

Effects of Price Increase and Wage Rise on Resource Diversification in Agriculture

The Case of Uttar Pradesh

LALMANI PANDEY

A price increase and improvement in the terms of trade of agriculture after 2004-05 have revived agriculture in Uttar Pradesh. The performance, however, has varied across regions within the state and among crop groups. Price policies in favour of cereals discourage land diversification, but rising agricultural wages induce shifts in favour of high-value crops. The growth momentum has to be sustained by price reforms and by promoting a set of non-price factors that encourages resource diversification towards high-value crops.

Agriculture is the backbone of the Indian economy though its share in output has fallen over the years, particularly after the economic reforms and structural adjustments of the 1990s. Agriculture still employs more than 50% of the total workforce in the country. Enhancing the long-term aggregate output of agriculture and improving its productivity and profitability are, therefore, a must for sustainable economic growth and the livelihoods and food security of the rural population (NAAS 2012). An upward shift in the aggregate production of agriculture in today's changed economic environment would require higher levels of capital stock and investment. The positive forces working towards this are demand-side factors accompanying the rise in per capita income and the strong performance and growth of the non-agriculture sector in the country. The potential for agricultural investment and growth must be exploited through judicious resource diversification that enables the production of high-value commodities and commercialisation of farm activity (Binswanger-Mkhize and Parikh 2012). Market reforms, price policies and government support programmes have a critical role to play in this by creating the proper incentives for private investment, efficiency of resource use and a better supply response of the farm sector through higher land and labour productivity.

Economic reforms in India coincided with favourable terms of trade of agriculture, a sharp increase in private investment and accelerated growth in agriculture along with the rest of the economy during the early 1990s (Chand et al 2007). However, after the mid-1990s, the terms of trade of agriculture deteriorated and the agricultural economy decelerated till it reached a bottom point in 2004-05. During this period, growth of private investment in agriculture declined along with a decrease in resource diversification towards non-foodgrains due to large international price volatility (Sen 2001). Thereafter, agriculture's terms of trade improved significantly due to a sharp rise in output prices in the world commodity market and higher minimum support prices for foodgrains in the country (Chand 2012). The growth of the agriculture sector rebounded and accelerated from 2005-06 onwards. The revival of agriculture accompanied a sharp rise in the agricultural wage mainly due to an urban spillover effect, public investment, welfare programmes and the increased income from non-farm activities in the rural economy (Chand et al 2009).

I thank Hans P Binswanger-Mkhize and an anonymous referee for their helpful comments on an earlier draft of this paper.

Lalmani Pandey (l.pandey@cgiar.org) is with the International Crop Research Institute for Semi Arid Tropics, Patancheru, Andhra Pradesh.

The other major factors influencing the wage increase were the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) enacted in September 2005 and the Minimum Wages Act. The growth of agriculture led by increased prices and higher wages has implications for resource substitution in the short run (Binswanger-Mkhize and Parikh 2012; Pandey et al 2011). The incentive structure created through the public policy on prices should encourage commercialisation of agriculture and attract additional resources through public and private investment and partnership. And the long-term impact on aggregate agricultural output growth will depend on the capacity of public policy to influence resource diversification for the right commodity mix across agro-eco-regions and production systems, which critically depend on growth of income and demand and trade policy. Similarly, the rise in agricultural wages and public policies to raise the opportunity cost of labour through government support programmes and the development of off-farm activities may have an important bearing on allocation of farm land and household labour, resource use efficiency and commercialisation of farm activities (Binswanger-Mkhize et al 2011).

