CHAPTER I

PROBLEM SETTING
CHAPTER-I

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1.1 INTRODUCTION

The term labour absorption means the total labour that is used or utilised in the process of production. The term’s absorption and utilisation, which are interchangeably used, refer to the labour employed rather than the labour required in agriculture. The actual labour employed may be more or less than the labour required. Labour required is the amount of labour to be put in the production process to get the optimum production.

Unlike in the secondary sector, in the agricultural sector the input output relations are not clear to determine the right amount of inputs required to obtain maximum profit. On the other hand, farmers may maximise output instead of profits. Due to seasonality factor in agriculture, it is very difficult to use the necessary amount of labour required. Farmers may employ less than the required number of workers in the peak season due to shortage of labour and more in the lean season due to social obligations that would force the farmers to accept extra hands every day. Hence it felt necessary to make explicit the terms “Labour absorption”, “Labour utilised”,

and "Labour used" and "Labour demand" are all used as synonymous. In the present study all these terms connote labour actually employed rather than required.

1.2 IMPORTANCE OF LABOUR ABSORPTION

Since Labour is the most significant and important factor of production both from the social and economic point of view, it is an extensively studied input. As for as agriculture sector is concerned, it is said to be over burdened with excess and unproductive labouring most of the under developed countries. Moreover, the rural labour markets are characterised by high seasonality resulting in over use in peak season and under-use in lean season. Inelastic supply of labour in peak season, leading to mechanisation and similarly lack of demand for labour in lean season is the major causes of poverty John Mellor (1976). Peak season being of very short duration the stress is always on the demand side of labour market.

India is one among the many developing countries where low demand for agricultural labour is co-exists with low per acre yield. While it is generally argued that crop yields could be improved through increases in per hectare labour input, the crux of the
Demand problem as to how to achieve this still remains to be solved Kusum Nair (1983).

I.3 FACTORS DETERMINING LABOUR DEMAND

It may be pertinent to note that the input demand functions are analogous to the consumer’s ordinary demand functions in many respects. The major difference is, that while consumer demand for a commodity is ‘direct’ demand, the demand for an input is derived from the demand for the commodity it produces. Conventional demand theory specifies that the higher the price smaller the quantity demanded and “vice-versa”. In the same way, for input demand function also, the most important determinants are its price, prices of other inputs and its output.

As far as agricultural labour is concerned, the market forces may not act in the same manner as they act in the case of other inputs or commodities. In the rural labour market, so long as the supply of labour exceeds the demand for it, reducing wages to equilibrium level may not be effective in reducing under utilisation of labour. Instead it may reduce the total wage bill due to inelastic demand for labour in agriculture Booth and Sundaram (1984).
According to Johnson and Cowine (1969) the wage subsidies are not effective policy instruments for accelerating employment. Hence in these countries where labour is abundant, even at very low wage rates it may not be possible to absorb the available labour force fully.

Agriculture being seasonal, where the slack season continues for a long time, the relationship between demand for labour and wage rate may not move in the same direction as it would otherwise. Under conditions of inelastic supply of labour, demand plays an important role in determining equilibrium wage rate. This may be due to the existence of an oligopsonistic competition in the rural labour market. This is because in peak season labour becomes relatively scarce and farmers compete among themselves by offering higher wage to get required amount of labour. On the other hand, in the lean seasons when labour is excess relative to the demand for it, labourers would be willing to work even for lower wages offered by the farmer, which often may touch subsistence wage level. Infact, as Mishra (1982) pointed out, it is at the low level of wage rate and in the absence of other alternatives that more and more labour would offer themselves for employment in order to get subsistence level of
income for the family. Hence, it appears that the role of wage rate determining demand for agricultural labour is over emphasised.

On the contrary, factors other than wage rate may have a greater role in determining the demand for agricultural labour. Most of the studies reveal that the demand for agricultural labour is elastic with regard to some other factors Bisalaiah (1987). In order to increase employment in rural areas, the stress has to be on these factors that determine or have a significant impact on the demand for agricultural labour. The important factor influencing demand for labour is quality of land, irrigation, bio-chemical inputs (HYV seeds, fertilisers, pesticides, etc.) and mechanical inputs (Pumpsets, Tractors, Threshers, etc.). Apart from these factors, institutional factors such as farm size, tenancy etc, influence labour absorption. These aspects are discussed in detail in the following sections.

I.4 QUALITY OF LAND-A DETERMINANT

The quality of land is mainly determined by its Soil content, type and quality which differs from region to region. The cropping pattern suitable to a region or regions is determined by the quality of land. To determine the soil quality and quantifying its impact on labour demand is not an easy task. However Vaidyanadhan (1978)
tried to estimate the impact of quality of land on labour absorption by taking productivity of land as a proxy for the quality of land, and agro-climatic conditions and other physical inputs. But the quality of land cannot be viewed separately, as there are other important variables like physical inputs, which are highly correlated with productivity. Land revenue can be an alternative proxy for quality of land but it is often linked with the level of irrigation. Besides these difficulties involved in determining the soil quality one should not be obsessed with the measurement of soil quality, cropping pattern etc. Hence, the impact of irrigation on labour demand covers the soil quality aspect to a larger extent.

