Understanding Agrarian Impasse in Bihar

The key hypothesis of policy-makers during the 1980s was that raising tubewell density would trigger agrarian upsurge in Bihar as it did in Punjab, Haryana and western UP. The state did record high growth rates of cereal yields during the 1980s, higher than the national figures. However, this promising development could not be sustained in the 1990s, and cereal yields have stagnated since then. Based on fieldwork in eight villages of Bihar, the paper argues that, more than agrarian structure, the lack of adequate infrastructure and economic incentives has contributed to the agrarian stagnation in Bihar. The growth potential unleashed by the expansion of shallow tubewell irrigation has been constrained by (a) complete neglect of public sector investments in physical and institutional infrastructure and (b) unfavourable output to factor price ratios.

Avinash Kishore

I Introduction

After a century-long stagnation, agriculture in eastern India experienced a turn around in 1980s with rapid groundwater development. Especially, West Bengal and eastern Uttar Pradesh performed very well with growth rates in production becoming as high as 4-6 per cent during 1981-82 to 1991-92. Agricultural production and productivity levels in the ‘middle state’ Bihar also witnessed a growth higher than the long-term growth trend of the state [Pandey and Pal 2000]. Yet, agriculture in the state grew at a slower pace, over a smaller base, for a shorter time after which the momentum was lost in spite of an impressive expansion of tubewell irrigation.

This paper tries to explore the reasons for this relapse. The first section of the paper presents a review of literature available from the existing body of research on reasons for the persistent agrarian stagnation in eastern India. The second section explores the latest trends in tubewell irrigation and discusses the structure of water markets and their productivity and equity implications based on data from a primary survey. The third section of the paper discusses various macroeconomic factors which limit farmers’ ability to leverage the newly created pump capital to increase crop productivity and raise incomes. This understanding is based on the knowledge of larger reality of agricultural scenario in Bihar and observations from field survey. The last and the concluding section discusses various alternatives for raising crops yield and farm incomes based on studies of well-performing farms in the region.

II Methodology Used in Study

The study involved an extensive review of literature available on issues of agrarian structure and production relations, agricultural growth, groundwater development and water markets in eastern India and primary data collection using focused group discussions and interview schedules.

The primary data were collected from field studies carried out in eight villages from six districts of Bihar in 2003. Two of our villages are from Nalanda and Bhabhua districts of south Bihar while the rest six are from districts, viz, Muzaffarpur, Saran, Gopalganj, Darbhanga and Madhubani in north Bihar. While Darbhanga and Madhubani are agriculturally least developed, Nalanda and Bhabhua are agriculturally the most developed districts. Muzaffarpur, Saran and Gopalganj fall in between these two extremes. This paper is an attempt to distill the lessons learned during the fieldwork in these eight villages and put them in perspective of the larger reality of agricultural development in Bihar.

III Literature Review

Till 1970s, the literature from agrarian studies were dominated by discussion on issues related to agrarian structure and production relations, groundwater development through expansion of tubewell irrigation and development of water markets became the thrust area after the pioneering RBI report on agricultural productivity in eastern India [RBI 1984].

Agriculture in Bihar has remained stagnant in spite of rich soil, abundance of easily accessible water and a rich peasant tradition. This stagnation has been ascribed to several factors including the state’s colonial legacy [Bharadwaj 1993; Banerjee 2002; Mearns 1999; Banerjee and Iyer 2002], ecological conditions [Ballabh and Pandey 1997; Ballabh and Sharma 1990], demographic pressure [Verma 1993] and most importantly, the land tenure system and the agrarian structure it supports [Bhaduri 1973; Prasad 1974]. These factors are believed to have impeded the transition of Bihar’s agriculture from a semi-feudal to capitalist production system – an essential condition for agricultural growth [Pataik 1987].

Inequitable land distribution and perverse land tenure relations are considered to be the backbone of semi-feudal agrarian structure in Bihar and therefore comprehensive land reforms is suggested as the policy measure. Abolition of ‘zamindari’, redistribution of surplus land, tenancy reforms and land consolidation are four components of comprehensive land reforms [Ballabh and Walker 1992]. Among all Indian states, land reforms have been the worst failure in Bihar, even when it took the first initiative in this direction by abolishing the zamindari system in 1953. While West Bengal could accomplish tenancy reforms through operation Barga and UP had considerable success in land consolidation [Pant 2004] both projects were abysmal failure in
Bore Density  

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agriculture, access to capital holds the key to agricultural growth, distribution has been at the core of the current outmoded agrarian and labour were the key and as a result inequitable land distribution is extremely difficult both politically and practically for agrarian transformation in this region; logics. He considered the technocratic approach to be the only systems and developing land saving and labour-using technologies. He posited that the trend would continue because the zamindari system was highly institutionalised and formally been abolished in the state [Wilson 1999].