Against this backdrop, this paper examines the effects of price increase and wage rise on resource diversification and commercialisation of agriculture across regions in Uttar Pradesh. The state has strategic importance at the national level in terms of agricultural production opportunities, food security, rural economic growth and rural poverty reduction. The hilly part of the state was separated to form a new state known as Uttarakhand in 2000. Even today, Uttar Pradesh, with around 16% of the country's population, is the most populous and densely populated state in India (Census 2011). It is the second largest state economy and contributes around 10% to gross domestic product (GDP) from the agriculture and allied sector. The state has good irrigation facilities, covers a sizeable proportion of the fertile Indo-Gangetic plain and contributes around one-fifth of the total foodgrain production of India. Over the years, however, the performance of agriculture has been uneven and there are large variations in rural and economic development across regions in the state (Pandey 2012). This study, therefore, explores the nature and trends in resource diversification and composition of high-value crops across regions in the state with different agricultural potential, infrastructure development and other agriculture-related specificities. The study also analyses the factors underlying agricultural diversification in general and towards high-value crops in particular and derives policy implications for the improved performance of agriculture in Uttar Pradesh.

Terms of Trade and Performance of Agriculture

The terms of trade of agriculture in Uttar Pradesh was 1.17 during 2000-01 at 2004-05 base prices (Table 1). And, after the downturn, it revived to 1.15 in the triennium ending (TE) 2008-09 mainly due to the upward revision of minimum support prices (MSP). The average annual growth rate in gross domestic product agriculture (GDPag) from 2000-01 to TE 2004-05 (period I) was 0.67%. With the revival of terms of trade during

TE 2004-05 to TE 2008-09 (period II), the growth rate in state GDPag improved to 1.93% per annum. The positive growth of agriculture GDP was also accompanied by a rise in the real agricultural wage, which reached 6.1% during TE 2008-09 compared to 5.3% during TE 2004-05. This rise in the real agricultural wage was partly due to higher wages in off-farm employment activities. Land was cultivated more intensively and cropping intensity improved to 154% during TE 2008-09 from a stagnant 150% during period I.

Table 1: Terms of Trade and Agriculture Performance, Uttar Pradesh (2000-01 to TE 2008-09)

Particular	2000-01	TE 2004-05	TE 2008-09
Agriculture terms of trade	1.17	1.00	1.15
Average annual growth rate of GDPag (%)		0.67	1.93
Real agricultural wage (index)		0.053	0.061
Cropping intensity (%)	150	150	154

Source: *Statistical Abstract of Uttar Pradesh* (various issues), Directorate of Economics and Statistics, Yojana Bhawan, Government of Uttar Pradesh, Lucknow.

Structural Composition and Performance of Agriculture and Allied Sector

A disaggregated analysis of the crop sub-sector shows that the share of cereals in the value of crop output declined from 44% in 2000-01 to 40% in TE 2004-05 with a decline in the real value of cereals at 1.8% per annum (Table 2). The share of cereals increased after TE 2004-05 and again reached 44% of the value of crop output during TE 2008-09. The real value of cereals during this period grew annually at 0.22%. Pulses maintained their share in the value of crop output during period I while their value of output declined sharply during period II,

Table 2: Composition and Performance of Agriculture and Allied Sectors, Uttar Pradesh (2000-01 to TE 2008-09)

Crop Groups	Share of Value of Output (%)			Growth in Real Value of Output (%)	
	2000-01	TE 2004-05	TE 2008-09	2000-01 to TE 2004-05	TE 2004-05 to TE 2008-09
Share in crop sub-sector					
Cereals	44.01	40.18	44.23	-1.76	0.22
Pulses	5.71	5.86	4.78	0.82	-6.22
Oilseeds	2.54	2.60	2.49	-5.34	2.68
Fruits and vegetables	17.34	19.05	15.79	2.49	1.55
Sugar cane	17.03	17.99	15.38	2.59	-0.57
Others	13.4	14.3	17.3	-0.14	0.99
Share in agriculture and allied sector					
Crops	71.28	70.46	68.21	0.06	0.18
Livestock	24.65	25.54	23.56	3.57	3.42
Fishery	0.94	1.08	0.91	6.17	5.67
Forestry	3.13	2.92	7.32	2.38	2.10

Value of output of agriculture and allied (Rs lakh)	2000-01	TE 2004-05	TE 2008-09	2000-01 to TE 2004-05	TE 2004-05 to TE 2008-09
	79,07,603	92,88,619	1,46,70,052	1.06	1.17

Source: *National Accounts Statistics*, various issues, Central Statistical Organisation, Government of India, New Delhi.

by 6.22% per annum in real terms. Oilseeds retained their share between 2.5% and 2.6% in the value of crop output during both periods. The real value of output of oilseeds, however, decreased at 5.34% per annum during period I, while it grew at 2.7% during period II. High-value crops such as fruits and vegetables and sugarcane each maintained a more than 15% share of the value of crop output during 2000-01 to TE 2008-09.