1.5 IMPACT OF IRRIGATION ON LABOUR DEMAND

It is an established fact that irrigation leads to more intensive use of labour per unit of land. It requires extra hands for preparing channels, bunding etc. It increases cropping intensity, which in turn needs more labour force and also induces shift in cropping pattern in favour of more labour intensive crops like sugarcane, paddy etc. Water is needed not only for assisting the biological process of plant growth but also for the physical preparation of soil, prior to sowing which needs more labour in the absence of
mechanisation. Labour intensity of irrigation also depends on the techniques of irrigation Raj (1993). When it comes to the comparison of irrigated and unirrigated crops, former has proved to be more labour intensive than the latter Shakuntala Mehra (1976).

However, Desai (1970) has noted a negative association between irrigation and labour input. Mishra (1987) attempted to analyse the impact of irrigation on labour use (in Cuddapah, Coimbatore, West Godavari districts) categorised districts into low and high district and noted that the impact of irrigation on labour use was much lower in high labour absorption on district probably this may be due to the existence of higher level of irrigation in the higher labour absorption districts. Barring these exceptions, irrigated cultivation is more labour intensive than dry cultivation. However, the impact of irrigation on labour use differs across crops and regions. Table I.1 gives the labour input use in irrigation on labour in irrigated and unirrigated cultivation for different crops across regions. The Farm Management Survey indicates that the rise in labour input per acre due to irrigation ranges from 15% for paddy in West Godavari district of Andhra Pradesh to 50% for cotton in Coimbatore and Salem district of Tamilnadu. In Karnataka, it was
found that the employment of landless labour per head increased by 74% after the advent of irrigation Nadkarni (1979).

TABLE I.1
EMPLOYMENT IN MAN-DAYS PER ACRE IN IRRIGATED
AND UNIRRIGATED AREAS

<table>
<thead>
<tr>
<th>SN.</th>
<th>Crop</th>
<th>District</th>
<th>Irrigated</th>
<th>Unirrigated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Paddy</td>
<td>West Godavai</td>
<td>48.00</td>
<td>41.00</td>
</tr>
<tr>
<td>2</td>
<td>Wheat</td>
<td>Ahmednagar</td>
<td>45.50</td>
<td>16.80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nasik</td>
<td>53.90</td>
<td>13.30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Meerut &amp; Muzafar Nagar</td>
<td>34.00</td>
<td>28.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Amrutsar</td>
<td>26.60</td>
<td>14.40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ferozpur</td>
<td>27.84</td>
<td>12.90</td>
</tr>
<tr>
<td>3</td>
<td>Jower</td>
<td>Coimbatore and Salem</td>
<td>57.0</td>
<td>17.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ahamed Nagar</td>
<td>32.40</td>
<td>10.00</td>
</tr>
<tr>
<td>4</td>
<td>Bajra</td>
<td>Cuddapah</td>
<td>98.00</td>
<td>51.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coimbatore and Salem</td>
<td>39.70</td>
<td>16.00</td>
</tr>
<tr>
<td>5</td>
<td>Ragi</td>
<td>Coimbatore and Salam</td>
<td>78.20</td>
<td>30.00</td>
</tr>
<tr>
<td>6</td>
<td>Cotton</td>
<td>Coimbatore and salam</td>
<td>75.50</td>
<td>14.60</td>
</tr>
</tbody>
</table>

Source: computed from farm management survey 1971-76

I.6. BIO-CHEMICAL AND MECHANICAL INPUTS

Introduction of these complimentary to substitutability of the traditional inputs like Land and labour is relatively a recent Phenomenon. In less developed countries, Bio-Chemical and
mechanical inputs started in 1960's. This process known as Technological revolution or Popularly known as Green revolution is a package of new inputs like High Yielding Variety seeds, fertilisers, pesticides, pumpsets, tractors, harvest combines etc. The advent of new technology has led to changes in cropping pattern and methods of production.

Broadly, the modern inputs can be categorised into labour using and labour saving (Ishikawa, 1978). Those inputs, which replace land (e.g. Fertilisers), are landeseque and those, which replace labour (e.g. Tractor), are laboureseque (Sen 1972). We shall examine here laboureseque factors in more detail though we do not order the two (landeseque and laboureseque) factors in any order of priority.

1.7 LABOUR USING TECHNOLOGICAL FACTORS

The factors such as irrigation and drainage, HYVs, fertilisers and improved cultivation practices are not only labour using but also yield increasing. This innovation is normally believed to be capable of employment generating and distributing it evenly through out the year, thus reducing seasonal underemployment and intensity of poverty of landless and landed poor (Bardhan 1977).
A number of studies have observed positive impact of new technology on labour use, for instance *Johnston and Cowie (1969)*. According to *Yudelman and others (1971)* the HYVs can affect labour use in the following ways. (i) Given the adequate water and fertiliser to short duration crops, multiple cropping becomes possible, resulting in increasing demand for labour. ii) As the yield rate per acre of HYV is higher relative to local varieties, there is a direct increase in labour requirement under HYV technology especially during harvesting season and iii) the cultural practices required for the realisation of full potential of new varieties are also more labour intensive compared to traditional practices. For instance more labour is required to be spent for seedbed preparation, careful planting and fertilisation, weeding and for water control. Due to one or more of these factors the increase in labour use due to HYV’s ranges from 6% in Maharastra (*Martin Billing and Arjun Singh, 1971*) to 57% in Uttar Pradesh (*Garg, et.al. 1972*).

