Dynamics of Agricultural Mechanisation and Rural Labour Force

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Abstract

Analysis of cost of cultivation data, NSSO data and poverty data of Planning Commission reveals that during 1996-97 to 2010-11, there is declining share of human labour cost in the total operational cost of paddy and wheat growing states and increase in the machine labour cost. Family labour cost and animal labour cost moves in the same direction. As per NSSO data since the rural male employment increased by 46% (making a shift from self employment and regular employment to casual and regular employment) and female employment by 12 % (shifting towards self employment and regular wage employment) during the period, the displacement is absorbed in the nonfarm activities. Further, faster average annual decline in rural poverty during 2004-11 (2.32%) than during 1993-2004 (0.81%) and reduction in the gap of rural urban poverty indicates increase in the standard of living. Effective Government policy on farm mechanization and diversification of rural activities will be a welcome strategy.

Keywords: Farm mechanization, Labour displacement, Input share, Rural poverty, Machine labour, Anim.

I: Introduction

Given the limitations in the expansion of acreage, the main source of long term output growth is yield rate. However, the revolutionary change in the agricultural production under the banner of Green Revolution through use of High Yielding Variety Seeds; increasing use of chemical fertilisers and pesticides, insecticides accompanied by the effective paddy support policy helped making India a surplus food producing country and this is what farm mechanisation took its debut in the field of agricultural production. The end objective of farm mechanisation is to enhance the overall productivity and production with the lowest cost of production. The contribution of agricultural mechanisation has been well recognised in enhancing the production together with

irrigation, biological and chemical inputs of high yielding seed varieties, fertilisers, pesticides and mechanical energy. It has been adopted in India on a large scale benefiting small, medium and large size farms (Singh, 2001 and Aurangzeb et al., 2007).

Farm mechanisation seems to adversely affect the labour input demand, which will adversely affect the exiting unemployment situation in the labour market. However, Sidhu and Grewal (1991) concluded that there was no significant difference in human labour use on tractor and bullock operated farms. Some other studies also indicated that net human labour displacement in agricultural operations was non-significant and it was more than compensated by increased demand for human labour due to multiple cropping, greater intensity of cultivation and higher yields. Furthermore the demand for non-farm labour for manufacture, servicing, distribution, repair and maintenance as well as other complementary jobs substantially increased due to mechanisation (GIPE, 1967; UPAU, 1969; Billing and Singh, 1970; AERC, 1970, 1973; Singh and Singh, 1972).

Kuznet (1957), while collecting the evidence in support of the view that rural areas are transforming from a purely agrarian to a diversified economy in developing countries as they continue to develop, had shown the continuous decline of labour force employed in agriculture overtime and the large increase in the share of labour force employment in the non-farm sector. Others confirming this are (Chenery and Syrquin, 1975; Mundlak et al., 1997; Long et al., 2011; Bdul, 2012; Ravallion and Datt, 1996; Lanjouw and Lanjouw, 2001; Barrett et al.,2001). However, the benefits of diversification are not equal among different sections of society, as majority of them are still dependent on low productive employment with low wages. Studies by FFYP, (1973), Gill, (1984), and Miah et al.,(2002) on the impacts of mechanisation on overall livelihood of the rural population in Bangladesh indicated that the increased use of tractors (principally) and to some extent mechanisation seriously affected the income of small farmers and landless labourers while contributing little to the overall productivity of farming system.

Several studies have also revealed that farm mechanisation greatly helped the farming community in the overall economic upliftment. NCAER (1980) survey revealed that tractor owners and users derived higher per hectare gross income compared to traditional bullock farms. The gross income per hectare was reported to be about 63% higher on tractor owning farms as compared to the bullock farms. The average net return from a tractor owning farm on per hectare basis was reported to be 152% that of a bullock owning farm (AERC, 1970, 1973; NCAER 1974; Patil and Sirohi, 1987; Balister et al., 1991).The survey also reported that farm mechanisation raises productivity in sorghum by 72 % and 7% in cotton as compared to bullock farms. Productivity Organization (1983) considered that despite certain gains, tractorisation increased debt, cost of fuel and repair, unemployment, disparity in income. Aggarwal and Mishra (1973) reported an estimated displacement of casual labour by cost of combine harvester in Ludhiana district to the extent of nine man days per acre. Mishra and Sundaram (1975) asserted both the cost and benefits of harvester combines. It was estimated that the use of harvester combine resulted in saving of about 15 man days of unskilled labour per acre.

