

Structural Change in Bihar's Rural Economy

Findings from a Longitudinal Study

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Bihar has been showing signs of emerging from stagnation and backwardness. For this to occur in full, an agrarian transformation is central in a state where urbanisation remains very low. This paper uses longitudinal household data from a sample of villages to explore changes in production relations, land and other assets, agricultural development and occupational diversification. There has been a significant change in class structure and a shift away from agricultural occupations for male workers (much less for female), but non-agricultural work is mainly outside the village and largely outside the state. Real wages have risen substantially, more than can be explained by rising agricultural productivity, migration being an important contributory factor. But the segmentation of the rural labour market has increased and local development is uneven.

This paper is derived from the Institute of Human Development Research Programme on Inclusive Development in Bihar, and includes contributions by other members of the research team, notably Sunil Kumar Mishra (survey and statistics), Amrita Datta (in particular, analysis of migration and income) and Janine Rodgers (especially work on occupation and gender). The paper is largely based on a presentation in the International Conference on "Policy Options and Investment Priorities for Accelerating Agricultural Productivity and Development in India," organised by the Indira Gandhi Institute of Development Research and Institute for Human Development, New Delhi on 10–11 November 2011.

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1 Introduction

In recent years Bihar has witnessed high economic growth, largely driven by construction and trade, but other sectors, including agriculture, have also shown an acceleration in growth. Higher public investment in infrastructure, particularly in roads and, recently, on electricity and an improvement in governance have been major factors behind this turnaround. Thirty years ago the state seemed to be stuck in a time warp. Archaic production relations dominated in rural areas and the state was mired in poverty. India's economy was growing only slowly at the time, but even so Bihar was falling further behind, in terms of both production and incomes.

When India's economic transformation started in the 1980s, and national growth rates rose, at first there appeared to be little spillover to Bihar. But, in retrospect, in the 1980s there was incipient change in economic and social relationships in the state and this spread in the 1990s. After the turn of the century, growth accelerated in Bihar as well. Indeed, in recent years the Bihar economy has been growing faster than India as a whole. The state remains one of the poorest in India—the per capita net state domestic product (NSDP) of Bihar in 2013–14 was only 42% of the Indian average—and hence there is a large gap to close, but there are clear signs of an emergence from stagnation and backwardness. Along with the growth, there has been a steep decline in poverty. According to the National Sample Survey Office (NSSO) estimates, the incidence of poverty in the state, as defined officially, fell from 54.4% in 2004–05 to 33.7% in 2011–12. This has been the fastest decline in poverty among all the major states in India.

What is the nature of this change? How did it occur? Bihar is still essentially a rural society, with one of the lowest urbanisation rates in India (only 11% as against 31% for India), so this story is in the first instance one of rural and agrarian transformation. A series of research projects has explored this transformation since the early 1980s, first at the A N Sinha Institute of Social Studies (ANSISS) in Patna, and then at the Institute for Human Development (IHD) in Delhi. These projects examined agrarian relations and agricultural development, living conditions, employment and wages, along with the impact of state policies, on the basis of data collected from a sample of 36 villages in different parts of the state and households in 12 of these villages. The same villages have been surveyed three times, in 1981–83, 1998–2000 and 2009–11, which makes it possible to study the evolving patterns of livelihoods and economic development at both village and household levels, and

to relate them to changes in occupations, perceptions and institutions. The villages were originally chosen to be broadly representative of Bihar as a whole in 1981. Of course, in the intervening decades Bihar has changed and they may no longer be as representative as they were; but this disadvantage is more than compensated by the ability to track changes over time.¹

This paper draws on these surveys to examine the pattern of change in the rural economy. We look not only at agricultural production, but also at the underlying social, economic and technological relationships, highlighting factors that have played an important role in change, and their implications for incomes and employment.

2 Changing Production Relations

Historically, Bihar's exploitative agrarian relations have been a major cause of rural stagnation and poverty. In the post-independence period, and up to the 1980s, the agrarian system was dominated by large landlords, whose workforce was controlled through interlocking mechanisms of labour attachment, tenancy and indebtedness, in a system that was described as "semi-feudal."² These mechanisms weakened market forces and stifled innovation, resulting in a stagnant rural economy. In this system it was possible to distinguish various "classes": agricultural labourers, either attached to landlords or casual wage workers, either landless or cultivating small plots of land; several categories of peasants, from the poorest who neither hired labour nor did wage work, up to the largest who hired workers and otherwise used only male family labour; and landlords who supervised cultivation on their land

and rented land out. A small non-agricultural class was mainly found in traditional caste occupations.

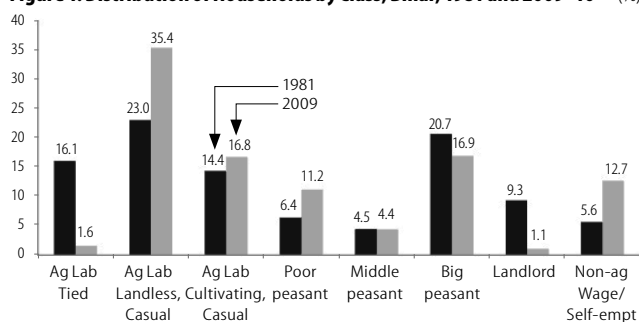
The last 30 years have seen a dramatic shift in this class pattern and the virtual disappearance of semi-feudal production relations. Figure 1 shows the distribution of households by class in the 1981–83 and 2009–11³ surveys. The numbers of attached labourers and pure landlords have declined sharply and now they constitute a tiny proportion of rural households. While there has been some decline in the big peasant categories and the proportion of middle peasants has remained almost constant, the proportions of casual landless agricultural labour and poor peasants have increased. The proportion of non-agricultural households has also increased, largely due to the expansion of services, mainly in education, health and administration. However, the chart understates the increase in importance of non-agricultural work, because the non-agricultural class here is defined as those who do no agricultural work at all. Many more households now depend mainly on non-agricultural activities for their income, but also do some agricultural work, a point to which we return below.

