A

WORKING PAPER NO. 244

Wage Determination in a Casual Labour Market: The Case of Paddy Field Labour in Kerala

K. PUSHPANGADAN

CENTRE FOR DEVELOPMENT STUDIES
THIRUVANANTHAPURAM - 695 011
JANUARY 1991

Wage Determination in a Casual Labour Market: The Case of Paddy Field Labour in Kerala*

K.Pushpangadan
Centre for Development Studies
Thiruvananthapuram 695 011, Kerala.
INDIA.

ABSTRACT

The wage rate in a casual labour market, paddy field labour, is estimated from a reduced form version of a supply and demand model after incorporating literacy, caste and the degree of unionisation in the structural equations. The empirical evidence shows that the degree of unionisation is the only factor that affects the wage rates in one of the most important labour markets in Kerala. The adjustment of paddy output and its components, area and yield, to wage increase is brought out by comparative static analysis of profit function. The estimation of the model from district level data provides an explanation for the observed decline in output and area and increase in the yield of paddy since 1975/76.

*This article is a substantially revised version of the first part of the paper presented at the twenty-eighth Indian Econometric Conference held in Raja Rammohunpur, Darjeeling, West Bengal on October 29-31, 1991. The revision has benefitted from the comments of A.Vaidyanathan, Mukesh Eswaran, B.G.Kumar and Hridul Eapen. The suggestions of an internal referee was also useful for sharpening the ideas further. The usual disclaimers apply.

Wage Determination in a Casual Labour Market: The Case of Paddy Field Labour in Kerala

The determinants of agricultural wage rates have been studied quite extensively in Indian agriculture. Although studies on the effects of trade unionism on the industrial wage rates are available, there is hardly any similar work on the rural labour market in India. It has been singled out as one of the most important factors in the determination of agricultural wage rates in Kerala[1]. Any attempt to study the impact of trade union on agriculture wage in general has been severely handicapped by the unavailability of trade union membership among the agricultural workers. Recently some estimates are available on the trade union membership as a result of the study on rural proletarian struggles in Kerala[2]. The present paper makes an attempt to model the impact of trade unionism on the formation of wage rates using the above data. In the process, the paper also develops an analytical frame work to explain the increase in land yield in the wake of stagnation in paddy production.

A survey on the literature suggests that two schools of thought are predominant in the characterisation of the Indian rural labour markets. While the first approach emphasises structural factors such as institutions, customs, religion etc. in the determination of wage rates, the second one tries to explain the wage rates in terms of demand for and supply of labour[3]. For the present analysis, we have chosen the second

approach because of its advantages for testing various hypothesis on the factors that influence wage rates in rural labour market. The limitations of the method will be discussed later.

The outline of the paper is as follows. In section I, a reduced form equation of the wage rate is derived from the structural equation of supply of and demand for labour. The model is estimated from cross section data. Section II shows the impact of cost escalation on acreage allocation and output in the absence of technical change. It also estimates the relationship between wage rate, yield and output as a result of the cost escalation using cross section and timeseries data.

Section I

1.1 Review of Theory

There are four major theories on wage determination that use supply and demand framework: (1) classical competitive model; (2) insider-outsider theory; (3) efficiency wage theory; and (4) implicit cooperation theory[4].

In the competitive model, the wage rates are determined, just like in any other commodity, on the basis of supply and demand factors. In such a model, the wage rates clear the market in the sense that no involuntary unemployment exists. The prediction of the model is inconsistent with the widespread involuntary unemployment in the rural areas. Remaining three

models were constructed to reconcile the supply-demand model of wage determination with involuntary employment.

The efficiency wage models are based on the following twin assumptions: (1) the employers set the wage rates and they have some market power to do so; (2) the firms lack the perfect knowledge of the productivity of each of its workers[5]. Moreover, the firms believe that the wage rate has positive effect on productivity and negative effect on average labour cost per time unit. Therefore, firms set higher wages as a screening devise for recruiting best workers and provide incentive for incumbent workers to put in more effort in the production process. This implies that the wage rate at the margin will be more than the opportunity cost of labour. Such a market is characterised by involuntary unemployment. Although the model explains the observed differences in the wage rates of the same type of labour in the industrial sector, it fails to provide a satisfactory explanations for the near-uniform wage rates existing in the rural labour market for a given task in a given locality (Osmani, 1988: 4). Hence, the model has very limited use in the present context.

