CHAPTER II
THE AGRICULTURAL SECTOR

To isolate the problems peculiar to any economy like India's, it is necessary to take into account the fact that there exists a substantial amount of unemployment, open or disguised which cannot be attributed to friction or deficiency of effective demand. In view of the fact that on a descriptive macro level the basic condition underlying the Lewis model¹ is applicable to the Indian situation, it is not unnatural to look to the Lewis model for providing a convenient starting point. The Lewis model attempts to explain the process by which a low savings, dual economy gets transformed over time into a high savings economy. In brief the situation envisaged in the theory of a dual economy is that the economic system may be divided into two sectors--the advanced or modern or manufacturing sector and the backward or traditional or agricultural sector. The special character of the development of the dual economy is a certain asymmetry in the production relations. The output of the traditional or agricultural sector is a function of land and labour alone. Land does not appear as a factor of

¹Ibid. Lewis.
production in the manufacturing sector and output is a function of capital and labour alone. Further, employment in the manufacturing sector is determined by conditions of profit maximisation whereas the traditional sector operates on a customary basis. The defining characteristic of the Lewis model lies in the postulate that real wages in the capitalist sector remain unaltered during the process of development, due to the prevalence of unlimited labour supply. Perfectly elastic supplies of labour play a crucial role in the Lewis model. At a constant real wage, capitalists' will choose a particular technique of production and, if there are constant returns to scale, earn a constant rate of profit. With classical savings behaviour, the rate of growth of the capitalist sector will be equal to the rate of profit multiplied by the capitalists' marginal propensity to save. In the face of a stagnant subsistence sector, therefore, the structure of the economy will become steadily more capitalistic and the overall growth rate will continue to accelerate until the capitalist sector has exhausted all reserves of labour in the subsistence or agricultural sector.

Thus, the behaviour of the dual economy depends upon the existence or otherwise of an unlimited supply of labour. According to Lewis, "... an unlimited supply of
labour may be said to exist in those countries where population is so large relatively to capital and natural resources, that there are large sectors of the economy where the marginal product of labour is negligible or zero\(^2\). Lewis goes on to add that in these conditions it is possible to maintain a constant agricultural output despite a transfer of labour force from the agricultural to the modern sector. In the densely populated economies of Asia the existence of surplus labour is taken to be axiomatic—in agriculture as well as other occupations. However, since the bulk of the population in Developing Countries derives its livelihood from agriculture, it will not be unreasonable to assume that agriculture constitutes the major source of the unlimited supply of labour. And it has often been observed in agriculture that the family holding is exceedingly small and that if some members obtained employment elsewhere, the remaining members could cultivate the holding just as well. But does surplus labour in agriculture really exist in the sense of a zero marginal product of labour? And, if so, how is it possible to reconcile the existence of surplus labour with a positive wage? Lewis attempted an explanation of this in terms of the incentive of the family farm to maximise output (by carrying the

2. Ibid. Lewis, pp402-3.
application of family labour on the farm to the point of zero marginal product of labour). This, however is not very convincing, since the family could have earned more, either (i) by working its farm up to the point where the marginal product of labour equals the market wage and sending its surplus labour out to work for wages, or (ii) by renting out its land and shifting entirely into wage employment. It thus becomes imperative to explain the coexistence of positive wages with surplus labour.

As regards the empirical evidence concerning the existence of surplus labour, the most famous test was conducted by Schultz for India. India had been affected by a major influenza epidemic in the year 1918-19 and at least fourteen million people were feared to have been killed. Schultz studied the data for agricultural production in India for the season immediately preceding the epidemic and the season immediately following the epidemic, and found that the reduction in agricultural labour force resulted in a fall in agricultural production. Schultz concluded that surplus labour did not exist in Indian agriculture. However, we find that a test of this kind makes sense only if in the season following

the epidemic, there is no fall in cultivated acreage. The impact of an epidemic is not uniformly distributed nor need it be correlated with the distribution of surplus labour and the likelihood of its wiping out whole families or villages in areas deficient rather than surplus in labour is quite substantial. Thus, it is quite possible that a decline in agricultural production could be accounted for by the decline in cultivated acreage.

During the 1950s and 1960s, the Planning Commission and the Ministry of Agriculture conducted several surveys of farm management data. The data showed that the smaller farms had a higher productivity per acre than the large farms. However, if the factor inputs of the small farms were evaluated at market prices, the costs of the small farms outweighed their total profits. This is economically significant, because if the family was to offer its services on the market, it would have earned a higher wage. This evidence was used to establish the fact that surplus labour did exist.