In Bihar there is a widespread tendency to interpret agrarian relations in caste terms rather than class. In practice, caste and class hierarchies reinforce each other, reflecting a historical process in which caste has played an important role in supporting the class structure because it has legitimised inequality. The close relationship between caste and class can be seen in Table 1, which shows the caste distribution for each of four classes (aggregated from Figure 1) over the three surveys.

All castes are represented in all classes, but it can be seen how agricultural labour is dominated by Scheduled Castes (scs) and Other Backward Classes (obcs)-I, while more than 60% of the big peasants and landlords come from upper castes. Each class has a distinct caste profile. Over the 30-year time period, there is a degree of stability in this relationship. The share of upper castes among big peasants and landlords has hardly changed; neither has the overall caste pattern for agricultural labour. But there are also some visible shifts. The expansion of the non-agricultural category has coincided with an increase in the share of upper castes in this category, for instance, and to some extent similarly in the share of middle castes (Koeri, Kurmi and Yadav). This suggests an evolution of the caste hierarchy away from an exclusively agricultural base. OBC-II mostly refers to traditional occupational castes, which are clearly declining.

These caste and community patterns are important politically in Bihar, where different political parties build their electoral strategies on shifting caste alliances; but they are also

Figure 1: Distribution of Households by Class, Bihar, 1981 and 2009–10 (%)



Class definitions: For purposes of this chart, agricultural labour households are divided according to whether or not they are tied (attached) to an employer, and among those who are not attached whether or not they are also cultivating some land as owner or sharecropper. Three peasant (cultivating) classes are distinguished—poor peasants, who neither hire in nor hire out labour, middle peasants who hire labour in and where both male and female family members also work in agriculture and big peasants who hire in labour and who use only male family labour. The "landlord" class rents out land and at most supervises agricultural work. Finally, there are non-agricultural households who do no agricultural work.

Source: IHD Bihar Survey 2009–10; ANSIS Bihar Survey, 1981–83.

Table 1: Distribution of Caste and Community by Class, Bihar, 1981, 1998, 2009 (%)

	Agricultural Labour			Poor and Middle Peasant			Big Peasant/Landlord			Non-agricultural Household			Total		
	1981	1998–99	2009	1981	1998–99	2009	1981	1998–99	2009	1981	1998–99	2009	1981	1998–99	2009
Upper caste	2.5	4.0	3.6	5.1	8.4	21.6	64.7	69.6	65.3	14.0	24.8	41.8	22.1	22.6	22.3
Kurmi/Koeri/Yadav	6.8	8.3	8.3	45.5	40.0	22.7	13.3	11.0	13.4	4.9	4.4	8.0	12.8	11.5	11.4
Other Backward II	3.4	4.6	3.2	14.9	10.5	6.1	6.7	5.5	3.0	30.8	15.3	9.0	7.2	6.1	4.3
Other Backward I	25.0	29.5	33.3	13.8	21.0	22.4	4.5	5.4	6.3	16.1	27.4	22.2	17.1	22.5	25.4
SC/ST	46.8	39.1	39.4	9.5	12.4	18.4	1.6	1.7	6.2	11.2	11.9	7.2	27.2	25.4	26.1
Muslim	15.5	14.5	12.2	11.3	7.7	8.8	9.2	6.8	5.9	23.1	16.1	11.8	13.6	12.1	10.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Compared with Chart 1, class categories have been grouped to improve visual clarity.

Source: IHD Bihar Surveys, 1998–99 and 2009–10, ANSIS Bihar Survey, 1981–83.

important for the pattern of agricultural change, for there are clear differences among castes in cultivation practices and investment behaviour.

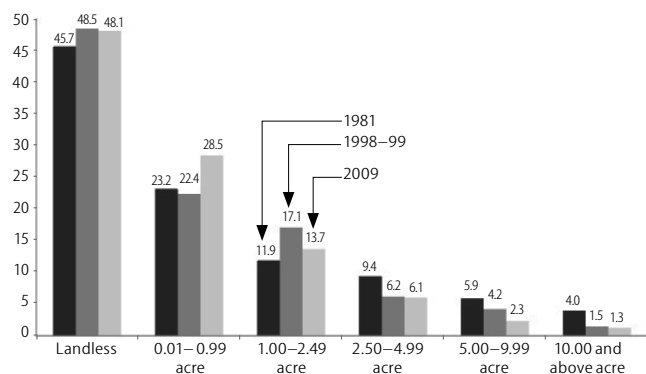
3 Land and Other Assets: Ownership and Changes

Land and Livestock: Alongside the shift in the class structure, there has been a change in land distribution (Figure 2). The proportion of landless households has risen slightly over the period as a whole, although it stabilised after 1998–99. In fact, this change is quite small considering the increase in population pressure, but the impact is more visible on the size distribution among landowning households. The share of households in the lowest landownership category in Figure 3 (p 48), below 1 acre, has increased to around 33% compared to around 23% in 1981, reflecting a downward shift from larger landholdings into this category, while the numbers of large holdings has been sharply reduced. Landlessness is very unevenly distributed by caste. It is highest among the scs (92% among Musahars), lowest among Bhumihars (5%) and middle castes—Kurmis, Yadavs and Koeris (7%–14%). Upper Muslims show 24% landlessness, lower Muslims 60%.⁴

The distribution of livestock is more equal than that of land. The caste group with the highest ownership of livestock is Yadavs (89%). But even 52% of sc households have at least some animals, although more chickens or goats and less cattle.