Both the theories, efficiency wage and insider-outsider, argue that it is the market power in the wage setting that results in the wage rates above the market-clearing wage rates. Only difference is the assumption on the market power of the

agents. In the efficiency wage model the market power rests with the employers while in the insider-outsider with the incumbent labourers. The insider-outsider model classifies the labourers into mutually exclusive groups; (1) the insiders who are employed; (2) the outsiders who are unemployed. The insiders exercise their power within the firm to extract a portion of the rent from the employers[6]. As a result, the wage rates are above the market clearing wage rates which result in unemployment[7]. Ackerlof (1991) has hailed the theory as the best among the models on unemployment with microfoundation that have appeared during the last twenty years. The main drawback of the model is its inability, like the efficiency wage model, to explain the existence of near-uniform wage rate for a given task in a given locality in the rural sector. On the contrary, the implicit cooperation theory predicts uniform wage rates in equilibrium within the supply and demand framework.

The theory of implicit cooperation assumes that the wage rate is the outcome of individual choice based on strategic considerations (Osmani, 1988). In this story, the wage rate is based on the probability of employment which depends very much on the interaction of supply of and demand for labour. Moreover, the strategic behaviour of the workers in setting the daily wage rate has the properties of a repeated non-cooperative game. The agents have, in such a game, some incentive for implicit cooperation of a self-enforcing nature in setting the wage rate.

Given the supply and demand conditions prevailing in the market, each worker sets his wage rate so as to maximise his expected pay-off. The most important point is that the quoted wage rate depends on the wage rates demanded by other workers. The equilibrium wage rate is established when it does not pay to revise the bid. The equilibrium wage rate based on the reactions of others is the usual Nash-equilibrium in the game-theoretic literature. Naturally the equilibrium wage rate is higher than the wage rate under competitive equilibrium. The difference in the wage rates explains the extent of involuntary unemployment.

Although, the game-theoretic approach characterises the near-uniform wage rates in a given locality better than the other three models, it becomes very difficult, if not impossible, to test the influence of non-economic factors on wage formation within the implicit cooperation theory. Therefore, we have chosen the competitive model, like Bardhan (1984) and Binswanger and Rosenweig (1984), on the assumption that the model approximates the rural labour market in India. This assumption is valid more in Kerala than elsewhere in India due to the increasing shortage of labour for agricultural operations in Kerala.

1.2 Wage Formation: Supply and Demand Model

The simplest formulation of the supply and demand model is to assume that it depends only on its price. But it is well

known that such a system of equations is not identified unless we impose some restrictions on the equations. One method of identification is to include additional variables that affect only the demand function but not supply and vice versa. Let us examine such factors for the specification. Hicks (1969) has shown that labour demand, under cost minimizing behaviour, is determined by the relationship between productivity and wage rate. Therefore, the structural equation of demand for labour should depend on the labour productivity. While explaining the inter-district variability in the agricultural wage rates, Raj has hypothesised that higher land-man ratio in a district can put upward pressure on the wage rates[8]. This would imply that land-man ratio is a factor that affects the demand for labour. The structural equation of the demand for labour becomes;

(1) $$D = \alpha_0 + \alpha_1 W + \alpha_2 X_1 + \alpha_3 X_2 \quad (\alpha_1 < 0,\ \alpha_2 > 0,\ \alpha_3 > 0)$$

where D, the demand for labour; W, the wage rate; X_1, the labour productivity; and X_2, the land-man ratio.

The supply side, on the other hand, depends on the preference maximization of the workers given their choice between income and leisure. In addition to the wage rate, the following non-economic factors influence the supply of labour in Kerala. Although the state has the highest unemployment rate in India, it has no effect on the wage rate of paddy labour since the majority of them are educated unemployed and they are simply not available

due to social stigma attached to such labour. As a result there exists shortage of labour along with high unemployment in Kerala during the peak seasons of agricultural activities. Recent studies on the educated unemployed also show that the unemployed with educational background of high school and above do not normally prefer to work as a paddy field labour. This would imply that high illiteracy rate among the agricultural labour force has a depressing effect on the wage rate. It has been observed that the main source of supply in this labour market is from socially backward classes especially from the scheduled caste (SC) and scheduled tribe (ST) population[3]. Therefore, the proportion of the illiterates among scheduled caste and scheduled tribe labour force has a positive impact on the labour supply.