The real value of output of both increased by about 2.5% per annum during period I. Growth in the real value of output of fruits and vegetables decelerated to 1.55% per annum during period II, while sugar cane declined annually by 0.57%. An analysis of the share of value of output of crop groups in the crop sub-sector indicates that period II saw cereals regain the share they had lost during period I. On the other hand, high-value crops gained during 2000-01 to TE 2004-05 while their value share declined during period II. In terms of growth in the value of output, oilseeds and cereals gained during period II compared to period I, fruits and vegetables decelerated and pulses and sugar cane declined.

The share of the value of output of the crop sub-sector in the value of output of agriculture and allied activities decelerated over the years and reached around 68% during TE 2008-09. Annual growth in the value of crop output increased from 0.06% during period I to 0.18% during period II. The share of the value of output of the livestock sub-sector in the agriculture and allied sector increased from 24.7% during 2000-01 to

than 10% during period I. However, it declined from 10.9% to 9.3% by TE 2009-10. The area under pulses declined by 3.48% per annum during period II. The area share of oilseeds decreased from 5.6% in 2000-01 to 4.5% during TE 2004-05 and increased to 5.1% by TE 2009-10. The area under oilseeds declined by 5.77% during period I, while it increased by 3.87% annually during period II. Fruits and vegetables maintained their area share of 4% during period I, while it increased to 5% by TE 2008-09. The area under fruits and vegetables increased sharply during period II at 6.34% per annum. Sugar cane's area share strengthened and reached 8.5% during TE 2009-10. The growth in area under sugar cane was 1.34% during period I and 1.48% per annum during period II. The area under other crops grew by 21% during period I, while it declined by 7.3% during period II. The allocation of more area from the increased GCA (1.21%) to high-value crops such as oilseeds and fruits and vegetables is a positive development, but the declining area under pulses is a matter of concern.

Table 3: Changes in Cropping Patterns, Uttar Pradesh (2000-01 to TE 2008-09)

Crop Groups	Crop Area Share as % of GCA			Crop Area Growth Rate (%)	
	2000-01	TE 2004-05	TE 2008-09	2000-01 to TE 2004-05	TE 2004-05 to TE 2008-09
Cereals	69.6	67.0	67.9	-1.15	0.67
Pulses	10.6	10.9	9.3	0.32	-3.48
Oilseeds	5.6	4.5	5.1	-5.77	3.87
Fruits and vegetables	3.93	3.97	5.0	0.00	6.34
Sugar cane	7.7	8.2	8.5	1.34	1.48
Others	2.6	5.5	4.0	21.09	-7.29
Gross cropped area (thousand hectares)	25,304	25,087	25,402	1.01	1.21

Source: Same as Table 1.

25.5% during TE 2004-05 and declined to 23.6% during TE 2008-09. This sub-sector, however, maintained more than 3% annual growth in the value of output through the two periods. The share of fishery in the agriculture and allied sector remained around 1% with an annual growth of almost 6% in the value of output during the two periods. After a small decline from 3.1% in 2000-01 to 2.9% in TE 2004-05, the share of forestry in the agriculture and allied sector increased sharply to 7.3% during TE 2008-09. The value of output of the forestry sub-sector grew by 2.4% per annum during period I and 2.1% per annum during period II. Overall, the growth in the agriculture and allied sector was around 1.1% per annum during 2000-01 to TE 2008-09.