Further, the impact of HYV’s on labour use (demand) is biased neither towards family nor hired labour (*Iqbal Singh et al, 1983*). Additional employment created due to HYV’s is distributed between family and hired labour in Karnataka, though not equally
(Parameswara, 1983) but the utilisation of family labour on highly progressive farms (with high proportion of area under HYV's and mechanisation) was less as compared to the traditional and less progressive farms. But the progressive total labour utilisation was found to be the highest among the highly progressive farms (Iqbal Sing et al, 1972). It can be attributed to income effect and changed outlook of progressive farmers and mechanisation.

Differences in the impact of HYV's on labour use across size classes are also attributed to higher proportion of area under HYV in higher size classes, which result in more labour use. According to (Garge, et al, 1972), the higher use of labour on large farms in the early years of HYV introduction might be due to the adoption of HYV's on large area. However in the latter years, labour use on these farms declined slightly because of labour scarcity consequently to over all increase in the area under HYV on all the farms. Another study of Punjab (Chawals et al, 1972) also reveals the increase in employment is more for large farms than small and medium farm growing HYV when compared to large, small and medium farmers growing local varieties.
From the above discussion, it is clear that the impact of HYVs and family labour across size classes is not conclusive; the advent of HYVs has undoubtedly led to an increase in total labourers. But in Saurashtra HYV wheat required less per acre labour than local wheat variety which is attributed to the short duration of the crop (Desai, 1970).

Like the other bio-chemical inputs, fertiliser too exerts a major influence on crop yield. While measuring its impact on labour use it is always clubbed with other inputs like seeds, farm yard Manure, Pesticides, etc., which make the separation of its impact difficult. Available studies reveal that the impact of these inputs on labour use is positive (Billings and Singh, 1971). The influence of these inputs on labour absorption can be of two kinds. viz, i) Increasing labour input directly (by the amount of labour required for its use) and ii) Indirectly through increased production. Of these inputs, farmyard manure is expected to be more labour intensive than fertiliser and pesticides because it needs more labour for transporting and spreading than the other. A study of Japan (Sawada, 1984) reveals that fertilisers are responsible not only for increasing per acre yield but also saving labour by particularly replacing green manure use especially manure from materials away
from the farm. However, in the Indian context, as there is no evidence in this regard, fertilisers along with other inputs are believed to have a positive impact on labour demand.

One major problem with these labour using or land augmenting inputs is the high complementarity among themselves. At times, HYV seeds are not very effective unless substantial amounts of fertilisers are used. Response of seeds to fertilisers cannot occur in the absence of water and hence irrigation fertilisers and pesticides are complementary in some regions (Griffen, 1974).

1.8 LABOUR SAVING TECHNOLOGICAL FACTORS

One of the main factors that differentiate agricultural production process from others is the source of energy used in agricultural operations (Bina Agarwal, 1983). Agriculture has been undergoing fairly rapid mechanisation in part of south Asia during the last two decades. The process has been conspicuous in certain areas like Punjab.

Normally, farmers opt for mechanisation if it is more profitable than the biological source of energy. In a labour abundant economy like India the scarcity of labour is felt only during peak seasons. The
size specific nature of mechanisation helped big farmers to solve the peak season labour problems. Most of the mechanical devices are concentrated among big landowners who use them mainly to substitute labour.

In India, well irrigation and tractor usage are the main components of mechanisation. Well irrigation is a more labour intensive device of irrigation than the canal irrigation. Open well irrigation need more labour for preparing channels, operating the source and close over all management of operation (Bina Agarwal, 1983). Well irrigation leads to more intensive cropping, because of assured irrigation. In most of the areas, canal irrigation is limited to one crop only whereas well irrigation provides round the year irrigation.

When open well irrigation or tube well irrigation is compared with canal irrigation, then the farmer seems to be more labour intensive (Bina Agarwal, 1983). But when it is compared with Persian wheel or Mhot irrigation it appears to be labour displacing. Mishra, (1982) has shown that the availability of pump set per thousand hectares does not influence labour use significantly. Raj (1973) was inconclusive in establishing any relationship between
mechanisation of irrigation and labour use. In fact a study of Rajasthan it was revealed that pump sets displace labour by 18% to 20% before accounting for cropping intensity. *Acharya (1973) and Rudra (1977)* states that pumps and tube wells create demand for Casual labour in the place of permanent labourers, but total labour use is always less than on non-mechanised farms.

Tractors form major capital investment in farming even for a large farmer and is a labour saving technology. Labour displacing capacity of tractor depends mainly on its intensity of use. Quite a few studies support the labour displacing hypothesis of tractorisation. However, the labour displacement effect of tractors is not conclusive. Some studies found that tractorisation leads to displacement of family labour and increase in permanent and casual labourers (*Kahlon and Gill, 1967*). *Rudra (1971)* also observes that tractor using farms need an extra farm servant if compared with non mechanised farms and two extra farm servants when compared with farms having pumps and tube wells, though the displacement effect of tractor on total labour use is found to range from 26% per acre (*Kahlon and Grewal, 1971*) to 50% (*Acharya, 1973*) in punjab.
However, tractorisation also increases labour absorption by way of higher cropping intensity and yield per acre. If tractor usage is limited to peak seasons due to rise in the scale of operation through increased cropping intensity and per acre yield. It can lead to a net increase in farm employment (Rao, 1972). Many studies show that even if tractorisation does not increase labour absorption, it does not lead to labour displacement (Dawlaty 1972). After reviewing the studies on tractor use in agriculture, Binswanger (1978) concludes that the use of tractor is associated neither with an increase nor a decrease in per hectare labour use though evidence may slightly favour a decreasing effect.

