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LABOR MARKET BEHAVIOR IN RURAL VILLAGES OF SOUTH INDIA: EFFECTS OF SEASON, SEX AND SOCIOECONOMIC STATUS*

JAMES G. RYAN AND R.D. GHODAKE†

INTRODUCTION

Most developing countries of the semi-arid tropics (SAT), particularly in Asia, have a relative abundance of labor resources relative to capital and land. Statistics on this apparent abundance are usually only available (if at all) in terms of national or regional aggregates, as pointed out recently by McDiarmid (1977, pp. 9-10, 18, 29, 54-55), Bardhan (1977), and Brannon and Jessee (1977, pp. 13-15). Even these statistics are often not reliable, particularly for the rural areas. It is in rural areas where problems of seasonal unemployment are most acute, as revealed in Rudra and Biswas' comprehensive study (1973), and where it is imperative to derive better measures and understanding of the demand and supply parameters of labor markets, particularly in India, where 70 percent of the labor force are classified as agricultural workers.

This paper is an attempt to bridge some of the gaps in our knowledge by studying the labor market behavior of a sample of 240 labor and cultivator households in six semi-arid tropical villages in Maharashtra and Andhra Pradesh States of South India. This region has largely been neglected in this field of research.

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The first section briefly describes the source of data on which the study is based, along with information on seasonal labor use patterns and the relative importance of males and females, family and hired workers in the total labor force. The second section discusses features of the rural daily hired labor markets in the six villages. This includes the participation rates of the various age, sex, and socioeconomic groups in the villages, their probabilities of obtaining employment, wage rates, and opportunity costs. The seasonal patterns of the above variables are analysed and statistical tests made of various labor market hypotheses. Amongst these are Sen's (1966) "dual labor markets" hypothesis; McDiarmid's (1977, pp. 48-49) hypothesis that labor markets are more "competitive" in peak seasons; and that male and female labor markets are "segmented". The final section contains the major conclusions.

BACKGROUND AND DATA

The data for this study are drawn from six villages in the SAT of south India in which intensive socioeconomic studies by the Economics Program at ICRISAT have been underway continuously since May, 1975. Since that time resident investigators have been interviewing at 2-4 week intervals a stratified random sample of 30 cultivator (small, medium and large size) and 10 labor households. Details of labor utilization of each family member and of hired personnel were obtained. These data related to both on- and off-farm activities as well as to household use.[1]

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1. The on- and off-farm activities were collected on a 2-4 week full recall basis. Household time allocation of each household member was collected only for the day immediately preceding each interview.

The six villages were selected purposefully to represent three broad agro-climatic zones of SAT peninsular India. Aurepalle and Dokur villages in Mahbubnagar District of Andhra Pradesh were selected to represent the Alfisol, low (713 mm), and uncertain rainfall areas in Andhra Pradesh, Karnataka and Tamil Nadu. Shirapur and Kalman villages in Sholapur District of Maharashtra represent the deep and medium-deep Vertisol, low (691 mm), and uncertain rainfall areas of Maharashtra, Karnataka and Madhya Pradesh. The villages of Kanzara and Kinkheda in Akola District of Maharashtra were chosen as typical of the relatively high (891 mm), and more assured rainfall areas of northern Maharashtra and Madhya Pradesh having medium-deep Vertisols.[2]

Major crops grown in the Mahbubnagar villages are paddy, sorghum, groundnuts, pigeonpeas, pearl millet and castor. The Alfisol soils in these villages have a low moisture-holding capacity and this means that all non-irrigated crops are grown in the rainy season. As a result, about two-thirds of total labor use on Farmer's fields occurs in the rainy season (Table 1). The Sholapur villages have medium-deep and deep Vertisol soils which have a high moisture-holding capacity. Most non-irrigated cropping occurs in the post-rainy season on residual soil moisture as a consequence. More than half of the total labor use in Sholapur is concentrated in the post-rainy season of September to March (Table 1). The predominant crops here are sorghum, chickpea and safflower. Some pearl millet and pigeonpeas are sown on the shallow Vertisols in the rainy season. Cotton is the primary crop of the Akola villages, being sown in rows in the rainy season, mixed with sorghum and pigeonpea on the medium-deep Vertisols. More than 90 percent of total crop labor use occurs in the rainy season in the Akola villages (Table 1).

2. For a detailed description of the methodology, villages and the complete range of information see Binswanger *et al.* (1977).

TABLE 1

PERCENTAGE DISTRIBUTION OF TOTAL CROP LABOR USE AMONGST SEASONS IN SIX SAT VILLAGES OF SOUTH INDIA, 1975-76 and 1976-77*

District/ Village	SEASON		
	Rainy	Post-Rainy	Pre-Rainy
MAHBUBNAGAR			
Aurepalle	65	33	2
Dokur	62	38	-
SHOLAPUR			
Shirapur	41	57	2
Kalman	41	53	6
AKOLA			
Kanzara	90	10	-
Kinkheda	91	9	-

* Labor use was measured in terms of total hours spend in field operations by males, females, and children, with equal weights for each category.

In Dokur, Shirapur, Kanzara and Kinkheda villages, the total female labor use on crops exceeded that of male (Table 2). In Aurepalle and Kalman there was slightly more total male labor used. These high proportions of female labor use on agricultural land far exceed the 20 percent figure cited for Asia by Boserup (1970). Little work on crop activities is performed by children. Increasing amounts of cotton and irrigation seem to imply increasing employment potentials for women in these villages. In all six villages the proportion of female labor which is hired is much higher than the proportion of male labor which is hired. In the Mahbubnagar and Akola villages 80-90 percent of total female labor is hired. In Sholapur the figure is somewhat less at 60-70 percent.[3]

Of the total hired labor used in Aurepalle, Dokur, and Shirapur villages, 63-88 percent consisted of females. In the Akola villages and in Kalman the share of males and females in total hired labor use was almost equal. Males always represented the largest proportion of the total family crop labor utilization, especially in the Mahbubnagar villages. The range was from 64 to 90 percent.

