kalpattu, Vegamangalam, Nesal, Vinayagapuram, and Sirungathur. The poor villages are the five resurvey villages plus Vengodu. Table 3.19 shows the average size of holding in 1973 and 1982 by quartile for the poor and rich villages.

Irrespective of whether owned or operated area is used, the average farm size in all four quartiles declined in the rich villages. The farms in the first and second quartiles lost relatively more land than average, but the farms in the top quartile lost the most land in absolute terms.

Average farm sizes also declined in the first three quartiles of the poor villages. But unlike the rich villages, the average farm size of the top quartile increased, by about 8 percent. There would seem to have been a clear worsening—albeit a modest one—in the equity of the distribution of land in the poor villages that is not evident in the rich villages. This is confirmed by the calculated Gini coefficients in Table 3.20. They declined modestly in the rich villages but increased in the poor villages. Although these differences are not statistically significant, they provide little support for the hypothesis that the green revolution—which, because of better irrigation resources, was most prevalent in the rich villages—worsened the distribution of land.

TABLE 3.19
Average Farm Sizes by Quartile for Rich and Poor Villages (ha)

	<i>1st Quartile</i>			<i>2nd Quartile</i>			<i>3rd Quartile</i>			<i>4th Quartile</i>			<i>Total</i>		
	<i>1973</i>	<i>1982</i>	<i>%</i> <i>Change</i>	<i>1973</i>	<i>1982</i>	<i>%</i> <i>Change</i>	<i>1973</i>	<i>1982</i>	<i>%</i> <i>Change</i>	<i>1973</i>	<i>1982</i>	<i>%</i> <i>Change</i>	<i>1973</i>	<i>1982</i>	<i>%</i> <i>Change</i>
<i>Owned area</i>															
Poor villages	0.25	0.23	-8.00	0.63	0.55	-12.70	1.08	1.05	-2.78	2.70	2.93	8.52	1.20	1.20	0
Rich villages	0.30	0.26	-13.30	0.64	0.52	-18.75	1.01	0.99	-2.00	2.98	2.84	-4.70	1.25	1.15	-8.00
Pooled villages	0.28	0.25	-10.71	0.63	0.53	-15.87	1.04	1.01	-2.88	2.87	2.88	0.35	1.23	1.18	-4.07
<i>Operated area</i>															
Poor villages	0.25	0.24	-4.00	0.64	0.55	-14.06	1.10	1.05	-4.55	2.73	2.94	7.69	1.18	1.19	0.84
Rich villages	0.30	0.26	-13.33	0.62	0.51	-17.74	1.10	1.00	-9.09	3.08	2.85	-7.47	1.27	1.15	-9.45
Pooled villages	0.28	0.25	-10.71	0.63	0.53	-15.87	1.10	1.02	-7.27	2.93	2.89	-1.37	1.23	1.17	-4.88

Source: Village listing data, Cambridge-Madras universities and IFPRI-TNAU surveys.

TABLE 3.20
Gini Coefficients for Land Area Owned and Operated

	<i>Area Owned</i>		<i>Area Operated</i>	
	<i>1973</i>	<i>1982</i>	<i>1973</i>	<i>1982</i>
Poor villages	0.652	0.665	0.639	0.658
Rich villages	0.697	0.663	0.669	0.654
Pooled villages	0.679	0.665	0.657	0.656

Source: Village listing data, Cambridge-Madras universities and IFPRI-TNAU surveys.

Conclusions

In this chapter we have used the data from the 1973/74, 1982/83, and 1983/84 surveys to evaluate some of the economic changes that took place in the sample villages. Our task has been complicated by the severe drought of 1982/83 and the incomplete village coverage of the 1983/84 resurvey. Clearly, comparisons between 1973/74 and 1982/83 must grossly underestimate the impact of the intervening changes in irrigation and paddy technology. On the other hand, comparisons between 1973/74 and 1983/84, while more acceptable in terms of the greater similarity of irrigation water reserves, are limited to a sample of the poorer villages in the region.

Within these constraints, our conclusions are that the landless laborers gained the largest proportional increase in family income (125 percent), followed by small paddy farmers, who almost doubled their incomes (90 percent). Large paddy farms gained relatively little (18 percent) because of sharp increases in their farm costs, especially the cost of fertilizers and hired labor. The nonpaddy farms—which do not have access to irrigated land—and the nonagricultural households increased their incomes by 17 and 55 percent, respectively.

The real value of consumption expenditure doubled for all the household groups analyzed between 1973/74 and 1983/84. This was accompanied by an improvement in the mix of commodities and services purchased toward more luxurious items: more livestock and horticultural products and vegetable oils at the expense of foodgrains, and more services, especially transport, entertainment, social and religious functions, and medical services. The purchase and ownership of consumer durables also increased.

These gains in absolute welfare have also been accompanied by an improvement in equity. Whether measured by income or by consumption expenditure, the relative welfare of the large paddy farms has declined, while that of the landless laborers and the small paddy farms has improved. The nonpaddy farmers and the nonagricultural house-

holds gained relatively less than the other groups because they did not gain directly from the changes that occurred in irrigation and paddy technology.

The main source of increase in farm incomes was an expansion in paddy production. Large farms, many of which had already adopted HYVs by 1973/74, increased their paddy production through an increase in the cropped area. But most of the increase was obtained from yield increases on small paddy farms. Increases in agricultural wage earnings were also important sources of income for small paddy farms, nonpaddy farms, and landless laborers.

Nonagricultural income, either from wage earnings or from a family-owned business, has become more important not only for the specialized nonagricultural households, but also for small paddy farms, nonpaddy farms, and landless laborers. To the extent that the rural nonfarm economy is driven by agricultural growth, this finding provides support for the argument that the growth linkages do benefit the poorer rural households. Moreover, since the large paddy farms obtain very little income from nonagricultural sources, it may also be concluded that the growth linkages have also contributed to an improvement in the relative distribution of income within the villages.

The results in this chapter have also highlighted the dramatic year-to-year fluctuations in incomes that occur in North Arcot. During the 1982/83 drought, many households were actually worse off than in 1973/74, despite the intervening changes in irrigation and paddy technology. Compared with 1983/84, agricultural employment was down about 50 percent during the drought, farm incomes were down 20 percent on average, and nonfarm business earnings almost disappeared. The impact of these changes was reflected by a roughly 50 percent reduction in the value of family consumption expenditure.

Finally, our analysis does not show any worsening of the distribution of land in North Arcot since the early 1970s. The number of farms increased, presumably because of population pressures, and the average size of holding shrank a little as a result. However, this decline in farm size seems to have affected small and large farms alike, and it has been largely neutral with respect to the distribution of land.

There is some evidence that the distribution of land may have worsened a little in the poorly irrigated villages, but not in the better-endowed villages. If so, this suggests that demographic pressures, combined with less favorable technological possibilities, are more damaging for equity than the green revolution per se. In this sense our results support Ricardo rather than the critics of the green revolution (Hazell and Anderson 1984).