Changes in Cropping Pattern

Cereals occupy more than two-thirds of the gross cultivated area (GCA) in Uttar Pradesh. Their share declined from 70% in 2000-01 to 67% during TE 2004-05 and increased to 67.9% during TE 2009-10 (Table 3). The total area under cereals declined 1.15% during period I and increased annually by 0.67% during period II. Pulses maintained their area share of more

Regional Performance of Agriculture and Resource Use

The structure and performance of agriculture and use of production resources show large variations across regions (Table 4). The share of agriculture in net district domestic product (NDDP) varied from a high of 28% in the Bundelkhand region to a low of 24% in the central region during TE 2008-09. Land productivity varied from a high of Rs 73,000 per hectare in the western region to a low of Rs 25,000 per hectare in the Bundelkhand region. In contrast to positive annual growth in the western (3.3%) and eastern regions (2.4%), the Bundelkhand region experienced a negative growth (-0.79%) in NDDP from TE 2004-05 to TE 2009-10. The agricultural wage was relatively high in higher agricultural productivity regions like the western region (Rs 102/day) compared to the low-productivity Bundelkhand region (Rs 90/day).

There are high disparities in the distribution of productive resources and the efficiency in resource use across regions in

Table 4: Regional Disparities in Agricultural Productivity and Resource (TE 2008-09)

Particular	Western	Central	Bundelkhand	Eastern	Uttar Pradesh
Share of agriculture in NDDP (%)	27.35	24.06	28.01	24.61	26.00
Land productivity (NDDP, Rs per hectare NCA)	72,852	50,009	24,873	42,777	53,056
Growth rate of NDDP (TE 2004-05 to TE 2008-09)	3.28	0.40	-0.79	2.38	2.29
Agricultural wages (Rs per day)	101.8	92.8	89.5	92.2	97.2
Region's share in NSDP, Rs lakh (%)	50.4	17.3	5.4	26.9	87,63,549
Region's share in state NCA, thousand hectares (%)	36.7	18.4	11.6	33.3	16,517
Region's share in state NIA, thousand hectares (%)	41.8	19.1	7.5	31.7	13,278

Source: Same as Table 1.

the state. The western region had about 37% of the net cultivated area (NCA) and 42% of the net irrigated area (NIA) in the state and contributed about 50% of the net state domestic product agriculture (NSDP) during TE 2008-09. The eastern region, on the other hand, contributed about 27% of the NSDP with about 33% of the NCA and 32% of the NIA in the state. The central region contributed 17% of the NSDP with 18% of the NCA and 19% of the NIA in the state. The Bundelkhand region used 11.6% of the NCA and 7.5% of the NIA in the state to contribute 5.4% of the NSDP. This indicates that there is

potential for improved regional agricultural productivity and efficiency in resource use in the state, especially in the relatively resource-rich eastern region and the resource-poor Bundelkhand region, which together have around 45% of the NCA and 39% of the NIA in the state.

Regional Structure of Cropping Pattern

Cereals occupied more than 64% of the GCA during TE 2008-09 in the western, central and eastern regions, whereas they covered only 41% of the GCA in Bundelkhand (Table 5). Pulses were the dominant crops in the Bundelkhand region, covering about 46% of the GCA of the region. The shares of pulses in the GCA were about 9% and 7% respectively in the central and eastern regions. Oilseeds occupied about 11% of the GCA in the Bundelkhand region, followed by the central (4.7%) and western regions (3.7%). The western region had the highest share of fruits and vegetables in GCA (6.1%), followed by the central (4.3%) and eastern regions (2.8%). The share of sugarcane in GCA was 13.9%, 9.5%, and 4.8% respectively in the western, central and eastern regions. The analysis reveals that cereals, sugarcane and fruits and vegetables were the dominant crops

Table 5: Regional Cropping Pattern, Uttar Pradesh (TE 2008-09)

Crop Groups	Crop Area as % of GCA of the Region			
	Western	Central	Bundelkhand	Eastern
Cereals	64.5	68.5	40.6	82.4
Pulses	2.5	8.8	45.8	7.2
Oilseeds	3.7	4.7	11.2	1.5
Fruits and vegetables	6.1	4.3	0.7	2.8
Sugar cane	13.9	9.5	0.4	4.8
Others	9.2	4.2	1.3	1.2
Gross cropped area (thousand hectares)	9.785	4.638	2.403	8.576

Source: Same as Table 1.

in the irrigated areas while pulses and oilseeds were the dominant crops in the rain-fed Bundelkhand region.