RURAL LABOR MARKETS

In this section we wish to discuss the functioning of the daily rural labor markets in the six villages. Particular attention will be given to the extent to which able-bodied people attempt to participate in the daily hired labor market throughout the year, what wages they receive and with what probability

3. For more details on farm labor use in these villages see Ghodake *et al.* (1978) and Ryan *et al.* (1979).

TABLE 2

RELATIVE CONTRIBUTION OF MALES, FEMALES AND CHILDREN TO TOTAL CROP LABOR USE IN SIX SAT VILLAGES OF SOUTH INDIA, 1975-76 and 1976-77*

District/ Village	CATEGORY		
	Males	Females	Children
		- -%- -	
MAHBUBNAGAR			
Aurepalle	52	47	1
Dokur	35	65	-
SHOLAPUR			
Shirapur	47	47	6
Kalman	51	48	1
AKOLA			
Kanzara	48	51	1
Kinkheda	44	55	1

* Labor use was measured in terms of hours spent in field operations by each category. The percentages represent the share of total hours (summed across categories with equal weights to males, females, and children).

they obtain employment. This will be examined separately for males and females from the four household categories of labor, and small, medium, and large farms using data collected on a 2-4 week recall basis throughout the 1975-76 year. Data have been smoothend into two-week periods for the subsequent analysis.[4]

PARTICIPATION RATES

The participation rate in the hired daily labor market was calculated as the number of person-days of wage work plus work-seeking (i.e., involuntary unemployment) in a period, expressed as a proportion of the total number of person-days where participation could have occurred. Work on the participants' own farms was excluded. The denominator was calculated using the number of able bodied people residing in the households at the beginning of the study. Family members who were disable, regularly at school, less than 12 years of age, living permanently outside the village, or who were employed in regular or professional jobs were excluded, as were permanent servants in the household.

The labor force participation rate was calculated in the same manner as the labor market participation rate above, except that person-days of work on one's own farm were also added to the numerator.[5]

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4. For details see Subrahmanyem and Ryan (1976, pp. 11-16). Most estimates reported here are annual averages. However the comparisons across farm size groups, villages, and sexes were also made separately for "peak" and "slack" labor seasons. In almost all cases results for the seasons were consistent with the annual average.

5. Farm work includes all those operations involved in producing crops such as ploughing, sowing, weeding, harvesting, threshing, etc. It excludes labor involved in livestock rearing, building repairs and construction, trade, marketing, transport, handicrafts and domestic work.

Labor market participation rates for males were significantly lowest in the two Mahbubnagar villages and generally highest in the two Akola villages (Table 3). From Appendix Table 1, it can be seen that inter-district participation rates were all significantly different for males as well as females. For only 7 percent of the time in Aurepalle did males endeavor to find a job on the daily labor market. In Kanzara, on the other hand, the males participated almost 50 percent of the time. The whole-sample labor market participation rates for all villages are made low by the meager participation by members of large farm households and, to a lesser extent, by those from medium farm households. Participation by labor and small-farm households is generally much higher. For males the highest average labor market participation rate during 1975-76 for both the labor and small farm groups was in Kanzara at 0.87 and 0.70 respectively, while the lowest was in Aurepalle at 0.18 and 0.14.

Females participated in the labor market substantially more (always significant at 0.1% level) than males in Mahbubnagar villages and in Kinkheda, while in other villages males participated significantly more than females. Dokur registered the highest average market participation for females at 0.61. In this village even females from large farms participated 36 percent of the time, whereas in both labor and small-farm households females participated 82 percent of the time, the highest of all villages. This indicates the influence of paddy irrigation on demand for female labor. It is such as to lead to substantial participation by females, even those from the large farm group.

TABLE 3

AVERAGE PARTICIPATION RATES, EMPLOYMENT PROBABILITIES, OPPORTUNITY COSTS AND WAGE RATES FOR MALE AND FEMALE ADULTS IN RURAL DAILY LABOR MARKETS IN SIX SAT VILLAGES OF SOUTH INDIA, 1975-76*

District/ Village/ Sex	Market Participation Rates		Probability of Market Employment		Daily Opportunity Cost		Daily Wage Rates	
	Mean	CV	Mean	CV	Mean	CV	Mean	CV
		(%)		(%)	Rs	(%)	RS	(%)
MAHBUBNAGAR								
Aurepalle:								
Male	0.07***†	48	0.71	23	1.77***	25	2.50***	33
Female	0.27	61	0.69	20	1.03	26	1.49	16
Dokur:								
Male	0.25***	14	0.76***	30	1.97***	35	2.59***	17
Female	0.61	10	0.82	20	1.58	30	1.93	15
SHOLAPUR								
Shirapur:								
Male	0.38***	29	0.70***	12	1.80***	12	2.57***	13
Female	0.25	22	0.49	37	0.68	47	1.39	18
Kalman:								
Male	0.29***	19	0.92***	11	2.50***	31	2.72***	19
Female	0.22	17	0.77	18	1.08	28	1.40	14
AKOLA								
Kanzara:								
Male	0.48***	14	0.82***	12	2.05***	15	3.72***	11
Female	0.39	22	0.77	30	1.41	35	1.83	12
Kinkheda:								
Male	0.30***	22	0.88***	12	2.52***	19	2.86***	11
Female	0.36	20	0.91	7	1.41	22	1.55	19

* Work on own-farms has been excluded from participation rate and employment probability calculations.

† Asterisks indicate significant differences between male and female figures of the same village:

** Significant at 1% level
*** Significant at 0.1% level.

The lowest female participation came in the drought-prone, predominantly foodgrain-growing Sholapur villages at around 0.25. The range within these two villages was a figure of around 0.47 for females from labor households down to 0.08 for those from the large-farm group.

There was a significant amount of seasonal variation in labor market participation of males and females, particularly in Aurepalle (Table 3). The CV's of fort-nightly male participation ranged from a high of 48 percent in Aurepalle to a low of 14 percent in Dokur and Kanzara. For females the range was from 61 in Aurepalle to 10 in Dokur. Again the effect of extensive paddy irrigation in Dokur is reflected in a much more steady market participation throughout the year.