It is well known that the labour force in Kerala is relatively well organised. Therefore the bargaining power of the labour force is higher in Kerala than elsewhere in India. This would imply that supply of labour is also influenced by the degree of unionisation. The relationship between the supply of labour and the degree of unionisation is not straight forward. It is established indirectly in the following way. The real wage (nominal wage/cost of living index) is usually assumed to be positively related to supply of labour in the literature (Lal, 1989; p.145). The real wage rate is high if the degree of unionisation is high and low if it is low. This would imply that the degree of unionisation has a positive impact on the labour

supply. The structural equation of supply of labour is given by

$$(2) \quad S = \beta_0 + \beta_1 W + \beta_2 X_3 + \beta_3 X_4 \quad (\beta_1 > 0;\ \beta_2 > 0;\ \beta_3 > 0)$$

where S, the supply of labour; W, the wage rate; X_3, the degree of unionisation; and X_4, proportion of illiterates among the SC and ST agricultural labour force.

The reduced form equation of the wage rate under equilibrium is given below:

$$(3) \quad W = \tau_0 + \tau_1 X_1 + \tau_2 X_2 + \tau_3 X_3 + \tau_4 X_4 + u$$

$$\text{where } \tau_0 = \frac{\beta_0 - \alpha_0}{\alpha_1 - \beta_1}, \quad \tau_1 = \frac{\alpha_2}{\beta_1 - \alpha_1} \quad \tau_2 = \frac{\alpha_3}{\beta_1 - \alpha_1},$$

$$\tau_3 = \frac{\beta_2}{\alpha_1 - \beta_1}, \qquad \tau_4 = \frac{\beta_3}{\alpha_1 - \beta_1}$$

and u, stochastic error term.

The source of data and the empirical results are given below.

1.2 Empirical Results

The estimation of the model is dictated purely by the availability of data, a problem which is common in applied work. The district level data on labour force are available only in the Census Survey. Therefore, we have information for the years

1961, 1971 and 1981. But there is no data on trade union membership for the year 1961 (Kannan, 1988: Table 6.8). This means that we have district level observations for only two years, 1971 and 1981.

The variables used for the estimation are defined as follows. Although wage rates of both male and female paddy field workers are available, the female wage rates are available only from 1973 onwards. Therefore, the wage rates and the related variables in the model are, as far as possible, related to male labour only. The estimate on labour productivity, the main determinant of the demand for labour, is available neither at the district level nor at the state level. The reason being the absence of any reliable data on the actual labour force employed in paddy production. Therefore, land productivity is usually used as a proxy for labour productivity (Acharya, 1991). This assumes that the land-labour ratio is constant across the districts. The validity of the assumption is not possible to verify. To overcome the problem, we have taken total scheduled caste and scheduled tribe agricultural male labour force as an estimate of labour employed in paddy production[16]. The degree of unionisation is defined as the ratio of the number of members in Karshaka State Thozhilali Union (controlled by the Marxian Communist Party) to total agricultural labour force. The break-up of the membership by sex is not available. Therefore, the degree of unionisation includes both the sexes. The impact of education on the wage rate is

captured by the ratio of male illiterates to the total scheduled caste and scheduled tribe male agricultural workers. The estimated equation in logarithmic variables is given below[11].

$$\ln w = \underset{(7.8)}{2.90} - \underset{(-1.7)}{0.66}\ln X_1 + \underset{(1.3)}{0.50}\ln X_2 + \underset{(5.2)}{0.23}\ln X_3 + \underset{(0.3)}{0.06}\ln X_4$$

$$R^2 = 0.76,\ D\text{-}W = 1.92,\ n = 18$$

The degree of unionisation is the only significant variable that influences the wage rates of paddy field labour in the post land reform period. The result seems to suggest that the caste and education that keep the wages depressed have no influence in the determination of wages once the labour is unionised. The findings, however, need to be substantiated with microlevel study.

Since the wages are determined by supply factors only, the behaviour of the farmers need a careful analysis. This is dealt with in the next section.