Changing the structure of landownership proved to be difficult because the zamindari system was highly institutionalised and the dominant groups were very strongly entrenched in the state machinery itself. The political difficulties apart, Dandekar and Rath [cited in Bardhan and Rudra 1979] have argued that in an overpopulated state like Bihar, it is futile to try resolving the problem of rural poverty by re-distribution of land which is in short supply as this will have to be achieved by enforcing extremely low land ceilings which cannot be justified on sound economic considerations or rational calculations. Similarly, Hayami (1981) argued that in conditions of high and increasing population pressure on land, land reform is likely to be infeasible and futile without reversing the trend of increasing return from land relative to labour. He posited that the trend would continue as long as increase in supply of labour outpaces the increase in labour demand and hence the best cure to the growing poverty and inequality was to augment land by investing in irrigation systems and developing land saving and labour-using technologies. He considered the technocratic approach to be the only practical approach for agrarian transformation in this region; since land redistribution is extremely difficult both politically and administratively [Hayami 1981].

### IV From Land to Groundwater: The Paradigm Shift

This has been the viewpoint of development economists, namely, Tushaar Shah and Richard Palmer-Jones also who argued that in rainfed low productivity agricultural system control over land and labour were the key and as a result inequitable land distribution has been at the core of the current outmoded agrarian structure. However, in the modern land-saving, input-intensive agriculture, access to capital holds the key to agricultural growth, while land has become less important. This is reflected in the declining share of land in the gross value of produce. But, eastern India suffers from severe capital scarcity and existence of monopolistic markets which exacerbate the existing inequality and reinforce the outmoded structure. Machine-reforms, wherein the government would help the resource poor farmers and landless labourers to get ownership of agricultural implements so that the inequity in landholdings could be compensated by equity in access to groundwater and technology, can bulldoze the ossified agrarian structure and unfold a new era of rapid agricultural growth with relative equity and reduced poverty. They suggest a government supported and subsidised capital formation in private sector with special targeting on poor and landless to bring about the change.

This was in line with the key recommendation of the widely quoted RBI report on eastern India [RBI 1984] which also stressed mainly on a machine based approach of exploiting region’s abundant groundwater resources using shallow tubewell technology to intensify irrigation and increase agricultural productivity, thereby reducing poverty. Rapid tubewell capital formation through government subsidised projects like free-boring scheme became the corner stone of public policy in Bihar as well as in other eastern states. This marked a clear shift in the policy focus from land-based strategies to water and machine capital-based strategy for agrarian change in the region. Unlike in the past, the tubewell capital formation was encouraged mainly in the private domain and special targeted schemes like the million wells scheme were devised for small and marginal farmers of scheduled castes and scheduled tribes.

Evolution of rental markets in pumps (often called water market in irrigation literature) helped overcome the problem of lumpiness of investment and scale bias of the tubewell technologies, earlier thought to be the main problems in adoption of these technologies in Bihar and rest of eastern India having stamp size plots and high land fragmentation [Dhawan1982]. Water markets facilitated access to groundwater of even the small and marginal farmers. Rapid groundwater development took place in Bihar powered by both policy push and private initiative. Density of boreswells and pumping sets had registered an exponential growth over last two decades. Between the two minor irrigation censuses in 1986-87 and 1992-93, the pump density increased fourfold in Bihar (Figure 1). Primary surveys carried out in nine villages in six districts of Bihar in 2002 and 2003 suggest that the pump density has increased even more rapidly in the last 10 years after the latest minor irrigation census (Figure 2). The surveys suggest that the density of borewells is much higher than the pump density. In fact in these nine survey villages there was one borewell for every 2.5 ha of cultivated area. Such high borewell density is a response to high and increasing land fragmentation in the state and this has been made possible by low cost of boring [Ballabh and Choudhary 2002] and portability of diesel pumps.