The mean fortnightly market participation rates of males and females from labor households were always greater than those from the small-farm households. The differences were significant at the 1 percent level using paired t-tests in five out of six villages for males, and in two of six in the case of females (Appendix Tables 2 and 3). The labor group also had higher participation rates than medium-farm households for males and females. These differences were statistically significant at the 1 percent level in five of six villages for males and in all villages for females. Except for Shirapur, males and females from small farm households participated significantly more than those from medium farm households.

The simple correlation between the market participation rates of males from labor and from small-farm households was positive and significant in four of the six villages (Appendix Table 4). Aurepalle and Kalman had negative correlations, the latter not being statistically significant. In five of six villages there was no correlation between the participation of the male members of the labor households in the market and that of those from medium farm households. For females the correlations between labor market participation of those from the labor and small-farm categories were significantly positive in three villages (Appendix Table 5). The other three village correlations were not significant. Only two correlations were significantly positive between labor and medium-farm female labor market participation rates. One was significantly negative and the others were not significant.

As expected, these results suggest that males and females from labor households participate more in the daily hired labor market than those from cultivator households. Those from the labor group tend to enter the labor market at a similar time to those from the small-farm group. However, there does not seem to be as much competition between participatns from the labor group and those from medium-sized farms, especially among males.

The above participation rates were calculated excluding agricultural work on one's own farm. They reflect the supply of labor to the daily hired labor market as a proportion of total available labor. They indicate on an average over these six villages that 30 and 37 percent of available male and female labor, respectively, participated in work outside their own farms, households and businesses during 1975-76. When we include own-farm work, as

is usually done when measuring labor force participation, as opposed to labor market participation shown in Table 3, there is a substantial increase in the rate for males in the Mahbubnagar and Sholapur villages (Table 4). Males in these villages devote considerable time to agricultural farm work. This is not so in the Akola villages or for females generally. Very little own-farm labor is contributed by family females from the cultivator households, even though on average they participate a lot in the hired labor market. To illustrate this, the average labor market participation rate for males in the six villages was 0.30 whereas the average labor force participation rate was 0.42, indicating that about 12 percent of the time of available male labor was devoted to agricultural work on own-farms during 1975-76. Though this seems a small fraction of the time, it is larger than that of females who spent only 3 percent of their available labor in own-farm agricultural work. Their average labor market participation was 0.37, with a labor force participation of 0.40.[6]

All these participation rates seem quite low and suggest there may be a lot of other work being done besides farm and market work in these households, and/or there is considerable leisure time. The latter explanation is more likely in the larger-farm households who also generally have larger families with much lower participation rates than other households. This group would tend to considerably lower the overall village averages. The large numbers of landless households in the sample with no own-farm work also keep the labor force participation rates low.

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6. Recall that all these rates are calculated assuming 365 days are available for work each year. When this is reduced to allow 1.5 days leisure per week, the labor market participation rates are 0.39 and 0.47 for males and females, respectively, whereas labor force participation rates rise to 0.53 and 0.51, respectively. Own-farm work then occupies 15 and 4 percent of the available time of all males and females, respectively.

Table 4

LABOR FORCE PARTICIPATION AND INVOLUNTARY UNEMPLOYMENT RATES IN SIX SAT VILLAGES OF SOUTH INDIA, 1975-76

District/Village/ Sex	Labor Force Participation Rates	Involuntary Unemployment Rates*
MAHBUBNAGAR		
Aurepalle:		
Male	0.30	0.07
Female	0.29	0.28
Dokur:		
Male	0.43	0.14
Female	0.64	0.17
SHOLAPUR		
Shirapur:		
Male	0.46	0.25
Female	0.30	0.43
Kalman:		
Male	0.38	0.06
Female	0.26	0.19
AKOLA		
Kanzara:		
Male	0.55	0.16
Female	0.42	0.21
Kinkheda:		
Male	0.35	0.10
Female	0.38	0.09

*Including farm and labor market work in both the numerator and denominator to calculate PE from which involuntary unemployment is calculated as (1-PE).

PROBABILITIES OF EMPLOYMENT

The probability of employment in the daily hired labor market (PME) was calculated as the number of days a person was successful in obtaining wage employment as a proportion of the days in the period he tried.[7] The probability of involuntary unemployment in the market (PMU = 1 - PME) is not equivalent to the usual measures of unemployment derived using stock concepts and data from one-time census or sample surveys.[8] PME is a flow concept which can be used to properly weight wage rates to indicate opportunity costs of leisure and farm or household work in the context of the new household economics framework. These opportunity costs are discussed later in the paper. For comparison with stock measures of unemployment in India we also calculate probabilities of unemployment (PU) with person-days of own-farm work included in both the numerator and denominator to first calculate probability of labor employment (PE). PU is then calculated as (1 - PE).

In the two drought-prone, predominantly foodgrain-producing villages of Sholapur region and in Kanzara village, males have a significantly better chance of obtaining daily market wage employment than females. In Aurepalle village, with light red soils and sorghum and castor the major crops, there is no significant difference. On the other hand in Dokur and Kinkheda females had a significantly higher probability of employment than males (Table 3).

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7. In calculating the probability of employment we have not differentiated between employment on other farms, in nearby urban areas, for private or government employers.

8. For example see Krishna (1973). "Unemployment in India," Economic and Political Weekly 8 (March 3, 1973): 475-84 and K. Bardhan. Such stock measures generally include farm or self-employed people in the labor force.

In Shirapur village females can only find market employment on half the occasions in which they wish to. This compares with males who are successful 70 percent of the time. In Shirapur not only are average female probabilities of employment low but their fluctuation throughout the season is particularly high, with a CV of 37 percent, whereas for males it is much less (12%). In Kalman village of the same region, average employment probabilties for both males and females were substantially better at 0.92 and 0.77, respectively, than in nearby Shirapur. Seasonal variations were also less. This illustrates the difficulties of generalizing results from individual villages to the region in which they are located. The fact that Shirapur is more drought-prone and has a higher proportion of post-rainy season cropping/rainy season fallow than Kalman probably accounts for its meager employment potential. Post-rainy season crops require much less hand weeding and interculturing than rainy-season crops and these operations are usually done by hired labor.