The pattern of tenancy has been changing (Table 2). The share of land rented in was stable up to 1998 (about a quarter of all land), but has since been increasing. Since 1981 there has

Figure 2: Landownership, Bihar, 1981, 1998–99 and 2009–10
(% distribution of households by size of holding)



Source: IHD Bihar Surveys, 1998–99 and 2009–10; ANSISB Bihar Survey, 1981–83.

Table 2: Tenancy (Leasing In of Land) by Landownership Class, Bihar, 1981–82, 1998–99, 2009–10 and 2011

Land Owned	% of Households Leasing In Land				Land Leased In as % of Area Cultivated			
	1981–82	1998–99	2009–10	2011	1981–82	1998–99	2009–10	2011
None	34.5	22.6	19.4	20.4	100.0	100.0	99.7	97.1
0.01 to 0.99	53.6	36.1	41.8	40.4	62.6	58.2	52.6	63.7
1.00 to 2.49	37.0	28.6	29.7	25.2	37.5	27.6	22.3	24.3
2.50 to 4.99	34.5	0.2	17.9	5.3	18.9	3.9	8.3	4.5
5.00 to 9.99	10.0	0.0	8.3	5.0	4.2	0.0	3.4	2.0
10.00 to 19.99	3.9	11.1	0.0	7.7	2.0	5.0	0.0	2.4
20 acres or more	0.0	1.2			0.0	2.0		
Total	36.2	22.7	26.6	26.2	24.6	25.5	34.0	38.1

Land leased in as % of area cultivated refers to the total for that category, not the average per household.

Source: Sharma (2005) and IHD Bihar Survey, 2009–10 and 2011.

been a shift downward in the percentage of households leasing in land within each landownership class, but this has been compensated by the general shift downward towards land classes where there is more renting in. On the other hand, in the more recent surveys the landless had less access to land rentals than in 1981. This is a logical consequence of the decline in semi-feudal agrarian relations, in which attached labour also sharecropped small plots of land. In practice, tenancy is increasingly governed by the market rather than by agrarian relations. There is also substantial outmigration of the labour households who used to earlier cultivate small plots of rented land. There was some reverse tenancy in 2011 (that is, small landowners leasing out to larger landowners) but this was also present in 1981 and 1998–99.

Finally, land sales are not common but not negligible either. In 2011, 12% of households reported sales in the previous five years (but only 8% reported purchase, the vast majority less than one acre). Seventy percent of sales were for marriage, health or funeral expenses. Upper castes accounted for 45% of sales and 30% of purchases; middle castes (OBC-II, including Yadav, Kurmi and Koeri) for 40% of sales and 55% of purchases. So there was a significant transfer from upper castes towards the OBC-II. For other groups, there was less difference between the proportions selling and buying.

Other Assets: Land is by far the most important asset, and as we have seen, its distribution has not changed very much. What about change in the overall pattern of asset holding?

Table 3 shows the value of assets of different types, in current rupees, in 1981 and 2009–10. It can be seen how assets are dominated by land and to a lesser extent by housing. All other assets combined accounted for well under 10% of the money value of all assets in both years.

Figure 3 shows the change in asset values over time. The bars in the chart measure the average value of assets per household in current prices in 2009, divided by the corresponding value in 1981. To interpret this pattern we need to allow for price changes in the intervening period. There is no good price index for assets

Table 3: Assets in 2009–10 and 1981 by Type, Bihar, Average Value per Household
(in current prices)

Asset Type	Per Household Value of Assets in 2009–10 (in Current Rs)	Per Household Value of Assets in 1981 (in Current Rs)
Land	2,11,077	18,411
Livestock	7,365	1,085
Other productive assets	6,274	887
Domestic possessions	2,098	111
Dwellings	90,599	10,372
Other assets*	4,180	—
Total	3,21,594	30,867

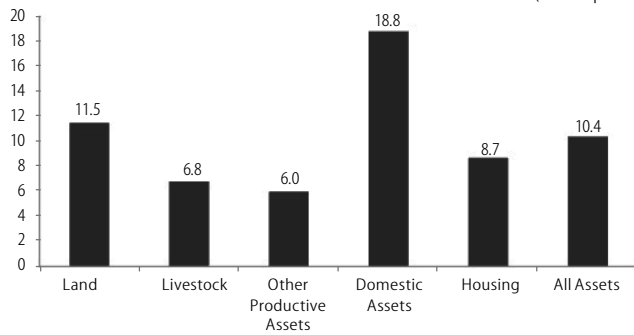
* "Other" assets concern savings, bank accounts and jewellery, not recorded in 1981 and probably not very accurate in 2009–10.

Source: IHD Bihar Survey 2009–10; ANSISB Bihar Survey, 1981–83.

available, but a first proxy would be the consumer price index for agricultural labour. In Bihar this was about 6.6 times higher in 2009–10 than in 1981–82. So by comparing the increase in the value of land, for instance (11.5 times), with 6.6, we can get an approximate idea of the real increase in value.