Section II

2.1 Wage Effect on Output, Area and Yield of Paddy

2.1.1 Profit Function Approach

The adjustment of output and its components, area and yield to change in input price is examined below using comparative statics analysis of profit function (Chambers, 1988; pp.126-33)

Consider the profit function

$$(4) \qquad \pi(p,w) = \max_{o} \pi = po - c(w,o)$$

where p: price of output;

o: output; w: the vector of input prices;

c(w,o): the minimum cost function for the production of output ,o, given the input prices.

From Hotelling lemma, the profit maximising level of output and the corresponding factor demand for ith input can be obtained from partial differentiation of the profit function:

$$(5) \qquad o(p,w) = \frac{\delta \pi(p,w)}{\delta p}$$

$$(6) \qquad -x_i(p,w) = \frac{\delta \pi(p,w)}{\delta w_i}$$

Let the ith input be labour. The adjustment of output to change in the wage rate is obtained by differentiating (5) with respect to w_i, the wage rate.

$$\frac{\delta o(p,w)}{\delta w_i} = \frac{\delta^2 \pi(p,w)}{\delta w_i \delta p}$$

$$= \frac{\delta^2 \pi(p,w)}{\delta p \delta w_i} \text{ (symmetry of derivatives)}$$

$$(7) \qquad = - \frac{\delta x_i(p,w)}{\delta p} \text{ (Shepherd's lemma)}$$

But the factor demand and the conditional demand for labour must be the same at the profit maximising level of output.

$$(8) \qquad x_i(p,w) = x_i(w,o(p,w))$$

Differentiating (8) with respect to p, we have

$$(9) \qquad \frac{\delta x_i(p,w)}{\delta p} = \frac{\delta x_i(p,o(.))}{\delta o} \frac{\delta o(.)}{\delta p}$$

Substituting (9) in (7),

$$(10) \qquad \frac{\delta o(p,w)}{\delta w_i} = - \frac{\delta x_i(p,o(.))}{\delta o} \frac{\delta o(.)}{\delta p}$$

Since the slope of the supply curve is positive, it is clear that the output adjustment to wage change is opposite to the change in the labour demand due to change in output. But the demand for labour due to output change is related to marginal cost in the following way.

Using Shepherd's lemma

$$\frac{\delta x_i}{\delta o} = \frac{\delta(\delta c(w,o))}{\delta o \; \delta w_i}$$

$$(11) \qquad = \frac{\delta(\delta c(w,o))}{\delta w_i \; \delta o}$$

$$= \frac{\delta(MC)}{\delta w_i}$$

Equation (11) shows that derivative of labour demand with respect to output depends on nature of change in the marginal cost due to wage change. Unfortunately, the effect on marginal cost is not unique since it depends on whether the labour input

s normal or regressive. In our case, the labour is a normal input. Therefore, the marginal cost and the wage rate change in the same direction. From (10) and (11), it can be concluded that the output declines as wage increases. Let us examine the impact of wage rates on area and yield, the two components of output.

The components are derived from the multiplicative formula.

(12) $o = l.o/l$

Differentiating (12) with respect to the wage rate and expressing in terms of elasticities,

$$\frac{\delta o}{\delta w_i} = \frac{\delta(l.o/l)}{\delta w_i}$$

(13) $\epsilon_o = \epsilon_l + \epsilon_y$

where ϵ_l: wage elasticity of land;

ϵ_y: wage elasticity of yield;

ϵ_o: wage elasticity of output.

Equation (13) means that the output elasticity of paddy is equal to the sum of land and yield elasticity. Let us examine the empirical evidence on output, area and yield adjustment to wage increase.

2.1.2 Estimation

The elasticities were estimated from the following double logarithmic specifications:

(14a) $\ln W = \beta_0 + \beta_1 \ln O + \beta_2 \ln Y + e$

(14b) $\ln W = \tau_0 + \tau_1 \ln O + \tau_2 \ln A + e$

(14c) $\ln W = \alpha_0 + \alpha_1 \ln A + \alpha_2 \ln Y + e$

where W, the wage rate of paddy filed male labour; O, output of paddy; Y, the yield of paddy; A, acreage under paddy; and e, the stochastic error term.

The equations, 14a - 14c, were estimated for each of the nine districts in Kerala for the period, 1975/76 86/87, during which the paddy production has registered a dramatic decline (Kannan and Pushpangadan, 1990). If the errors were autocorrelated from Durbin - Watson test, then Cochrane-Orcutt method (CORC) was used for its correction. If CORC failed to give any significant result, then first difference versions of 14a, 14b and 14c were estimated. If the equations were still not giving any theoretically and statistically corrrect estimates, then simple double logarithmic functions of the following specifications, 15a-15c, were estimated.