In this context, the paper, considering both paddy and wheat crops, has focussed on three important aspects of farm mechanization*. Section II explains the input share in paddy and wheat production and the trend of their use. Section III shows the linkage between farm mechanization; human labour displacement and the gender- specific rural and urban employment. The next section makes an attempt to link the changing scenario of employment in rural and urban areas with the trend in the level of poverty sex wise during the period under study. The last section sketches the conclusion.

II: State -wise Share of Input Use Pattern in Paddy and Wheat Production

As per the land use statistics (State of Indian Agriculture 2012-13, Directorate of Economics & Statistics, Government of India) the total area under crops in 1990-91 was 185.74 million hectare (mha) and went up to 192.20 mha in 2009-10. The decline in the net shown area from 143 mha in 1990-91 to 140.02 mha in 2009-10 implies an increase in cropping intensity from 130 % to 137 %. In 1990-91, out of the total crop area, 23% was under paddy; 12.9 % under wheat; 19.5% under coarse cereals and 13.4% under pulses making a total of around 70% under food crops (Table-1). Paddy and wheat alone constitute half of the total area under food crops and 24% was under non-food crops. In 2010-11, paddy and wheat alone constitutes 37% of the total area under the food crops.

Table 1: Crop-Wise Share in Area (All India) (in %)

Crop	1990-91	2003-04	2009-10
Paddy	23	22.3	22
Wheat	12.9	14.2	14.9
Coarse Cereals	19.5	16.5	14.5
Pulses	13.4	12.9	12.5
Non-food	24.1	25.1	26.6

Source: State of Indian Agriculture 2012-13, Directorate of Economics a & Statistics, GoI

As per the state-wise percentage area under paddy and wheat between the period 2001 and 2010 (Table-2) the major paddy producing states are Andhra Pradesh, Assam, Bihar, Odisha, Kerala, Tamil Nadu and West Bengal where the area under paddy of the total cereals and millets constitute more than 70 % and in states like Gujarat, Haryana, Karnataka and Madhya Pradesh it is 20% to 30% . 30% to 60% of the total cereal and millets area in the states of Bihar, Gujarat, Haryana, Himachal Pradesh Madhya Pradesh, Punjab, and Uttar Pradesh are under wheat cultivation

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*State wise time series data (1996-97 to 2010-11) on cost of cultivation and input use data per hectare (ha) (Directorate of Economics and Statistics, Government of India), the NSS 50th round, 58th round survey data on employment and unemployment for the period 1993-94 to 2010-11 and data from data book for the use of Deputy Chairman, Planning Commission, Government of India (2014) have been accessed for the study.

Table 2: State-Wise area under Paddy & Wheat (2001-02 & 2010-11)
(in 000 Hectares)

State	2001-02	2010-11	*	@	State	2001	2010-11	%(**)	%(+)	%(#)
AP	3825	4751	74	80	Bihar	2126	2100	31	34	37
Assam	2536	2570	96	97	Gujarat	442	1274	12	25	35
Bihar	3552	2845	56	50	Haryana	2300	2504	57	56	55
Gujarat	686	808	22	22	HP	376	357	47	47	47
Haryana	1028	1243	25	27	MP	3692	4633	48	50	58
Karnataka	1407	1532	27	28	Punjab	3420	3510	56	55	54
Kerala	322	213	98	99	Rajasthan	2287	3036	24	23	28
MP	1766	1574	23	20	UP	9956	9637	52	54	55
Maharastra	1514	1581	16	17	-	-	-	-	-	-
Odisha	4500	4226	91	95	-	-	-	-	-	-
Punjab	2487	2825	41	44	-	-	-	-	-	-
Rajasthan	144	131	1.2	1.5	-	-	-	--	-	-
Tamil Nadu	2060	1906	74	75.	-	-	-	--	-	-.
UP	6071	5657	34	34	-	-	-	--	-	-
WB	6069	5630	92	93						