Even though the density of groundwater extraction measures (WEMs) has rapidly increased, the actual role and potential of this pump-led market based reform strategy to bring equitable growth in the precapitalist agrarian economy of Bihar has been questioned by many researchers (for instance Wood (1995),

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**Figure 1: Shallow Tubewell Density in Bihar**


**Figure 2: Density of Bores and Pumpsets (per 100 ha if NCA)**

Chakravarty (2001) and Wilson (2002). They have used detailed village studies to show how machine distribution has in fact increased the inequity and strengthened the vice grip (rent extracting capacity) of already dominant landlords. They argue that the rental markets for equipments are far from impersonal and context-neutral as assumed in neoclassical economics. Wood suggests that exchanges in rural water markets have non-economic motives and they are essentially linked to the social fabric and embedded in social relationships. The imperfect, socially embedded groundwater markets have functioned to reinforce rather than relax the dependence, constraining the opportunity for many small farmers with non-favoured client status to increase their cropping intensity. As a productivity outcome, land is either increasingly coming into the hands of adequately capitalised farmers or its potential with the new technology is under-realised. Thus, these technological opportunities are socially constrained to serve non-productive purposes.

This, however, does not seem to be true everywhere. In our survey, we found access to groundwater to be more equitable than the land distribution in Bihar. According to the last minor irrigation census (1992), 76.67 per cent of all mechanised shallow tubewells (STWs) in the state are owned by marginal and small farmers. This is much more than their share in the total cultivable land in the state. This was corroborated in a recent primary survey of 263 farmers carried out by IWMI in seven villages in six districts of both north and south Bihar (Table 1). As evident from the table, marginal farmers in the sample had only 7 per cent of the total land cultivated by the sample but they accounted for 25 per cent of all pump-owners in the sample. If we take both marginal and small farmer categories together, they have 55 per cent of all pumpsets while they cultivate only 25 per cent of the total land-owned by the sample farmers.

The IWMI survey showed that a significant number of the sub-marginal category of farmers, having less than 0.5 ha of land, also owned pumpsets. From the sample of 263 farmers, 32 sub-marginal farmers had nine pumpsets among them while in marginal category (0.5 – 1 ha landholding) 66 farmers had 25 pumpsets among them. Thus, a large number of pumps are now owned by small and very small farmers, who are compelled to sell water as irrigation surplus from their own fields is not enough to make the pump investment viable. They pump for profit and not power as suggested by Woods (1995) and Dubash (2000). These farmers resort to renting out pumpsets to improve the capacity utilisation which ensures access to groundwater to even inadequately capitalised farmers. Interestingly, the analysis of sample survey data showed that even large farmers were selling water as much as the small and marginal farmers. The correlation between landholding size and hours of water selling per year was positive, though weak (r = 0.18) and significant only at 90 per cent confidence level (Figure 3). This probably indicates increasing acceptance of water selling by even the well off sections of the rural society in Bihar, a change from the early days of groundwater development when it was a social taboo [Clay 1974 as cited in Mukherjee 2004 and Wood 1995].

Wood argues that quite like in canal irrigation, there are tail-enders in groundwater irrigation also. The pumpset and boring combinations irrigate the land of pumpset owner first; close non-competitive kin second; favoured clients third; and then a non-random group of non-intimate others. These non-intimate others, who are generally the marginal and sub-marginal farmers of deprived castes, like tail enders in canal irrigation, have by design, more precarious access to pump rental services in availability, timeliness and price of water. This constrains their ability to realise the full potential of groundwater irrigation resulting in sub-optimal productivity outcomes.

Wood’s analysis was based on a detailed study of one village in Purnea: one of the most underdeveloped districts of Bihar. We made an attempt to test if it was true across different regions of the state and if the picture has changed over last 10 years since Wood did his study. We correlated total hours of pumping/acre/year of water buyers against their landhoding size and found the correlation between the two variables to be very weak and insignificant. The scatter plot (Figure 4) revealed that both very large farmers and very small farmers use much less hours of irrigation per acre of their net sown area than the small and medium farmers. The correlation was run again after excluding the large farmers (> 10 acres of land) from the sample and found that the correlation coefficient for this sample became moderately strong (0.525); positive and significant even at 99 per cent confidence level (Figure 5). This suggests that irrigation use intensity follows