(15a) $\ln A = \beta_0 + \beta_1 \ln W + e$

(15b) $\ln O = \tau_0 + \tau_1 \ln W + e$

(15c) $\ln Y = \alpha_0 + \alpha_1 \ln W + e$

The estimated equations are given in Appendix and the resulting elasticities[12] in Table 1.

Table 1. Wage Elasticity of Output, Area and Yield of paddy (1975/76-86/87)

District	Wage Elasticity of Area (1)	Yield (2)	Output (1) + (2)
Trivandrum	-Ø.61	Ø.25	-Ø.36
Quilon	-2.57	1.22	-1.35
Alleppey	-Ø.24	Ø.Ø7	-Ø.17
Kottayam	-Ø.18	Ø.15	-Ø.Ø3
Ernakulam	-Ø.46	Ø.17	-Ø.29
Trichur	-Ø.48	Ø.2Ø	-Ø.28
Palghat	-Ø.22	Ø.1Ø	-Ø.13
Kozhikode	-1.43	Ø.43	-1.ØØ
Cannanore	-Ø.74	Ø.25	-Ø.49
Kerala	-Ø.4Ø	Ø.19	-Ø.21

Source: Table 1 in Appendix.

The elasticity estimates show that the output decline is due to the increase in the wage rates in all the districts in Kerala. The output adjustment in two districts, Quilon and Kozhikode, is more than or equal to the proportional increase in wage rates. The effect of wage rate on output is maximum in Quilon followed by Kozhikode and the least in Kottayam followed by Palghat. Since the intercept term is significant in almost all the equations the wage rates are influenced by factors other than the level of production. The estimation clearly shows that decline in paddy production is widespread in Kerala and the main source is due to area decline. At the same time the yield has shown a positive increase everywhere in Kerala. In fact, the districts with highest area decline, Quilon and Kozhikode, have registered the highest yield increase. Similarly the lowest yield increase has also been in the districts with lowest area decline under paddy.

In other words, there exists a negative association between area and yield adjustment to wage increase during the stagnation period. This finding needs an explanation which is given below.

The above analysis shows that wage rates of paddy field labour are determined by supply considerations only. In fact the wage rates of paddy field labour, both product wage and real wage, have grown very rapidly relative to productivity[13]. In such a situation, cost minimising farmer would substitute away the expensive input. But such cost reducing technology, mechanical and biological, is not easily available with its critical complementary inputs like irrigation in Kerala. This may be a reason for decline in area under HYV paddy in Kerala. Moreover, there is very little incentive for farmers to develop indigenous technology because of the public nature of such investment. As a result, the cost of production increases proportionately with increase in wage rates. Under such technological constraints, the observed behaviour of area and yield is the result of the cost minimising behaviour of the farmers as demonstrated below[14].

In figure 1, the output is measured along the x-axis and the unit cost and price of paddy along the y-axis. The marginal producers and their unit cost of production are plotted at the beginning of the x-axis. As a result, the difference between the price and unit cost is the rental value of the paddy land. The

se of family labour in the production of paddy creates onceptual difficulties in the calculation of unit cost. If the ost is only paid out cost, then unit cost of output will be lower for family farms since the family labour is not valued. On the contrary, if the family labour is also included in the cost calculation then unit cost will be higher for family based farms[15]. Therefore, the small producers become marginal or not depend very much on the valuation of the family labour. Moreover, the behaviour of the family based farms to a change in the unit costs is also not predictable since the production is not motivated for profit alone. If the objective is only to produce enough for on-farm consumption, the farmers' response to cost increase is very difficult to predict. In order to predict the impact of wage increase on output with certainty, we have, therefore, excluded the subsistence farmers from the analysis.