In brief, displacement effect of tractor on labour utilisation is not very conclusive, because in most of the cases the utilisation of tractors is not a labour intensive operation like puddling sowing and harvesting. This displacement of labour would have been much higher if tractors were used in all the operations. As pointed out by Kahlon and Grewal (1972) mechanisation in agriculture follows a time path and only in advanced stages of mechanisation, displaces labour. However, in the early stage bullock labour is displaced. One additional explanation for this inconclusive employment affect of
tractor may be as follows: unless the effect of seed-water-fertiliser innovation is separated from tractorisation, it is difficult to arrive at a concrete conclusion. Hayami and Ruttan (1970) points out that in Japan and America the seed-fertiliser might be labour saving when its effects are not separated from tractor. According to Raj Krishna (1974) the indirect employment effect of tractorisation always ends up in attributing to tractors, some of the effects that are really due to other innovations and farm practices.

In the case of harvest combines and mechanical threshers, there is hardly any disagreement regarding their negative impact on labour absorption, unlike pump sets and tractors their land augmenting potential is limited. Mechanised harvesting and threshing are unambiguous cases of labouresque mechanisation (Booth and Sundaram, 1984). Use of these mechanical equipment’s is limited to Punjab and Harayana and hence literatures on its impact on labour absorption are confined to the Punjab experience only. These studies conclude that mechanical devices lead to displacement of labour (Kahlon 1967). It is found that mechanical threshers need only 2.5 man-hours, as against 10.5 man hours and 5 bullock hours required in the traditional palla system to threshing
(Kahlon and Gill 1967). A study by Billing and Singh (1971) found that 5% decline in labour demand after the introduction of mechanical threshers. According to them “reapers” and “corn Sheller’s” use $1/5^{th}$ and $1/7^{th}$ of the labour needed for traditional methods. While Rao study reveals that harvest combines, and mechanical threshers displace 40% of labour if used along with tractors. Bina Agarwal’s (1983) study on Punjab shows that mechanisation of threshing displaces mainly family labour and to some extent casual labour on smallholdings (below 12 hectare) whereas in large holdings it displaces family and permanent labour. Thus, the impact of mechanical devices on labour use depends on the kind of machinery used and the intensity of its usage. Moreover, the usage of advanced techniques like, threshers, harvest combines, etc, is very limited in India.

I.9. INSTITUTIONAL FACTORS

Institutional factors like farm size and tenancy are important catalytic determinants of labour absorption. As evident from the farm management surveys, labour use is inversely related with farm size (Bhardwaj 1974 and Singh 1972) show that this inverse relationship holds good in most of the regions. The factor that have

Quality of land depends on the nature of soil and irrigation. As irrigation helps to increase quality of land and cropping intensity, these three factors are interrelated. In most of the districts, except in Madras irrigation and cropping intensity are inversely related to the farm size (Bharadwaj, 1974 and Khusro, 1973) considered land revenue as a proxy for quality of land and found gross output, net profit and paidout cost per acre decline by holding size largely disappears. Regarding the cropping pattern, small farmers put in more labour per hectare on individual crops and go in for a more labour intensity-cropping pattern due to availability of family labour (Shakuntala Mehra, 1976). In dual farming system, small peasant households maximise gross output with family labour and bigger capitalistic farmers maximise profits with hired labour (Sen 1964).

But the statistical basis for most of the studies is questionable. Usha Rani (1971) found the relationship between farm size and labour use to be not statistically significant in all the regions. Even Rudra and Sen (1980) warn against treating farm size as the only
significant parameter in affecting the utilisation of labour. In a study of Maharastra the relationship between farm size and labour input was of an inverted ‘U’ shape (Ghodke 1973).

The relationship between farm size and employment depends on various factors like percentage of irrigated area in each size class, availability of complementary inputs, etc. If medium size farmers use more of these inputs per unit of area than small and large farmers, then the inverted ‘U’ shape relationship is expected. Thus the inverse relationship between farm size and labour use might differ from region to region and time to time.

A few available, studies on the influence of tenancy on labour use do not give any clear cut idea as to whether it leads to higher labour absorption or labour displacement. According to Khurso (1973) the proportion of land leased increases along with size of holdings. Farmers apply themselves and other inputs qualitatively better than on their own lands on leased-in-lands (Khurso, 1973). This indicates that tenancy leads to displacement of labour, (Bardhan and Rudra, 1978).

It is also found that higher labour intensity on own farms when compared to tenant farms (Bardhan and Rudra 1978). But
contrary to this, some studies show that there is no significant relationship between land tenancy and labour use (Ghose, 1981). This may be ascribed to cost sharing by the landlord and HYV growing tenants that would have worked as an incentive to increase output through increasing use of other inputs like labour (Oberoi and Ahmed, 1981). Infact, a recent study (Lakshminarayana and Tyagi, 1978) reveals that in the 1970's the proportion of land leased-in-to total land is inversely related to farm size in India which contradicts Khurso's (1973) findings. Even in Indonesia, Pakistan and Philippines the data shows the same kind of inverse relationship (Booth and Sundaram, 1984). Therefore the discussion on the impact of tenancy on labour use remains inconclusive.