How does one explain the coexistence of surplus labour, in the sense of a zero marginal product of labour, with a positive wage? Various attempts have been made to reconcile the two. Sen⁴ argues that the assumption of zero marginal product of labour is neither a necessary nor

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a sufficient condition for the existence of surplus labour. The model of a peasant economy postulated by Sen is characterised by a community of identical peasant families with the number of total members of the family exceeding the number of working members. It is assumed that the work on the family farm is equally divided between working members and income equally divided between all members. The family output, $Q$, at any given point of time is a function of labour alone and the function is assumed to be smooth (twice differentiable throughout) and normal (with diminishing marginal productivity of labour).

$$Q = Q(L) \text{ with } Q''(L) < 0$$

Sen assumes that the peasants are guided in their allocational efforts by the aim of maximising the happiness of the family. Further, every member of the family is assumed to have a personal utility function, which is a function of individual income, $q$, and every working member has a personal disutility function related to his labour, $l$. The marginal utility from income is positive and non-increasing and the marginal disutility from labour is non-negative and non-decreasing.

$$U = U(q) \text{ with } U'(q) > 0 \text{ and } U''(q) \leq 0$$
Surplus labour is defined as that part of labour force in the peasant economy which can be removed without reducing the total output. However, a reduction in total family labour results in a positive marginal product of labour, even if it was zero to begin with, owing to the diminishing marginal product of labour. Thus, a smaller workforce would imply a smaller output. And a fall in the number of working members has to be compensated by a rise in the amount of work done per person for surplus labour to exist. This will be the case when the real labour cost remains constant despite the withdrawal of a part of the labour force. \( x \) is defined to be the "real cost of labour" and is given by the individual rate of indifferent substitution between income and labour. Or,

\[
Q'(L) = \frac{V'(l)}{u'(q)} = x,
\]

labour is applied up to the point where its marginal product equals the "real cost of labour".

Thus, the existence or otherwise of surplus labour depends on the marginal utility of income schedule and the marginal disutility schedule being flat in the relevant region, which in turn amounts to the fact that there is
perfect substitutability between consumption and leisure. Under these conditions a reduction in the size of the farm family does not result in a decline in output. For, those remaining on the farm would be willing to work harder since they are indifferent between work and leisure.

However, we find that the assumption of perfect substitutability between consumption and leisure is implausible. The bulk of the agricultural population in developing Countries are at or close to subsistence and therefore, value consumption very highly. Hence, to regard leisure as a perfect substitute of consumption is very far fetched. Sen's model does explain the coexistence of surplus labour with a positive wage, but under highly unrealistic assumptions.

An alternative model which attempts to reconcile the coexistence of surplus labour in agriculture with a positive wage is the Efficiency-Wage model, postulated by Leibenstein and Mazumdar. The basic axiom underlying this model is that a worker's productivity/efficiency is related to his level of consumption which in turn depends


on his income. Thus, there emerges a distinction between the supply of labour time (i.e., the man-hours) and the supply of work (or effort) units. And, given the possibility of variation in the efficiency of the worker with the wage paid to him, the wage rate can no longer be determined by the intersection of the demand and supply curves for labour because the supply curve itself varies with the wage level.

The significance of the wage efficiency relationship for the determination of the wage rate depends on the elasticity of supply of work units with respect to the wage rate. It is assumed both by Leibenstein as well as Mazumdar that starting from a very low level of wages, as the wage paid to a labourer is increased, the number of work units supplied by him increase more than proportionately, which in turn leads to a decline in the wage cost per work unit. After a certain level of wages is reached, however, the supply of work units per man increases proportionately less than the wage rate and hence with each successive increase in the wage per man, the wage per work unit goes on increasing (see figure 2.1).

In order to derive the demand for the individual worker's labour it is assumed that the available work is divided equally among all labourers—that is, the total labour force is employed. The wage rate must be
positive irrespective of the supply of workers relative to demand, given the existence of the wage-efficiency relationship. If the wage rate falls too low, the supply of work units per man will be so low that the total demand for work units cannot be met. The most profitable wage rate is determined by the equality between the marginal cost of a work unit and its marginal revenue product [see point A' in figure 2.1(b)]. The marginal revenue product curve facing the individual is simply the aggregate marginal revenue product curve scaled down by the number of workers.