<table>
<thead>
<tr>
<th>Table 1: Distribution of Cultivable Land and Pumpsets among Different Land Class Sizes in Seven Villages of Bihar</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Farmer Size</strong></td>
</tr>
<tr>
<td>------------------</td>
</tr>
<tr>
<td>Pump-owners (PO)</td>
</tr>
<tr>
<td>Land (acres)</td>
</tr>
<tr>
<td>Land/PO</td>
</tr>
<tr>
<td>Non-owners</td>
</tr>
<tr>
<td>Land (acres)</td>
</tr>
<tr>
<td>Land/PO</td>
</tr>
<tr>
<td>Pumps/100 acre</td>
</tr>
</tbody>
</table>

competition in the market induced by increase in pump density as diesel prices after the recent enforcement of open market price admitted to us that pump rentals had not increased as frequently as is evident from the declining water to diesel price ratio had declined from 2.80 only twofold from Rs 22-25 to Rs 50 per hour. The water to diesel price in the area. For example, when Shah and Ballabh carried their study in Muzaffarpur (Figure 6).

**Groundwater Irrigation Intensity in Rice-Wheat Systems**

The irrigation pattern of pump-owners was compared with that of renters for paddy and wheat. The purpose of this comparison was to see if the differential pumping patterns had any significant impacts on the productivity outcomes. In paddy, the most important crop for Bihar, there was no significant difference between pump-owners and renters in terms of hours of pumping/irrigation per acre and crop yield (Table 3). Also, the correlation between hours of irrigation/acre of paddy and the yield obtained was found to be weak and insignificant at the state level. This is understandable as rainfall in the survey year was timely and adequate. A recent collaborative study by Rajendra Agricultural University (RAU) and International Rice Research Institute (IRRI) in eight villages of north Bihar also showed similar results with irrigation coefficient being weak and insignificant in the production function plotted for paddy [Singh, Paris and Luis undated].

In the case of wheat, a weak but positive and significant correlation was found between pump-ownership and hours of irrigation/acre provided to the crop. Hours of irrigation and yield also had weak but positive and significant correlation between them. But the correlation between pump-ownership and yield was insignificant. A closer look at the data suggested that though the incidence of pump-ownership was higher among the farmers in south Bihar, wheat yields were lower there.

This dichotomy was noticed during IWMI’s fieldwork also. Farmers in villages of south Bihar invest greater amount of resource and effort in kharif crop while rabi crops were more important.

**Table 3: Crop-Economics of Farmers Obtaining Average and High Yield of Wheat**

<table>
<thead>
<tr>
<th>Item</th>
<th>1995 (1)</th>
<th>2003 (2)</th>
<th>Ratio (2/1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modality (N = 23)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yield (Q/ha)</td>
<td>11,000</td>
<td>11,000</td>
<td>1.00</td>
</tr>
<tr>
<td>Gross return</td>
<td>1,339.2</td>
<td>1,339.2</td>
<td>1.00</td>
</tr>
<tr>
<td>Seeds</td>
<td>2,616.25</td>
<td>2,616.25</td>
<td>1.00</td>
</tr>
<tr>
<td>Fertilisers</td>
<td>1,965</td>
<td>1,965</td>
<td>1.00</td>
</tr>
<tr>
<td>Tractor</td>
<td>1,756.25</td>
<td>1,756.25</td>
<td>1.00</td>
</tr>
<tr>
<td>Irrigation</td>
<td>9,051.7</td>
<td>9,051.7</td>
<td>1.00</td>
</tr>
<tr>
<td>Labour cost</td>
<td>452.58</td>
<td>452.58</td>
<td>1.00</td>
</tr>
<tr>
<td>Total cost</td>
<td>30,841.25</td>
<td>30,841.25</td>
<td>1.00</td>
</tr>
<tr>
<td>Cost/quintal</td>
<td>452.58</td>
<td>452.58</td>
<td>1.00</td>
</tr>
</tbody>
</table>


Over the years as pump densities have increased, water markets have become broader, deeper and more efficient and monopoly rents have gone down significantly as is evident from the declining water to diesel price ratio in the area. For example, when Shah and Ballabh studied the six villages in 1995, diesel price was around Rs 7.50 – 9.05 while water price ranged from Rs 20 to 30 (Table 4 in Shah and Ballabh 1997:A-186). Seven years later, when one of the six villages (Narayan) was revisited, it was found that while diesel price had increased more than threefold to around Rs 25 per litre, water price in the village had increased only twofold from Rs 22-25 to Rs 50 per hour. The water to diesel price ratio had declined from 2.80 – 3.18 to less than 2 now.

