EMPLOYMENT, WAGES AND PRODUCTIVITY IN INDIAN AGRICULTURE

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Abstract

Employment in agriculture almost stagnates. In certain sub-sectors of agriculture like livestock, forestry and fishing employment has in fact, declined during the 1990s (1994-00). There are mixed trends from states; push as well as pull factors appear to have been responsible for these trends in agricultural employment. The share of female workers in agriculture has increased at the aggregate level; though there are many states registering a decline in its share. Real wage for agricultural workers increases consistently during the 90s, though certain indices of agricultural productivity have not increased significantly during the reference period. Labour productivity in agriculture also increases; its effect on real wage has decreased while that of the labour-land ratio has increased during the reference periods (1983-99). The present study also discusses opportunities for increasing employment in agriculture.

I. INTRODUCTION

Though the share of agriculture in the aggregate economy has declined rapidly during the planned development of the country; it assumes a pivotal role in the rural economy. The NSS quinquennial surveys on employment show a decline in the share of agriculture and an increase in the share of non-agricultural sector in aggregate employment. Such a structural shift though expected in a developing economy, has been slower in the Indian economy. This process is even slower in the rural economy. Nevertheless in rural India the growth rate of employment in the non-agricultural sector has been far short of the increase in the rural workforce. As a consequence, the incidence of rural unemployment on the basis of current daily status (CDS) is as high as seven percent in the year 1999-00. There is no evidence to

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suggest improvement in the quality of rural employment, which is generally associated with the structural changes of employment.

In this context employment in agriculture remains important. The recent NSS quinquennial survey on employment shows that the number of agricultural workers has almost stagnated[1]. Agricultural income during the '90s has however grown at an impressive rate. Does this suggest job-less growth in agriculture as well? The association between employment and income in agriculture needs to be investigated, considering a general perception that agriculture is a labour intensive proposition. There are studies reporting deceleration in the productivity growth in agriculture[2] during 90s. Real wages in agriculture however, maintained an increasing trend. Increase of real wages in agriculture in the context of growth in agricultural income and a stagnation of agricultural employment is important. In this situation the kind of relationship that exists between employment, labour productivity and wages in agriculture needs to be investigated.

The present study attempts to address some of the above concerns related to agricultural employment. This study is organized into three sections. Section I presents major trends in agricultural employment, it also presents a comparative account of employment and income in agriculture at the aggregate and disaggregate levels. Subsequently the issue of labour productivity and wages in agriculture is discussed in Section II. Finally, in Section III some of the emerging activities with significant implications for increasing the intensity and quality of employment in agriculture are presented.

[1] Employment in agriculture during the last NSSO quinquennial surveys were 1.9E+08 (1999-00), 1.88E+08 (1993-940, 1.45E+08 (1983).

[2] Most of the studies related to productivity growth in agriculture are crop- and region- specific. These studies generally conclude a decrease in productivity growth in agriculture during 1990s. Ministry of Agriculture index number of yield based on important food and non-food grain crops increased from 133.8 in the year 1991 to 141.8 in the year 2003, respectively. The corresponding figure in the year 1981 was 102.9.

II. EMPLOYMENT AND INCOME IN AGRICULTURE

Agriculture accounts for almost 60 per cent[3] of aggregate employment in India. Employment in agriculture is rural-based (97 percent); but it is depressing to note that in the rural sector the rate of growth of agricultural employment is abysmally low (0.01 per cent[4]) and was insignificant during the '90s. The corresponding growth during the '80s was moderate and significant (1.18 per cent). The decade of 80s and 90s frequently referred in the present discussion strictly refers to periods 1983-93 and 1993-99, respectively. These are in fact the years for which NSSOs quinquennial survey results based on a large sample is available[5] for employment. With increased pressure on land, the role of allied activities increases but the annual compound growth rate (ACGR) of employment for most of the allied activities are negative during the 90s (see Table 1).

The growth of agricultural income during the 90s is not only satisfactory and significant; it is marginally higher (0.02 per cent) than the corresponding rate of growth in the 80s. The income trend for allied activities is encouraging. In forestry and fisheries the income growth is not only positive but it is marginally higher than the previous decade. In the case of livestock though the income growth is highest amongst all allied activities, the growth rate in the '90s declined over the previous decade. This mis-match between employment and income suggests job-less growth in agriculture as well. For a proper understanding of the reasons for this disconcerting trend an enquiry into the pattern of agricultural growth in the country is necessary.

Agricultural income (GDP at factor cost) as per the CSO annual series consists of income from crop outputs (field and plantation crops), livestock, fisheries and forestry. At the individual sub-sector level income for the crop and livestock sector GDP at factor cost is

[3] On the basis of current daily status (CDS) figure is 58 per cent.

[4] This change is observed at the third decimal place (actual figure is .006) only.

[5] The NSS data for employment based on a large sample are also available for the year 1987-88. Being a drought year this has been ignored deliberately. In the present study, a comparison of employment figures between the year 1983 and 1993-94 presents employment growth during pre-reform period (conveniently referred as 1983-93); this comparison between the years 1993-94 and 1999-00 presents employment growth during the post reform period (frequently referred as 1999-93).

not available in the agricultural sector; it is largely based on crop and livestock outputs. A temporal comparison of the various components of agricultural income and its constituents at 1993-94 prices is presented in Tables 2a, 2b and 2c. Tables 2a and 2b show that since the 1980s, livestock has been growing at a rate of more than 4 per cent. As a result of high growth the livestock output is now one-third of the agricultural (crop and plantation) output; the corresponding figure in the year 1970-71 was one-fifth (see Table 2a). Since the 80s, GDP fisheries increased at an exponential rate of around 2 per cent; fisheries also improved its share in aggregate agriculture GDP from 2.5 to 4.4 per cent in the year 1981 to 2003 (see Table 2a). The rate of income growth in fisheries has however decelerated during the 90s. Forestry, another sub-sector of agriculture presents a different picture. The rate of growth in GDP forestry was abysmally low (0.02) during the 80s; the corresponding figure improved in the subsequent decade (see Table 2a).

Table 1: Annual Compound Growth Rate (ACGR) in Income, Employment and Employment Elasticity of Agriculture and Major Allied Activities.

	ACGR in Income		ACGR in Empm.		Employ. Elasticity	
	1983-93	1993-99	1983-93	1993-99	1983-93	1993-99
Crops & plantation	2.89	2.85	1.75	0.01	0.61	0.01
Livestocks	4.29	3.59	-3.19	-0.68	-0.74	-0.19
Forestry & fishing	2.19	2.54	3.29	-3.93	1.50	-1.55
Agriculture - aggr	2.82	2.84	1.44	0.01	0.51	0.02

Note: In the above table, 1983-93 is actually difference between the year 1993-94 and 1983; similarly 1993-99 is actually the difference between the 1999-00 and 1993-94.

The CSO income output series presents relatively detailed statistics for crops and the livestock sector; these sectors also account for the bulk of employment in agriculture. The structural changes in value of agriculture and livestock output at the specific disaggregate level during last three decades is presented in Table 2c. This table presents triennium average, percent share of commodity aggregates during the beginning of a decade and also the annual compound growth rate (ACGR) in these aggregates during the decade. A perusal of these figures suggests, that there has been continuous decline in the share of cereals, pulses, oilseeds and fibres. Fibres are essentially aggregates of cotton, jute and mesta. Some commodities for which the share in value of output remained almost stagnant are sugar, drugs and narcotics. Tea, coffee and tobacco together constitute the drug and narcotics group.

As is evident from Table 2c, the commodities whose share increased in the value of agricultural output are fruits and vegetables, condiments and spices. These items emerged as important exportables during the 90s. The share of pulse and oilseeds declined during 90s; as a matter of fact, the import of these items also increased during the 90s. If we collate these trends in commodity aggregates with the agricultural -export -import basket (see Annexure Table 6); it is evident that the share of exportable commodities in the value of agricultural output increased while that of the importable commodities has declined. The share of the commodities in which India has been a traditional exporter, remained stagnant during the reference period.

With trade liberalization, the relative price of exportable commodities generally increases and that of importable commodities decreases (see Annexure Boxes 1&2). In the short run (here 3-4 years) a continuous increase in the relative price of a commodity increases its production more often by substituting it for importable commodities without any significant effect on the cropped area (see Annex Tables 5 and 6). As a result, the relative share of exportable commodities increases in the aggregate value; [6] such increase in share may not result in significant increase of employment at the commodity aggregate level. Increase of employment at the aggregate level would depend on employment intensity of the competing crops, and its effect on the cropped area. Indices of cropped area however show a marginal decline in the 90s over the previous decade (see Annex Table 3).

In the 90s, a liberal import policy for certain farm inputs like pesticides has also encouraged use of the same. There are evidences of these chemicals such as weedicides replacing labour in certain regions of the country (Sidhu and Singh 2004). These are some of the possible reasons for stagnating employment but increasing output / income in agriculture during the 90s.

[6] Increase in the share of horticultural products and spices in agricultural output during recent years are examples in this context.

The CSO information related to livestock output is presented separately for milk, meat, egg and wool. Milk, egg and wool have a bearing on bovine, poultry and ovine rearing respectively, while the meat group includes flesh of all these livestock beside birds. The historical trend growth in output of these items suggests that milch animals and poultry bird are emerging as important. The share of output from bee and silk-worm (api and sericulture) even though small (1.3%) has increased during the reference period; whereas the share of wool and hair obtained from goat and sheep has decreased during the said period (1971-2003). The share of meat in livestock products has stagnated; trade statistics further suggest that poultry meat is as emerging important in the meat group. It must be noted that a large proportion of meat in the meat group is actually obtained from cattle and the population of cattle has declined during the 90s (see Box 1). A decreasing trend in share of meat might also have been because of decline of goat population towards the end of the 90s (see Box 1). The population of sheep is increasing, yet the share of wool and hair in livestock output has declined. This suggests a high growth in other components of livestock output.