The most buoyant daily labor markets appear to be in the two cotton growing Akola villages. In Kanzara both males and females succeed about eight times out of 10 in finding a job while in Kinkheda they succeed nine times in 10. Seasonal fluctuations are not substantial except for Kanzara females, whose CV is 30 percent.

Males in Mahbubnagar are successful in finding off-farm employment about three times in four attempts. Dokur females are successful eight times out of 10, but in Aurepalle females succeed only seven times out of 10. The seasonal variation in job probabilities also seems higher for males compared to females in these two villages, where irrigated paddy is important. The periods of the

year when the probabilities of employment were lowest varied from village to village, even within the same region.

Paired t-tests showed that for males there was a mixed picture with respect to the relationship between probabilities of market employment for the labor group and the small- and medium-farm groups (Appendix Table 2). In three villages there was no significant difference between the mean probability of employment of the labor and small-farm groups. In two villages the probability for small-farm males was significantly greater than for males from the labor group. In one village the reverse was true. In three villages the probability of employment for males from the medium-sized category was significantly less than that of the labor group, and in the other three there was no significant difference. In four villages the small-farm males had a significantly better chance of finding a job than medium-farm males. In the remaining two villages there was no significant difference.

Females from small farms in three of the villages had significantly better employment probabilities than those from labor households. In one village the reverse was true but in the other two there was no significant difference (Appendix Table 3). Females from the medium farm group in three villages also had significantly better chances of finding a job than those from the labor households. There was no significant difference in the other three villages. Females from the small and medium farm group did not differ statistically in their employment probabilities in four out of the six villages. In Dokur the latter had a better chance while in Shirapur the former did.

What the above pattern suggests is that in general males from labor households hava a better chance of being successful in finding daily wage employment vis-á-vis their counterparts in the cultivator households, than do their spouses. Hence it is not only true that females generally are no better, and often worse off, than males in terms of daily labor market employment opportunities, but in addition females from the poorest households, namely the labor group, are often the most disadvantaged.

It seems that movements in probabilities of market employment throughout 1975-76 for females from the labor, small-, and medium-farm group in each village were more positively related than those of the males. This is suggested by the fact that all correlations were positive and significant in the case of the females while for males only half were. This suggests that females from the different socio-economic groups within these villages tend to be competing for similar jobs more so than males.

The overall average probability of involuntary market unemployment (PMU) for males in these six villages during 1975-76 averaged 0.19, while for females the average was about 0.23.[9] Because of the relatively small amount of time devoted to own-farm work in most of these villages, the unemployment rates (PU) do not fall a great deal when we include farm work in the numerator and denominator (Table 4). The exceptions are for males in the two Mahbubnagar villages and for females in Shirapur where own-farm work is more significant. On average across the six villages the PU for males was 0.14, and for females 0.21. These

9. The average PMU's for males were 0.12 and 0.39 during peak and slack periods, respectively; while for females, the corresponding figures were 0.11 and 0.50. These indicate that during peak periods the probabilities of involuntary unemployment for males and females become almost equal while during slack periods the difference increases, affecting female labor employment more adversely.

estimates of the extent of unemployment are far in excess of the rates derived in the 1961 census in India of 0.005 and 0.001 for males and females, respectively. They are also much higher than in the 21st round of the National Sample Survey in 1966-67 of 0.018 for rural males and 0.045 for females, as reported in Sen (1975). However, there are many deficiencies in the aggregate statistics on unemployment in India and these are described in detail by Sen. Our average PU's compare with Mehra's figure for disguised unemployment in the total agricultural labor force in India of 0.17 as reported in Sen (1975, p.130). They are about double those derived by Krishna using National Sample Survey data on rural workers who are idle but willing to work more. Krishna points out that his figures are minimum estimates. They are also much higher than the 0.13 derived by Bardhan (1979) for West Bengal using the rural sub-sample of the 1972-73 National Sample Survey of that state.

A number of models of rural-urban migration, such as those by Harris and Todaro (1970) and McDiarmid (1977, pp. 75-76), assume the probability of employment in rural areas to be 1. Lal (1974) reports a value of 1 as the ratio of the market to the "social wage rate" in a number of states in India. These are often used as implicit weights in social benefit-cost analysis of projects. The results from these six villages suggest that calculations of opportunity costs of rural labor based on probabilities of employment of 1 may be considerably overestimated. This may explain the paradox of increasing rural-urban migration in India in spite of apparently increasing amounts of urban unemployment. Ignoring rural unemployment in such models may be the villain of the piece.

WAGE RATES

Average female daily wage rates in these six villages in 1975-76 were about 56 percent of those for males and also were significantly different at the 0.1 percent level.[10] Male wages averaged Rs 2.83 per day and females Rs 1.60 (Table 3). Male wages were generally highest in the two Akola villages. Kanzara had the highest of Rs 3.72 and the lowest was in Aurepalle at Rs 2.50.[11] Of the females, those from Dokur had the highest average wage rate of Rs 1.93 per day. This seems to be explained by the importance of paddy in Dokur which requires a large amount of female labor for transplanting and weeding. The lowest female wages were in the drought-prone Sholapur villages, where they average only Rs 1.40 per day. The much reduced demand for weeding labor in the case of the post-rainy season cropping pattern in the Sholapur villages no doubt helps explain the lower female wages there.

Employed women tend to work about 5-12 percent fewer hours per day on the job than employed men (Table 5, columns 5-6). Hence on an hourly basis women's wages are around 60 percent of men's in these villages.[12] However, women work 10-30 percent more hours per day than men on those days when activities are performed by both for their own farms/households and/or for someone else on wages (Table 5, columns 1-2). This is no doubt a reflection of the dominant role of women in household chores such as domestic work, food and fuel gathering/processing and handicrafts, which are in addition to their participation in agricultural activities.

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10. This is much lower than the 80 percent figure for 13 states in India in 1960-61 derived by Rosenzweig (1978).

11. These are expressed in nominal terms. Deflating by a foodgrain price index in the two states would no doubt bring these wages closer together.