The timeline data on water to diesel price ratio in Table 4 of Shah and Ballabh (1997) study reveals that in 1990s, one rupee increase in price of diesel used to cause several times higher increase in pump-rent in the market. IWMI’s field studies in Bihar suggest that the trend has now reversed. Several water buyers admitted to us that pump rentals had not increased as frequently as diesel prices after the recent enforcement of open market price regime on diesel. This indicates a significant increase in the buyer power in the market which might have occurred due to increased competition in the market induced by increase in pump density over last decade. It would be interesting to point out here that more than half of all pumpsets the samples selected (76 out of 137) were purchased after 1995, the year when Shah and Ballabh carried their study in Muzaffarpur (Figure 6).

**Table 2: Increase in Cost of Agricultural Inputs in Nariyar, Muzaffarpur between 1995 and 2003**

<table>
<thead>
<tr>
<th>Item</th>
<th>1995 (1)</th>
<th>2003 (2)</th>
<th>Ratio (2/1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel (Rs/liter)</td>
<td>7.85</td>
<td>24</td>
<td>3.05</td>
</tr>
<tr>
<td>Irrigation (Rs/hr)</td>
<td>22/25:10/12</td>
<td>50-60</td>
<td>2.5</td>
</tr>
<tr>
<td>Tractor (Rs/ha)</td>
<td>400</td>
<td>825-1100</td>
<td>2.06</td>
</tr>
<tr>
<td>Team (Rs/day)</td>
<td>40</td>
<td>60</td>
<td>1.5</td>
</tr>
<tr>
<td>Thresher</td>
<td>16th share</td>
<td>10th share</td>
<td>1.6</td>
</tr>
<tr>
<td>Sowing</td>
<td>Rs 20 + Meal</td>
<td>Rs 40 + Meal</td>
<td>2</td>
</tr>
<tr>
<td>Spade-work</td>
<td>Rs 20.00</td>
<td>Rs 40</td>
<td>2</td>
</tr>
<tr>
<td>Weeding</td>
<td>Rs 8-10/half day</td>
<td>Rs 15/half day</td>
<td>1.5</td>
</tr>
<tr>
<td>Storage (Rs/qtl)</td>
<td>65</td>
<td>140</td>
<td>2.15</td>
</tr>
</tbody>
</table>

to the farmers in the villages of north Bihar. Separate analysis carried out for the four villages of north Bihar showed that yield difference between pump-owners and water buyers was small but significant at 95 per cent confidence level while the difference in hours of irrigation given per unit area of wheat was significant even at 99 per cent confidence level. Correlation coefficients between ownership and yield and ownership and hours of irrigation were also found to be positive and significant though quite weak (0.176 and 0.281 respectively). Except in case of wheat in the four villages of north Bihar, the results of our survey are similar to what Shah and Ballabh (1997) found in their study of six villages in Muzaffarpur. Water buyers in IWMI’s sample also use lesser hours of groundwater irrigation but use it more productively to reap same levels of yields as the pump owners.

Thus, it can be inferred that water markets have become more widespread and dense over the years facilitating almost universal access to groundwater in Bihar. Markets have also become more efficient as evident from declining monopoly rents over the years. Even though groundwater irrigation has become widespread and market exchanges have become more equitable, the intensity of groundwater irrigation has remained quite low. Farmers continue to economise on their irrigation cost which has risen sharply due to rise in diesel prices. The need for upfront cash payment for diesel pump irrigation also forces cash-starved farmers to under-irrigate. The economisation of irrigation cost is clearly evident from the annual pumpage data of all categories of farmers in our sample (Figure 7). Three-fourths of sample farmers in Bihar provide less than hundred hours of irrigation per hectare of their land under intensive rice-wheat cropping system. Assuming an average discharge of 35 m³/hour, the depth of irrigation works out to be less than 0.35 metres for 71.3 per cent farmers. This is quite low for a double cropped land even in a high rainfall area like Bihar. If we look at wheat, the main rabi crop in the state, it can be found that half of the farmers provide less than 50 hours of irrigation per hectare of their cropped area (Figure 8). This translates to an average irrigation depth of just 0.175 metres which is much lower than the irrigation level recommended for the crop in the state.