Box 1 Trends in Livestock Population

	1982	**1987**	**1992**	**1997**	**2003(p)**
	figures in millions				
Cattle	192.5	199.7	204.6	198.9	187.4
Buffaloes	69.8	75.9	84.2	89.9	96.6
Sheep	48.8	45.7	50.8	57.5	61.8
Goat	95.3	110.2	115.3	122.7	120.1
Total	419.6	445.3	470.9	485.4	482.8

The recent livestock census data thus show decreasing trend in the cattle and goat population; while the rearing of cattle and goat is highly labour intensive. A decline in absolute number of livestock population suggests reasons for decline of employment in the livestock sector. The structural changes in bovine population[7] suggest transformation of cattle rearing from subsistence to the commercial level. Such transformation in the livestock sector may not increase employment in the short run, though this increases output of the sector.

[7] The bovine population has started decreasing since the year 1997, the share of buffaloes in total bovine and share of cross-bred cattle in total cattle population also increased during the 90s. (Jha 2004)

Table 2: Structural Changes in Agriculture and Allied Sectors

Table 2a: A Comparative Account of Important Sectors / Sub-sectors during Selected Years

Year	Value of output		Gross Domestic Product at factor cost (GDP)				
	Agri.	Livestock	Agricul.	Fisheries	Forestry	Agri-A	Aggregate
	Value in billion Rs. At 1993-94 prices						
1970-71	115626	25571	121356	3004	13086	137320	296278
1980-81	142555	36682	143431	3952	11910	159293	401128
1990-91	192989	58896	204421	6943	11751	223114	692871
1999-00	246329	83081	286983	10972	12753	286983	1148368
2002-03		93361	263096	12717	13573	289386	1318321

Table 2b: Annual Compound Growth Rates (ACGR) in the Value of Output in Selected Sectors

Reference period	Agriculture	Livestock	Fisheries	Forestry
1971-80	0.1	4.1	1.1	-0.34
1981-90	1.1	4.3	2.2	0.02
1991-00	1.1	4.4	1.9	0.28
1991-03	0.6	4.6	1.9	0.48

Table 2c: Structural Changes in Value of Agriculture and Livestock Output

Items	1970-73	1980-83	1990-93	2000-03	1971-80	1981-90	1991-00	1991-03
A. Agriculture	Percent share in value of output				Annual Compound Growth Rate			
Cereals	35.5	34.8	36.3	33.0	0.2	1.2	0.9	0
Pulses	8.8	7.1	6.1	4.6	-1.2	0.7	-0.2	-1.0
Oilseeds	9.5	8.3	11.3	9.2	-0.5	2.3	0.6	-0.2
Sugar	7.4	7.8	7.8	8.0	0.3	1.4	0.9	0.6
Fibres	4.7	4.4	4.5	3.5	1.6	2.0	0.9	-0.2
Indigo dye etc.	0.01	0.01	0.01	0.01	0	4.2	3.8	4.1
Drugs & nar'cs	1.9	2.1	1.9	2.2	1.1	0.9	1.3	1.2
Cond's & spices	2.5	2.6	3.0	3.7	0.8	1.7	1.8	1.8
Fruits & Veg'les	17.3	18.2	18.2	25.7	0.7	0.8	2.1	2.1
Others	12.5	14.7	10.9	10.1				
B. Livestocks								
Milk etc.	57.3	62.2	65.3	67.6	1.6	2.1	1.6	1.6
Meat etc.	18.6	16.3	17.9	16.8	1.2	2.2	1.4	1.4
Eggs	2.1	2.6	3.3	3.9	2.4	2.9	1.6	2.3
Wool & hair	0.8	0.3	0.3	0.3	0.7	1.3	1.2	1.2
A. & S. culture	1.2	1.3	1.5	1.3	2.0	2.8	0.3	1.0
Others	20.0	17.3	11.7	10.1	1.1	-0.4	4.4	3.4

In forestry and fishing, the income increased at a considerable rate. The growth in workforce has however made a turn around; a positive and highly significant rate of growth of employment during the 80s became negative (-3.93) in the subsequent decade (1990s). The possible reasons for this trend are deliberated separately for these sectors.

In the 90s fisheries has also undergone a transformation; marine fisheries lost its dominant position to inland fisheries[8]. There was also an expansion of culture fisheries during the period and cultured fish enterprises are supposed to be less labour intensive as compared to marine fisheries. Nevertheless, a large part of the income growth in fisheries during the '90s is also because of the rapid rise in its price as compared to similar other items during the period (see Annex Box II). This must not be construed to near that there is limited scope for increasing employment in fisheries. There is sufficient scope for expanding marine fisheries beyond the shallow sea-zone that exists in the country. Though this requires special kind of infrastructure.

In forestry, the reasons for a negative employment growth during the 90s may be found in the decreasing forest area in the country during the reference period. [9] Though a decreasing trend in forest area during last few decades is more-or-less secular in the country; the decade of 80s was different in the sense that a spurt in social forestry activities[10] and so employment growth in the sector was experienced during the period. Subsequently, profitability in some of these trees like papular and eucalyptus declined and so did the area under these trees. As a consequence, social and agro-forestry was on wane during the 90s. Saxena (2000) also reports that head loading, which was probably one of the most important

[8] The CSO National Accounts Statistics income series at 1993-94 prices shows that the inland fisheries has registered a growth of around 6 per cent while marine fisheries grew by around 2 per cent during last few years (1994-02).

[9] The State of Forest Report 2001 shows a decline of forest cover from 6,39,386 sq. km to 6,37,293 sq. km between the years 1993 to 1999 respectively. These figures are about 19.45 and 19.39 per cent of the total geographical area of the country. (*Source*: Forest Survey of India, Ministry of Environment and Forests, Dehradun).

[10] In the 80s several international development and financial organizations started co-funding social forestry activities. There was also a rapid increase in area under *papular* and *eucalyptus* trees during this period. The enthusiasm, with which all these activities were started, could not be sustained for long for various reasons.

employment activities in many forest infested tribal areas during the 80s, lost its dominant position in the late 90s.

Agricultural Employment Across States

The share of rural employment in agriculture is presented in Annex Table 1. Information for the years 1983 and 1999-00 is based on current daily status (CDS) of employment and is for important states of the country. As is apparent from Annex Table 1, in a span of 17 years the share of agriculture in rural workers declined by only 2 per cent. At a disaggregate level there are mixed trends; in six out of 17 states the percent share of agriculture in the rural worker has not declined; these states are Karnataka, Madhya Pradesh, Bihar, Andhra Pradesh, Maharashtra and Orissa. In the later three states, this particular phenomenon is more conspicuous. In order to enquire into the above trend the present study has made a comparative account of growth in employment (see Annex Table 1) and income in these states (see Annex Table 2). A general profile of these states suggests different possible reasons for the increase in the proportion of agricultural workers in these states.

It is interesting to note that in all the above states, barring Karnataka, agricultural income growth is less than the country average (2.8 as in Table1). The state of Maharashtra may also escape this disadvantaged group, since agricultural growth in 80s in the state is very high and sustenance of that growth with a moderate rate (less than the country average) during 90s is not less credible. From these two state level instances, one can infer that the pull in agriculture has attracted rural workers in the respective sector. In Andhra Pradesh and Orissa, the dearth of employment opportunities in sectors other than agriculture as is apparent from the low growth of the non-farm sector appears to have pushed rural workers towards agriculture. The push phenomenon becomes more evident with a low growth of agricultural income in AP and negative agriculture growth in Orissa during the 90s. In states like Maharashtra and Bihar, employment growth in the non-farm sector is higher than the country average which prohibits us from arriving at the above inference; but a different rate of growth of the economy in these two states, high in Maharashtra and low in Bihar, as is apparent from the GSDP column of Annex Table 2, definitely shows a different development trajectory in these states. In Bihar the poor growth in agriculture and aggregate economy

shows that the non-agricultural sector even though it is not doing so well, is employing a significant proportion of workers; this probably indicates that the non-farm sector is also emerging as the residual sector following the poor status of agriculture in the state.