12. Hourly wages for children are about 55 percent those of adult males.

TABLE 5

AVERAGE HOURS WORKED PER DAY FOR ADULT MALES, FEMALES AND CHILDREN IN SIX SAT VILLAGES OF SOUTH INDIA, 1975-76*

District/ Village	When all activities are for own farm/household and/or others			When working for others on wages		
	Adult Males	Adult Females	Children	Adult Males	Adult Females	Children
MAHBUBNAGAR:						
Aurepalle	6.90 (0.91)†	8.05 (1.17)	6.49 (1.80)	7.58 (1.15)	6.83 (0.94)	7.02 (0.76)
Dokur	7.19 (1.35)	9.34 (0.94)	4.56 (1.19)	7.50 (0.87)	7.13 (0.23)	6.94 (0.29)
SHOLAPUR:						
Shirapur	8.62 (1.25)	9.87 (1.89)	7.02 (1.16)	8.26 (0.57)	7.74 (0.95)	8.05 (0.52)
Kalman	6.65 (0.63)	7.23 (1.03)	5.54 (0.72)	7.71 (0.95)	6.80 (0.57)	6.70 (0.90)
AKOLA:						
Kanzara	6.81 (0.58)	7.42 (1.50)	4.17 (1.16)	7.42 (0.55)	7.01 (0.66)	6.73 (0.76)
Kinkheda	7.76 (1.00)	9.54 (0.68)	5.85 (0.89)	7.70 (0.45)	7.31 (0.51)	7.53 (0.48)

* Unlike other data on labor use in the paper this table includes labor on the following: crop production, animal husbandry, building and construction, repairs and maintenance, trade, marketing, transport, domestic work, food and fuel gathering/processing, and handicrafts. Time spent travelling is also included. These data are based on averages of one-day recalls made more than 20 times from mid 1975 to the end of 1976 by all respondents.

† Standard deviations appear in parentheses.

Table 3 shows that generally the daily hours of work when on wages do not fluctuate a great deal seasonally. As one would expect, there is a larger seasonal variation in daily hours of work when it is performed on one's own farm or in one's own household with or without market wage work. The higher CV's for children's work is primarily due to their lower mean hours of work (50 to 80 percent of adult females). When women and children work for wages they tend to work the same hours.

There did not appear to be consistent differences in hours of work of household members across the four categories, labor, small, medium and large farms within each village. However, those from large farms often worked fewer hours per day than those from the other households, particularly in the case of women.

We find more evidence in support of Rodgers' (1975) contention that the degree of seasonal wage variability is less than that of employment variability in the case of females than we do for males. Rodgers contends that wages are more "sticky" than employment due to provision of meals by employers and inter-seasonal "guarantees." We find in five of the six villages CV's of wages are less than the CV's of the employment probabilities for females. For males it is true in three villages but not in the other three. Contrary to Raj (1959), we found a general tendency for lower average employment probabilities to be associated with higher CV's of wages for males. In line with Sethuraman (1972) and McDiarmid (1977, pp. 48-49) we found that whenever there was a statistically significant correlation between fortnightly daily wages and probabilities of employment for the labor and small farm households, it was in most cases positive (Table 6). However, this was true in only one of the 12 cases for males and in

TABLE 6

SIMPLE CORRELATION COEFFICIENTS BETWEEN FORTHNIGHTLY DAILY WAGES AND PROBABILITIES OF EMPLOYMENT IN SIX SAT VILLAGES OF SOUTH INDIA 1975-76

District/ Village	Labor Households		Small Farm Households	
	Males	Females	Males	Females
MAHBUBNAGAR				
Aurepalle	0.07	0.21	-0.62**	-0.16
Dokur	-0.01	0.46**	0.02	0.38*
SHOLAPUR				
Shirapur	-0.17	0.17	-0.17	0.39*
Kalman	0.20	0.11	0.19	0.23
AKOLA				
Kanzara	0.00	0.07	0.00	0.50**
Kinkheda	0.39**†	0.27	-0.09	0.10

† ** and * indicate significance at the 1 and 5 percent levels, respectively.

four of 12 for females. On the other hand there was at least one case of small farm males in Aurepalle wherein the correlation coefficient value was significant and negative, which is in line with Rodgers. Hence the evidence on this relationship is still quite weak.[13]

It seems that for males there is no tendency for the labor group, who generally participate more in the rural daily labor market, to receive higher wages as a result of their being more continuously available throughout the year. In fact, there is evidence from these villages to the contrary (Appendix Table 2). Hence it seems that small-farm males in these villages can hire daily workers from labor households at the same time they hire themselves out, and be better off for it. The same is not true for females (Appendix Table 3). This no doubt helps explain the relatively high level of labor hiring observed on the small farms by Ghodake *et al.* (1978, p. 17). It may also help explain the predominance of hired females in the female labor force.

There were significant positive correlations between male participation rates and probabilities of employment in four of the six villages. For females this was true in only two villages, and in two others the correlation was significantly negative. This suggests for males there is a better chance of obtaining a job the more one participates. This is not so true for females. This implies there may be stronger "discouraged-worker" effects operating for males than for females in these villages. Women have fewer hired agricultural tasks

13. K. Bardhan (1977) provides an excellent review of the available Indian literature on the relationships between labor supply, demand, and wage determination.

which they exclusively perform than men do. These are mainly restricted to nursery bed raising, transplanting, planting, weeding and thinning. It seems that this task segmentation so limits effective demand for female labor that increased female labor market supply (participation), operating on such a restricted demand leads to excessive unemployment.

OPPORTUNITY COSTS

Opportunity cost is defined here as the expected wage foregone by a prospective labor market participant when that person works instead on their farm, in their household, or chooses leisure. It is measured as $(OC)_t$ where:

$$OC_t = W_t \cdot (PMU)_t \qquad (1)$$

and W_t = market wage rate in period t.