1.10 LABOUR ABSORPTION AND FACTOR PRODUCTIVITY

So far, the discussion centred around the impact of various factors on labour absorption only. Unless the labour already working on farms or the additionally absorbed labour is productive, it would lead to an increase in the redundant labour on farms; therefore productivity of additional agriculture labour is important (Barker et al 1973). Any factor of production, for that matter has to be employed productively for efficient running of the activity.
Productivity of a factor is decided on the basis of whether its marginal value product is equivalent or more than or less than its marginal cost, if the marginal value of an input is less than its marginal cost than the input is not productively employed to maximise profit. In Indian agriculture, it is believed that labour is being used excessively (where marginal productivity of labour is either zero or low which in turn has given rise to disguised unemployment Alagh et al (1978) in their study of 281 districts, found that the land yields are inversely related to land man ratio both in 1960's as well as 1970's even in the regions classified according to their growth of output. A recent study of Karnataka indicated that the inverse relationship between land-man ratio and land yields holds good in Karanataka though it does not seem to be true in all regions (Venkata Ramana, 1986). Hence it is possible to increase labour use in agriculture without foregoing productivity of labour. Eve the case of other Asian Countries, it was found that per hectare out put and labour input are positively associated (Ishikawa, 1978). Whereas the other inputs like material inputs, irrigation etc, are under-utilised in Indian agriculture. Low usage of these complementary inputs has been one of the main reasons for inter-regional variations in labour use. Therefore, productive
employment can be generated by increasing use of labour and other complementary inputs.

**I.11 CONCLUDING REMARKS**

The above discussion indicated that the impact of various factors on labour demand is not very conclusive. Often the impact of these factors on labour use varies from region to region and time to time. Hence, it would be interesting to probe into deeply in order to analyse the impact of this factor on labour absorption at regional level and at different points of times.

Some important propositions emerging from the above discussion which need to be probed into are as follows: i) wage rate may not influence labour absorption to the extent of reducing under utilisation of labour ii) irrigation and seed-fertiliser use result in increasing labour use iii) labour displacement effect of tractor use mainly depends on the intensity of its use. There may be possibility of inverse relationship between farm size and per acre labour use.

Agriculture dominates the economy to such an extent nearly 69% of the work force in rural India has been engaged in agriculture sector (population census 1991) and there was hardly any significant dent on occupational diversification during last few
decades (Acharya, 1992). With the declining trend in the share of agriculture vis-a-vis other sectors in the total net domestic product, the income of agricultural workers is likely to dwindle in both absolute and relative terms. Over time, the casualisation of agricultural labourers is on the rise and in the light of the apprehensions of a falling employment elasticity of agricultural output the levels of living to fall further (Parthasarathy Padmanabhan and swaminatdhan, 1994) to prevent such epimerisation in the growth process, the need for identification of various ways and means of increasing the productive labour absorption in the key sector viz., agriculture hardly be laboured.

A number of studies have been conducted during the 70's and 80's with a view to assess the magnitude of labour use in agriculture and also to identify the key factors favouring the labour absorption (Hanumantha Rao 1975, Mehra 1776, Bardhan 1977, Ishikawsa 1978, George and Raju 1980). A few studies have hypothesis an inverted U shape relationship between land holding size and labour use (Rao, 1974) while a few examined the labour use under different typologies viz., irrigated agriculture, rain fed agriculture and agriculture in hilly region (Rao 1978, Hanumantha Rao and Mohan
Rao 1982, Radha Krishna, Reddy and Mitra 1995). The trends and patterns in employment and also gender dimensions have been reviewed by a few others Bhalla (1987), Basant Rakesh (1987), Radhakrishna (1993), Padmanaban and swaminathan (1994). It can be inferred form these studies that several factors are at play determining the quantum and type (male/ female) of labour use in crop husbandry which include cropping pattern, technology wage rate, nature of labour markets farm size category and type of geographic location. It is evident that some of these factors are interrelated and the isolation of the pure effects of each factor on employment situation becomes a difficult task. One conclusion that emerges out of these studies is that with net irrigated areas expanding at the rate of 2.5% per annum, the rate of labour absorption would be hardly 1%. Given the current rate of growth of labour force at 2.6% the agriculture sector ceases to be a potential source of employment.

Most of the developing economies like India have experienced rapid growth of population and labour force in recent decades. The population census, NSS and Rural Labour Enquiries provide information at a macro level regarding labour force participation and unemployment in India. It is relevant to substantiate the growth
rate of population, Labour force participation and unemployment rates, to provide perspective to the present in the study.

TABLE 1.2
GROWTH OF POPULATION IN INDIA

<table>
<thead>
<tr>
<th>Year</th>
<th>Number in Millions</th>
<th>Growth of population (In percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961</td>
<td>439.10</td>
<td>21.60</td>
</tr>
<tr>
<td>1971</td>
<td>548.20</td>
<td>24.80</td>
</tr>
<tr>
<td>1981</td>
<td>683.30</td>
<td>24.66</td>
</tr>
<tr>
<td>1991</td>
<td>843.90</td>
<td>23.50</td>
</tr>
</tbody>
</table>

Source: Various census reports

TABLE 1.3
THE ANNUAL GROWTH RATE OF POPULATION

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Year</th>
<th>Average Annual Growth Rate (in percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1941-51</td>
<td>1.25</td>
</tr>
<tr>
<td>2</td>
<td>1951-61</td>
<td>1.96</td>
</tr>
<tr>
<td>3</td>
<td>1961-71</td>
<td>2.20</td>
</tr>
<tr>
<td>4</td>
<td>1971-81</td>
<td>2.22</td>
</tr>
<tr>
<td>5</td>
<td>1981-91</td>
<td>2.11</td>
</tr>
</tbody>
</table>