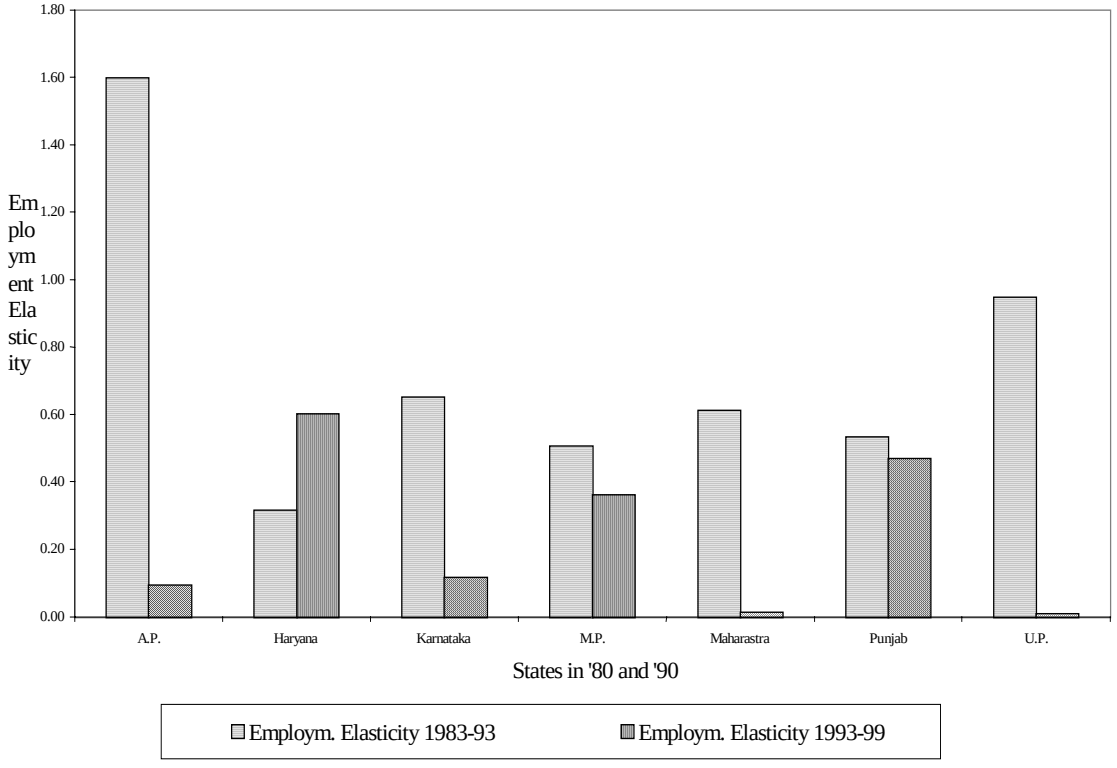
The above phenomenon may be further examined while comparing employment and income growth in agriculture in employment elasticity. Table 1 shows that employment elasticity in agriculture at the aggregate level reduced over the decade, the corresponding figure almost approached zero in the year 1999-2000; this further encourages an enquiry into state-level figures of employment elasticity. Employment elasticity here is the percent increase of employment in agriculture due to a one per cent increase of income in agriculture. It is interesting to note that employment elasticity in agriculture for many states is negative in the 90s (1993-99). Negative employment elasticity in six of the seventeen states is because of the negative growth of employment in agriculture; while in one of the 17 states namely, Orissa, it is because of a negative growth of income during the 90s.

The states with negative employment growth in decreasing order are Goa, Kerala, Tamilnadu (TN), Himachal Pradesh (HP), Assam, and West Bengal (WB) (see Annexure Table 1). A general profile of these states suggests different reasons for the negative growth of employment in agriculture. In Goa for instance, rapid urbanization and the consequent decline of agricultural employment could be one of the possible reasons; this may hold true for some other states like Kerala, Tamilnadu. Again in many of these states one of the allied agricultural activities like plantation, fisheries, livestock, and forestry dominates rural employment; and the poor performance of employment in these allied activities has resulted in a significant decline of employment in agriculture. In West Bengal, the decline of employment in agriculture is only marginal; this decline was not observed on the basis of the usual status of employment as reported by Chaddha et al 2004. The state of Orissa was an exception, where negative employment elasticity was because of the negative growth in agricultural income during the ‘90s. It is interesting to note that employment growth in agriculture in the state continued during the reference period. Such growth may have adverse implications for labour productivity, wages and the welfare of agricultural workers in the state.

In the 80s, employment elasticity was positive for most of the states except Bihar and Gujarat; negative employment elasticity in these states is because of a negative growth in agricultural income rather than employment (see Annex Table 1). Employment growth during 80s (1993-83) was positive for all the referred states including the above two states. Further enquiry into the pattern of income and employment growth in these states in fact shows a contrasting picture. In Gujarat, very high growth of the non-agricultural economy (see Annex Table 2) and an equally impressive growth of employment in the non-farm sector suggests signs of pull; while in Bihar, the low growth of the economy other than agriculture and a lower growth rate in rural non-farm employment as well shows signs of push for agriculture workers. This situation has probably led to the migration of rural workers to other states.

Temporal and spatial comparison of employment elasticities in agriculture are presented in Fig 1; states having negative employment elasticity in either of the reference periods are dropped from the pictorial presentation (see Fig 1). The figure shows decreasing

Fig. 1: A Comparative account of Employment Ealsticity in Agriculture



employment elasticity in agriculture for most of the states barring Haryana. The state of Haryana was an exception; lower employment elasticity in the state during the 80s (1983-93) was because of a very high growth of agricultural income (9.4 per cent) during the period; the same rate of growth in agriculture could not be sustained in the 90s; nevertheless, employment growth in agriculture also reduced during the 90s in Haryana. A decline of employment elasticity in the majority of the states during the 90s is consistent with the trend of employment elasticity at the aggregate level. Decreasing employment elasticity and its possible implications for labour and welfare would be clear once we analyse the issue of productivity and wages in agriculture.

The state-wise trend in agricultural employment shows mixed trends during the 90s. Agricultural employment declined in many states; as a result employment elasticity was negative for many states during the 90s. Employment elasticity was negative for only a few states during the 80s; negative elasticity during this period was because of a decline in agricultural income rather than employment.

Gender Aspects of Agricultural Employment

Employment for women apart from increasing the family income also increases their say in the household decision-making, and enhances their status in the society. In a labour- surplus rural economy, changes in the sex composition of the workforce have implications for the household income security and poverty in the region; these in turn also influence womens participation in the rural workforce. Table 3 presents the proportion of female workers in agriculture and the rural sector as such for important states of India; the reference years are 1983, 1993-94 and 1999-00. As is evident from Table 3 less than 30 per cent of the rural workers are female at all the industries level. The proportion of female workers at all the industries level in the rural sector has increased marginally (0.5 per cent) during the entire period of reference (1983-99).

The bulk of female workers in the rural sector is concentrated in agriculture; other industrial categories wherein females are in sizeable proportions are manufacturing and community services. The proportion of female workers in agriculture varies across states;

this has been particularly low in the state of Assam and West Bengal, whereas, in the state of Himachal Pradesh (HP), Rajasthan, and Maharashtra, the female workers' share is very high. It is interesting to note that states in either of the above groups are in different levels of resource endowments and economic well-beings; therefore it appears that female's participation in agriculture depend on various other factors, Further enquiry into trends in sex composition of rural workforce in agriculture may throw some light on these factors.

Table 3: Changing Proportion of Female in Agriculture and Rural Employment in India

	in Agriculture Employment			in Rural Employment		
State	**1983**	**1993-94**	**1999-00**	**1983**	**1993-94**	**1999-00**
Andhra Pradesh	38.01	41.26	42.04	36.34	39.16	39.34
Assam	12.17	19.92	19.1	12.14	19.12	16.28
Bihar	22.69	21.25	20.89	21.96	19.9	19.73
Delhi	36.33	58.45	9.29	18.81	20.58	6.43
Goa	43.24	32.19	29.13	29.63	23.12	19.99
Gujarat	37.01	36.31	39.53	32.91	31.72	32.94
Haryana	21.24	29.91	24.73	18.01	20.97	16.67
Himachal Pradesh	44.96	51.58	52.06	37.67	40.66	38.09
Karnataka	33.23	35.81	36.85	32.02	34.6	34.21
Kerala	25.55	25.08	27.01	26.44	23.85	24.67
Madhya Pradesh	37.5	34.91	36.26	35.5	33.36	34.45
Maharashtra	41.85	44.5	45.44	37.76	40.35	39.25
Orissa	24.61	27.16	27.1	25.15	26.43	26.59
Punjab	10.24	22.58	29.04	9.8	15.97	20.31
Rajasthan	42.56	44.35	42.71	38.72	37.52	35.26
Tamilnadu	38.22	43.05	41.92	34.88	38.71	37.92
Uttar Pradesh	22.15	22.01	22.73	20.06	19.43	19.66
West Bengal	12.4	12.32	11.57	13.97	14.92	14.62
India total	30.18	31.84	32.19	28.04	29.04	28.56

At the all India level, the proportion of female workers in agriculture increased by more than 2 per cent during the entire period (1983-99) of reference. Unlike the aggregate figure, the proportion of female agriculture workers declined in Bihar, Madhya Pradesh and West Bengal during the reference period. If we divide the entire reference period (1983-99) as per the earlier segmentation into 1983-93 as the decade of the 80s and 1993-99 as 90s, the trend in sex-wise composition of agriculture workers emerges as more interesting. In the 80s women's share in agriculture workforce increased by almost 1.7 percent; the corresponding changes was only marginal (0.35 per cent) during the 90s. Nevertheless in many of the states the increase in the share of female workers in agriculture got reversed during the 90s.

Ignoring Delhi and Goa, the states in a decreasing order of percent decline in woman share are Haryana, Rajasthan, Tamilnadu and West Bengal. In Haryana and Rajasthan, female workers in agriculture are more concentrated into livestock activities and a general decline of employment in livestock might have contributed to such decline of female workers' share in agriculture in these states. Livestock also assumes an important position in rural economy of these states.

If we make a correspondence between female's share in agricultural workers and the general performance of agricultural employment, it may be noted that in TN and WB employment in agriculture also declined during the 90s, so did the share of female workers. Again in Bihar and Madhya Pradesh, though the share of agriculture in rural employment did not decrease the performance of agriculture and the non-farm sector suggests pressure on agriculture for employment in these states. In this kind of situation, males generally crowd out females for employment in agriculture. It is also important to note that in most of these states the bulk of the females in the rural sector work as agricultural labourers[11] (see Annex Table 4); and it is easy to replace agriculture labourers.

Field visits to rural areas show that participation of females in a region is often specific to particular agricultural operations[12] in a crop; naturally a significant change in acreage under such crop may change woman's share in agriculture. A significant change in the structure of allied activity can also changes woman's share in agriculture since women generally dominate allied activities like livestock. In this context a significant increase in the proportion of female workers in agriculture in the Punjab is worth mentioning. An increased emphasis on allied activities like, livestock and poultry in the state could be one possible reason for this increased share. Allied activities are mostly practiced in the backyard of the household, so women's participation in these activities is generally high. Again, in Punjab the proportion of agricultural workers has reduced drastically; this suggests that employment

[11] Proportion of agricultural labour in total rural female workers in Bihar, MP, TN and WB are 64.6, 43.5, 54.3, 38.6 per cent, respectively in the year 2001. The corresponding figure for the country is 43.4 per cent taking into account both main and marginal workers (*Source*: Census 2001).