In such a scenario, if there is a reduction in the number of workers, the marginal revenue curve swivels to the right since available work is now shared by a smaller number. The employer would thus find it profitable to pay a lower wage per work unit but employ the workers for more work, enhancing the worker's total income. And since in this range the efficiency of workers increases proportionately more than the rise in wage income, the original quantity of work units can be supplied with a smaller wage bill. The total supply of work by all labourers increases and so also does output. Thus, the interpretation of zero marginal product of labour is quite different in this model—the reduced labour force can
Wages per Man

Fig 2.1(a)

Wages per Work Unit

Fig 2.1(b)
supply more than the original quantity of work units but only with an accompanying rise in wages. And hence the marginal product of labour in a static equilibrium sense must necessarily be positive. However, a labour surplus exists in the sense that a smaller workforce can produce more inspite of the fact that the marginal product of labour is positive.

The explanation of surplus labour based on the wage-efficiency relationship was dismissed by Stiglitz\(^7\), Bliss and Stern\(^8\) and Basu\(^9\). According to them the nutritional explanation cannot be reconciled with profit maximisation. Since it is assumed that output depends on the number of efficiency units of labour used which in turn are a function of the wage a worker receives, the wage-efficiency relationship can be written as

\[ h = h(w) \]

where \( h \) is the total number of efficiency units produced.

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by each labourer and \( w \) is the wage rate. Total output \( X \) depends on the number of efficiency units used and is given by

\[
X = f[n \cdot h(w)]
\]

where \( n \) is the number of labourers. Now if labour were available to an employer at the subsistence wage \( \bar{w} \), it might seem that no rational employer would pay more than \( \bar{w} \). However, an employer facing an unlimited supply of labour will choose to pay the wage that minimises the average cost of one efficiency hour of labour since different wages buy labour of different efficiencies. And, since the cost of one efficiency unit is given by \( w/h(w) \), the wage \( w \) will be chosen to minimise \( w/h(w) \), provided that the optimum cost-minimising level of \( w \) exceeds \( \bar{w} \). Having selected his wage, the employer will then employ the required labour force to produce the output he desires.

Formally, the problem which the employer faces is

\[
\min \limits_{w,n} \quad w \cdot n \quad \text{s.t.} \quad f(nh(w)) \geq \bar{X}, \quad w \geq \bar{w},
\]

that is, the employer minimises his wage bill subject to producing an output \( \bar{X} \).
$h = h(w)$

Fig 2.2
Solving the above set of equations we get

\[ w = \frac{1}{h(w) h'(w)} \]

If \( w = w^* \) be the solution to the above equation, then \( w^* \) is the efficiency wage which is given by the tangent from the origin to the wage-efficiency curve [see figure 2.2]. At this point the average cost of an efficiency unit is equal to the marginal cost \( 1/h'(w) \).

Critics of the Leibenstein-Mazumdar hypothesis argue that if at the efficiency wage the supply of work units exceeds the demand, there is unemployment but it is open and not disguised. Further, Basu argues that any withdrawal of labour force, would, in such a situation, result in a decline in output. Thus according to the critics the wage-efficiency hypothesis cannot explain the existence of surplus labour.

However, the Stiglitz-Bliss-Basu critique ignores an extremely fundamental link in the wage-efficiency relationship---the consumption-productivity link is not instantaneous but a long term one. And, therefore, the employer will be reluctant to pay more unless there is a long run enforceable contract which binds the worker to
the employer. But, as Mazumdar has pointed out—a multiplicity of employers and the casual system of employment in agriculture, rules out the possibility of a high wage. The only profitable system of engaging labour is on a casual day-to-day basis and the total employment is consequently distributed among a large number of workers. In cases where a close approximation to a perfect long term contract is feasible—as for instance the case of "attached" or permanent labourers in agriculture—higher wages are paid in order to deter the labourer from leaving. However, permanent contracts in agriculture are not very common because of the seasonal nature of agricultural operations.

Thus, we find that under the casual system of employment, the efficiency-wage relationship does not operate and consequently there is a floor to the wages paid. In the long run, the wages are so low that all workers will be employed and the work units supplied will be extremely low. The total demand for work units will just be met when everybody is employed. Any withdrawal of labour from agriculture results in a rise in the wages of the remaining workers leading to a rise in the supply of work or efficiency units. Hence the agricultural output actually increases with the reduction in labour force. The
wage-efficiency relationship is thus able to explain the coexistence of surplus labour with a positive wage rate. But, the marginal product of labour in a static equilibrium sense is necessarily positive and the wage rate equals the marginal product of labour.