Source: Various census reports
### TABLE I.4

**Labour Force Participation Rates by Sex**

<table>
<thead>
<tr>
<th>Approach</th>
<th>Rural Male</th>
<th>Rural Female</th>
<th>Sex ratio of labour force</th>
<th>Urban Male</th>
<th>Urban Female</th>
<th>Sex ratio of labour force</th>
</tr>
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<td></td>
<td>87-88</td>
<td>93-94</td>
<td>87-88</td>
<td>93-94</td>
<td>87-88</td>
<td>93-94</td>
</tr>
<tr>
<td>Usual status principal</td>
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<td>549</td>
<td>254</td>
<td>237</td>
<td>407</td>
<td></td>
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<tr>
<td>Principal and subsidiary</td>
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<td>561</td>
<td>331</td>
<td>330</td>
<td>556</td>
<td></td>
</tr>
<tr>
<td>Current status weekly</td>
<td>526</td>
<td>547</td>
<td>229</td>
<td>276</td>
<td>475</td>
<td></td>
</tr>
<tr>
<td>Daily</td>
<td>525</td>
<td>534</td>
<td>223</td>
<td>232</td>
<td>410</td>
<td></td>
</tr>
</tbody>
</table>

The labour force participation rates are defined as the number of persons in the labour force per 1000 persons. In the above table 1.3 the LFPR, based on different concepts are of all India. The corresponding rates obtained from 43 round (1987-88) survey are also given in the table for comparison. During the period of six years upto 1994 usual status of LFPR’s have increased by about 1% for males and remained stable for females, in both the sectors. In 1993-94, about 56% of rural males and 33% of the rural females were usually available for employment. The corresponding urban proportion was 54% and 16 % respectively. Compared to the current status, the usual statuses LFRS’s were higher in both the sectors and much higher for rural females. This indicates that some of the usually employed withdrawn from labour force, when there is no work during some part of the year rather than report themselves as unemployed in the current status. It is more evident that for females in the rural areas where the seasonality work is known to be substantial.
Table 1.5 depicts unemployment rates on usual status, current weekly status and current daily status. The unemployment rates obtained under various approaches adopted for its measurement are provided in the Table 1.5 for all India. The proportion of the unemployed is given in parentheses along with rates. Although the unemployment rate was also absent in the rural areas, it was
significant in urban areas and the rates were high among urban females according to all the approaches. The unemployment person day rates were higher than the rates obtained for person day rates were higher than the rates obtained for person including a high degree of intermittent unemployment. This is mainly due to the absence of regular employment.

According to 1961 census number of unemployed in India was 1.40 million of which 0.60 millions were in rural area and the rest in urban areas, by 1971 the number of unemployed swelled to 3.30 millions of which 1.82 million were in rural areas and the remaining 1.48 million were in urban areas. Of the total unemployed persons 2.77 million were males and 0.53 millions were females. The rate of increase has been much higher in rural areas rather than in urban areas. The latest data available from NSS and are the First, second, third, fourth and fifth quinquinal surveys 27th round of 1972-73, 32 round of 1977-78, 38th round of 1983-84, 43rd round of 1987-88 and 50th round of 1993-94 of unemployment. The estimates of different aspects of active population are based on three approaches (50th round of NSS 1993-94) i.e. 1) usual status, ii) current weekly status and iii) current daily status. Under each of these three approaches the population is classified into three categories,
working (employed) not working but available for work (unemployed) and neither working nor available for work (out side the labour force). The estimates of unemployment rates over various NSS rounds 27, 32, 38, 43 and 50th are given in the below table.

<table>
<thead>
<tr>
<th>Survey period and round</th>
<th>Male</th>
<th></th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Us (Adj)</td>
<td>Us</td>
<td>cws</td>
</tr>
<tr>
<td>Rural</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1972-73 (27)</td>
<td>-</td>
<td>12</td>
<td>30</td>
</tr>
<tr>
<td>1977-78 (32)</td>
<td>22</td>
<td>13</td>
<td>36</td>
</tr>
<tr>
<td>1983-84 (38)</td>
<td>21</td>
<td>14</td>
<td>37</td>
</tr>
<tr>
<td>1987-88 (43)</td>
<td>28</td>
<td>18</td>
<td>42</td>
</tr>
<tr>
<td>1995-96 (50)</td>
<td>20</td>
<td>14</td>
<td>30</td>
</tr>
<tr>
<td>Urban</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1971-72 (27)</td>
<td>-</td>
<td>48</td>
<td>60</td>
</tr>
<tr>
<td>1977-78 (32)</td>
<td>65</td>
<td>54</td>
<td>71</td>
</tr>
<tr>
<td>1983 (38)</td>
<td>59</td>
<td>51</td>
<td>67</td>
</tr>
<tr>
<td>1987-88 (43)</td>
<td>61</td>
<td>52</td>
<td>66</td>
</tr>
<tr>
<td>1993-94 (50)</td>
<td>45</td>
<td>40</td>
<td>52</td>
</tr>
</tbody>
</table>

The corresponding rates obtained from various quinquennial surveys are given on the above table 1.6. It may be recalled that for the 27th round survey only the usual status (adjusted) figures are available. For all the statuses, no definite trend is observed in the all unemployment rates over the period 1972 to 94. The fluctuations were more for female. However the rates were substantially lower in 1993-94 compared to those in 1987-88 except in the case of current daily Status rates for rural males for which there was a slight increase. The effects of seasonality within a survey period is prominent from current weekly status and current daily status estimates, as there are intended to capture the component of the unemployment.