Looking at the share of regions in the total area under crop groups in the state, we see that the eastern region has about 40% of the area under cereals in Uttar Pradesh, followed by the western (36%) and central (18%) regions (Table 6). The performance of cereals depends mainly on the eastern and western regions, which together have more than three-fourths of the area under cereals in the state. Unlike cereals, about 46% of the area under pulses in the state is in the resource-poor Bundelkhand region. However, 54% of the state's area under pulses is distributed among the relatively well-endowed eastern, central and western regions. About 73% of the state's area under oilseeds is in the western, central and eastern regions and about 27% in the rain-fed Bundelkhand region. This indicates that pulses and oilseeds compete against each other for resources in both irrigated and rain-fed areas and explains the state-level decline in area under pulses and increase in area under oilseeds from TE 2004-05 to TE 2008-09. Fruits and vegetables are grown in irrigated places in the western region (61%), followed by the central (20%) and eastern (19%) regions. The western region contributes about 57% of the area

under sugar cane in the state, followed by the eastern (23%) and central (19%) regions.

Factors Affecting Land Diversification

The land diversification index¹ is highest in the central (2.91) and western (2.78) regions, which have relatively better agro-climatic conditions and resource endowments (Table 7). It is the lowest in the Bundelkhand region (0.11) where crop

Table 6: Regional Share of Crop Area, Uttar Pradesh (TE 2008-09)

Crop Groups	Crop Area as % of Total Area under the Crop in the State				
	Western	Central	Bundelkhand	Eastern	Uttar Pradesh (000 ha)
Cereals	36.0	18.1	5.6	40.3	17,534
Pulses	10.4	17.2	46.4	26.0	2,374
Oilseeds	37.4	22.2	27.4	13.1	979
Fruits and vegetables	61.2	19.8	0.4	18.6	2,227
Sugar cane	56.5	18.8	1.7	23.0	1,050
Others	73.0	15.9	2.6	8.5	1,238

choices are limited. The western (92%) and central (83%) regions have the highest percentage of irrigated NCA and relatively high cropping intensity. Fertiliser use per hectare, electricity consumption and the number of tractors are higher in the western region. The regions with higher agriculture potential also have better developed banking facilities, markets and road connectivity compared to the resource-poor and low-productivity Bundelkhand region. The agricultural wage was highest in the western region, Rs 92 per day, and the lowest in the eastern region, Rs 77 per day, during TE 2008-09. Urban wages were higher in the western and central regions, which had better agricultural productivity, than the eastern and Bundelkhand regions. The analysis reveals that regions with better agro-climatic conditions respond better to market signals than regions with a relatively harsh agricultural environment like Bundelkhand.

This analysis is supplemented with an econometric estimation of the determinants of land diversification in the state.

Table 7: Factors Influencing Land Diversification, Uttar Pradesh (TE 2008-09)

Factors	Western	Central	Bundelkhand	Eastern	Uttar Pradesh
Land diversification index	2.78	2.91	0.11	1.45	4.38
Cropping intensity (%)	162	153	125	156	154
Net area irrigated (% of NCA)	92	83	52	76	80
Net area irrigated by canal (% of NCA)	12	17	19	16	15
Fertiliser use (NPK kg per ha NCA)	284	229	57	247	232
Electricity supply to agriculture (kwh per ha NCA)	566	229	134	334	378
Tractors (number per 100 ha NCA)	5.94	3.48	3.17	3.72	4.42
Banks (number per 10,000 ha NCA)	5.73	6.15	2.53	5.74	5.45
Markets (number per 1,00,000 ha NCA)	4.36	3.74	3.06	3.00	3.64
Roads (km per 1,000 ha NCA)	7.55	7.67	4.96	9.66	7.96
Agricultural wage (Rs/day)	91.85	68.10	81.62	77.25	81.39
Urban wage (Rs/day)	101.83	92.85	89.53	92.15	97.17

Source: Same as Table 1.