This over-economy of groundwater use affects the yields of the crops received in the state and precludes further intensification of cultivation on land in spite of high population pressure. Figure 6 shows that 40 per cent of the farmers in Bihar receive less than 6 tonnes of cereal yield (rice + wheat) per hectare of net sown area. Almost three-fourths of farmers (72.56 per cent) receives less than 7 tonnes of cereal yield per hectare of net sown area (Figure 9). Combined yield of rice and wheat of one-fifth of farmers in our sample was less than a typical Punjabi farmer’s rice yield alone. Accordingly, gross returns from agriculture are also extremely low. While one-third of farmers in the sample earned Rs 25 to Rs 30,000 per hectare of their net sown area under rice-wheat system, another one-third realised less than Rs 25,000. Combined per hectare gross value of produce at farm-gate prices was less than Rs 35,000 for 90 per cent of the farmers in the state (Figure 10). The average figure for the whole sample is around Rs 28,000/ha/year. Considering the land-man ratio of 12.78 persons/ha in rural Bihar, the gross value of produce/capita/year amounts to just around Rs 2,000.

This is one of the important reasons for high incidence of rural poverty in Bihar, the only state in India where the absolute number of poor people below poverty line has registered an increase between the last two rounds of sample surveys of NSSO (Ahluwalia 2001).

### V

**Why Tubewell Irrigation Development Is Not Enough to Sustain Growth?**

Agricultural growth remains low in Bihar in spite of increased pump density and access to irrigation. Growth fuelled by groundwater development has been short-lived and much less significant than that in the neighbouring West Bengal, Eastern UP and even Bangladesh with which it shares its history and ecology (Figure 11). Whatever production increase has been realised had been offset...
migration in peak seasons is cited as the reason for this increase in wage rates than the non-peak season wage rates. Increased monetisation. There has been a sharper increase in peak-season outlay of agriculture with increased dieselisation and rising diesel prices, resulting in a resource squeeze in these credit-starved villages.

As subsidies were reduced, there has been a substantial increase in price of chemical fertilisers, For example, the retail price of urea remained stable at Rs 2.50/kg. throughout the 1980s while by population growth and as a result, per capita food availability and labour productivity have remained at the same level as in the 1960s (Figure 12).

What explains the persistence of agrarian stagnation in Bihar in spite of rapid pump capital formation? Why have farmers in Bihar failed to leverage access to groundwater to increase productivity, intensity and income from agriculture?

**Declining Output-Input Price Ratio**

This issue was raised repeatedly in focus group discussions with farmers during the fieldwork and in all the eight villages covered in the study the response was unanimous: sharp increase in diesel prices is the principal factor affecting agricultural growth. Today diesel has replaced muscle as the main motive power in agriculture and its price has increased more than three times in last eight years (from 1995 to 2003) resulting in a corresponding increase in costs of irrigation, land preparation and threshing (Table 3). Since diesel is available only on cash payment, there has been a substantial increase in the cash outlay of agriculture with increased dieselisation and rising diesel prices, resulting in a resource squeeze in these credit-starved villages.

As subsidies were reduced, there has been a substantial increase in price of chemical fertilisers, For example, the retail price of urea remained stable at Rs 2.50/kg. throughout the 1980s while in last 10 years the price has increased more than two times to about Rs 5.30/kg. There has been a much steeper rise in prices of DAP and potash. Agricultural wages have also doubled up and between 1995 and 2003 and they have become progressively more monetised. There has been a sharper increase in peak-season wage rates than the non-peak season wage rates. Increased out-migration in peak seasons is cited as the reason for this increase even during a time when land owners’ returns from agriculture have taken a beating.

Depressed foodgrain prices and absence of effective price support were also considered to be equally responsible for agricultural stagnation. It was pointed out that while cost of all inputs have increased manifold, food prices have gone down in real terms. The average farm-gate price of paddy and wheat has hovered around Rs 350/quintal and Rs 525/quintal respectively in the last three seasons. The harvest price of paddy is lower than even its C2 cost of cultivation as estimated by Commission of Agricultural Cost and Prices (CACP), let alone the minimum support price offered by government of India.