Looking at Figure 3 as a whole, we see that there has been a substantial real increase in the value of assets, except for livestock and other productive assets. Land has increased in value

Figure 3: Change in the Value of Assets, Bihar, 1981 to 2009–10, Ratio of Value of Assets in 2009–10 to Value in 1981 (current prices)

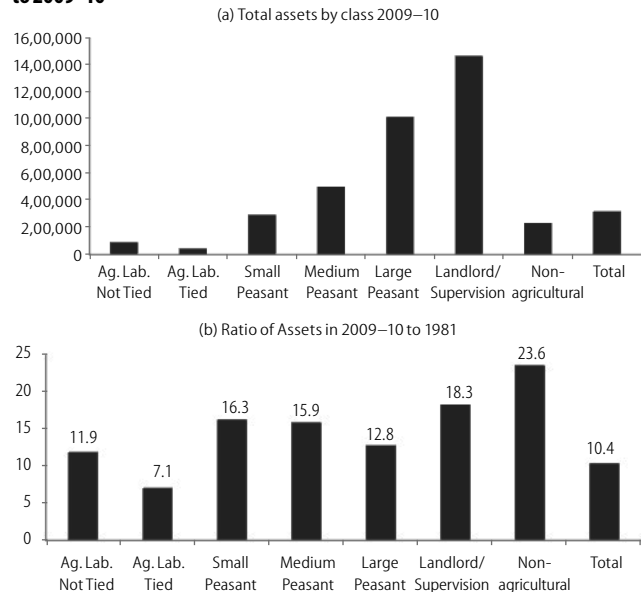


Source: IHD Bihar Survey 2009–10; ANSIS Bihar Survey, 1981–83.

by 70% more than the rise in prices. Since the quantity of land is fixed, this of course reflects its scarcity value, but also land improvements and increasing productivity. The value of housing too has risen substantially. But the largest proportionate increase concerns domestic assets, which includes furniture and electronic goods such as mobile phones and televisions. The much lower increase in the value of livestock and other productive assets is noteworthy. In real terms, there is virtually no increase at all for these two categories. This points to lack of capital accumulation, which would be an important constraint on agricultural growth. However, one reason for the lack of increase in the value of livestock is the replacement of bullocks by tractors for ploughing. The value of cows and buffaloes has, in fact, increased while that of bullocks has sharply declined. Nevertheless, the purchase of tractors has not been sufficient to increase the overall real value of productive assets.

Figure 3 gives average changes for the population as a whole, but it is equally important to investigate changes in the distribution of assets among different population groups. Figure 4 shows the pattern of assets by class. The upper part of the graph shows the absolute value of all assets in 2009–10, where the enormous gap between agricultural labour and the rest is particularly clear. The assets of big peasants are more than 10 times, and of landlords more than 15 times higher than those of agricultural labourers. The lower part of Figure 4 shows the change between 1981 and 2009–10, using the ratio of asset values in current prices in the same way as Figure 3. Here, the differences are smaller. With the exception of tied agricultural labour, which as we saw is disappearing fast, all agricultural classes showed asset ratios in the range 12 to 18. Agricultural labour has the lowest ratio, and landlords the highest, but there does not seem to be an increase in asset inequality across the board because small and medium peasants also do fairly well, and large peasants less well, while the number of households in the landlord category has sharply declined. Nevertheless, the gap between the top and the bottom is widening in absolute terms. Non-agricultural households have shown greater improvement than agricultural households, but they were starting from a low base and still had lower assets than all peasant groups in 2009–10 (largely, of course, because of the ownership of land among the latter).

Figure 4: Value of Assets by Class, Bihar, 2009–10 (Rs) and Change from 1981 to 2009–10



Source: IHD Bihar Survey 2009–10; ANSIS Bihar Survey, 1981–83.

It is interesting to extend this analysis to differences between caste groups. Figure 5 (p 49) gives an example that is relevant for our discussion of agricultural development in the next section. The chart shows changes in assets of the prominent middle caste, Yadavs, compared with the upper caste Bhumihars and Rajputs who (along with Brahmins) previously dominated the upper echelons of the semi-feudal system. The difference is startling. On an average, Yadavs increased their assets much more than Bhumihars (18 times against 8). But the pattern differed considerably from one type of asset to another. The largest difference concerns land, where the upper castes did worse than the average (7.4 times increase against an average of 11.9), while Yadavs did considerably better. Yadavs also did much better for livestock, and for domestic assets. On the other hand, Bhumihars and Rajputs did somewhat better than Yadavs for productive assets other than livestock, while there was not much difference between them as concerns housing. This comparison, it is worth repeating, concerns the proportional change, not the absolute numbers; with respect to the latter, Yadavs remained well behind the upper castes in 2009–10 (except for livestock).

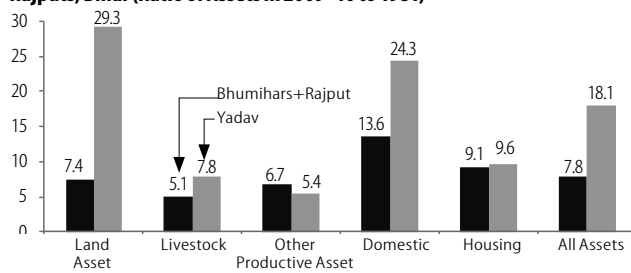
We can see a clear difference of agricultural development pattern in these asset changes. The upper castes seem to have been losing land but mechanising to some limited extent (much investment in productive assets other than livestock concerns mechanisation), while Yadavs have been investing in livestock and expanding their landholdings.

4 Agricultural Development

What is the overall impact of these structural changes on agricultural performance?