(*) shows the percentage of area under paddy in 2001-02 of the total acreage under total cereals and millet (@) shows the percentage of area under paddy in 2010-11 of the total acreage under total cereals and millet Source: Directorate of Economics and Statistics, Department of Agriculture, Government of India. (**) shows the percentage of area under wheat in 2001-02 of the total acreage under total cereals and millets. (+) shows the percentage of area under wheat in 2005-06 of the total acreage under total cereals and millet. (#) shows the percentage of area under wheat in 2010-11 of the total acreage under total cereals and millets Source: Source: Directorate of Economics and Statistics, Department of Agriculture, Government of India

On the basis of the cost of cultivation data between 1996-97 and 2010-11 (Table 3), (computed from the cost of cultivation data) in paddy crop, the human labour (family followed by hired / casual labour) are the major input cost share to the operational cost. In the year 1996-97, FLC (family labour cost) and HLC (hired labour cost) per hectare constituted almost 50% of the operational cost. However, states like Madhya Pradesh, Uttar Pradesh and Haryana with comparatively less area under paddy, (20% to 34%), FLC share to the operational cost is more compared to the hired labour cost. The states using more family labour use more animal labour and states using more family labour use less hired labour This is evident from the correlation coefficient (r) between FLC and HLC (-0.70), r is 0.86 between animal labour cost (ALC) and FLC and - 0.506 between ALC and HLC. This shows the subsistence farming using the own account resources such as family labour, owned bullock labour. In the states like Tamil Nadu, Kerala, Andhra Pradesh and Bihar, the percentage of HLC to the total operational cost of paddy cultivation is more compared to the family labour cost. However, in the states like Odisha and Punjab, the share of

both FLC and HLC gets equal weight. In total the human labour cost share (FLC and HLC) is the major part of the total operational cost of production of paddy.

As far as the trend of the input share is concerned, FLC and ALC per ha have declined over the period (1996-97 to 2010-11 and the percentage share of HMC (hired machine cost) and the OMC (owned machine cost) have shown an increasing trend. The states using more hired labour have used more hired machine (correlation coefficient (r) between HLC and HMC is 0.628) and more quantities of fertiliser compared to the states who used more family labour (r between FC (fertiliser cost) and FLC is -0.507 and r is -0.657 between FC and ALC). The states incurring higher FLC compared to the hired/casual labour cost incur more cost on the ALC (hired/owned).

Table 3: State-Wise Percentage Share of Inputs Cost to Paddy Operational Cost (per ha)

	State	FLC %	% HLC	ALC %	HMC%	OMC %	FC%
1996-97	AP	18	33	5	7	0.4	15
2010-11	AP	16	39	2	17	0.1	9
1996-97	Assam	54	8	21	0.3	0.8	0.3
2010-11	Assam	41	16	23	5	0.8	2
1996-97	Bihar	24	28	15	4	0.5	13
2010-11	Bihar	25	32	5	12	0	7
1996-97	Harayaa	25	16	2	6	7	15
2010-11	Harayaa	20	30	0.3	8	3	10
1999	Karnataka	15	29	7	8	0.2	18
2010-11	Karnataka	19	32	8	15	1	12
1996-97	Kerala	14	54	3	5	0	7
2010-11	Kerala	8	46	0.1	25	0	6
1996-97	MP	27	19	22	0.3	8	10
2010-11	MP	23	25	13	11	0	7
1996-97	Odhisa	29	28	15	0.8	0	9.2
2010-11	Odhisa	28	34	14	4	1	6
1996-97	Punjab	11	14	0.3	9	8	17
2010-11	Punjab	14	25	0.4	11	8	12
1999	TamilNadu	15	37	3.4	10	0	11
2010-11	TamilNadu	17	29	1	18	0.4	9
1996-97	UP	32	20	8	0.7	9	13
2010-11	UP	25	20	4	13	2	13

Source: Computed from the Cost of Cultivation Data (Directorate of Economics and Statistics)

Note: FLC-family labour cost, HLC-hired labour cost, ALC, animal labour cost, HMC-hired machine cost, OMC-owned machine cost and FC fertiliser cost.