Post-1991 increase in oil prices, reduction in subsidy on diesel and fertiliser and slackening food prices in both national and international markets have together created a situation where terms of trade have progressively moved against agriculture and the profitability of food production has gone down in spite of a modest increase in crop productivity in Bihar. According to Harriss (1993), it was favourable factor price ratio (in conjunction with availability of a new high yielding variety of rice (IR 36)) that facilitated agricultural take-off in West Bengal. Now, depressed foodgrain prices and increased cost of cultivation are producing a reverse effect, suppressing farmers’ margins and motivation to intensify inputs in agriculture, resulting in relapse of stagnation in state in late 1990s after a short period of growth in the 1980s. Similar problems have been reported in Bangladesh also when rise in diesel price following the Gulf war resulted in a fall in boro production in subsequent years [Palmer-Jones 1999]. Decline in rice-price-fertiliser price ratio has been associated with slowdown in agricultural growth in Bangladesh [Shahabuddin 1999] and Assam [Hussain and Kalita 2004]. In an analysis of slowdown of agricultural growth in Bangladesh, Palmer-Jones (1999) posits that the trends of rice prices in relation to agricultural input prices including agricultural wages have been an important determinant of agricultural growth.

**Decapitalisation of the Rural Areas**

Reduced rate of public capital formation and virtual collapse of infrastructure (such as rural roads, power supply, major and medium irrigation systems, sugar mills, etc) has further worsened the situation. Empirical results for a period 1980-98 of an all India level study suggest that gross domestic product of agriculture (GDPA) is strongly influenced by: (a) capital formation in agriculture; and (b) terms of trade [Gulati and Bathila 2001]. Traditionally, public capital formation in agriculture in India has been mainly in form of major and medium irrigation systems, whereas in the 1970s and 1980s the focus shifted towards expanding well irrigation by providing increasing amount of electricity to agricultural sector [Dhawan 1996].

In the last two decades, public capital investment in agriculture in Bihar has concentrated mainly in increasing the density of shallow tubewells and pumpsets through credit and subsidy schemes like Free Boring Scheme, Million Shallow Tubewell Project, On-farm Water Management Project, IRDP loans, etc. However, performance in major and medium irrigation systems and rural electrification which would have given long-term cost advantage to farmers in the state has been miserable. The actual irrigated area by major and medium schemes has gone down from 2.15 million hectares in 1990 to 1.58 million hectares in 1997 [Sharma 1998]. Nearly 21,000 villages are yet to be electrified in the state, while by Bihar State Electricity Board’s own admission, 18,000 of the electrified 47,000 villages have become de-electrified due to various reasons.¹ The per capita annual power consumption is as low as 22 kWh in north Bihar and 87 kWh in south Bihar [Sharma 1998]. Thus, when private cost of irrigation was falling in other states of India on account of free and subsidised power supply in 1980s and 1990s, farmers in Bihar incurred increasingly high cost for irrigation. Poor infrastructure means inefficiencies and higher costs of
production, marketing, storage and processing making agriculture uncompetitive in the state.

**Absence of the New Agrarianism in Bihar**

Some researchers argue that phenomena like rapid decline in rural infrastructure, absence of procurement support and poor performance of rural credit schemes may well be the problems of demand rather than supply [Wilson 1999 and Shah, personal communication]. Kalpana Wilson argues that de-electrification and state apathy by themselves cannot explain the stalled growth of capitalism in Bihar. Faced with similar problems, farmers in other parts of the country have responded very differently. Remunerative prices, reliable power supply, free electricity and writing off of farm loans have been the rallying points of peasant movements in the capitalistically developed rural areas of the country like western UP, Punjab, Haryana, Gujarat, Maharashtra and Karnataka where peasants of varying economic status came together to extract concessions from the state [Gail Omvedt quoted in Harriss 1992]. This marked a clear shift from the historical pattern of peasant movements which had almost always targeted at intra-rural class relationships [Hariss 1992]. But there has been complete absence of any such movements in Bihar which shows a lack of demand for such services even if the need is not lacking. Wilson (1999) argues that this is mainly because the peasant capitalist development which started in parts of Bihar under favourable conditions of 1970s and 1980s could not be supported by the underlying agrarian structure and the nature of the state.