Like in India as a whole, agriculture's share of the Bihar gross state domestic product (GSDP) has been declining rapidly in recent years (43% in 1980–81, 30% in 1999–2000, 18% in 2009–10). But the reduction in the agricultural labour force

Figure 5: Asset Changes by Caste, Yadavs Compared with Bhumi-hars/Rajputs, Bihar (Ratio of Assets in 2009–10 to 1981)



Source: IHD Bihar Survey 2009–10; ANSISS Bihar Survey, 1981–83; Prasad et al (1988).

was much slower, so that there has also been a decline in labour productivity compared with other sectors.

This would appear to correspond to a model of agricultural stagnation. But our data do not really support this picture, for they show that there has been considerable change, not only in agrarian relations but also in land and crop productivity. First, we find from village surveys that yields of paddy and wheat increased substantially between 1981–82 and 2009–10 (Table 4). In the almost three decades between the two surveys, average yield rose by 99% for paddy (2.5% per year) and 91% for wheat (2.3% per year). In addition, growth of output was certainly higher than growth of productivity because increased irrigation also permitted an increase in cropping intensity. Table 4 gives the census figures for irrigation in 2001, which are high (over 70% of cultivated area), and a substantial increase compared with earlier estimates from the 1970s. Indeed, in Bihar a large proportion of agricultural land is irrigable in principle, because of the availability of groundwater near the surface, and the constraint is essentially one of cost (of borings, pumpsets and diesel oil, since electricity supply remains unreliable).

While these figures are only for paddy and wheat, and subject to caution because of the year to year variability in agricultural output, it seems clear that there is higher growth in agriculture than the official figures suggest. Official district level data for Bihar show growth of agricultural output at 2.25% per year between 1980–83 and 1990–93 but only 0.13% from 1990–93 to 2003–06. These look like underestimates, not only because our survey shows higher growth of yield for both

Table 4: Agricultural Productivity by District, Bihar, 1981–2009

	(survey districts only)							
	Average Yield of (Aghani) Paddy (Quintals/Acre)			Average Yield of (Rabi) Wheat (Quintals/Acre)			Irrigation (%)*	
	1981–82	2009–10	Ratio	1981–82	2009–10	Ratio	1977–78	2001
Gaya	7.3	13.8	1.90	5.2	10.0	1.91	33.0	81.5
Gopalganj	7.4	13.5	1.82	8.0	13.5	1.69	52.7	69.6
Madhubani	6.2	8.6	1.39	4.9	6.3	1.30	5.7	45.8
Nalanda	7.1	14.8	2.08	N/A	10.6	N/A	53.2	85.3
Purnia/Araria	5.6	11.8	2.11	3.5	8.4	2.39	11.1	51.3
Rohtas	7.6	20.2	2.65	6.9	10.2	1.47	63.5	100.0
All	6.7	13.4	1.99	5.0	9.6	1.91	N/A	72.3

* "Modern" irrigation only (canal and tubewell).

Source: Village surveys carried out by ANSISS in 1981 and IHD in 2009–10 in these six districts (Purnia and Araria being considered together since they formed a single district in 1981). These are "average normal yields," obtained from interviews of cultivators. There is of course a great deal of variability from year to year in actual yields, and the following year (2010–11) agricultural production was severely affected by drought in Bihar. Data for several years would be needed to allow for these fluctuations. Irrigation figures from the Census of India 2001 and for 1977–78 from Rodgers (1981).

paddy and wheat, but also because agricultural diversification should be generating higher growth rates in the total value of agricultural output than for cereals alone.

At the district level it can be seen that there was no relationship between backwardness in 1981 (in the sense of low productivity) and subsequent productivity growth. There are two opposite possibilities here: one is that backward areas would be able to catch up as improved technologies spread. Alternatively, structural factors may cause backwardness to persist. In fact, both patterns can be observed. Purnia, the most backward district in 1981, had faster than average productivity growth over the next 28 years, though not enough to reach the average for the state as a whole. On the other hand, Madhubani, also backward in 1981, grew slowest of all, and was well behind Purnia in 2009. Rohtas District, relatively advanced in 1981, subsequently had the highest productivity growth for paddy, but low productivity growth for wheat. One reason may be that Rohtas is the only district in Table 4 that is well served by canal irrigation, and this was already the case in 1981, thus limiting the scope for further improvements in wheat yields.

As noted above, diversification away from cereal crops should be a source of increase in agricultural output. But while there is some diversification, three quarters of the value of agricultural output was still accounted for by cereals in 2011. There is a regional pattern here, for the returns to non-cereal crops vary in different parts of the state. Ninety-four percent of the value of agricultural output in Rohtas was in cereals, but this is clearly connected with the availability of water from canal irrigation, which is not adapted to the frequent irrigations required by vegetables, for example. There was more non-cereal production in Gaya, Nalanda and Purnia (over 30%), the first two with some diversification into vegetables, while Purnia, with higher rainfall, had some jute production and some rain-fed rabi crops.

Apart from these regional factors, the relationship between diversification and factors such as caste, class and landholding is complex. For instance, the share of cereals was highest among Bhumi-hars, Rajputs and Yadavs, and lowest among Muslims. It was also higher for medium and large peasants and landlords, and lower for small peasants and agricultural labour. There may in fact be an inverted u-shaped relationship with operational landholdings, as can be seen from Table 5. The largest share of cereals is found in the largest and smallest holdings.