District-level data for TE 2008-09 was used to analyse the determinants of land diversification in the crop sub-sector. As found in Chand et al (2009), there are possibilities of reverse linkages among urbanisation, rural non-farm employment and agricultural income. And there has been a sharp acceleration in the growth of the rural non-farm sector and the

linkage effects of rural non-farm employment (RNFE) on the income of agricultural workers (Binswanger-Mkhize et al 2011). It is, therefore, hypothesised that the rise in the opportunity cost of agricultural labour due to urbanisation and the rise in non-farm wages has an important bearing on the agricultural wage and the cost of agricultural production and, therefore, positive effects on land diversification. This has implications for the allocation of land and household labour towards production of high-value commodities. To capture the reverse linkages between urbanisation, development of the non-farm sector and rural income and their effects on resource diversification, we used the following econometric framework and estimated the system of regression equations to see the effects of various factors and policy variables on the agricultural wage and land diversification in the crop sub-sector.

Land diversification = f (canal irrigation, net irrigated area, cropping intensity, tractors, electricity consumption, roads, markets, banks, agriculture terms of trade, agricultural wage).

Agricultural wage = f (net irrigated area, cropping intensity, tractors, electricity consumption, roads, markets, agriculture terms of trade, urban wage).

Land diversification is a dynamic diversification index constructed using the methodologies developed by Chand and Chauhan (2002). The terms of trade of agriculture is the ratio of implicit price deflator of agricultural GDP to non-agriculture GDP at constant 2004-05 prices and base 2004-05 = 100. The agricultural wage is the real wage of agricultural workers derived using the wholesale price index of all commodities at base 2004-05 = 100. Similarly, the urban wage is the real wage of urban unskilled labour. Other explanatory variables are standardised using the NCA of the respective districts. Two stage least square methodologies were used to estimate the parameters of the regression model. Estimates of the regression model are provided in Table 8.

The agricultural wage equation is identified by the urban wage. The other determinants of the agricultural wage are terms of trade of agriculture, infrastructure, mechanisation, irrigation and intensity of land cultivation. These factors together explain 88% of the variations in agricultural wage in Uttar Pradesh. As expected, the urban wage and terms of trade of agriculture have positive and significant effects on the agricultural wage with an elasticity of 2.13 and 1.61, respectively. The elasticity of the agricultural wage is negative and significant with respect to tractors (-0.142). This may be because of the labour saving and/or labour displacing effect of tractors in agricultural operations. The coefficients of electricity (0.105), roads (0.148) and markets (0.075) are positive and significant. These factors are conducive to agricultural intensification and also facilitate movement of the labour force. The effects of irrigation (0.036) and cropping intensity (0.086) are positive but non-significant.

Land diversification among crops is influenced by canal irrigation, NIA, cropping intensity, tractors, electricity consumption, roads, markets, banks, terms of trade of agriculture and

the agricultural wage. These explanatory variables together explain about 89% of the variations in the land diversification index. The effect of terms of trade of agriculture on land diversification is negative (-1.22) though non-significant. This indicates that improved terms of trade of agriculture along with other factors are favourable to a few major crops like cereals in the state. The agricultural wage has a positive and significant effect on land diversification with elasticity of 0.251. This indicates that the rise in the agricultural wage is primarily driven by growth in the non-farm sector and government-supported off-farm employment activities lead to allocation of land to the production of high-value commodities to utilise and allocate household labour more efficiently. The intensity of cultivation (0.89) and use of tractors (0.656) have positive and significant effects on more diversified allocation of land among crops. Similarly, infrastructure variables such as canals (0.639), roads (0.577) and markets (0.813) have positive and significant effects on resource diversification. The effect of electricity (0.86) is positive though non-significant. The NIA (-1.282) and banks (-0.508) have negative and significant effects on diversification. This indicates that the structure of water prices and crop output prices encourages specialised production and allocation of land to certain crops. This phenomenon is also supported by the availability of institutional finance in the region.