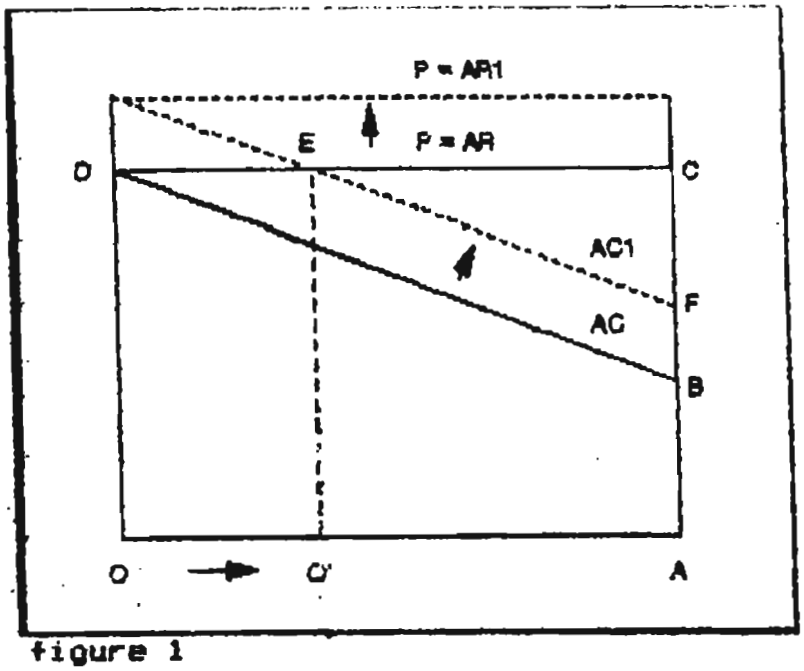

figure 1

Let OA be the maximum output of the commercial farmers that can be produced with the available land at the initial cost-price configuration. Let the price per unit of paddy is OD which remains constant[16]. Suppose the relative price of input, say labour, changes. In the absence of innovation in the production technology, the unit cost curve will shift outwardly. As a result, the unit cost will shift to EF. In the new price-cost situation, the farmer who produces O_1 output becomes the marginal producer. The producers with higher unit costs incur losses. These farmers have only two options: either keep the land fallow or allocate it for the best alternative use. In either case, the area under paddy declines along with output. Since only better quality land that can sustain the cost increase is put under paddy cultivation, the yield per acre naturally goes up due to the fertility of the soil with static technology. This provides an analytical explanation for the observed negative association between area and yield elasticity. This implies that the wage rate is negatively related to output and positively to output per acre. It is also worth mentioning that the rental value of the land under paddy reduces uniformly in such a situation. This will provide an incentive for the farmers either to shift the land to other profitable uses. However the cost increase would not have any impact if the price of paddy had increased to OD_1 per unit.

Conclusion

The wage formation in the rural labour market in Kerala has been examined with a case study of paddy field labour using a simultaneous equation model of supply and demand. Non-economic variables were included in the specification of the structural equations. The estimated reduced form equation shows that the wages are determined by the degree of unionisation only. In the absence of diffusion of cost reducing innovations, mechanical as well as biological, the cost of production of paddy increases proportionately with wage rates. Therefore, the marginal land, mostly less fertile land, becomes uneconomical for cultivation of paddy without a corresponding increase in the output price. The farmers allocate only better quality land which can sustain the cost increase. Under such cost minimising behaviour, output and area decline when wage increases. But the yield should go up as a result of cultivating only better quality land. The estimated elasticity of output and its components, area and yield, with respect to wage rate supports the validity of the hypothesis at the district level.

The widespread decline in the profitability of paddy cultivation has uniformly reduced the rental value of paddy land. Therefore, the land owners have an incentive for allocation of such land for the next best use. This may also work as a catalyst to develop a land market in Kerala and further

contribute to the decline in area under paddy. In such a situation, cost reducing innovation in production technology is the only way to reverse the declining trend in paddy production in Kerala.

APPENDIX

The estimated regressions with theoretically correct sign and statistically significant are given below:

Table 1. Output, Area and Yield response to Wage change

District	Regression Equation	R^2	D-W
Trivandrum	$\ln W = 31.2 + 4 \ln Y - 2.8 \ln O$ (7.9) (8.9) (-7.6)	Ø.93	1.73
Quilon	$\triangle \ln W^* = Ø.62 \triangle \ln Y - Ø.74 \triangle \ln O$ (2.4) (-2.5)	Ø.48	1.4Ø
Alleppey	(i) $\ln A = Ø.2 - Ø.24 \ln W$ (3.1) (-3.8)	Ø.56	1.64
	(ii) $\ln O = 12.3 - Ø.17 \ln W$ (71) (-2.5)	Ø.39	1.49
Kottayam	(i) $\ln A = 1Ø.9 - Ø.18 \ln W$ (54) (-2.3)	Ø.34	Ø.55
	(ii) $\ln Y = Ø.3 + Ø.15 \ln W$ (1.6) (2.3)	Ø.34	1.4Ø
Ernakulam	$\ln W = 4.2 + 5.9 \ln Y - 3.5 \ln O$ (6.6) (12) (-6.4)	Ø.94	1.69
Trichur	$\ln W = 43.9 + 4.9 \ln Y - 3.6 \ln O$ (2.1) (7.Ø) (-2.Ø3)	Ø.83	1.91
Palghat	$\ln W = 95 + 10.3 \ln Y - 7.9 \ln O$ (4.4) (3.5) (-4.2)	Ø.59	Ø.34
Kozhikode	$\ln W = 13 + 2.3 \ln Y - 1.Ø \ln O$ (13) (4.3) (-1Ø.6)	Ø.91	1.5Ø
Cannannore	(i) $\ln A = 13.1 - Ø.74 \ln W$ (52) (-8.5)	Ø.88	2.1Ø
	(ii) $\ln O = 12.7 - Ø.49 \ln W$ (44) (-5.3)	Ø.74	2.2Ø
Kerala	$\ln W = 67.7 + 5.3 \ln Y - 4.8 \ln O$ (4.5) (5.3) (-4.6)	Ø.87	1.4Ø

*Cochrane-Orcutt method; the values in the brackets are t-ratios

Source: 1) BES, Season and Crop Reports (various issues).
2) BES, Statistics for Planning (various issues).

Durbin-Watson Statistic for Sample size less than 15 with and without intercept term for positive autocorrelation at 5% and 1% level are given below:

level of Significance	Sample size	K' =1 dl	du	K' =2 dl (with intercept)	du	K' =2 dM (without intercept)	du
5%	12	.697	1.Ø23	.569	1.274	.451	1.274
	11	.653	1.Ø1	.519	1.297	.394	1.297
1%	12	.971	1.331	.812	1.579	.674	1.579
	11	.927	1.324	.758	1.6Ø4	.61Ø	1.6Ø4

Source:1) Johnson (1984), Table B5: pp. 554-557.
2) Farebrother (198Ø): pp. 1553-1563.

The t-values for two-tailed test at 1Ø % and 5 % are given below:

t(Ø.Ø5,1Ø) =1.81; t(Ø.Ø25,1Ø) =2.23
t(Ø.Ø5,9) = 1.83; t(Ø.Ø25,9) = 2.26.

NOTES

1 See Jose (1980), Raj and Tharakan (1983) and Krishnan (1991).

2 Districtwise membership of Kerala State Karshaka Thozhilali Union (KSKTU), trade union in agriculture controlled by Communist Party of India (Marxist), is given in Kannan (1988: Table 6.5).

3 For a survey of supply-demand models in the Indian context, see Osmani (1989), Lal (1989), Acharya (1989) and Jose (1989) among others. For a recent exposition of the institutional approach to the formation of rural wage rates and the related literature, see Krishnan (1991).

4 Here only the most important models are examined. A complete survey is given in Lindbeck and Snower (1988: Chapter 2) and Blanchflower et. al. (1991).

5 See Osmani (1988) and Lindbeck and Snower (1988: Chapter 3). For a simple diagrammatic exposition of the model, Lindbeck and Snower (1988: 67).

6 See Lindbeck and Snower (1988: 68) for the sources of the market power of the employees.

7 For a simple diagrammatic exposition of the theory, see Lindbeck and Snower (1988: 71).

8 See Raj and Tharakan (1983: 78).

9 See ibid. pp. 88-89, notes 13.

10 Professor Vaidyanathan was very critical about the use of yield per acre as a proxy for labour productivity. He has suggested total agricultural labour force as an estimate of actual labour employed in paddy production. However, this proxy again assumes the ratio of paddy workers to agriculture labour force remains constant across the districts.

11 The sources of data are the following:

X_1: Season and Crop Report and Census of India (1971, 1981);
X_2: Same as for X_1;
X_3: Kannan (1988: Table 6.8);
X_4: Census Of India (1971, 1981).