[12] In West Bengal for instance, paddy dominates the cropping pattern and women are more involved in transplanting and harvesting of paddy.

in industries other than agriculture increased; these industries are more dominated by male workers. In other words, it appears that in Punjab, males are opting for jobs in the non-agriculture sector leaving agriculture, especially allied activities more in the hands of females. The above discussion suggests that some possible determinants of women's participation in agriculture are social structure and woman's position in the society, cropping pattern, importance of allied activities on farm and so on.

In total rural employment, the share of females has increased marginally (0.5 percent) during the entire period of reference. Decade-wise growth at the all India level shows significant increase (one percent) in the proportion of female workers during the 80s; followed by a decline in the corresponding share (around a half per cent) during the 90s. In eleven out of eighteen states for which information is available, the share of females in rural employment has increased during the period 1983-1999. Agriculture in fact accounts for a large proportion (around 80 percent) of female workers in the rural sector; female worker's share in rural employment to a large extent reflects the employment pattern in agriculture. The share of the female in rural workers increased in relatively well-off states.

The states, which reported a decline in female worker's share in the total rural employment, are Bihar, Rajasthan, Madhya Pradesh, Kerala, Haryana, Delhi and Goa. Even in these states, different trends emerge over the decades of 1980s and 1990s. In the first two states there was a consistent decline in the share of female workers in the rural sector; in the next two states in contrast to the all India trend, the share of female workers declined during the 80s and increased during the 90s; whereas in the remaining states, Haryana and Delhi in particular, the increase and decrease during the 80s and the 90s is more conspicuous. A profile of these states indicates different reasons for a decline in the share of female workers. The first few states suggest push factors or incommensurate increase of employment opportunities in the rural non-farm sector as possible reasons for a decline in the share of female workers; whereas, the latter states suggest that urbanization, shift of work place has contributed to decline of the female share in the rural workforce. In urban places, with better infrastructure there have been instances of rural jobs created in the urban places. In this process, people live in rural places because of the low cost of living while they go for work

in one of the nearby urban places. This situation demands high mobility of the rural work force; and in such situations males have certain advantages over females. This phenomenon is particularly strong in well-infrastructure endowed regions of the country illustrates possible reasons for a decline in the share of female in the rural employment.

It must be noted that the proportion of females in total rural employment has increased (0.52%) marginally, though a corresponding share for agriculture increased significantly. This difference suggests that the share of female workers in industries other than agriculture has declined. This decline has been severe in the state of Bihar and Rajasthan. Female workers' share in the rural non-farm sector also indicates a crowding out of the female by male workers in certain laggard states in non-farm activities as well.

III. LABOUR PRODUCTIVITY AND WAGE IN AGRICULTURE

Labour productivity is one of the various dimensions of productivity; increase in labour productivity is important but not necessarily with a decrease of employment in agriculture especially in a labour surplus rural economy such as that of India. Creation of new employment opportunities at a rising level of productivity is the most cherished objective. Though labour productivity can be defined in various ways, in the present discussion it is GDP agriculture at the 1993-94 price divided by employed persons in agriculture on a CDS basis and the figure in the table (see Table 4) is in rupees per head. The spatial and temporal trend in labour productivity is presented in Table 4.

The table shows wide diversity in labour productivity across states; in Bihar, Orissa and Andhra Pradesh (AP) labour productivity is not only low, this has also decreased during the reference period (1983-99). Some states with a very high level of labour productivity are Goa, Punjab, Haryana, Kerala and West Bengal. It is interesting to note that labour productivity in one of the high labour productivity states (Punjab) is more than six times as that of the low labour productivity state (Bihar) in the year 1999-00. In terms of disparity in labour productivity across states, the situation was much better during 80s, the corresponding

difference was around three and half times during the year 1983 and five-and half time during the year 1993-94.

Table 4: A Comparison of Labour Productivity and its Constituents: Agriculture Income and Employment, across Space and Time

	Labr prod'vity (LPR) in Rs per head			ACGR in LPR in %		ACGR in Agri. income		ACGR in agri. Employment	
State	**1983**	**1993-94**	**1999-00**	**1983-93**	**1993-99**	**1983-93**	**1993-99**	**1983-93**	**1993-99**
Andhra Pra'h	105.88	93.42	98.98	-1.18	0.99	2.15	1.07	3.44	0.10
Assam	116.49	107.57	113.05	-0.77	0.85	1.70	0.25	2.51	-0.58
Bihar	90.62	65.59	66.76	-2.76	0.30	-0.56	1.40	2.70	1.10
Goa	279.15	240.74	550.15	-1.38	21.41	2.50	3.75	4.03	-9.60
Gujarat	165.11	110.56	113.14	-3.30	0.39	-2.26	1.34	1.73	0.95
Haryana	220.76	345.52	362.99	5.65	0.84	6.85	2.10	2.17	1.27
Himachal Pra'h	66.03	69.92	72.83	0.59	0.69	2.81	0.04	2.22	-0.63
Karnataka	104.11	121.00	157.28	1.62	4.99	4.47	5.10	2.91	0.60
Kerala	146.05	168.42	248.00	1.53	7.87	5.10	1.97	3.61	-4.40
Madhya Pra'h	75.93	93.01	98.34	2.25	0.95	4.25	1.47	2.15	0.53
Maharashtra	96.14	114.90	126.26	1.95	1.65	4.78	1.60	2.93	0.02
Orissa	99.39	83.06	75.93	-1.64	-1.43	0.24	-0.91	2.06	0.58
Punjab	305.32	380.36	408.23	2.46	1.22	4.89	2.26	2.61	1.06
Rajasthan	100.69	84.30	111.84	-1.63	5.44	0.09	4.83	1.89	0.01
Tamilnadu	82.85	121.75	147.85	4.69	3.57	6.13	1.33	2.12	-1.90
Uttar Pradesh	99.30	100.47	119.23	0.12	3.11	2.31	2.92	2.19	0.03
West Bengal	116.63	147.60	188.43	2.66	4.61	5.08	3.85	2.64	-0.29

Note: In the above table, 1983-93 is actually difference between the year 1993-94 and 1983; similarly 1993-99 s actually the difference between the 1999-00 and 1993-94.

In Table 4, the ACGR in LPR shows a periodic growth in labour productivity between the years 1999-00, 1993-94, and 1983. In the 80s (between the year 1983-93), labour productivity declined in Assam, AP, Bihar, Goa, Gujarat, Orissa, Rajasthan; the state of Orissa is an exception in the sense that labour productivity not only declined in the 80s but in 90s as well; otherwise a decline of labour productivity during the 90s is not reported from other states. Though the 80s is generally regarded as a better decade in terms of agricultural performance, the decline of labour productivity of agricultural workers in so many states during the 1980s requires further investigation into the sources of labour productivity, that is, income and employment in agriculture. The previous table shows that employment in agriculture increased for all states during the 80s, while in the 90s agricultural employment

declined in many states like Assam, Goa, HP, Kerala, TN and WB. The growth in GDP agriculture has been positive for most of the states barring Bihar and Gujarat during the 80s and for Orissa during the 90s.

A comparison of trends into sources of labour productivity, that is, employment *vis-a-vis* agricultural income suggests that an encouraging trend in labour productivity during the 90s is associated with a higher growth of agricultural income rather than employment in states; employment in agriculture in fact declined in many states. In contrast, a discouraging trend in labour productivity, at least in certain states, during the 80s is more a reflection of higher growth of employment in agriculture during the 80s. In a labour surplus economy as that of India, increase in labour productivity is not sufficient. This needs to be accompanied by an increase of employment in agriculture. The states with different combinations of labour productivity and employment growth during the 80s and 90s are presented in the Box 2.

Box 2. States with combinations of Labour Productivity (LPR) and Employment growth (EMP) during 1980s and 1990s

+ve LPR and +ve EMP:

1980s: Haryana, HP, Karnataka, Kerala, MP, Maharashtra, Punjab, TN, UP, WB
1990s: AP, Bihar, Gujarat, Haryana, Karnataka, MP, Maharashtra, Punjab, Rajasthan, UP

-ve LPR and +ve EMP:

1980s: AP, Assam, Bihar, Goa, Gujarat, Orissa, Rajasthan
1990s: Orissa

+LPR and –ve EMP:

1980: nil
1990s: Assam, Goa, HP, Kerala, TN, WB

The above discussion on labour productivity and its sources that is employment and income in agriculture can be formalized with different variants of regression between these variables. The following regression equations explain how far growth in labour productivity and employment in agriculture is related with the performance of agriculture during the same period. Performance is measured with the growth in GDP agriculture during the reference periods namely the 80s (1983-93) and 90s (1993-99). Labour productivity growth in agriculture (GRLPR) is finally regressed upon growth in agricultural income (GRAGI) during the corresponding periods; similarly employment growth (GREMP) in agriculture is

also regressed upon agricultural income (GRAGI) during the same period for a cross section of states and the same is presented below.

1994-1983,	GRLPR = -2.198 + 0.758GRAGI (9.10) (15.33)	R^2 = 0.939	N = 15
2000-1994,	GRLPR = -0.0128 + 1.546GRAGI (0.007) (2.52)	R^2 = 0.297	N = 15
1994-1983,	GREMP = 2.7514 + 0.0467GRAGI (8.74) (0.73)	R^2 = 0.034	N = 15
2000-1994,	GREMP = -0.002 - 0.2245GRAGI (0.02) (0.73)	R^2 = 0.035	N = 15

The above OLS estimates suggest that growth in agricultural income has a positive and significant impact on labour productivity. In the 80s (1983-93), the elasticity coefficient is less than one (0.76) indicating that a one per cent increase in the growth of agricultural income has led to a 0.76 per cent growth in labour productivity during the 80s (1983-93). The corresponding coefficient almost doubled (1.55%) during the 90s indicating the higher effect of income growth on labour productivity during the '90s. This relationship as apparent from the coefficient of determination (R-sq) has weakened during the 1990s.