**VI Towards Breaking Agrarian Impasse**

**Input Intensification for Improving Efficiency and Income: A Possible Option for Farmers**

With all these structural and macroeconomic constraints facing agriculture in Bihar, what are the options available for an individual farmer to expand his production and profit margins? To understand this, an analysis of best practices in agriculture was carried out in one of our study villages, in which the agricultural practices and crop-economics of a small group of farmers who achieved the highest productivity levels were studied and compared with that of the modal group of farmers. The comparison revealed two important points. First, the yield obtained by most of the farmers was just enough to cover their input costs and there was hardly any surplus left even for consumption, let alone capital formation. This resulted in continued poverty and stagnation of agrarian economy. Also, with just 28 per cent increase in cost of cultivation, the productivity increased by 85 per cent and the net returns increased by more than 250 per cent. This means that most of the farmers in Bihar are practising what Tushaar Shah calls ‘cost-covering agriculture’ and from this point if the crop yields are raised even by 20-25 per cent, the net incomes of farm households would increase by 60-70 per cent making a significant dent in rural poverty in the state. Second, farmers who made more intensive use of inputs and incurred higher costs towards cultivation were more efficient and competitive producers with much lower per quintal cost of cultivation. This shows that input intensification to increase yields is one possible way of reducing per quintal cost of production and increasing profit margins. IWMI research in north China shows that it is through relentless intensification and raising crop yields that Chinese farmers have retained the viability of their farming in the face of declining global foodgrain prices and rising input costs and local taxes [Shah, Giordano and Wang 2004].

This strategy, however, will catch on only if production and price risks are low and farmers have access to suitable crop varieties which respond adequately to input intensification. Paddy crop faces risk from flood in large parts of north Bihar. Lack of suitable varieties for poorly drained lands called ‘chaunrs’ which form a significant proportion of the total cultivable land in the region is also a big stumbling block. This is the reason why south Bihar where problems of flood and drainage are not very serious (except in Mokama Tal) level of input use in paddy and its yields are much higher when compared to flood-prone north Bihar.

In case of wheat, the main rabi crop in Bihar, almost all our respondents complained that the crop was not very responsive to input intensification and seed up-gradation. Agronomists agree to this point. The problem lies in the late sowing of wheat in Bihar which forces early maturity, resulting in lower yields. Field experiments carried out by the ICAR scientists in Directorate of Water Management Research, Patna have shown that one month delay in wheat sowing from its recommended time of November 19-25, results in about 53 per cent reduction in yield [Singh et al 2002]. Such delay is common in Bihar and in fact in many areas the sowing goes on till as late as second week of January. The delay is caused by late sowing (and hence late harvest) of paddy crop. At present farmers wait for monsoon rains to sow paddy and transplantation is carried out generally in the third week of July. ICAR studies show that advancing sowing of rice by a month will help to realise higher yields of both rice and wheat. However, this requires irrigation for the crop in pre-monsoon period. Therefore, increasing groundwater use is still the key to agrarian development in Bihar [Singh et al 2001]. Prohibitive high cost of irrigation is the biggest hurdle in large-scale adoption of this proven strategy of yield enhancement in rice-paddy systems of Bihar.

**VII Policy Choices for State**

Rural electrification is one state initiative which can provide major boost to agriculture in Bihar. It can bring down the cost of irrigation and improve the working capital situation of farmers. It can also trigger growth in storage and processing infrastructure which will permit value addition and the much needed crop diversification in the state. Cheaper access to irrigation with electricity will also encourage farmers to bring larger areas under summer crops where higher yields can be obtained under more controlled conditions.

Behaviour of producer prices has been another important impediment to agricultural growth in Bihar. The high level Committee Report on Food Policy notes that the producer prices were higher in this region than Punjab-Haryana in the early 1980s but became lower in the early 1990s as surpluses appeared (http://camin.nic.in/hlc_contents.htm). The combined pressure from subsidised sales by Food Corporation of India (FCI) under its Open Market Sales Scheme (OMSS) and local seasonal gluts results in producers getting prices well below the actual economic
cost of production in Bihar. Poor infrastructure and under-developed primary agricultural marketing network further worsened the problem of farmers by increasing the cost of marketing and price fluctuations. Unless this is addressed by extending procurement operations more effectively in the state, there will be insufficient incentive for the sustained yield increase.

Address for correspondence
a.kishore@cgiar.org

Notes

1 Very few people would know that transplanted, wet rice was first developed and used in the world in the amply watered fields below the Raigir Hills in Patna district during the sixth century BC [Hagen 2000].

2 Data for two of these nine villages (Machchhia and Faripani) have been obtained from Ballabh et al (2003).

3 http://www.bihar.nic.in/Depts/Energy/rural_electrification.htm

4 The word New Agrarianism was used first by L I Rudolph and S H Rudolph in their famous book: *In the Pursuit of Lakshmi: The Political Economy of the Indian State* first published in 1987 by Chicago University Press.

5 Among all states in India, Bihar has the highest share of its gross cultivated area under cereals (~ 90 per cent) and it has increased in last 10 years.

References


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