According to 1991 census, 77.63% of the total population lived in rural areas and depended on agriculture. Indian agriculture supports the largest share of the working population of the economy. The small farmers and landless labourers constitute about 80% of rural community and they depend on agricultural employment for their subsistence. Substantial part of the work-force, engaged in this sector suffers from chronic under employment in the sense that per worker disposal labour time, per year is not fully utilised. The peculiar characteristic of agriculture is its abundant supply on most
of the farms, except during the peak operation period when the majority of the farmers experiences scarcity of farm labour. It has also been observed that labour absorption input per unit of land is the lowest in Indian agriculture compared to some East Asian countries and this associated with low level of agriculture output per unit of area. (Ishikawa, 1978).

**L12 PROBLEM SETTING**

Generation of gainful employment in agriculture has become difficult in the traditional framework of agriculture. For instance, according to 1991 census, in the total rural labour force of 249.3 million, nearly 221.6 million main workers do not find regular employment. Further, the degree of underemployment or disguised unemployment is also high in rural areas. Absorption of this surplus labour in gainful activities is the major preoccupation of growth strategies in India. On the basis of the experience of the developed countries, it has been suggested that the surplus labour force have to be transferred from agriculture to the secondary and tertiary sectors. Since the scope for absorption of additional labour force in agriculture is limited (Rostow, 1971). Later, a new line of thinking has emerged which advocates that there is still scope for absorbing
additional labour force in agriculture sector itself by introducing land augmenting technology Morten Pallin (1965). The advent of seed-fertiliser technology in the sixties and the successful augmentation of output in subsequent decades have generated more opportunities in agriculture. In fact, the new technology has been found to be labour absorbing rather than labour replacing as predicted (Turham, 1970).

The technological change as experienced in the wake of the green revolution has brought about changes such as use of high yielding variety seeds, chemical fertiliser, farmyard manure and better water management. These changes have led to marked changes in the output per acre. It is opined that though the high yielding variety programme has increased the demand for labour, wage rates have not raised, as the supply of labour was quite elastic. It is also seen that the medium and large farms have intensified their agriculture by double and multiple cropping. This has led to the mechanisation of farm operation and a decrease in employment of farm labour. A feature of the new technology is that skilled labour is needed to perform the water, soil and crop management practices and to maintain the machinery (Shah and Singh, 1970).
Output per hectare is positively associated with labour input per hectare. The association is explained by the extent of cropping intensity, which has a bearing on both labour intensity and yield per unit of area. The latter is again facilitated by the expansion and improved management of irrigation. The difference in agro-climatic conditions (rainfall, soil condition, etc.) have also influenced the level of labour utilisation and yield per hectare (Vaidyanathan, 1978). Thus, it is possible to show that favourable agro-climatic conditions have lead to profitable utilisation of manurs and fertiliser and also higher utilisation of labour. The use of labour is further intensified by the non-availability of animal power.

Many structural changes have been effected to transform low productivity-agriculture into one of high productivity and to provide employment to the farm workers. The technological changes call for more frequent application of water, fertiliser, insecticides and weeding. Multiple cropping, better transplanting, scientific farming and sowing and other improved agriculture operations are also looked at. All these processes need more labour. Therefore, it is believed that new farm practices would reduce the acute problem of underemployment. In fact, introduction of new technology is viewed

Irrigation is the principal factor of agricultural development in a country where rainfall is inadequate and is universally agreed both in terms of time and space. In a situation like this, growth in agriculture largely depends on the expansion of irrigation facilities, which in turn promotes double and multiple cropping with greater use of strategic inputs like fertiliser. While rapid growth in production is the primary result of irrigation development and employment is one of the important secondary effects that follows. In this context, it is well observed that the improvement in the standard of living and generation of additional employment opportunities at the required level of productivity will have to be obtained through the expansion of irrigation and the spread of new technology (Patel, 1981).

The use of tractor for ploughing, threshing and transportation has replaced the human and bullock labour. It however, facilitates multiple cropping as well as raising yield per acre owing to the better quality of tractor ploughing. Further, there may be some complementarity between the use of tractors and high yielding
varieties. Thus, whereas, the immediate impact of tractor use in the technological displacement of labour, additional employment may be generated for inter-culturing, harvesting and similar activities through its secondary or dynamic effects. The latter effects may be significant in developing countries where there is a growing demand for agricultural commodities, which acts as an incentive for the farmers to expand the agricultural output. Thus, the overall impact of tractorisation on farm employment depends upon the extent to which its labour augmenting effect is compensated by its land-augmenting effect (Sen, 1974).

The introduction of high yielding variety has not only raised the agricultural production per unit of area it has also reduced rural unemployment. The higher labour input has been caused on account of intensive use of land in terms of ploughing, higher fertilisation, intercultural operations, irrigation, harvesting, threshing and winnowing of a larger volume of produce.

The present study addresses these issues in the context of Yanam, a part of the Union Territory of Pondicherry, which is situated in the coastal area of Bay of Bengal. Yanam soil is alluvial as it is located on the delta basin of river Godavari and river Coringa
and is very well suited for paddy cultivation. The main stay of Yanam population is agriculture. With 80% population depending on it, Which has also adopted new technology in agriculture since the advent of green revolution, which kept the productivity high.