A model of surplus labour more in tune with Nurkse and Lewis (in the sense that a withdrawal of workers from agriculture leaves total output and marginal labour product unchanged) can however be developed. Assuming the existence of a long term relationship between wage and efficiency, the possibility of an enforceable long term employment contract and the seasonality of the production cycle in agriculture, Guha\(^\text{10}\) has argued that there emerges a trade-off between the positive effects of the permanent labour contracts on productivity and the costs of supporting permanent labour in seasonal idleness. Guha assumes a two period crop cycle with all the work concentrated in the second period. Permanent and casual labour are assumed to be perfect substitutes--but work efficiency of permanent labour is higher owing to their different consumption histories. The employer may choose to maintain a permanent work force at a wage \(w_p\) -- and thereby sustain their work efficiency by supporting the

\(^{10}\text{A. Guha, "Consumption Efficiency and Surplus Labour: A Reexamination of Issues", Journal of Development Economics, (forthcoming).}\)
work force during off season idleness. The work done by the permanent worker in the busy season is a function $h(w_p)$ of the wage that he draws during the offseason. The efficiency of the casual labourer is assumed to be a function $h(w_0)$ of his offseason income $w_0$, which is assumed to be generated by a diminishing returns process,

$$w_0 = g(n_c), \quad g' < 0$$

where $n_c$ is the number of casual labourers per acre of cultivated land.

Assuming constant returns to scale, the output generated per acre is

$$f[n_p h(w_p) + n_c h(w_0)]$$

where $n_p$ is the number of permanent workers per acre.

Profits are given by

$$\pi = f[n_p h(w_p) + n_c h(w_0)] - n_p w_p (2+r) - n_c w_0$$

where $n_p w_p (2+r)$ comprises the cost of supporting a permanent worker over the two periods.

Maximisation of $\pi$ with respect to $w_p$, $n_p$ and $n_c$ yields

1) $h'(w_p) = h(w_p)/w_p$
Equation (1) shows that the optimal $w_p$ is determined at the point at which the elasticity of the consumption-efficiency function equals one. Since, by assumption the elasticity of $h(w_p)$ is a continuously diminishing function of $w_p$, (1) determines $w_p$ uniquely at $\bar{w}_p$. Equation (2) implies that the employer would equate the marginal product of effective work to the cost per unit of effective work by permanent labour if he is to employ any permanent labour. A similar condition for casual labour is implied by equation (3). The employer's choice between casual and permanent labour depends on the unit costs of effective work done under the respective mode of recruitment. If $w_p(2+r)/h(w_p) < w_e h(w_0)$ only permanent labour will be employed. If on the other hand, $w_e h(w_0) < w_p(2+r)/h(w_p)$ only casual labour will be employed. The employer will be indifferent between the two modes of recruitment if $w_p(2+r)/h(w_p) = w_e/h(w_e)$.

The possible outcomes include (i) the coexistence of casual and permanent contracts with the number of workers affecting the proportion of permanent to temporary employees but not the aggregate output—the classical
disguised unemployment situation; (ii) exclusively casual employment with output negatively related to the number of workers—the Leibenstein-Mazumdar concept of surplus labour; and (iii) permanent contracts only, with open unemployment and a positive relationship between output and the number of workers—the Bliss-Stern-Stiglitz solution. A population size adequate to bring about an equality between the unit cost of permanent and casual labourers results in an interior equilibrium in the labour market with casual and permanent labour coexisting and the unit cost of effective work equals \( \bar{w}_p(2+r)/h(\bar{w}_p) \).

If, however, the size of the population is large enough to drive the unit cost of casual labour below \( \bar{w}_p(2+r)/h(\bar{w}_p) \), then \( f'\{nh\{g(n)\}\} > \bar{w}_p(2+r)/h(\bar{w}_p) \) where \( n \) is the total working population. In this case all employment is casual but marginal withdrawal of workers increases the work effect and output because of a more than proportional effect on working capacity—the Leibenstein-Mazumdar equilibrium. For very large populations, the irregularly employed may multiply without limit and their offseason income \( w_o \) may be driven so low that they can no longer work in the busy season. A part of the workforce is employed on a permanent basis in order to maintain the levels of work done and output produced and
the rest of the population would be openly unemployed. This situation is closest to the one envisaged in the Bliss-Stern-Stiglitz model.

Thus, Guha's nutritional model is able to explain the characteristics displayed by the Leibenstein-Mazumdar model of surplus labour as well as the Stiglitz-Bliss-Stern model. It is also able to explain the coexistence of permanent and casual labour contracts in agriculture.