As reported in Table 4 the share of FLC and HLC in wheat production which was more than 50% of the operational cost in 1996. had shown a declining trend during the period despite their price rise. Similar is the case for the share of animal labour cost share per hectare. On the other hand there is a sharp rise in the share HMC during the period 1996-97 to 2010-11 (r between HMC and Are under crop is 0.77). The importance of animal labour in wheat cultivation is evident from the fact that even though there is increasing use of machine labour, all the major wheat growing states except Punjab, have shown higher percentage of FLC in the total operational cost

than the percentage of HLC per ha (r between $_{HLC\,and\,FLC}$ is - 0.66). The percentage ALC is also comparatively more than it is for Punjab. But the percentage of HMC for every state is almost equal. The use of more machines reduced the use of more animal labour (r between ALC and OMC is -0.54). But the HLC and OMC has a positive correlation of 0.55. Another fact is that the use of more machine and HL has a positive impact on the use of fertiliser (0.66 for FC and HLC; 0.76 for FC and OMC and -0.87 for FC and FLC). That is farming with more family labour and animal labour is less mechanised than those using more HL and HM and OM.

Table 4: State-wise Percentage Input Cost to Operational Cost of Wheat Production (per ha)

Year	State	FLC%	HLC%	ALC%	HMC%	OMC%	FC%
1996-97	Bihar	17	14	12	8	2	20
2010-11	Bihar	20	16	5	19	2	12
1996-97	Gujarat	18	13	4	12	1	14
2010-11	Gujarat	14	10	3	19	1	15
1996-97	Harayana	24	8	3	15	4	20
2010-11	Harayana	22	13	1	22	4	12
1996-97	HP	48	1	6	12	1	8
2010-11	HP	34	3	3	26	0	6
1996-97	MP	21	9	10	13	2	16
2010-11	MP	19	10	4	25	1	10
1996-97	Punjab	10	20	1	10	9	27
2010-11	Punjab	9	13	0	27	8	18
1996-97	Rajasthan	34	6	4	14	1	13
2010-11	Rajasthan	35	8	0	18	1	10
1996-97	UP	20	11	8	15	1	17
2010-11	UP	20	11	3	22	2	13

Note: Computed from the Cost of Cultivation Data (Directorate of Economics and Statistics)

As reported in Table 5 and 6, except Assam, Haryana and West Bengal, all other paddy producing states show a decline in the use of the HLH (human labour hour) during the period. Those states using more family labour compared to hired labour have shown a positive change in the quantity of casual labour hour (CLH) (Assam, Haryana) (r between ΔCLH and ΔHLH is 0.7). The decline in the yield rate of paddy in Haryana and MP shows a link between the proportion of use of human labour and the yield rate (There is negative correlation of -0.26 between ΔYR and ΔHLH) during the period. However the ΔYR is positively related to ΔHMC (0.63) and to ΔOMC (0.74). This shows that the paddy productivity per hectare is positively related to the use of machines but negatively related to the use of HLH. Further increase in HMC reduces the operational cost as these two are negatively correlated (-0.32) and the use of more HLH and CLH raises the operational cost of Paddy per hectare (r between ΔCLH and ΔYR is 0.6)

The decline in ΔHLH is highest in case of Kerala (-46%) followed by Andhra Pradesh (-34%) and Tamil Nadu (-32%) and percentage decline in the casual labour is the main factor behind the decline in HLH (r between ΔHLH and ΔCLH is 0.60) with an exception in Assam, with 114 % increase in the casual labour hour per hectare in between 1996-97 and 2010-11. On the other hand, the percentage change in the share of HMC during the period is very large on an average it is

1312%. In case of Kerala it is 8687%. The minimum increase in percentage of hired machine cost is in Punjab. It should be noted that the low percentage change does not mean that the farm people in Punjab are using comparatively less machines.

Table 5: State-wise Percentage change in different costs/Quantity in Paddy Cultivation (per hectare during the Period 1996-97 to 2010-11)

States	ΔOPC	ΔVMP	Δ HLH	ΔALH	ΔOMC	ΔHMC	ΔYR	ΔCLH
AP	149	155	-34	-79	35	466	13	-31
Assam	218	188	4	-59	736	1927	43	114
Bihar	168	1199	-14	-71	-60	665	-9	-24
Haryana	146	265	7	-92	17	213	-12	64
Kerala	91	230	-46	-97	1066	8687	38	-43
MP	144	178	-23	-51	40	715	0	-10
Karnataka	111	69	-18	-30	842	288	9	-17
Odisha	223	167	-28	-12	633	1301	17	23
Punjab	134	216	-9	0	128	179	15	7
Tamil Nadu	110	100	-32	-82	424	293	4	-43
UP	195	169	-2	-76	723	409	12	-6
WB	184	130	1	-49	-20	602	0	-2
Average	156.1	255.5	-16.17	-58.17	380.3	1312.1	10.83	2.67