The effect of growth in agricultural income on employment in agriculture is formalized in equations 3 and 4; and it is interesting to note that growth in NSDP agriculture has less effect (very low R-sq) on employment in agriculture during the reference period. The estimated equation for the 80s shows a positive relationship between growth in agricultural income and employment in agriculture; the corresponding coefficient during the 90s (1994-00) was negative. The changes in these relationships over the decade is not devoid of economic logic; a comparative look at the state-wise growth in agricultural employment and income in fact shows that in many states employment growth was negative though income growth was positive during the 90s, therefore a negative relationship between employment and income in agriculture is during the 90s is not unexpected. This in fact corroborates the reasons for different trends in labour productivity during the reference periods, that is, 80s vis-à-vis the 90s.

Wages in Agriculture

The wages and salaries to some extent reflect the productivity of labour in sectors / sub-sectors of an economy. A comparative account of real wages in agriculture and other sectors across gender during selected years (1987-88, 1993-94 and 1999-00) is presented in Table 5. The real wage is obtained by dividing daily wage / salary, as obtained from various NSS round surveys, with the consumer price index of agricultural labour (CPIAL) for the respective year. The base year for CPIAL is the year 1986-87, so real wages in table are therefore at the 1986-87 price.

A comparison of real wages suggests that rural wages in agriculture, construction and trade have almost doubled during the reference period (1987-99). Certain studies also report an abrupt increase in agricultural wages during the late-80s. A relatively higher increase in real wages for these industrial categories might also have been because of the abnormal[13] base year (1987-88) in the existing example / table.

Table 5: Real Wage / Salary Earnings for an Average Illiterate Employee by Industries, Sex and Sector (in rs. per day at 1986-87 price)

Industry division	Rural 1999 - 00		Rural 1993 - 94		Rural 1987 - 88		Urban 1999 - 00		Urban 1993
	Male	Female	Male	Female	Male	Female	Male	Female	Male
Agriculture (01-05)	0.145	0.127	0.111	0.108	0.068	0.086	0.183	0.199	0.167
Manufacture (15-27)	0.244	0.098	0.149	0.080	0.137	0.041	0.243	0.116	0.217
Manufacture (23-37)	0.300	0.147	0.219	0.110	0.172	0.081	0.256	0.235	0.238
Construction (45)	0.287	0.190	0.216	0.130	0.126	0.065	0.296	0.156	0.271
Trade (50-55)	0.206	0.357	0.121	0.080	0.085	0.042	0.207	0.162	0.161
Transport & str. (60-64)	0.316	0.364	0.227	0.000	0.165	0.117	0.325	0.393	0.270
Services (65-74)	0.267	0.318	0.126	0.017	0.232	0.161	0.269	0.176	0.220
Services (75-93)	0.363	0.141	0.195	0.073	0.197	0.124	0.390	0.248	0.231

Source: Computed from NSSO wage/salary data.

[13] The year 1987-88 was a drought year and lower wages in these years because of that adverse situation cannot be ruled out.

Table 5 clearly shows that the average wage for a male worker is significantly higher than that of the female worker for most of the industrial categories; this difference in wages is the maximum in the manufacturing sector. A higher wages for female workers in a few employment categories as that of transport and storage or agriculture in the urban sector may be ignored, as the sample size for these specific categories in the NSS Sample during the year 1999-00 is very small.

In rural India, the growth of real wages across industries suggests different trends for different periods (1993-99, 1987-93); agricultural wages have grown at a faster rate as compared to non-agriculture wages during the first period (1987-93), whereas growth in non-agriculture wages were higher than that of agriculture during the later period (1993-99). The sector-wise trend in real wages appears to be related with the relative performance of respective sectors during the reference periods. Though there is less scope for assessing the performance of the specific sector in the present discussion; several indices related to the real performance of agriculture like productivity and crop area indices (in Annex Table 2) in fact suggests that the performance of agriculture during ‘80s is better than in the 90s. Certain factor productivity based analysis also shows that the total factor productivity in agriculture declined during the 90s.

In most of the employment categories, the real wages in the rural sector is significantly lower than in the urban sector in the early 90s. The difference in wages between the rural and urban sector has however tapered-off in non-agriculture employment categories during the year 1999-00. This negates a general belief that rural wages are significantly lower than the urban wages. In the year 1999-00, the real wages in certain industrial / sectoral categories like agriculture in the urban sector and non-organic manufacturing in the rural sector, is higher than its urban counterpart. These may be ignored, as the sample size in these categories is too low.

As the NSS data on wages has certain limitations;[14] a more detailed analysis of agricultural wages has been carried out with the Labour Bureau statistics published as Agricultural Wages in India, (more recently as, Rural Wages in India). The wages of farm workers for the important states of the country during selected years 1991-92 and 2002-03 are presented in Table 6. The nominal wages and statutory minimum wages (SMW) of farm workers often vary across regions in a state and in order to make a suitable temporal and spatial comparison the mid-value of these wages are presented in Table 6. As is apparent from Table 6 the average wages vary across states; in certain low farm wage states like Karnataka, Orissa and Tamilnadu, the wage is less than 40 per cent of the high wage states like Haryana and Punjab during the year (1991-92).

It is interesting to note that Tamilnadu (TN) and Kerala emerged as high farm wage providing states in the year 2002-03. In Kerala because of very strong trade unions the agricultural wages are abnormally high. The high wage in TN is however surprising. Primary investigation shows that because of the poor performance of agriculture in the late 90s and the early years of the decade, agricultural workers in large numbers have migrated to urban places and there is scarcity of agricultural workers. Following a good agricultural year (2002-3), this scarcity became conspicuous, and the agricultural wage has increased significantly. This phenomenon has transformed the state into a high wage providing state in the country. A particularly high wage in Kerala and Tamilnadu is not very encouraging since these states also recorded significant decline of employment in agriculture during the reference period (1999-00). If we exclude the high wage providing states, the disparity in agricultural wages across states decreased during the year 2002-03.

Though there can be various reasons for this high growth of wage and decline of employment, the role of the statutory minimum wages (SMW) in particular is probed herewith. The role of SMW in determination of wages in rural India also assumes importance as a high level of unemployment and consistent increase of wages co-exists in rural India.

[14] The NSS wages based on large samples are for selected years. The wages of workers under certain industrial / sector categories are inconsistent even at the aggregate level during the specific years; analysing this information at the level of state is therefore not desired. Moreover, these are actual wages and cannot be compared with other sources of information on wages.

Table 6 presents a comparative account of the minimum and the prevalent wages in important states of the country during the years 1991 and 2002. The SMW in a state varies across region; mid-value of these wages is presented in the Table 6. The table shows that the average wage for most of the states was higher than the statutory minimum wage (SMW)[15]for agricultural workers in the respective state. It appears that the SMW is the floor price of labour in agriculture in the respective state. Variation in minimum wages across states is high during the early 90s; while spatial variation to some extent has reduced in the year 2002. Though the minimum wages for the states of Haryana and Punjab remain significantly higher than for the other states.

A high SMW and agricultural wages in the states of Punjab and Haryana was justified in the '70s, '80s, and early '90s. There are now studies to report stagnation of agricultural productivity in these states (Paroda 1998). In the 90s even though the nominal wage in these states increased at a slower pace, it also encouraged the adoption of labour-displacing technology as that of weedicides in place of manual labour (Sidhu *et al.* 2004). In such situation there is need to reconsider the role of the SMW as productivity increase in agriculture must be taken into account while determining the SMW in states. In recent years, while the nominal wage in these states increased marginally, the real wages in these states in fact declined. As compared to Haryana and Punjab, the SMWs in Kerala and Tamilnadu are modest while the average wages of farm workers in the year 2002-3 is high, indicating a lesser influence of SMW in high agricultural wage. The situation as in Kerala and Tamilnadu is very specific and not encouraging, as this has led to a decline of agricultural employment in these states. It is however not difficult to believe that the SMW for agricultural workers has by and large supported the increase of agricultural wages in most of the states.

The temporal and spatial comparison of wages can be understood in a better way with the real wage. The real wages of farm workers is obtained by dividing the nominal wage with the consumer price index number of general items for agricultural labour with the year 1986-

[15] Few states in specific years are exceptions; for instance Assam and Orissa in the year 1991, and Madhya Pradesh and Uttar Pradesh in the year 2002. The status of agriculture in these states is probably not able to support the relatively modest minimum wage in these states.

87 as base. The trend as well as point-wise growth in real wages for important states is computed for different time periods, and the same is presented in Table 6. The first and second reference periods in the table are to correspond with the NSS data on employment, whereas the third reference period (1996-03) shows recent trends in agricultural wages. Experiences with trend growth for small intervals show that the growth rates are far from the reality since log-linear equation is not the best fit; point-wise growth has therefore been worked out. Point-wise growth since it ignores the mid-value has its own problems. Thus a very high point-wise growth of wages (5.82) in Maharashtra and a negative growth of wages in Rajasthan (-1.08) during the first period (1983-94) is not substantiated with the trend growth.

It is evident from Table 6 that in the 80s (first reference period), the real wages for agricultural workers increased at a rate of more than 2 per cent, barring the states of Gujarat.[16] In the second period of reference (1994-00) based on rate of employment growth there were two group of states; first group consists of states which experienced a high rate of growth in real wages (more than 2 percent) are AP, Haryana, Karnataka, Kerala, MP and AP; and second group constitutes states with lower growth in real wages, these are Assam, Bihar, Gujarat, Maharashtra, Orissa, Punjab, Rajasthan, TN and West Bengal. In Punjab, the negative rate of growth of real wages during period 1994-00 was evident in trend as well as point-wise growth and this pattern of decreasing real wage is further extended to the third period (1996-03). Like Punjab, Haryana also depicted a negative growth of real wages during the later period (1996-03). It is interesting to note that in most of the other states, the rate of growth of real wages is high (more than 2 per cent) during the period 1996-03.