Can these patterns of agricultural production be related to the structural changes in agrarian systems discussed above? In Purnia, semi-feudal relations were strong in 1981, so faster growth there is consistent with a weakening some of these institutional constraints on agricultural development. However, in Madhubani, where semi-feudal relations were also strong,

Table 5: Share of Crop Output Accounted for by Cereals by Operational Landholding Bihar, 2011

Operational Landholding	Cereals as % of Value of Output (% of value)
0.01 to 0.99 acre	80
1.00 to 2.49 acres	74
2.50 to 4.99 acres	78
5.00 to 9.99 acres	73
10 acres or more	85
Total	77

Source: IHD Bihar Survey, 2011.

the pace of growth was lower. These differences are best analysed through in-depth studies at the village level, since patterns of behaviour are not uniform and different villages may engage in very different development paths. A recent analysis comparing a village in Madhubani District with one in Nalanda District found that high rates of outmigration from the former, combined with the persistence of a caste hierarchy in which many of the main landowners (Brahmins) were not strongly engaged in agricultural production themselves, had been important factors discouraging local investment in agricultural growth (Datta et al 2014); meanwhile in the village in Nalanda, the dominant Kurmi caste was investing in agricultural mechanisation and diversifying. Much depends on the social make-up of the village and its history.

One important aspect of change in agriculture is the spread of new technology.⁵ Today virtually all farmers in Bihar use modern irrigation, high yielding seeds and chemical fertilisers, but there is some variation between farmers in the intensity of their use. There are also differences between villages and cultivators in the adoption of new techniques of composting, ploughing, pest control, etc. In the 2011 round of the survey several variables were used to explore these issues:

- First, there is a question as to whether the household concerned has adopted any new agricultural technique.
- Second, there are measures of the amount spent on various types of “modern” inputs. A good indicator is the use of sprayers, because here substantial costs are incurred for purchase of pesticides.
- Third, there is expenditure on current inputs such as seed or fertiliser. Seed is often kept from year to year, so current expenditure may not be a good indicator. Expenditure on fertiliser is more regular, and is normally correlated with irrigation and with use of advanced seeds, since both increase the returns to fertiliser.

There are considerable regional variations in agricultural technology, as measured by these three indicators. Nalanda and Gopalganj are the most advanced districts overall, with the highest adoption of new techniques, while Nalanda is top for sprayer use and Gopalganj for fertilisers. Madhubani and Gaya are the most backward districts overall.

What factors might determine the technology level, other than regional differences? Normally it is assumed that there is some relationship with farm size, although this too varies from one indicator to another, for some technologies are scale neutral while others require large landholdings for efficient

Table 6: Technology Indicators by Operational Landholding, Landowning Households, Bihar, 2011

Operational Landholding	% Adopted Any New Technique in Agriculture	Sprayer Costs per Acre Operated (Rs)	Fertiliser Costs per Acre Operated (Rs)
0.01 to 0.99 acres	15	182	1,621
1.00 to 2.49 acres	20	253	1,395
2.50 to 4.99 acres	40	266	1,207
5.00 to 9.99 acres	53	130	1,193
10 acres or more	54	97	1,180
Total	22	210	1,328

Source: IHD Bihar Survey 2011.

operation. Table 6 shows that there is a tendency for larger farmers to report higher adoption of new techniques, but the relationships of sprayer and fertiliser use with landholding are quite uneven.

There was little relationship between technology adoption and class (as defined above), with the exception of a rather low technology level for landlords, but an interesting pattern can be observed by caste (Table 7). Kurmis have the highest level for all indicators, and Yadavs are above average for all. For other groups the pattern is more mixed, but there is a general tendency for SC, ST, OBC-I and Muslims to be below average (if Muslims are divided into upper and lower categories, the lower group has particularly low technology indicators). Upper castes show a mixed pattern, generally less advanced than middle castes, with the pattern varying from one indicator to the next.

Table 7: Technology Indicators by Caste and Community Landowning Households, Bihar, 2011

Operational Landholding	% Adopted Any New Technique in Agriculture	Sprayer Costs per Acre Operated (Rs)	Fertiliser Costs per Acre Operated (Rs)
Brahmin and Kayastha	36	203	1,458
Bhumihar and Rajput	14	104	1,364
Kurmi	59	761	1,764
Yadav	19	210	1,298
Koeri	21	156	937
Other OBC-II	18	138	1,188
OBC-I	14	186	1,181
SC/ST	17	285	1,435
Muslim	18	52	953
Total	22	210	1,328

Source: IHD Bihar Survey 2011.

Overall this suggests that different technology indicators have different determinants. For instance fertiliser use is more strongly related to caste than to landholding, while for the general indicator of adoption of new techniques the reverse is true.

In order to pursue these relationships further, a multivariate analysis of the determinants of agricultural technology was carried out, using a technology index that was the sum of three dummy variables: whether the household reported any use of sprayers; whether expenditure on fertilisers was above the mean for the survey; and whether any agricultural equipment was owned (pumpsets, threshers, tractors, tillers, etc). This analysis, reported in more detail in Rodgers et al (2013), found that there is a strong positive relationship between landholding and this measure of technology, independently of the other factors. It also found that caste had considerable explanatory power. Kurmis had a notably high technology index and Bhumihars and Muslims notably low. Class was much weaker as an explanatory variable. In other words, the multivariate analysis suggested that the adoption of new technology was mainly determined by landholding and caste, not by class. In a similar analysis in 1981, both caste and class had significant effects, so contrary to some expectations, the influence of caste has strengthened, not weakened over time.