Note-OPC-Operational cost, VMP-value of main product, HLH-human labour hour, ALH-animal labour hour OMC-owned machine cost, HMC, hired machine cost, YR-yield rate, CLH-casual labour hour
Source: Computed from the cost of Cultivation data (Directorate of Economics and Statistics)

The fact is that the share of OMC in 1996-97 was around 10% of the total operational cost and it went up to 27% where as other states have almost very negligible share of the owned machine cost per hectare. Similarly the HMC share of the total OPC was 8% for Punjab; where as for all other states it varied from 0.5% to 1%.

Table 6: State-Wise percentage Change in Different Costs/Quantity on Wheat Production (per hectare during 1996-97 to 2010-11)

State	ΔOPC	ΔVMP	Δ HLH	ΔALH	ΔOMC	ΔHMC	ΔYR	ΔCLH
Bihar	161	128	-20	-70	-58	544	4	256
Gujarat	118	132	-34	-65	127	257	24	-10
Haryana	146	171	-25	-88	2364	262	10	5
HP	276	139	-30	-59	7	403	99	-61
MP	147	221	-30	-72	39	360	55	-21
Punjab	112	144	-55	-66	107	476	0	112
Rajasthan	97	142	-21	-81	-28	141	22	18
UP	151	199	-16	-88	382	254	16	54
WB	252	51	41	143	25	112	16	-32
Average	162.22	147.44	-21.1	-49.55	329.44	312.11	27.33	35.67

Note-OPC-Operational cost, VMP-value of main product, HLH-human labour hour, ALH-animal labour hour, OMC-owned machine cost, HMC, hired machine cost, YR-yield rate, CLH-casual labour hour

Source: computed from the cost of Cultivation data (Directorate of Economics and Statistics)

As per Table-6 all the wheat producing states have shown a large decline in the use of HLH quantity with an average of 21% (highest 55% for Punjab followed by West Bengal and Gujarat). ΔOMC and ΔHMC for all the states are positive indicating the increasing use of farm machineries and modern tools. All the wheat growing states have shown decline in HLH as well as ALH and increased in the HMC. But ΔCLH is negatively related to the ΔYR (correlation coefficient is -0.6 and ΔHLH has a negative correlation with ΔVMP -0.61). HLH and ALH have negative impact on the VMP; but ΔALH and ΔHLH are positively correlated (0.855). This shows that higher use of human labour and animal labour reduces the yield rate and therefore the value of the product is declining. However, there is no definite pattern of relation between yield rate and proportion of machine cost even though all the states have shown nonnegative change in the yield rate during the period. Increase in the machine cost implies use of more machines as is evident from the sales of tractors and power tillers. In 1982-83, 63073 numbers of tractors and 2221 power tillers were sold in India and it went up to 4 lakh 19 thousands for tractors (about 565%) and near about 40000 for power tillers (about 1696 %) in the year 2011-12 (Ministry of Agriculture, Govt. of India).

As per the information released by The Lok Sabha of India it is very much interesting that the percentage share of agricultural worker in the agricultural sector declined drastically from 15.11% in 1971-72 to a mere 5.77 % in 2005-06 whereas, the share of tractor power increased sharply from 7.49 % to 46.70 % during reference period. There is also a similar decline of the draught animal's share (from 45.26 % in 1971-72 to 8.02 % in 2005-06). (Table-1 of the Supportive material)

III: Direction, Composition and Structure of Employment of Farm Labour

This section examines NSS state-wise data on employment and unemployment (50th and 68th round) for 1993-94 and 2011-12 to find out the movement of the displaced human labour owing to mechanization in the rural and urban areas (both male and female)

As per the data on usual status (principal as well as subsidiary occupation) at the all India (Key Indicators of Employment and Unemployment, MOSPI, 2013) level, in 1993 out of 1000 employed persons in rural area 561 persons are male and 330 are female, where as in urban areas this number was 543 for males and 165 for females. This showed that on an average the rural works are dominated by male workers. However, there was a state wise variation with respect to male female employment in rural and urban areas. The states with rural employment below the all India figure are Assam (541), Bihar (521), Haryana (470), Maharashtra (558), Punjab (554), Rajasthan (542), Uttar Pradesh (527) and the states with rural male employment above the national figure are Andhra Pradesh (635), Gujarat (581), Karnataka (609), Kerala (568), Odisha (577), Tamil Nadu (613) and West Bengal (567).