Table 8: Estimates of Regression Model: Two Stage Least Square

Dependent/Explanatory Variables	Land Diversification	Agricultural Wage
Intercept	12.834* (2.3154)	0.439* (0.4121)
Region dummy	-0.195* (0.0283)	0.016** (0.0074)
Net irrigated area by canal (% of NCA)	0.639* (0.1044)	
Net irrigated area (% of NCA)	-1.282* (0.1575)	0.036 (0.0333)
Cropping intensity (% of GCA)	0.890* (0.1910)	0.086 (0.0825)
Tractors (number per 100 ha NCA)	0.656* (0.1047)	-0.142* (0.0261)
Electricity supply to agriculture (kwh per ha NCA)	0.086 (0.0887)	0.105* (0.0183)
Roads (per 1,000 ha NCA)	0.577* (0.1311)	0.148* (0.0331)
Markets (number per 1,00,000 ha NCA)	0.813* (0.2259)	0.075*** (0.0453)
Banks (number per 10,000 ha NCA)	-0.508* (0.1269)	
Agriculture terms of trade (index)	-1.220 (1.1524)	1.611* (0.2982)
Real agricultural labour wage (index)	0.251* (0.0544)	
Real urban labour wage (index)		2.126* (0.1159)
R-square	0.894	0.887

Figures in parentheses are standard errors; *, **, and *** are levels of significance at 1%, 5% and 15% respectively.

Source: Same as Table 1.

Conclusions

The agricultural economy of Uttar Pradesh has shown signs of revival with improved terms of trade of agriculture after TE 2004-05. A price increase also accompanied a continued rise in the real agricultural wage. The intensity of land cultivation and resource use has improved. However, there have been substitutions of resources in the crop sub-sector in the state. While the area under fruits and vegetables and oilseeds increased by 6.34% and 3.87% per annum respectively, the area under pulses and other crops declined by 3.48% and 7.3%, respectively. The area response of cereals to changing prices amid rising wages was very low.

The performance of agriculture varied across regions and wide disparities are observed in land productivity, agricultural

growth and cropping patterns. During TE 2008-09, land productivity in the western region was almost three times higher than that in the Bundelkhand region. Between TE 2004-05 and TE 2008-09, the growth in NDDP-ag varied from -0.75% per annum in the Bundelkhand region to 3.28% per annum in the western region. During TE 2008-09, the eastern region allocated 82% of its GCA to cereals and contributed about 40% of the area under cereals in the state, while the Bundelkhand region allocated 40% of its GCA to cereals and covered only about 6% of the area under cereals in the state. However, the Bundelkhand region allocated 46% of its GCA to pulses and had about 46% of the area under pulses in the state, while the three other regions shared 54% of the area under pulses. In oilseeds, the share in area varied from a high of about 37% in the western region to a low of 13% in the eastern region. The share in area under fruits and vegetables varied from a high of 61% in the western region to a low of 0.4% in the Bundelkhand region.

Land diversification and area allocation in the crops sub-sector depend on prices and non-price factors such as irrigation, mechanisation, urbanisation, availability of banks and infrastructural facilities like electricity, canals, roads and markets. The urban wage (2.1 elasticity) and terms of trade of agriculture (1.6 elasticity), along with infrastructure, are the major determinants of the agriculture wage. The terms of trade of agriculture (-1.2 elasticity), though non-significant,

and the NIA (-1.3 elasticity) have a negative effect on land diversification. But the agricultural wage (0.25 elasticity) and infrastructure such as roads (0.58 elasticity), markets (0.81 elasticity) and canal irrigation (0.64 elasticity) have positive and significant effects on land diversification. Similarly, the intensity of cultivation (0.89 elasticity) and use of tractors (0.66 elasticity) have positive and significant effects on the diversified use of land.