Table 8: Principal and Secondary Economic Occupations of Workers Aged 15–59, Bihar, 2011 (in %)

Occupation/Industry	Principal Occupation			Secondary Occupation		
	Males	Females	Total	Males	Females	Total
Agriculture, livestock, fishing	34	71	39	81	96	88
Traditional village-based service, artisan	7	2	6	2	2	2
Skilled technical workers	8	1	7	1	0	1
Unskilled physical	23	4	20	10	1	6
Industry and agro-processing	10	3	9	0	0	0
Sales worker	7	3	6	2	1	2
Modern services and professional	10	12	10	2	0	1
Other	2	4	3	2	0	1
Total	100	100	100	100	100	100
Not economically active (% of population)	18	86	51	51	51	51

Source: IHD Bihar Survey 2011.

5 Occupational Diversification and Income

The pattern of change in agriculture occurs in tandem with wider changes in Bihar’s economy. In 1981, 80% of principal (economic) occupations in the survey villages were in agriculture, and 94% of secondary occupations. For women there has been very little change since that date, as can be seen in Table 8. But there has been a great deal of occupational diversification for men. Now only a third of the male primary occupations are in agriculture (though there has been far less change in secondary occupations). On the other hand, 70% of female workers still report agriculture to be their primary occupation.

However, this change mainly occurs outside the village. Of men aged 15 to 59, 40% migrated for some or all of the year in 2011, 23% of them for more than eight months (as much as 57% of those aged 25 to 39, of which 29% for more than eight months). And the occupational profiles of migrants are

totally different from those of non-migrants, as Table 9 shows. Only 32% of migrants give agriculture as their primary occupation (although many more give agriculture as a secondary occupation). In contrast, this was the case for 54% of non-migrants.

These occupational changes have displaced agriculture not only as the primary source of employment (for men) but also as the primary source of household income, as can be seen from Table 10. Overall, only 26% of income comes directly from agriculture, either through own production or wage work. Over 30% comes directly from non-agricultural work, of which 11% from regular jobs, and close to another 30% comes from remittances from migrants outside the village (mostly sourced outside agriculture). The remaining 15% of “other income” consists largely of government transfers and rental income. It can be seen that there is a great deal of variation across class, caste and regional breakdowns, but in no category does agriculture account for as much as half of income, the highest being among Yadavs, within the caste breakdown,

Table 9: Occupational Distribution of Migrants and Non-Migrants, Bihar, 2011 (percentage distribution of those reporting an economic activity; males aged 15 to 59, primary occupation)

Occupation/Industry	Non-migrants	Migrants
Agriculture, livestock, fishing	50	28
Traditional village-based service, artisan	4	8
Skilled technical workers	8	7
Unskilled physical	21	23
Industry and agro-processing	1	15
Sales worker	7	6
Modern services and professional	7	10
Other	1	3
Total	100	100

Source: IHD Bihar Survey 2011.

Table 10: Distribution of Household Income by Source, by Caste, Class and District, Bihar, 2011 (in %)

		Own Production	Wage Work	All	Own Production	Casual Wage	Income from	Other	Remittances	Total
		in Agriculture and Allied	in Agriculture	Agriculture	in Non-Agriculture	in Non-Agriculture	Regular Employment	Income		Income
Caste group	Brahmin and Kayastha	34	0	35	11	1	14	18	21	100
	Bhumihar and Rajput	24	0	24	6	0	20	14	36	100
	Kurmi	19	2	21	13	2	28	24	12	100
	Yadav	46	2	48	8	2	10	14	17	100
	Koeri	13	1	14	50	0	3	6	27	100
	OBC-II	14	1	15	32	9	14	11	18	100
	OBC-I	21	8	29	9	10	7	11	33	100
	SC/ST	12	9	21	4	18	9	15	33	100
Class of household	Muslim	12	4	16	5	17	8	18	35	100
	Agricultural Labour	15	9	24	6	16	5	14	36	100
	Small peasant	24	2	26	25	4	7	9	28	100
	Medium peasant	39	2	40	19	7	2	10	22	100
	Large peasant	35	0	35	9	2	18	18	18	100
	Landlord/supervision	11	0	11	1	0	45	21	23	100
	Non-agri wage employment	10	1	11	4	5	28	16	35	100
	Non-agri self-employment	10	1	10	50	2	1	19	19	100
District	Gaya	16	3	18	26	2	6	20	27	100
	Gopalganj	18	2	20	7	4	10	9	51	100
	Madhubani	16	4	20	6	16	12	9	37	100
	Nalanda	16	5	22	11	11	20	21	15	100
	Purnia/Araria	24	5	30	11	5	13	17	25	100
	Rohtas	38	4	42	10	9	7	16	15	100
Total	22	4	26	11	8	11	15	28	100	

Other income includes income from employment in government programmes, income from transfers from government and rental income.

Source: IHD Bihar Survey 2011.

with 48%. It is likely that the share of agriculture is underestimated in these data, simply because there are many agricultural by-products and kitchen gardens. Farmers may also underestimate production for own consumption. But allowing for such factors is unlikely to change the basic picture.

Table 11: Distribution of Agricultural Income, Bihar, 2011 (in %)

Class of Household	Income Source							Total
	Own Production				Wage Work			
	Cultivation	Fruit	Forest Products	Live-stock	Casual Wage	Contract Work	Attached Labour	
Agricultural labour	32	2	2	26	29	5	5	100
Poor peasant	49	7	2	36	5	1	0	100
Middle peasant	56	3	1	36	4	0	0	100
Big peasant	61	7	4	28	0	0	0	100
Landlord/supervision	17	10	6	67	0	0	0	100
Total	47	5	2	29	13	2	2	100

Source: IHD Bihar Survey 2011.