In case of rural female employment per 1000 persons in 1993 were very low in Assam (172), Bihar (173), Haryana (272), Kerala (264), Odisha (319), Punjab (223), Uttar Pradesh (219), West Bengal (189). This reflects limited participation and the restrictions on occupational mobility of the women; hard physical labour demands more male employment except in sowing and crop harvesting and the limited availability of non-farm activities. During the same period the urban male female employment was quite low (543 for male and 165 for female). It may be due to little

opportunity available in the urban areas higher wage rate in non-farm activities. This is supported by Reddy (2013).

But 2011-12 data obtained from the 50th and 68th NSSO survey report (Key Indicators of Employment and Unemployment, MOSPI, 2013) shown different picture. First, there is a huge increase in the rural male employment (46%) in comparison to the increase in female employment (12%); second, the male female employment in the urban areas also show similar trend; Third, the % increase in the male employment in the rural area is higher than the male urban male employment (44%) but the percentage increase in the urban female employment (27%) is more than the rural female employment (12%). This suggests that despite displacement of labour from farm activities due to farm mechanisation, the rural employment has increased around 4 times than that of the increase in female employment as the rural works have been diversified from a purely agricultural work to other non-farm activities which required male worker than female Kuznet (1957). Secondly, the better wage in non-farm activities in the rural area especially due to the public works opportunities at higher wage creates more employment opportunities. In case of the urban area, the increase in the male employment is less than the rural areas because, the rural people lack more skills and training and the exodus of the rural people in urban employment is comparatively less. The urban female employment increases at a higher percentage than the rural female employment because of the impact of globalisation and government legal laws which created a lot of freedom for the women work participation.

All most all the paddy and wheat growing states show a large shift in the labour force participation from usual status to current weekly status. Another significant thing is that the female labour force participation has increased to a large extent under current daily status. The states showing increase in both male and female employment (ps+ss) per 1000 persons are Andhra Pradesh (AP), Maharashtra, Kerala, Odisha, Punjab, Tamil Nadu, Uttar Pradesh and West Bengal. In all most all the states, the rural male employment has increased between period of 1993-94 and 2011-12. But in some states like Bihar, Haryana, both rural and urban female employment has gone down which may be due restrictions on women out of home mobility. On the other hand, in case of Assam, Gujarat, the rural female employment has increased but the urban female employment between these periods has come down. In case of Karnataka, Madhya Pradesh, the rural female employment declined and urban employment increased. The education specific worker population ratio for persons of age 15 and above as per the usual (ps+ss) status for male and female in the rural area makes suggests that the overall female educated worker to total population in Karnataka is 323 which is much below the all India average figure of 486. Due to increasing non- farm activities in rural area the employment is correlated with the skill- higher the skill, higher the chance of employment opportunities. In case of Madhya Pradesh (MP) proportion of non literate worker to total population is 671 and 205 persons of the total surveyed people are high school educated. This is one of the important factors reducing the rural female employment.

In case of Assam the non literate rural female workers are 304 and the number of graduates is 446 which is more than the all India figure. This may be the factor for increasing rural female employment during the period. In case of Gujarat, the number of primary, middle, high school and graduate educated workers are larger than the all India figures [(542,416), (480,290), (326, 258), (349,234)]. In case of Bihar and Haryana, the overall rural literate female workers

number is much lower (269 for Bihar, 440 for Haryana) than the all India female literate worker (486). This may be ascribed to both rural and urban female employment.