Juxtaposing wage growth across states during this period (1996-03) with the rate of growth in real wage during the previous period (1994-00) presents two contrasts among the groups of states. Some southern States like AP, Karnataka, Kerala, Maharashtra have recorded high growth in real wages, while another group of states are seen as lagging behind lagging behind in wage growth during the previous periods, examples in this category are

[16] In Gujarat, growth of the real wage is negative on the basis of point as well as trend growth, while in Rajasthan it was negative only on the basis of point-wise growth of wages.

Assam, Gujarat, Orissa and Rajasthan. For Tamilnadu, figures for wage growth vary across point- and trend-wise estimates; primary investigation suggests reason for the abnormal fluctuation of wages[17] during 1996-03.

Table 6: A Comparative Account of Average Wage of Farm Workers, Statutory Minimum Wage and ACGR in Real Wages across States during 80s and 90s

	Nominal Wage in Rs.		Statutory Min. Wage		Trend growth in real wages in %			Point-wise growth in real wages in %		
STATES	**1991-92**	**2002-03**	**1991**	**2002**	**1983-94**	**1994-00**	**1996-03**	**1983-94**	**1994-00**	**1996-03**
Andhra Pradesh	21.14	59.59	17.1	53.25	2.02	2.36	6.16	2.65	3.29	4.17
Assam	27.19	65.56	32.6	42	2.07	1.07	3.13	2.04	0.71	4.43
Bihar	22.2	55.27	16.5	45.18	2.51	1.44	5.00	3.25	1.69	5.61
Gujarat	22.64	66.68	15	50	-0.70	3.83	-0.52	-0.08	1.62	4.32
Haryana	41.75	83.2	NA	74.6	3.42	2.41	-0.02	3.42	2.15	-1.62
Karnatka	16.84	58.41	14.8	51.63	2.70	4.48	8.76	4.33	2.05	11.67
Kerala	39.61	247.14	28	35.1	3.73	9.83	7.92	4.50	8.49	14.16
Madhya Pradesh	20.13	49.72	18.43	51.88	3.55	4.88	3.64	3.91	6.65	2.19
Maharashtra	22.86	60.11	16	45	3.60	1.85	4.00	5.82	1.77	3.92
Orissa	17.37	58.63	25	52.5	4.14	1.17	8.53	4.65	1.32	9.47
Punjab	43.18	NA	37.5	77	3.56	-1.89	-1.52	3.69	-1.80	-1.99
Rajasthan	31.1	86.11	22	60	1.05	2.52	3.18	-1.08	1.36	5.83
Tamil Nadu	17.58	118.83	14	54	3.32	1.99	1.58	4.46	-0.92	15.50
Uttar Pradesh	25.15	56.38	18	58	2.42	4.04	1.92	2.34	3.05	0.56
West Bengal	28.16	80.25	60.5	22.88	6.63	1.66	4.79	7.67	0.69	5.59

Note: Nominal wage and the SMW for farm workers in a state vary across regions; the mid-value of these wages are presented in the above table. Real wage is obtained by dividing average wage with the consumer price index of agriculture labour with 1986-87 as base.

A relatively higher growth of real wages in the southern states and a negative growth of real wages in Punjab and Haryana to lesser extent is a reflection of the agriculture performance of these states. By and large, investigation of figures suggests that increase of real wages for agriculture workers have been significant. Agricultural productivity as

[17] The nominal wage figures are obtained from different volumes of *Agricultural Wages in India*, latter known as *Rural Wages in India*, published from Labour Bureau Statistics. Wages for the state of Tamilnadu during the year 2002-3 and 2003-04 have been abnormally high. There are reports of migration of rural labour to urban places in the state on a massive scale following the not so good performance of agriculture in the state during the late '90s and the early years of the present decade. Subsequently in the 2002-3, agriculture has done extremely well and demand for agriculture labour increased but the supply of labour has reduced, because of migration, resulting into a significant increase of agriculture wage in TN.

apparent from productivity indices (see Annex Table 3) however, increased only marginally during the 90s. This further raises the issue of what exactly determines the real wages for agricultural workers in the country?

The wage alternately referred to as price of labour, like any other price, should depend on supply and demand for labour in the agriculture / rural sector. Productivity of labour in agriculture is often considered as the most important determinant of demand for labour. Labour productivity in the present study is agricultural income per worker. Though there may be several determinants of supply of labour in agriculture, the population and proportion of agricultural labour in rural workers population is the most important; it is generally presumed that the proportion of landless labour in the total workforce would exert an upward pressure on labour supply and this may affect real wages in agriculture adversely. In recent years, there are evidences of the agriculture labour market extending beyond the landless labour as small and marginal farmers with reduction of their holding size in fact present themselves into labour market for casual work. The present study therefore considers pressure on land represented as the labour-land ratio in a state as one of the possible determinants of supply of labour and is presumed to influence real wages negatively.

The supply and demand for labour in agriculture and so the wages of farm workers are also influenced by the performance of the non-farm sector. The present study postulates that growth of employment opportunities in the non-farm sector for example construction also exerts an upward pressure on demand for agricultural workers and so on the wages of farm workers. The present analysis considers concentration of rural non-farm worker (CRNFW), measured as proportion of workers in RNF sectors to total rural workers in the state as possible explanatory variables for the real wage of farm workers.

Finally, the real wages of farm workers (RW) for the year 1983, 1993-94 and 1999-2000 are regressed on labour productivity (LPR), concentration of rural non-farm workers (CRNFW), and labour-land ratio (LBLR). The predictability of real wage equations at least in the year 1983 increased with the dropping of CRNFS. Therefore, the real wage was also regressed on labour productivity (LPR) and the labour-land ratio (LBLR) as well for all the

three years of reference, 1983, 1993-94 and 1999-00. The OLS estimates with standard errors in parenthesis are presented below:

1983 $RW = -5.239 + 0.658LPR^{*} - 0.031CRNFW - 0.069LBLR^{*}$ $R^2 = 0.35$
(0.027) (0.341) (0.024) F-stat = $3.88^{\#}$

1983 $RW = -5.270 + 0.644LPR^{*} - 0.082LBLR$ $R^2 = 0.40$
(0.023) (0.434) F-stat = $6.14^{\#}$

1993-94 $RW = -4.608 + 0.418LPR^{*} + 0.25CRNFW - 0.039LBLR$ $R^2 = 0.69$
(0.012) (0.253) (0.792) F-stat= $12.65^{\#}$

1993-94 $RW = -4.445 + 0.541LPR^{*} - 0.058LBLR$ $R^2 = 0.68$
(0.0002) (0.648) F-stat = $18.25^{\#}$

1999-00 $RW = -4.209 + 0.323LPR^{*} + 0.299CRNFW - 0.133LBLR$ $R^2 = 0.44$
(0.155) (0.34) (0.58) F-stat = $6.42^{\#}$

1999-00 $RW = 4.015 + 0.468LPR^{*} - 0.019LBLR$ $R^2 = 0.44$
(0.008) (0.929) F-stat = $3.88^{\#}$

Note: The sign # shows significance of F-statistics whereas sign * shows significance of t-statistics at 10 per cent level of significance

The above equations show adjusted R-square, this figure is low at least for the year 1983 and 1999-00; the F-statistic is therefore calculated to measure the strength of the above relationships. The above estimates show that the labour productivity in agriculture is the most important determinant of real wage followed by labour-land ratio. The estimates for labour productivity in different equations suggests that for a one per cent increase of labour productivity the real wage increases by 0.65 to 0.32 per cent in different years keeping other determinants of wage constant. The sign of the estimates are on expected lines except the estimate for concentration of non-farm workers in the year 1983. One would presume that with increased emphasis on RNFS the real wage in agriculture should increase. The sign of the estimate is however negative for the year 1983. As mentioned earlier once this variable is dropped from the 1983 equation, the predictability of real wage (as measured through R-sq) increases. It is interesting to note that the sign of the estimate for the concentration of RNFW becomes positive during the year 1993-94 and 1999-00. There is possibility of this variable becoming important as a determinant of real wages in states during the 90s only.

The strength of the above relationships weakened during the 90s; increase of agricultural wage in the recent decade is also not commensurate with the productivity indices (see Annex Table 3). Do these trends suggest that increase of wages in agriculture is less explained in recent years in terms of real factors related to agriculture? The coefficients of determination for these equations (R-sq) are not very high. This further indicates that various other factors determine wages in agriculture, and in this context statutory minimum wage (SMW) is important.

In sum, there has been consistent growth in real wages for farm workers since the mid-80s. Real wages in agriculture for certain states had in fact declined towards the late '90s; a large part of the growth in real wages during the '90s is unexplained with reference to the productivity growth in agriculture and similar other determinants. The statutory minimum wage (SMW) appears to have a significant influence on agricultural wage in a majority of states. The regression analysis shows that pressure on land, that is, the labour-land ratio is the most important determinant of agricultural wage in the country. It is interesting to note that the effect of labour productivity on agricultural wage is not significant in most of the reference years; while concentration of non-farm workers has emerged as important during the 90s only.

IV. EMERGING OPTIONS IN AGRICULTURAL EMPLOYMENT

Agriculture in the present discussion does not include only crop and livestock activities but also forestry and fisheries. Employment in these sectors is closely associated with the performances of these sectors. This section presents agriculture and its allied activities, which emerged as important in recent years and have also a significant bearing on the intensity and quality of employment in the country.