Hence, the above discussion leads to an understanding that the labour absorption in agriculture, in the present context depends on the two-fold propositions: Inter-locking of (i) the components of new technology and agricultural operations. More clearly, the components of new technology, in terms of Bio and mechanical aspects are operation-specific. Inter locking of (ii) the new technology and input substitutability. The new technology seems to improve the substitutability among inputs, particularly labour thereby, the adoption of the technology is more specific factor abundance. In view of the above frame work the focus of the study centres around the following research issues.

- What is the extent and pattern of labour absorption among farm operations across farm size categories?

- How labour is influenced by socio-demographic and economic characteristics of the farm households?
Whether the labour use in agriculture is a constant proportion to other inputs? If not, what would be the substitutability of labour with other inputs?

1.13 OBJECTIVES OF THE STUDY

The present study intends to throw light on operation-wise labour use and input relations with labour, factor elasticity and elasticity of substitution. More specifically the study attempts to examine the following objectives.

1. To find out the extent of the inter-locking between the new technology components, viz., HYVS, fertilisers, pesticides, irrigation and tractors and the agricultural operations:

2. To analyse the extent and pattern of labour utilisation among farm operations across different farm size categories:

3. To assess the changes in factor substitutability, particularly with reference to labour input across different farm size categories;

4. To examine the inter-relationship between labour use and socio-demographic and economic characteristics of farm households; and

5. To suggest policy measures for improving labour absorption capacity in agriculture.
I.14 HYPOTHESES

1. There is a substantial difference in the labour absorption across farm operations.

2. The socio-economic and demographic variables do influence the labour use in a particular activity.

3. The input relationship with labour varies across different farm size categories.

4. The variations in seed, farm yard manure, fertilisers, pesticides expenses are positively related with total amount of labour employed per acre and the variations in bullock labour and tractor expenses are negatively relate to the amount of total labour employment inclusive of hired labour.

I.15 METHODOLOGY

I.15.1 AREA OF STUDY

The study area namely Yanam is situated in the coastal area of Bay of Bengal covering 10 villages. Government of Pondicherry has been implementing the number of programmes in the Yanam region as well for improving agricultural farm households. As a means of achieving technological breakthrough in agricultural sector, the government introduced high yielding variety programme in the year 1967. The government took initiatives in providing infrastructure to
farmers for increasing agricultural production. Many developmental programmes also started to improve the socio-economic conditions of farm households. The need for the study is manifold. Yanam cropping pattern is not uniform. Cropping pattern is diversified. No single study was pursued on agricultural labour absorption pattern.

1.15.2 SURVEY DESIGN

A Census survey design is employed. Farm household of five villages of Yanam region, which are agriculturally concentrated viz., Kanakalapeta, Mettakuru, Farampeta, Adivipolam and Dariyalatippa. There are 170 farm households in all the five villages together. All 170 farm households have been covered in the survey.

1.15.3 PERIOD OF THE STUDY

The primary survey is conducted during May 96 to June 97. Since a minimum one-year is necessary to undertake farm operations of paddy from pre-cultivation to post harvesting of the same crop. This study is based on primary and secondary source of data the sources of secondary data are the various administrative reports, surveys, records, articles, thesis of scholars and official documents. For the primary data the farm households were
personally interviewed and information is collected based on specially designed comprehensive schedules.

1.15.4 DATA ANALYSIS, TECHNIQUES & MODEL DESIGNING

In a micro context, the study aims to understand the extent of labour use in selected operations namely pre-cultivation, preparation of soil, nursery preparation, transplantation, irrigation, fertiliser application, disease control, weeding, inter-cultural activities and post harvesting operations of paddy crop in Yanam agriculture. The linear multiple regression models are employed to examine the determinants of labour use across farm operation and farm categories wise. For the purpose of finding out the input changes with labour, input ratios, factor elasticity, elasticities of substitution, marginal rates of substitution are computed. In addition, the cross tables are made to present socio-demographic and economic variability for viewing its relationship with labour utilisation.

1.15.5 DATA AND DATA SOURCES

The study is based on the primary and secondary sources of data. The sources of secondary data are various administrative
records of Agriculture Department and Department of Economics and Statistics, Pondicherry. The pilot survey was conducted in one of the selected village by conversing specially prepared schedules. The primary data related to size of family, literacy, age, sex composition, size of land holdings, assets structure, indebtedness, cost of cultivation. Labour utilisation across farm categories and cropping pattern are collected.

1.6 LIMITATIONS

i) The data regarding irrigation charges in some cases are given separately and in some cases clubbed with land revenue. Hence, there may be a bias. ii) Important information on horsepower of the machinery is not given as the intensity of usage of time required depends on the horsepower. The study has been restricted to the money spent on machinery power only. iii) Farmers may not fully remember the input and output costs, as there is no maintenance of records. The primary survey from all 170 farmers on land utilisation, irrigation, yields, size of land holding, credit facilitates were taken to reduce the memory bias to the minimum.
The First Chapter presents a theoretical frame, problem setting, objectives and methodology of study. In the Chapter II, a review of earlier literature is made. Chapter III gives the profile of the study area. Chapter IV analyses the socio-economic feature of farm households and its relationship with labour use. Chapter V discuses an analysis of substitution: labour versus non-labour inputs. Chapter VI assesses analysis of determinants of labour use across operations. Summary and conclusion are given in the last Chapter VII.