It is important to know the opportunity cost of labor in different seasons as some of the prospective technologies for rainfed areas, such as watershed-based land and water management technologies under investigation at ICRISAT and in the All India Co-ordinated Research Project for Dryland Agriculture, require engaging labor in capital-creating activities like building tanks, wells, bunds, levelling land, etc. For these it is necessary to know the seasonal opportunity cost of labor in order to determine the appropriate time for carrying out such activities. More importantly, seasonal opportunity cost data are required to enable proper benefit-cost analyses of these types of technologies.

In many instances one is able to obtain data on seasonal rural market wage rates but there is no way of knowing how close these are to the seasonal opportunity costs of labor. It is the latter which are at the heart of questions

related to labor supply analysis and the value of household production and time. McDiarmid (1977, pp. 9-10, 18, 29, 54-55) refers to the necessity of local or regional measures of seasonal opportunity costs (as opposed to the countrywide single measures he derives) under conditions where religious and language constraints prevent free labor mobility. These circumstances generally prevail in the parts of the Indian SAT studied here.

Opportunity cost of labor for males averaged Rs 2.26 per day during 1975-76, which was 90 percent higher than that for females (Rs 1.20). In spite of the fact that there was a mixed picture for probability of employment in these villages, the opportunity wage figures showed consistency, males having significantly higher opportunity wages than females (Table 3). The CV's of opportunity costs were in general higher than for both daily wages and probabilities of employment. There would therefore seem to be considerable scope for designing technologies which specifically aim at capitalizing upon periods when labor opportunity costs are low. This would enhance the profitability of the technology as well as create employment in slack/unremunerative periods with consequent redistributive benefits.[14]

The periods of the year when opportunity costs are at their maxima and minima are shown in Table 7. Peak periods are generally associated with such operations as harvesting, threshing, preparatory tillage, transplanting, sowing,

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14. Hired labor may benefit relatively more than family labor from this if the generally positive correlations between fortnightly total labor use and percentage of hired labor found in Ghodake *et al.* (1978, p. 57) are any indication. Also, large farmers have lower CV's of fortnightly labor use than small farmers and hire more labor (Ghodake *et al.* 17, 24). This further suggests that smoothening of labor peaks may benefit hired labor proportionately more.

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TABLE 7

PEAK AND SLACK PERIODS FOR ADULT MALES AND FEMALES IN SIX SAT VILLAGES OF SOUTH INDIA, 1975-76

District/ Village	Category	Peak Period		Slack Period Months
		Months	Major Operation	
MAHBUBNAGAR:				
Aurepalle	Males & Females	Dec.-Jan.	Harvesting and threshing sorghum, pearl millet, castor	Feb.-April
Dokur	Males & Females	Nov.-Jan.	Harvesting and threshing sorghum, nursery bed preparation paddy, paddy transplanting	Feb.-June
SHOLAPUR:				
Shirapur	Males	April-May July-Aug.	Preparatory tillage, ploughing, sowing pearl millett, meats, mungbean	Dec., Feb.-March
	Females	Sept.;	Harvesting and threshing pearl millet, mesta mungbean	Apr.-Aug.
		Dec.-Feb.	Sowing & harvesting wheat, sorghum, chickpea, safflower	
Kalman	Males	Jan.-Mar.	Harvesting and threshing wheat, sorghum, chickpea, safflower	Aug.-Oct.
	Females	May	Preparatory tillage, ploughing	
		Mar.-Apr.	Harvesting & threshing wheat, sorghum, chickpea, safflower	Oct.-Dec.-Jan.
		Nov.	Harvesting & threshing pearl millet, mesta	
AKOLA:				
Kanzara	Males	Mar.	Harvesting cotton; harvesting & threshing pigeonpea	Apr.-Sept.
		Aug.-Sept.		
		Nov.	Preparatory tillage, sowing wheat, chickpea, harvesting sorghum, groundnut	
	Females	Oct.-Dec.	Harvesting & threshing sorghum, groundnut, cotton	Apr.-June
		March	Harvesting cotton	
Kinkheda	Males	April	Preparatory tillage	Aug.-Oct.
		June-July	Sowing, interculturing cotton, sorghum, pigeonpea, mungbean.	May
		Nov.-Dec.	Harvesting & threshing, sorghum, groundnut; sowing wheat and chickpea.	
	Females	May	Field cleaning.	Feb.-March
		Sept.-Dec.	Harvesting & threshing sorghum, groundnut; weeding cotton.	

and weeding. This is supported by an analysis of actual labor use on farmers' fields in the six villages in 1975 '6. The general breakdown was as follows:

Operation	%
Harvesting and threshing	33 - 42
Preparatory tillage, field preparation	10 - 21
Transplanting and nursery bed raising	18
Weeding and thinning	14 - 20
Sowing	6 - 8

To test the labor market dualism hypothesis of Sen (1966) that the imputed price of labor to small farmers is lower than the actual price of labor to large farmers, paired t-tests were performed on the fortnightly wage rates of the labor category (by sex) compared to the fortnightly opportunity costs of labor from the small-, medium, and large sized farms. The hypothesis contends that as large farmers are excess demanders of labor their labor cost is the full agricultural wage. Small farmers are excess suppliers of labor and their relevant labor "price" is their opportunity wage.

In three of the six villages the differences between wage rates of males from labor households and small-farm male opportunity costs were significantly positive. In two, the differences were not significant and in one the difference was significantly negative (Table 8). In all six villages the wage rates of females from the labor group significantly exceeded the opportunity costs of family female labor

TABLE 8

PAIRED t-TESTS OF DIFFERENCES BETWEEN FORTNIGHTLY WAGE RATES OF LABOR HOUSEHOLDS AND OPPORTUNITY LABOR COSTS OF SMALL, MEDIUM AND LARGE FARMS IN SIX SAT VILLAGES OF SOUTH INDIA, 1975-76