Further the per 1000 distribution of persons by states of employment by usual status (ps + ss) between 1993-94 and 2012-13(Key Indicators of Employment and Unemployment, 1993-94, 2011-12, NSSO, MOSPI, Government of India) shows that at all India level out of 1000 male persons employed in the rural areas, 577 are self employed, 85 regular wage earners and 338 are casual labours. Similarly, out of 1000 rural female employed in the rural area in 1993-94, 586 are self employed, 27 are regularly employed and 387 are casual workers. The number of rural female self employed and female regularly employed went up to 593 and 56 respectively in 2011-12. But the number of rural casual female worker declined to 351 in 2011-12. Since self employment activities include agricultural activities and non agricultural activities, the increase in the non-farm activities helped increasing both self employment and regular employment.

State-wise male-female employment distribution per 1000 employed persons in 1993-94 indicates that the male self employed persons are comparatively more in all states except Gujarat, Haryana, Kerala, Punjab, Rajasthan, UP and West Bengal including the all India figure. In case of regular employment all states have more rural male regular employment than the female regular employment except Assam (134 for male and 182 for female). One important fact is that the number of rural regular female employment is very less compared to the counterpart suggesting the fact that almost all regular employment belong to male member where as in case of self employment the female participation is more.

In case of casual labour the rural female employment is more than the rural male employment. This is one of the factors which makes them economically unsecured and remain under the domain of the household activities. In order to make women more economically and socially empowered their participation in regular wage should be more. Female participation in the regular employment will be ensured through constitutional guarantee, equal employment opportunities for female workers in the rural areas. When compared to the 2011-12 data, it is clear that the participation of rural women in the self employment and regular wage has increased but still the number of regular female employment at the all India level is less than the male employment (100, 56). Except Kerala, Assam and West Bengal, other states have higher male regular employment in rural areas. In case of male self employment the number at all India level has declined from 5787 to 545 and increased from 85, to 100 in case of regular employment, but the casual employment increased from 338 to 355. . In case of Assam, Kerala and West Bengal, the illiterate female in the total working population are 304, 372 and 339 respectively which is much lower than the male number as well as the average numbers (540). Secondly, the proportion of high school, college and graduate level worker play an important role. Thus the composition of rural male employment has been shifted from self employment to regular employment and casual employment between 1993-94 and 2011-12. In case of female employment the direction is reversed from casual labour to self employment and regular employment. To bring economic gender equality, the public policy towards more regular female employment should be created.

IV: Linkage between Rural Employment and Poverty

This section focuses on the issue whether creation of more employment opportunities help reducing poverty level among the male female and rural urban poverty gap. As per the Tendulkar Methodology (2009) (Planning Commission of India Data Book: 2014) , the rural poverty ratio has declined from 56.4% in 1973-74 to 50.1% in 1993-94 and 25.7% in 2011-12 that is roughly 54% decline in the rural poverty, where as the urban poverty declined from 49% to 13.7% i.e., a decline about72%. The annual average decline in poverty in rural area during 1993-94 to 2004-05 is 0.82% which is 0.61% for urban areas where as the all India decline in poverty is 0.77%

The annual average decline in poverty between 2004-05 and 2011-12 for the rural and urban and at all India level are 2.32%, 1.69% and 2.18% respectively. During both the periods, the annual average decline in poverty is much faster for rural areas compared to the urban area and all India poverty. Comparing the population below poverty line (Tendulkar methodology, Planning Commission of India, 2014) between 1993-94 and 2011-12 it can be inferred that at all India level 21.92 % (declined from 45.3% in 1993-94)of the total population are below the poverty line in 2011-12. Except Assam Bihar, Madhya Pradesh, Odisha, the percentage of the population below poverty line is less in all other states than the corresponding all India poverty.

The further look at of the displacement of labour data, it is seen that in states like Assam there is 114% increase in the hired labour in producing paddy in between 1996-97 and 2010-11 and 23% increase for Odisha and there is marginal decline in the hired labour in production of paddy in between the above period. Hence, more dependence on the human labour in the farm production shows that there is a slow decline in the poverty in those states. It may be due to comparatively low wage rate in agricultural activities than that of the non agricultural activities. Similarly, the states like Kerala and Tamil Nadu where the percentage of displacement of human labour is highest (43% for both) the poverty ratio is lowest (7.05% in Kerala) in 2011-12 and 11.28% for Tamil Nadu. The NSS data has been examined to know the rural urban poverty level.