The negative effects of terms of trade of agriculture and the positive effects of the agricultural wage on land diversification have important policy implications. Skewed price policies in favour of cereals will have discouraging effects on land diversification. On the other hand, rising agricultural wages will induce shifts in cropping pattern in favour of high-value crops. Therefore, rationalising and reforming prices to improve markets and incentives and promoting a set of non-price factors will encourage land diversification towards production of high-value crops and commercialisation of farm activities. Sustaining the transformation process in agriculture and aggregate output and productivity growth of the farm sector would require better focused public programmes that evoke a greater private investment response. A holistic approach to agriculture and rural development, and need-based priority setting for investment across agro-eco-regions and production systems, are the desired strategy.

NOTE

- 1 The dynamic diversification index incorporates both the magnitudes of year to year changes in GCA and changes in area under individual crops as well as their distribution across crops. The detailed methodology followed to calculate the dynamic diversification index can be found in Chand and Chauhan (2002).

Cynthia S Bantilan and Hans P Binswanger-Mkhize (2011): "Supply Response and Investment in Agriculture in Andhra Pradesh", paper presented at the seventh Asian Society of Agricultural Economists International Conference, Hanoi, 13-15 October.

Pandey, Lalmani (2012): "Farm Productivity and Rural Poverty in Uttar Pradesh – A Regional Perspective", *Agricultural Economics Research Review* (forthcoming).

Sen, Abhijit (2001): "Agriculture: A Long Road Ahead", *Hindu*, 19 July.

REFERENCES

- Binswanger-Mkhize, H P and Kirit Parikh (2012): "India 2039 – Transforming Agriculture", Syn-genta Foundation, Washington DC.
- Binswanger-Mkhize, H P, Kailash C Pradhan, Hari K Nagarajan, Sudhir K Singh and J P Singh (2011): "Structural Change at the Village and Household Level: India 1999-2007", paper presented at the workshop on Long-Term Future of Indian Agriculture and Rural Poverty Reduction, New Delhi, 27-29 April.
- Chand, Ramesh (2012): "Sustaining Farm Growth Is Possible: Investment, Price Assurance to Yield Results", *Economic Times*, 9 February.
- Chand, Ramesh and Sonia Chauhan (2002): "Socioeconomic Factor in Agricultural Diversification in India", *Agricultural Situation in India*, Vol 58 (11), pp 523-29.
- Chand, Ramesh, S S Raju and L M Pandey (2007): "Growth Crisis in Agriculture: Severity and Options at National and State Levels", *Economic & Political Weekly*, Vol 42 (26), pp 2528-33.
- Chand, Ramesh, S S Raju, L M Pandey and Surabhi Sonalika (2009): "Linkages between Rural Non-Farm Employment and Agricultural Income: A New Perspective", *Indian Journal of Agricultural Economics*, Vol 64 (3), 409-20.
- NAAS (2012): "State of Indian Agriculture 2011-12", National Academy of Agricultural Sciences, New Delhi.
- Pandey, Lalmani, P Parthasarathy Rao, P S Birtal,

Economic & Political WEEKLY

EPW 5-Year CD-ROM 2004-08 on a Single Disk

The digital versions of *Economic and Political Weekly* for **2004, 2005, 2006, 2007** and **2008** are now available on a single disk. The **CD-ROM** contains the complete text of 261 issues published from 2004 to 2008 and comes equipped with a powerful search, tools to help organise research and utilities to make your browsing experience productive. The contents of the **CD-ROM** are organised as in the print edition, with articles laid out in individual sections in each issue.

With its easy-to-use features, the **CD-ROM** will be a convenient resource for social scientists, researchers and executives in government and non-government organisations, social and political activists, students, corporate and public sector executives and journalists.

Price for 5 year **CD-ROM** (in INDIA)

Individuals - Rs 1500

Institutions - Rs 2500

To order the **CD-ROM** send a bank draft payable at Mumbai in favour of *Economic and Political Weekly*. The CD can also be purchased on-line using a credit card through a secure payment gateway at epw.in

Any queries please email: circulation@epw.in

Circulation Manager,

Economic and Political Weekly

320-321, A to Z Industrial Estate, Ganpatrao Kadam Marg, Lower Parel,
Mumbai 400 013, India