Employment in agriculture to some extent is directly proportional to the cropped area. However, there are lesser chances of increasing the net sown area with the kind of pressure on land. Though there is scope for increasing cropped area by increasing intensity of land

use; this requires investments in infrastructure, as that of irrigation. Investment in infrastructure and the role of public investment in it is well documented; and is therefore excluded from the present discussion. This section of the paper illustrates relatively lesser-known employment generating activities in agriculture.

In crop-based agriculture, there is possibility of increasing employment by substitution of crops. In this context, vegetable growing is more labour-intensive as compared to many other crops. As the demand for vegetables would continue to rise in the country for many years to come farmers, especially small and marginal in well-endowed region can therefore specialize in vegetable farming. In low rainfall regions, where the land is not so productive certain non-edible wild seed, rich in oil for bio-diesel are emerging important. In recent years some of the fast growing non-edible oil seed species such as *Pongamia* and *Jatropha* start giving economic yields (about 18-19 quintal of oil per hectare) at the end of the fourth year. These species have other advantages[18] as well.

There is sufficient scope of increasing the intensity and quality of employment by altering resource utilization. Some emerging options in agricultural practices are precision farming[19], organic farming, integrated crop and nutrient management system[20]. It is difficult to say whether a shift to these farm practices would necessarily increase employment in agriculture as such. These farm practices are knowledge-intensive and the adoption of these farm practices would increase the demand for skilled extension workers to help farmers. Adoption of the above farm practices will however further widen the market of traditional farm inputs like farm-yard-manure (FYM), vermin-composts, bio-fertilizers. Production of these fertilizers as compared to chemical fertilizers is often more labour intensive

[18] These plants help in upgrading the quality of soil besides controlling erosion and desertification. These plants also have some medicinal use and are not easily browsed by cattle.

[19] Precision farming to some extent is self-explanatory with its word ‘precision’; resources here are used in their exact amount and the goal is to increases resource use efficiency to its maximum.

[20] Integrated crop management is a strategy which best meets the requirements of sustainable agriculture by managing crops profitably without damaging the environment.

Bio-fertilizer is a heterogeneous group of commodity and the production of some bio-fertilisers can also be organized on a small scale at the level of the farm. Vermi-compost is a labour intensive enterprise: quite suitable for women as it can be produced in their backyard with household food left-over during their spare time. Production of vermi-compost on a large scale needs supportive infrastructure for packaging and marketing of these products. Vermi-compost has a good market in urban places.

Agriculture Service Providers: The above-suggested activities are knowledge-intensive and require knowledge providers at the village level with up-to-date information about precision farming, integrated crop and nutrient management, and possible allied activities of the region. There is a general feeling that the government-sponsored extension services have almost failed in many states. The importance of extension services however, increases when technology and the market become the main driving forces for agricultural development.

With fragmentation of land, a significant proportion of land holdings have emerged as unviable. As these units cannot afford to invest in tractors / trolleys, and similar other lumpy goods, they will require a human workplace. This holds good not only for the crop and dairy activities, but for efficient organization of many allied activities in the rural sector as well. In this situation the need for physical service providers, apart from knowledge providers would increase. This has the potential to emerging as an important rural activity.

Allied Activities: In recent decades with the decreasing size of land holdings, allied activities have emerged as important. Considering the kind of competition between man and beast for food and fodder and ultimately on land, there is not much scope for expanding employment in traditional allied activities like dairy by increasing numbers of cattle. Though there is sufficient scope for increasing productivity, and value-added growth in these items, the Indian dairy sector is in the process of consolidation;[21] all these would affect quality of employment for these workers.

[21] In livestock, though employment is decreasing because of a decline in the livestock population; the productivity of employment in the sense of value of livestock output per unit of worker is increasing.

Poultry, another important allied activity has peaked in the last one decade owing to its phenomenal growth in certain pockets of the country. There is scope for increasing its spread across the country. With the increased role of animal protein in an average Indian diet, bird keeping will gain further importance especially when the livestock base is depleting.

Certain lesser-exploited allied activities like bee keeping, seri- and lac-culture must not remain an occupation of the people living around forests. Some of these activities especially bee keeping, has been extended to oilseed growing and orchard-inhabited regions of the country. This trend needs to be strengthened further.

Primary Processing: Employment in agro-processing technically does not belong to the primary sector. Primary processing refers here to certain processing activities, which can be practiced at the household level without using much of machinery and is important for household income diversification. Primary processing at the small-scale level requires supportive infrastructures and institutions. Unfortunately certain government policies[22] often act as dampener to farmers' initiatives.

Inland and Marine Fisheries: Modern fishing practices such as oceanic purse seining, oceanic gill netting, bottom trawling and dynamite /blast fishing have led to the rapid decline of fish resources beyond the point of recovery in the shallow zone. Development of marine fisheries beyond the shallow zone requires special kind of infrastructures.

Though shrimp has played an important role in the phenomenal growth of fisheries GDP in the recent decade; negative externalities associated with shrimp farming have constrained its future growth. Eco-friendly fishing and fish farming are effective answers to sustained growth in sea-food production and employment. Eco-friendly shrimp culture requires less chemicals, anti-biotics, low stocking densities in a polyculture system. Eco-friendly sea farming of fin-fishes, like silver pomfret and shell-fishes such as oyster,

[22] In Nasik for instance, a grape-growing region of the country, farmers started producing wine on a small scale; they almost started marketing of that product in the domestic and international market but the excise policy of the State Government ruined the entrepreneurial skill of farmers.

seaurchins and seaweeds may be promoted. The floating net cage culture of fish, which is very popular in China, can also be adopted in India for growth and employment in fisheries sector. In the recent decade, with the promotion of cultured fisheries, nursery rearing and seed production may also emerge as an important activity for coastal fisherman.

Forestry: The scope of employment in the forestry sector largely depends on government's attitude towards the people living around forests. Joint-forest management (JFM), which recognizes role of local people in management of forest, was started in the late 80s. Increase of employment in this sector to some extent would depend on the spread of JFM.

Social forestry and farm forestry emerged important in the 80s. Farm forestry was encouraged with the increased profitability of some fast growing tree species like eucalyptus and popular, while social forestry got an impetus following the interests of various multilateral and similar other organizations. As neither of these could be sustained for long, as a consequence employment growth in forestry could not be maintained at the same pace. The present study believes that social forestry has large potential since the country has a significant proportion of marginal and degraded land, often suitable for tree growing only.

Alternate social forestry development models based on state, corporate, NGOs and co-operatives have emerged over the years. Ideally, the government should make its wastelands available to tree-growers-cooperative societies[23] (TGCS) on long-term lease for tree plantations (Singh 2000). Innumerable commercial uses of trees are well documented; for example there are some oil-bearing trees namely *neem, mahua, karanja, undi, kusum, pilu, dhupa, nahor, kokum* and *sal*. The oil extracted from these seeds, often not edible can however be utilized as bio-fuel and increase energy security of the country. NGOs and private companies may complement and supplement the social forestry development work of TGCS. The state forest department should create a congenial environment for TGCS to work effectively. The government should also provide them with the requisite technical information and financial support (Singh 2000).

[23] Researchers like Singh, K. (2000) have found that the performance of cooperative as compared to other institutional arrangements in relation to social forestry is better.

V. CONCLUSION

There is hardly any increase of agricultural employment during the 90s (1994-00), while employment in certain sub-sectors of agriculture like livestock, forestry and fishing has in fact, declined. There are mixed trends from the states. Thus employment in agriculture has declined in many states, while in certain states, where the employment increased, the trends are not necessarily encouraging. Push as well as pull factors appear to have been responsible for these spatial trends in agricultural employment. In agriculture, the share of female workers has increased at the aggregate level; though there are states registering a decline in the corresponding share. From certain states there are also evidences of male workers crowding out female workers in agriculture.

Labour productivity in agriculture has increased; this increase is associated with almost a complete decline of agricultural employment in the 1990s. The real wages for agricultural workers has increased consistently during the 90s, though certain indices of agricultural productivity have not increased significantly. A regression analysis to explain the factors behind real wages in agriculture shows that the effect of labour productivity on real wage has decreased while that of the labour-land ratio has increased during the reference period (1983-99). In other words, in agriculture the labour market influence of demand decreases while that of supply has increased. The effect of the statutory minimum wages on agricultural wages appears to have increased during the 1990s. Though disparity in wages across states has declined during the 90s, wages in certain states like Punjab and Haryana remain higher than in many other states. Only recently (2001-03), the real wage in these states has decreased suggesting that increase of wage incommensurate with the increase in agricultural productivity cannot be sustained for long.

With a not-so-encouraging state of affairs in agricultural employment, the present study illustrates opportunities for increasing employment in agriculture. These opportunities encompass crop-based activities and also allied activities, and range from organization of

production to processing and marketing as well. Most of these activities are in operation in selected pockets in the country; and their spread on a larger scale would however, require favourable infrastructures, institutions, and incentive structures.

