

Notwithstanding the huge potential in terms of fertile soils, groundwater reserves, and rich peasant tradition, eastern India is characterized by low agricultural productivity, backwardness, and poverty.

Groundwater development can transform the stagnant east Indian agricultural economy into a vibrant one, with positive productivity and equity impacts. However, due to a multitude of policy differences coupled with varying agrarian structures, the beneficial impact of groundwater has not been realized equally across the region.

A few policy level changes can go a long way in unleashing an unprecedented boom in the emerging groundwater based agrarian economy in eastern India.

IWMI-Tata

Comment

Groundwater Development and Agrarian Change in Eastern India

Aditi Mukherji

Based on Research by
Vishwa Ballabh
Kameshwar Choudhary
Sushil Pandey
Sudhakar Mishra

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Groundwater Development and Agrarian Change in Eastern India¹

RESEARCH HIGHLIGHT BASED ON A PAPER TITLED:

“GROUNDWATER DEVELOPMENT AND AGRICULTURE PRODUCTION: A COMPARATIVE STUDY OF EASTERN UTTAR PRADESH, BIHAR AND WEST BENGAL”

THE “EASTERN INDIA” PARADOX

The 'Eastern India' syndrome characterized by low agricultural productivity and backwardness has been at the heart of raging debates on agrarian structure and rural poverty in India. Three broad types of explanation of the 'eastern India' problem have been given. These are related to characteristics of agro ecology, agrarian structure, and public policy in the region, which have been euphemistically referred to by some as problems of “floods, fuedals and fabians” (Palmer Jones 1999:125)². Notwithstanding the huge potential in terms of fertile soils, groundwater reserves, and rich peasant tradition, many scholars have doomed agricultural destiny of the region as one having reached an “impasse” (Boyce 1987)³.

But a turn around did happen, courtesy rapid groundwater exploitation through shallow tubewell technology. Agricultural growth rates in much of eastern India in the 1990s were much higher than all-India growth rates (Saha and Swaminathan 1994)⁴. However, while eastern

Uttar Pradesh and to a large extent West Bengal started realizing fruits of groundwater-led agrarian transformation in the late 1980s to the early 1990s, the state of Bihar was still grappling with problems of huge gap between actual and potential yields of major foodgrains and vast fallow land even during the *rabi* season.

Groundwater irrigation has the potential of unleashing unprecedented agrarian boom in eastern India. However, due to a multitude of policy differences coupled with varying agrarian structures, the beneficial impact of groundwater has not been realized equally everywhere.

Spatial variation in the impact of groundwater irrigation on agricultural dynamism in the region has been attributed to public policies as well as private initiatives at work, whether they be pump subsidies made simpler through “dealer dynamics” in Uttar Pradesh (Shah 2001)⁵ or sweeping land reforms in West Bengal (Bose⁶1999; Gazdar and

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²Palmer Jones, Richard (1999). 'Slowdown in Agricultural Growth in Bangladesh', in Rogaly, Ben, Barbara Harriss-White and Sugata Bose (eds) *Sonar Bangla? Agricultural Growth and Agrarian Change in West Bengal and Bangladesh*. Sage Publications. New Delhi.

³Boyce, James K (1987). 'Agrarian Impasse in Bengal: Agricultural Growth in Bangladesh and West Bengal 1949-1980'. Oxford University Press New York.

⁴Saha, Anamitra and Madhura Swaminathan (1994). 'Agricultural Growth in West Bengal in the 1980s: A Disaggregation by Districts and Crops'. *Economic and Political Weekly*, 29(13): A2-A11.

⁵Shah, Tushaar (2001). 'Wells and Welfare in the Ganga Basin: Public Policy and Private Initiative in Eastern Uttar Pradesh, India'. IWMI Research Report 54. Colombo, Sri Lanka: International Water Management Institute

⁶Bose, Sugata (1999). 'Agricultural growth and agrarian structure in Bengal: A historical overview', in Rogaly, Ben, Barbara Harriss-White and Sugata Bose (eds) *Sonar Bangla? Agricultural Growth and Agrarian Change in West Bengal and Bangladesh*. Sage Publications. New Delhi.

Sen Gupta⁷ 1999). Similarly important (though widely contested) has been the role of groundwater markets as a vehicle of access to groundwater for the rural poor.