The class breakdown, which is essentially based on agricultural occupation, and which was designed to reflect the situation in the early 1980s, is clearly much less useful as a guide to economic differences now than it was then. Today, the key factors lie in the possibilities for migration and the ability to access work outside the village, especially regular jobs, rather than in agrarian relations. More research would be needed to investigate alternative ways of conceptualising class that are better adapted to the new economic environment.

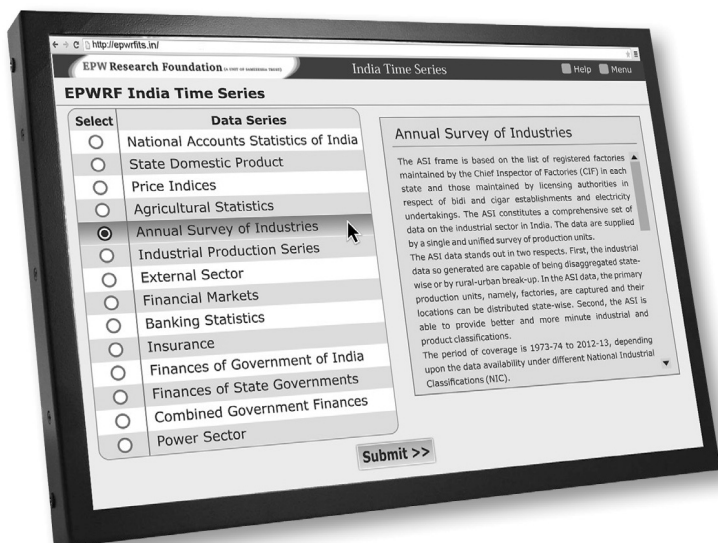
Table 11 gives a more detailed breakdown for the distribution of agricultural income by class. Only 16% is recorded as coming from wage labour in agriculture, and almost 29% comes from livestock. The low level of income from wage labour in agriculture is another indication of diversification towards other occupations, outside the village, which provide more regular work and higher wages.

A notable aspect of the pattern of change is a rise in wages, which have been multiplied by two to three times in real terms between 1981 and 2011.⁶ This cannot be explained by the increase in agricultural productivity, which has to be considered against a substantial increase in the population, nor by programmes such as under Mahatma Gandhi National Rural Employment Guarantee Act that started only relatively recently and whose impact in rural Bihar is rather small. The most plausible explanation is that the growth of alternative opportunities outside agriculture is responsible, most of them accessed through migration to other parts of India.

Outmigration seems to have grown initially as response to lack of opportunity in local labour markets. But it also has important effects on the dynamics of the rural production system. Today there is a tendency towards labour shortage and rising local wages. In some places this is associated with a lack of innovation in agriculture; elsewhere it may be encouraging cultivators to invest in labour-saving cultivation techniques. In

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either case the result is a slow growth of local employment opportunities. At the same time, agricultural labour markets are becoming feminised as women occupy the space left by migrating men—but with worse terms and conditions. The segmentation of Bihar's rural labour market is therefore increasing, reflecting a lack of balance in Bihar's rural development.

6 Concluding Remarks

Overall, this story of Bihar is one of rising real incomes and increasing agricultural productivity. But at the same time there has been little local diversification, whether in terms of cropping patterns or of occupations within the village. Agricultural growth has been modest, and has not been the main driving force: that comes from non-agricultural occupations outside the village, many of them requiring migration to other parts of India. Migration was earlier mainly from North Bihar, but now a substantial proportion of the migrants are also from South Bihar, although still less than from the North. In fact, the most important factor behind the transformation of the rural labour market as well as decline in poverty seems to be

migration from the state. But it is not clear that a model based on migration is sustainable. There has been some change in wealth distribution, but the pattern is complex, and overall inequality has probably not greatly changed in the last three decades. But there are groups that have distinctly improved their position and others who have done relatively poorly, depending to a large extent on whether they have been able to take advantage of opportunities outside the village.

This paper reports only some of the results of the survey. More research is required to better explain some of the changes reported here. For instance, it would be useful to examine in greater detail the relative importance of class and caste, and how this is changing. Some of the class categories identified above are becoming less relevant, and a new conceptualisation of the rural class structure is required. The power and position of different castes and caste groups is also changing. All these factors will play a role in determining whether a deeper transformation of the production system in rural Bihar is possible; such a transformation is surely needed for a transition to sustainable growth.

NOTES

- For more details, see Rodgers, Datta et al (2014), and other sources given at the end of the article.
- On this issue, see the writings of Pradhan H Prasad (for example, 1979, 1987), among others.
- There were two rounds of data collection in the 2009–11 survey, in 2009–10 and 2011, covering overlapping but in some respects different topics. We use data from both rounds in this article. Data from the 1981–83 survey refer to the period from mid-1981 to mid-1982. Information for the 12 survey villages is pooled in this and subsequent tables.
- The distinction between upper and lower Muslims reflects the official categorisation of some groups among Muslims as OBCs.
- Some authors consider that technology options and choices are the main determinants of agricultural change in Bihar, and much more important than institutional factors—see, for instance, Fujita (2014).
- See, for instance, Datta et al (2014); Rodgers and Rodgers (2011).

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Data from the surveys are subject to a continuous process of review and cleaning. As a result there can be differences between the estimates reported in this article and earlier publications. It should also be borne in mind that while the villages were originally chosen to be broadly representative of rural Bihar, they do not have the statistical reliability of a large random sample. Any particular estimate must therefore be regarded as approximate. But we would argue that the surveys capture the broad qualitative patterns of change in rural Bihar.

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