District/ Villages	Males			Females		
	Small	Medium	Large	Small	Medium	Large
MAHBUBNAGAR						
Aurepalle:						
Mean differences (Rs/day)	0.05	0.21	†	0.32	0.15	-0.08
Paired t-values	0.34	0.73		5.15**	1.94	-1.09
Dokur:						
Mean differences (Rs/day)	0.69	0.23	0.33	0.31	0.25	0.26
Paired t-values	5.87**†	2.08*	1.68	5.34**	4.82**	3.28**
SHOLAPUR						
Shirapur:						
Mean differences (Rs/day)	0.39	0.90	0.66	0.62	0.69	0.68
Paired t-values	3.64**	6.18**	2.63*	6.74**	6.74**	5.12**
Kalman:						
Mean differences (Rs/day)	-0.32	0.13	-0.40	0.35	0.42	0.28
Paired t-values	-2.72*	0.53	-4.15**	5.85	7.41**	6.36**
AKOLA						
Kanzara:						
Mean differences (Rs/day)	0.02	0.33	0.60	0.57	0.45	0.32
Paired t-values	0.19	2.52*	3.32**	5.54**	4.65**	3.12**
Kinkheda:						
Mean differences (RS/day)	0.38	0.91	1.37	0.11	0.004	0.12
Paired t-values	2.58*	8.30**	8.12**	2.99**	0.07	2.89**

† ** significant at 1% level
* significant at 5% level

† No participation by large farm members.

from the small-farm households. Ghodake *et al.* (1978, Table 5) observed that the proportion of family female labor used on farms in these villages is inversely related to farm size. This is not so for family males.

In the three villages where wages of males from labor households were significantly greater than small farm opportunity labor costs, family male labor use per ha was significantly greater on small farms than on large farms, as the dualism hypothesis predicts. This was also true in all six villages for females. On this evidence labor market dualism receives stronger support in the case of females than for males. A major reason for this is the higher involuntary unemployment probabilities for females in general, (particularly those in the drought-prone regions) which create larger divergences between their wage rates and opportunity costs. This in turn leads to the more substantial differences we observe between family female labor use per ha on small compared to large farms.

A paradox remains, however, in cases of large farms where we have some labor market participation. In three out of six villages the fortnightly wage rates of male labor from the labor category were significantly higher than the market opportunity labor costs of males from large farms (Table 8). In the case of females, five out of six villages showed positive, significant differences between labor wage rates and opportunity labor costs of females from large farms. Hence for those large farms whose members enter the labor market, the "dual labor market" hypothesis holds equally well.[15]

15. It is recognised that OC_t may not be a good measure of the value of time for farmers who do not participate in the labor market. For them OC_t is less than their "reservation wage." This selectivity bias is more important for large farm families where market participation is generally less than that by smaller farm families.

That is to say, many large farmers are also faced with higher wage rates for labor they hire than the opportunity costs of their own family labor. It hence seems clear that the hypothesis is an oversimplification of the operations of the labor market in these villages.

Judging by the generally low and/or nonsignificant correlations of wage rates of males and females, there would appear to be considerable segmentation in the male and female labor markets in five of the six villages studied here (Table 9). The notable exception is the highly irrigated village of Dokur. A detailed analysis of the relative contribution of males and females to the various field activities showed there were only two joint operations - harvesting and threshing (Table 10). Women almost exclusively concentrate on five tasks - nursery bed raising, transplanting, planting, weeding, and thinning. Men focus on nine major operations, four of them involving bullock power.

Males and females tend to participate in the daily labor market at similar times, particularly in Aurepalle and in the Sholapur villages. They also experience similar movements in their chances of obtaining a job throughout the year (Table 9). In theory then, one would expect wage rates of males and females to also move together if females were able to shift in and out of similar tasks to those done by males as their respective wage rates begin to diverge. The extent to which this does not occur in four of these six villages is an indication of the degree of apparent segregation of their male and female labor markets.

TABLE 9

SIMPLE CORRELATION COEFFICIENTS BETWEEN MALE AND FEMALE PARTICIPATION RATES, PROBABILITIES OF EMPLOYMENT AND WAGE RATES IN SIX SAT VILLAGES OF SOUTH INDIA 1975-76*

District/ Village	Participation rates	Probabilities of employment	Wage rates
MAHBUBNAGAR			
Aurepalle	0.47*†	0.75**	-0.16
Dokur	0.22	0.95**	0.76**
SHOLAPUR			
Shirapur	0.40*	0.70**	-0.24
Kalman	0.56**	0.68**	0.30
AKOLA			
Kanzara	0.21	0.82**	0.10
Kikheda	0.26	0.59**	0.46**

* Data for all respondents has been pooled here, including that from large farm households who do not participate much in the labor market.

† ** and * indicate significance at the 1 and 5 percent levels, respectively.

TABLE 10

RELATIVE IMPORTANCE OF SEXES IN CROP PRODUCTION ACTIVITIES IN SIX SAT VILLAGES OF SOUTH INDIA 1975-76*

Jointly performed operations†	Predominantly female operations‡	Predominantly male operations‡
Harvesting & Threshing	Nursery bed raising, transplanting & planting; weeding & thinning;	Field preparation; fertilizing and manuring; sowing interculturing; watching; irrigating, plant protection; supervision.

* Children contributed little to labor use on crops and have not been included here. There were some minor exceptions to these classifications in some villages.

† Defined as operations where either males or females contribute between half and two-thirds of total labor used.

‡ Defined as crop operations where the respective sexes contributed more than two-thirds of the total labor used.

CONCLUSION

If these six villages are representative of the SAT regions of south India, it appears women have an equal role to men in the agricultural labor force. It is also clear that on average they have less chance than men of finding daily wage employment, particularly in the slack agricultural seasons, and especially so for landless females. New agricultural technologies for these regions must therefore have enhanced demand for the tasks generally reserved for females if their already inferior labor market opportunities are not to be made worse. There would certainly appear to be a large untapped reserve of female labor able and willing to engage in more market-oriented activities in slack seasons, and this may exceed the sizeable male reserves. There would hence seem excellent scope for designing technologies so as to capitalise on this.

However, there is a need for closer study of how these villagers allocate the 50 percent or more of their time which presently is not devoted to own-farm or paid market work. This is a surprisingly high figure and it is imperative to understand why, in order to assess whether the large apparent labor reserve mentioned above is inded a potential market supply. The work of Bardhan and Rosenzweig suggest that labor supply elasticities for adults in north India are less than unity. It is proposed to test this hypothesis on a seasonal basis using these data from south India, which are unique in the sense that they consist of panel data over several years on more than 1 500 individuals. The new household economics models developed by Mincer (1974), Heckman (1974), MacCurdy (1979) and others would seem the appropriate ones to quantify the determinants of individual wages and labor supply. Differences in human capital, village and household characteristics undoubtedly influence these.