12 The elasticity with respect to wage from the multiple regression is the inverse of the regression coefficient. In the case of simple regression, the elasticity is the same as the regression coefficient.

13 The annual growth rate in yield per acre of paddy is only 1.1 % but the product wage has grown about 7.7 per annum during the period 1975/76-1985/86 (Kannan and Pushpangadan, 1990, Table 8: 1990). In the case of real wage, nominal wage deflated by cost of living index, Kerala has the thus highest wage rate in the country, after Punjab and Haryana (Krishnan, 199, Table 1: A83).

14 The diagram is first introduced by Steindl (1976: 44).

15 See Bharadwaj (1974: Chapter 3) for detailed discussion of this problem.

16 The analysis is valid even if the price of paddy changes. The only condition is that the price increase is less than the cost increase.

REFERENCES

Acharya, S. (1989), 'Agricultural Wages in India: A Disaggregated Analysis', Indian Journal of Agricultural Economics, Vol. 44, No.2, pp. 121-139.

Berlof, G. (1991), Book Review of Lindbeck and Snower (1988), Scandinavian Journal of Economics, Vol. 93, No. 3, pp. 472-474.

Bardhan, Pranab K. (1984), Land, Labour and Rural Poverty, Oxford University Press, Delhi.

Bharadwaj, Krishna (1974), Production Conditions in Indian Agriculture. A Study based on Farm Management Surveys, University of Cambridge, Cambridge University press, London.

Binswanger, H.P. and Rosenweig, M.R. , eds., (1984), Contractual Arrangements: Employment and Wages in Rural Markets in Asia, Yale University Press. New Haven.

Blanchflower, David G., Oswald, Andrew J. and Garret, Mario D. (1990), 'Insider Power in Wage Determination', Economica, Vol. 57, No. 226, pp. 143-70.

Bureau of Economics and Statistics (BES), Government of Kerala, Season and Crop Reports (various issues), Trivandrum.

————. Statistics for Planning (various issues), Trivandrum.

Chambers, Robert G. (1988), Applied Production Analysis: A Dual Approach, Cambridge University Press, New York.

Directorate of Census Operations (1975), Census of India, 1971, Series 9-Kerala, Kerala.

Farebrother, R.W. (1980), 'The Durbin-Watson Test for Serial Correlation when There Is No Intercept in the Regression', Econometrica, Vol.48, No. 6:pp. 1553-1563.

————(1988), Census of India, 1981, Series-10 Kerala, Kerala.

Hicks, J.R. (1968), Theory of Wages, 2nd ed., Macmillan co. New York.

Johnston, J. (1984), Econometric Methods, 3rd ed., McGraw-Hill Book Company, Singapore.

Jose, A.V. (1988), Agricultural Wages in India, Working Paper of ILO-ARTEP, Delhi.

Kannan, K.P. (1988), Rural Proletarian Struggles, Mobilizatio and Organization of Rural Workers in South-West Asia, Oxfo University Press, Delhi.

———— and Pushpangadan, K. (1990), 'Dissecting Agricultur Stagnation in Kerala: An Analysis across Crops, Seasons a Regions', Economic and Political Weekly, Vol. 25, No. 3 pp. 1982-2004.

Krishnan, T.N. (1991), 'Wages, Employment and Output Interrelated Labour Markets in an Agrarian Economy: A Stu of Kerala', Economic and Political Weekly, Vol. 26, No. 3 pp. A82-A96.

Lal, D. (1989), The Hindu Equilibrium, Vol.2, Aspects of Indi Labour, Clarendon Press, Oxford.

Lindbeck, A. and Snower, Dennis J. (1988), The Insider-Outsid Theory of Employment and Unemployment, MIT Press, Cambridg

Osmani, S.R. (1988), Wage Determination in Rural Labour Market The Theory of Implicit Cooperation, Working Paper N0.4 World Institute for Development Economics Researc Helsinki.

Raj, K.N. and Tharakan, P.K.M. (1983), 'Agrarian Reform in Keral A Preliminary Assessment' in: Ajit Kumar Ghose, ed Agrarian Reform in Contemporary Developing Countries, S Martin Press, New York.

Steindl, Josef (1976), Maturity and Stagnation in Ameri Capitalism, Monthly Review Press, New York.