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ANNEXURES

Annex Table 1: Status and Growth in Agricultural and non-Agricultural Employment across Space and Time						
	Agril. in rural empl.		**ACGR in Agril.empl.**		**ACGR in Non-Agril empl.**	
State	**1983**	**1999-00**	**1993-99**	**1983-93**	**1993-99**	**1983-93**
A.P.	74.93	77.24	0.10	3.44	1.18	1.47
Assam	78.95	69.91	-0.58	2.51	7.59	2.57
Bihar	81.59	81.54	1.10	2.70	2.69	1.78
Delhi	40.08	15.92	0.28	-3.61	-5.36	13.22
Goa	31.82	27.3	-9.60	4.03	3.02	-1.70
Gujarat	82.67	77.21	0.95	1.73	2.94	4.05
Haryana	73.01	68.24	1.27	2.17	3.54	3.16
H.P.	82.42	74.97	-0.63	2.22	3.09	4.57
Karnataka	80.43	80.8	0.60	2.91	1.58	2.07
Kerala	54.61	46.07	-4.40	3.61	5.00	1.35
M.P.	86.61	86.43	0.53	2.15	3.40	0.59
Maharastra	78.5	79.74	0.02	2.93	2.71	0.55
Orissa	74.33	76.29	0.58	2.06	1.99	0.15
Punjab	75.68	72.19	1.06	2.61	2.04	3.89
Rajasthan	84.51	77.39	0.01	1.89	2.15	5.40
T.N.	70.27	67.37	-1.90	2.12	0.84	1.81
U.P.	80.01	77.74	0.03	2.19	2.47	2.10
W.B.	69	64.74	-0.29	2.64	-0.35	4.67
Total	77.55	75.89	0.15	2.65	2.13	2.40

Anex Table 2: Simple Annual Average Growth in Agriculture, Forestry and Fisheries during the 80s and 90s

	Agricultur	Forestry	Fisheries	GSDP	Agricultur	Forestry	Fisheries	GSDP
States	**1994-83**	**1994-83**	**1994-83**	**1994-83**	**1994-00**	**1994-00**	**1994-00**	**1994-00**
Andhrapradesh	2.37	3.52	8.68	5.81	1.10	1.82	7.48	6.24
Assam	1.83	-2.67	7.60	4.15	0.25	1.23	-0.63	2.20
Bihar	-0.55	11.09	10.27	4.29	1.45	-1.28	5.03	4.31
Goa	2.81	-7.96	36.00	9.55	4.12	119.65	-6.16	12.87
Gujarat	-2.05	0.00	20.00	12.22	1.38	0.00	5.55	6.72
Haryana	9.39	4.07	11.11	7.41	2.22	-0.85	0.88	8.44
HP	3.19	-2.08	18.86	6.57	0.04	2.07	1.75	8.74
Karnataka	5.49	0.69	5.52	8.33	5.79	1.90	8.79	9.86
Kerala	6.44	5.54	2.62	9.22	2.07	1.34	0.56	6.45
Madhyapdesh	5.16	-0.74	2.39	10.56	1.52	-0.79	4.85	7.26
Maharashtra	5.96	-3.79	23.00	8.04	1.67	0.42	25.24	5.32
Orissa	0.24	-3.66	14.00	4.00	-0.89	0.18	4.94	3.94
Punjab	6.12	-3.75	53.33	6.44	2.39	4.58	24.84	5.62
Rajasthan	0.09	90.17	-2.88	7.08	5.45	3.02	1.35	10.50
Tamilnadu	8.13	47.64	2.12	9.43	1.37	2.49	3.06	8.08
UP	2.56	-6.07	21.37	4.69	3.14	-3.84	7.58	5.03
WB	6.42	-1.70	11.61	7.12	4.23	1.94	4.45	8.58

Anx. Box 1: Index number of Wholesale Prices of Important commodity groups with base 1993-94 = 100

Years	Agricul.	Manufa.	General
1994-95	116.1	112.3	112.6
1995-96	125.9	121.9	121.6
1996-97	136.4	124.4	127.2
1997-98	140.3	128.0	132.8
1998-99	157.2	133.6	140.7
1999-00	159.1	137.2	145.3
2000-01	163.6	141.7	155.7
2001-02	169.5	144.3	161.3
2002-03	175.3	148.1	166.8
2003-04	182.8	156.5	175.9

Source: Economic Survey, 2004-05

Anx. Box II: Wholesale price indices of important commodities in India base 1981-82=100

Years	Fish	Meat	Foodart.	Allcomdties
1990	193.5	188.9	191.6	177.2
1991	216.4	214.1	230.3	201.4
1992	264.8	249.5	266.8	224.7
1993	331.2	283.8	281.8	242.1
1994	441.4	343.9	303.6	267.4
1995	535.1	392.3	331.1	292.4
1996	431.4	490.9	362.7	309.0
1997	500.4	544.6	384.3	325.6
1998	582.4	567.6	431.8	348.2

Source: Handbook on Fisheries Statistics , MOA Dept. of Animal Husbandry & Dairying, GOI

Annex Table 3: Index Numbers of Area, Production and Yield of Foodgrain and Non-foodgrain Crops in India (triennium ending 1981-82=100)

Year	Food grains (wt. 62.92)			Non-foodgrains (37.08)			All principal crops		
	Area	Prod'n	Yield	Area	Prod'n	Yield	Area	Prod'n	Yield
1951	76.4	46.5	64.2	66.6	45.8	75.1	74.1	46.2	67.8
1961	90.9	69.6	81.9	83.8	67.4	84.0	89.2	68.8	82.7
1971	97.9	87.9	93.2	91.1	82.6	91.4	96.3	85.9	92.6
1981	99.8	104.9	105.1	99.4	97.4	99.2	99.7	102.1	102.9
1991	100.7	143.7	137.8	120.0	156.3	128.0	105.2	148.4	133.8
1992	96.0	137.6	136.5	124.8	158.8	123.7	102.7	145.5	131.0
1993	97.0	144.3	142.0	123.2	164.0	130.2	103.1	151.6	137.2
1994	96.7	150.2	146.5	127.3	169.5	132.7	103.8	157.3	140.7
1995	97.6	155.9	150.4	126.2	180.9	138.9	104.2	165.2	145.5
1996	95.3	146.1	143.1	131.8	185.5	135.7	103.8	160.7	139.8
1997	97.4	160.9	154.5	134.6	200.9	143.8	106.0	175.7	149.8
1998	97.6	155.7	148.4	133.6	181.6	132.3	105.9	165.3	141.2
1999	98.6	165.2	154.0	134.8	200.2	141.2	107.0	178.2	148.4
2000	97.0	169.7	159.8	130.7	189.0	136.4	104.8	176.9	149.6
2001	95.4	158.4	152.8	127.0	178.2	133.2	102.7	165.7	144.3
2002	96.0	171.8	164.8	127.6	187.7	138.0	103.3	177.7	153.1
2003	89.1	146.8	150.7	119.6	170.4	130.5	96.2	155.5	141.8

Note: The above information is for the terminal year, 1951 for example, 1950-51.

Annex Table 6: Important Exportable and Importable Agricultural Commodities with its Share During Selected Years

	1990-91	1991-92	1992-93	2001-02	2002-03	2003-04
Agri-exportables						
Tea, coffee & tobacco	26.47	24.5	20.2	12.18	10.58	10.23
Spices	3.82	4.74	4.35	5.04	4.77	4.14
Sugar	0.62	2.01	3.91	5.41	5.11	3.25
Fruits & vegetables	4.64	5.52	4.8	5.94	5.82	6.67
Marine products	15.96	18.41	19.3	19.83	19.99	16.45
Poultry products	0	0	0	0.49	0.52	0.67
Agri-exp as % of Exports	18.49	17.8	16.84	14.22	13.58	12.65
Agri-importables						
Pulses	39.2	17.26	11.63	19.44	15.54	10.28
Oils & oilseed	28.1	17.5	6.23	39.84	50.01	53.44
Agri-import as % of Imp	2.79	3.09	4.54	6.63	5.92	6.19

Annex Table 4: State-wise Distribution of Agricultural Workers by Sex in the Year 2001 *(% to total workers, main and marginal, based on US)*						
	Cultivators			Agril. Labourers		
State	**Male**	**Female**	**Persons**	**Male**	**Female**	**Persons**
A.P.	31.8	21.9	27.6	37.9	60.7	47.5
Assam	44.4	42.9	43.9	14.1	17.4	15.1
Bihar	34.3	23.0	31.2	46.1	64.6	51.3
Delhi	6.9	17.5	8.4	2.3	5.7	2.8
Goa	12.5	24.8	16.5	7.4	19.9	11.5
Gujarat	43.0	31.2	38.3	26.7	44.0	33.6
Haryana	44.6	48.6	46.1	16.6	22.9	18.9
H.P.	55.2	88.5	70.4	3.6	2.9	3.3
Karnataka	45.9	29.0	39.1	23.7	50.4	34.4
Kerala	10.1	5.5	8.9	17.6	26.2	19.7
M.P.	54.8	46.6	51.4	27.4	43.5	34.1
Maharashtra	42.5	40.7	41.7	30.3	48.2	38.4
Orissa	39.6	20.5	33.2	30.2	56.9	39.1
Punjab	37.6	15.4	31.5	22.5	20.8	22.0
Rajasthan	60.9	70.5	65.0	8.7	17.1	12.3
T.N.	29.1	23.7	26.9	35.3	54.3	43.1
U.P.	52.6	36.8	48.4	24.1	43.9	29.3
W.B.	28.7	16.1	25.4	31.0	38.6	33.0
Total	42.2	36.5	40.1	27.5	43.4	33.2

Annex Table 5: Land Distributions under Crops on the basis of Cropped Area for Selected Years

Crops / Items	**1991-92**	**1992-93**	**1999-00**	**2000-01**
Cereals & millets	54.78	54.62	54.13	53.45
Pulses	12.45	12.61	11.62	11.19
Sugar	2.31	2.27	2.39	2.44
Condiments & spices	1.3	1.45	1.52	1.47
Fruits	1.48	1.51	1.78	1.86
Vegetables	2.3	2.23	2.54	2.48
Oilseeds	14.69	14.37	14.1	13.29
Fibres	4.93	4.88	5.34	5.21
Dyes & tanning mat'al	0.02	0.02	0.02	0.02
Drugs & Narcotics	0.66	0.63	0.64	0.61
Fodder crops	4.28	4.56	4.92	5.19
Other crops	0.8	0.85	1	2.79
	100	100	100	100

Source: Fertilizer Statistics, 2003-04, Fertiliser Association of India, New Delhi.