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APPENDIX TABLE 1

PAIRED t-TESTS OF DIFFERENCES IN MARKET PARTICIPATION RATES AND PROBABILITIES OF EMPLOYMENT IN DAILY LABOR MARKET FOR MALE AND FEMALE ADULTS IN SIX SAT VILLAGES

Variable/ Sex	Mean Difference		
	Mahbubnagar-Sholapur	Mahbubnagar-Akola	Sholapur-Akola
Market Participation rate			
Male	-0.19***† [21.63]‡	-0.23*** [16.43]	-0.06** [3.61]
Female	0.22*** [16.92]	0.11*** [10.58]	-0.14*** [9.73]
Probability of employment			
Male	-0.16** [3.432	-0.16*** [4.95]	-0.05* [2.67]
Female	0.07 [2.07]	-0.07** [3.62]	-0.19*** [6.30]

† *** Significant at 0.1% level

** Significant at 1% level

* Significant at 5% level

‡ Bracketed figures are "t" values.

APPENDIX TABLE 2

PAIRED t-TESTS OF DIFFERENCES BETWEEN MARKET PARTICIPATION RATES, PROBABILITIES OF EMPLOYMENT AND WAGE RATES FOR MALES FROM DIFFERENT HOUSEHOLDS IN SIX SAT VILLAGES

	Labor - Small			Labor - Medium			Small - Medium		
Village	Market Participation rate	Probability of employment	Wage rate	Market Participation rate	Probability of employment	Wage rate	Market Participation rate	Probability of employment	Wage rate
Aurepalle	1.01	-0.23	-2.16*	4.47**	2.05	-0.58	6.02**	2.87**	1.13
Dokur	15.88**†	0.33	0.60	20.40**	-0.64	1.59	10.18**	-0.76	1.44
Shirapur	3.11**	-2.42*	-2.18	0.19	2.14*	-0.98	-4.94**	6.86**	1.85
Kalman	4.98**	2.97**	-5.79**	9.96**	2.85**	-1.46	12.04**	2.35*	1.52
Kanzara	6.81**	0.41	6.33**	17.94**	1.61	-4.13**	6.98**	1.45	1.19
Kinkheda	16.70**	-6.79**	1.52	22.10**	4.01**	3.04**	4.27**	6.21**	0.88

**Significant at 1% level
*Significant at 5% level.

APPENDIX TABLE 3

PAIRED t-TESTS OF DIFFERENCES BETWEEN MARKET PARTICIPATION RATES, PROBABILITIES OF EMPLOYMENT AND WAGE RATES FOR FEMALES FROM DIFFERENT HOUSEHOLDS IN SIX SAT VILLAGES

Village	Labor - Small			Labor - Medium			Small - Medium		
	Market Participation rate	Probability of employment	Wage rate	Market Participation rate	Probability of employment	Wage rate	Market Participation rate	Probability of employment	Wage rate
Aurepalle	0.55	0.49	-4.21**	7.33**	0.64	-1.12	7.30**	0.10	6.09**
Dokur	0.33	1.45	-0.93	12.80**	-3.17**	0.48	19.19**	-4.62**	1.67
Shirapur	4.79**†	-8.21**	-0.09	2.84**	-3.95**	-1.99	-2.05	3.93**	-1.75
Kalman	1.59	-3.35**	0.51	14.50**	-5.57**	3.87**	10.62**	-0.73	1.78
Kanzara	0.94	2.06*	1.89	9.67**	1.22	-0.14	7.65**	-1.23	-1.64
Kinkheda	8.64**	-2.15*	1.68	27.95**	0.03	-1.46	17.13**	1.28	2.52**

† **Significant at 1% level
*Significant at 5% level.

APPENDIX TABLE 4

SIMPLE CORRELATION COEFFICIENTS OF MARKET PARTICIPATION RATES, PROBABILITIES OF EMPLOYMENT AND WAGE RATES FOR MALES FROM DIFFERENT HOUSEHOLDS IN SIX SAT VILLAGES

	Labor - Small			Labor - Medium		
	Market Participa-rate	Probability of employment	Wage rate	Market Participa-rate	Probability of employment	Wage rate
Aurepalle	-0.48*†	0.30	-0.41	-0.41	0.02	-0.69**
Dokur	0.44**	0.89**	0.75**	0.10	0.80**	0.23
Shirapur	0.40*	0.29	0.49**	0.15	0.11	0.24
Kalman	-0.31	0.35	0.67**	-0.40*	-0.08	-0.07
Kanzara	0.44*	0.58**	0.35	0.34	0.46**	0.41*
Kinkheda	0.43*	0.78**	-0.11	0.15	0.78**	-0.003

† **Significant at 1% level
*Significant at 5% level.

APPENDIX TABLE 5

SIMPLE CORRELATION COEFFICIENTS OF MARKET PARTICIPATION RATES, PROBABILITIES OF EMPLOYMENT AND WAGE RATES FOR FEMALES FROM DIFFERENT HOUSEHOLDS IN SIX SAT VILLAGES

Village	Labor - Small			Labor - Medium		
	Market Participa-rate	Probability or employment	Wage rate	Market Participa-rate	Probability of employment	Wage rate
Aurepalle	0.83**†	0.62**	0.53**	0.88**	0.88**	0.38
Dokur	-0.24	0.97**	0.77**	0.05	0.92**	0.85**
Shirapur	0.33	0.73**	0.25	-0.60**	0.64**	0.28
Kalman	-0.22	0.40*	0.12	0.12	0.74**	0.64**
Kanzara	0.39*	0.79**	0.59**	0.18	0.77**	0.19
Kinkheda	0.42*	0.83**	0.77**	0.61**	0.72**	0.72**

† **Significant at 1% level
*Significant at 5% level.