As per the 68th round NSSO data (2011-12), the percentage of people below poverty line at all India level is 21.92 % with 25.7% in the rural area and 13.7% in the urban area (Planning Commission of India, 2014). Comparing the 2004-05 data with 2011-12 data, it is clear that the rural urban poverty gap has been reduced and even in some states the figures are very close. Secondly, the rural poverty figures equivalent to the total poverty figure of the state. This implies that there is movement of the labour within the rural area from farm activities non farm activities either in the form of casual labour, self employment or in the form of regular wage employment. Thus, both farm mechanisation and increasing non-farm activities in the rural area not only helped increasing yield rate per hectare but also raises the income of the farm household because of the increasing number of earning members in the farm house hold and more earnings due to better wages in the non agricultural activities. The increase in non- farm employment opportunity not only reduces rural poverty but also reduces the gap between rural and urban poverty. Relatively higher wage in the non agricultural activities attracts the rural worker to switch over to non- farm activities.

As per the date provided by State of Indian Agriculture (2012-13) there is different wage rate for different agricultural occupation. For ploughing it increased from ` 69.9   in 2001-02 to

`145.5 in 2010-11; for harvesting from `56.3 to `122.5 in the same period. But for non agriculture, it went up from `152.4 to ` 247.7. The compound annual growth rate of wage rate was 8.5%, 9% and 6.3% respectively .The scarcity of workers in the farm activities led to increase in the wage rate for the farming activities.

V: Conclusion

While focussing on the inputs share to total operational cost in paddy cultivation, more than 50% of the total operational cost in paddy production was incurred on family labour as well as hired labour per hectare but human labour declined and the share of machine labour cost increased during the period under study. States with less area under cultivation (MP, UP and Haryana) used more family labour and less hired labour. States using more hired labour shows more use of machine labour and more fertiliser. Fertilizer cost has negative correlation with FLC and ALC. In case of wheat, share of FLC and HLC were 50% and shown a declining trend despite their price rise. There is sharp rise in share of HMC and it varies directly with the area under the crop. More use of machine labour reduced the use of Animal labour but MLC and HLC varies in same direction.

In addition to the cost the quantities of HLH has declined and more use of family labour shown more use of casual labour (Assam and Haryana). The yield rate negatively correlated to HLH and positively correlated to HMC. Increase in HMC reduces the cost of paddy cultivation. But for wheat, there is decline in HLH and increase in machine cost. ALH and HLH are positively related and yield rate is negatively related to CLH.

In 1993-94 rural work was dominated by male workers. Urban male and female employment was quite low compared to rural areas in 1993-94.In 2010-11 increase in rural male employment in comparison to increase in rural female employment. Same trend was seen for the urban areas. However, percentage increase in the urban female employment was more than the rural female employment.

In case of the distribution of rural employment, largest employment is in the form of self employment followed by casual labour employment and regular wage employment in 1993-94. In 2010-11, the number of female casual worker declined and both self employment and regular wage employment number has increased but the male employment in casual form and regular wage form has increased. Further, the employment in the regular wage earning has a direct relation with the high school and college education of the workers. The annual average decline in the poverty in the rural area during 2004-05 to 2011-12 is 2.32% which is more than 2004-05 to 2009-10 (1.6%) and 1993-94 to 2003-04 (0.81%). More significantly, the annual average decline in poverty in urban area during all the three periods is less than the figures in the rural area. The analysis suggests that the poverty gap between the rural and urban area is declining and for many states the rural poverty is equal to the percentage of total poverty of the states. Hence, the study concludes that there is farm mechanisation in the form of human as well as animal labour displacement and use of more machine labour and the mechanisation instead of creating problem of unemployment, created a movement of labour from the farm activities to the non farm activities in the rural area. The employment opportunities created by the public works helped absorbing all the displaced labour and comparatively higher wage earning in the non-farm activities along with more people getting employment opportunity helped reducing rural poverty and narrowed down the rural urban poverty

gap. Thus, the government must focus on state level agricultural plan for the states that are still lagging behind the process of farm mechanisation. Farmers should be provided farm tools and implements either with subsidised rate or should be provided on loan basis. Farmers training on various forms of farm mechanisation should be provided at the village level. Lastly, the Government should generate employment opportunity through provision of public welfare schemes. The women must be provided income generating assets or vocational training so that they can be economically more empowered and social inequality can be minimised.

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