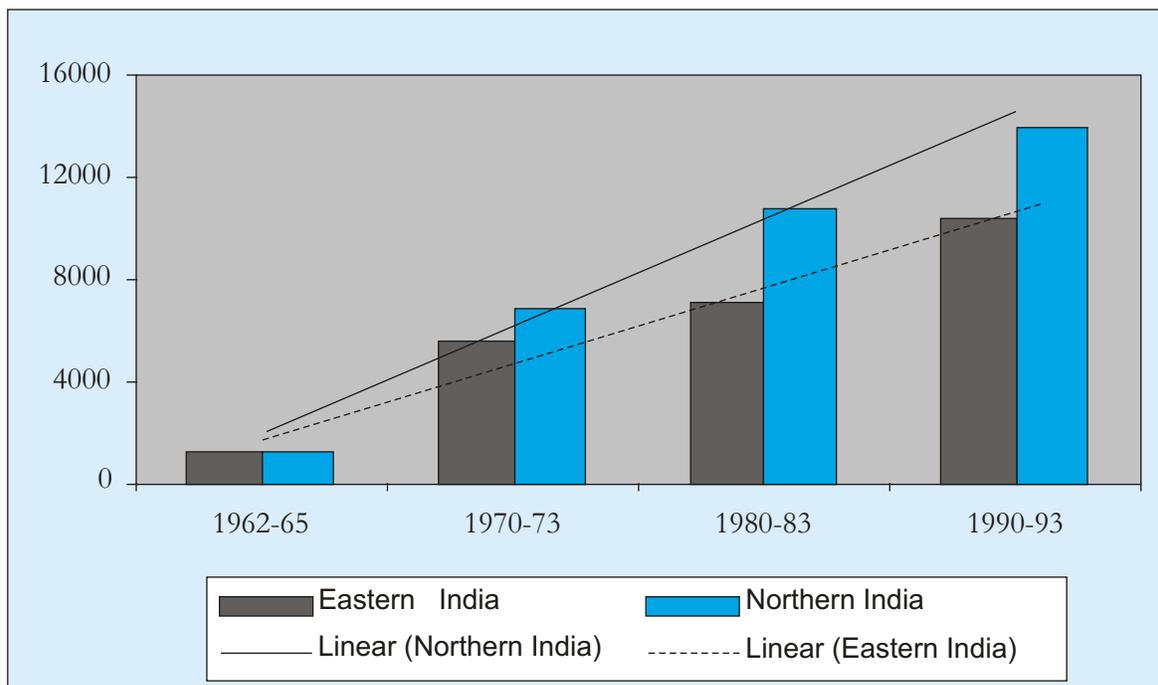
A new study supported by the IWMI-Tata Water Policy Program⁸ builds on a huge wealth of studies on agricultural situation in eastern India but, unlike many others, it examines the issue through the lens of groundwater development in the region. The authors, drawing evidence from past research and their own surveys forcefully put forward the thesis that groundwater irrigation has the potential of unleashing unprecedented agrarian boom in this region. However, due to a multitude of policy differences coupled with varying agrarian structures in the three states⁹, the beneficial impact of groundwater has not been els

equally realized everywhere. As a result, even within eastern India there are wide variations in levels of agricultural development, surplus generated, and potential for reinvesting that surplus to bring about capital induced productivity growth.

GROUNDWATER DEVELOPMENT AND AGRICULTURAL GROWTH IN EASTERN INDIA

In the early 1960s, states of eastern India had almost the same levels of agricultural productivity as the north Indian states of Punjab and Haryana. In the late 1960s came the green revolution and the whole of eastern India failed to capitalize on it. The gap between the east and the north increased (Figure 1).

Figure 1: Agricultural Productivity (Rs/ha) in Eastern and Northern India, 1962-65 to 1990-93



⁷ Gazdar Haris and Sunil Sen Gupta (1999). 'Agricultural growth and recent trends in rural West Bengal', in Rogaly, Ben, Barbara Harriss-White and Sugata Bose (eds) Sonar Bangla? Agricultural Growth and Agrarian Change in West Bengal and Bangladesh. Sage Publications. New Delhi.

⁸ Ballabh Vishwa, K Chowdhary, Sushil Pandey and Sudhakar Mishra (2002). 'Groundwater Development and Agricultural Production: A Comparative Study of eastern Uttar Pradesh, Bihar and West Bengal'. IWMI-Tata Water Policy Research Program, Anand

⁹ Ballabh *et al.* (2002) have based their conclusions on study of 6 villages, two each from eastern Uttar Pradesh, Bihar and West Bengal respectively. In doing so, they have drawn their sample villages from two districts in each state that are widely thought to be agriculturally dynamic and agriculturally stagnating.

Lack of development of groundwater has been thought to be the most important reason for stagnating agriculture in eastern India. Dhawan (1982)¹⁰ reiterated that pump revolution had preceded the green revolution in much of northwestern India. While the 1970s were characterized by low to medium productivity and very low pump capital, the 1990s saw a rapid expansion in pump density in eastern India followed by higher agricultural productivities (Figure 2).

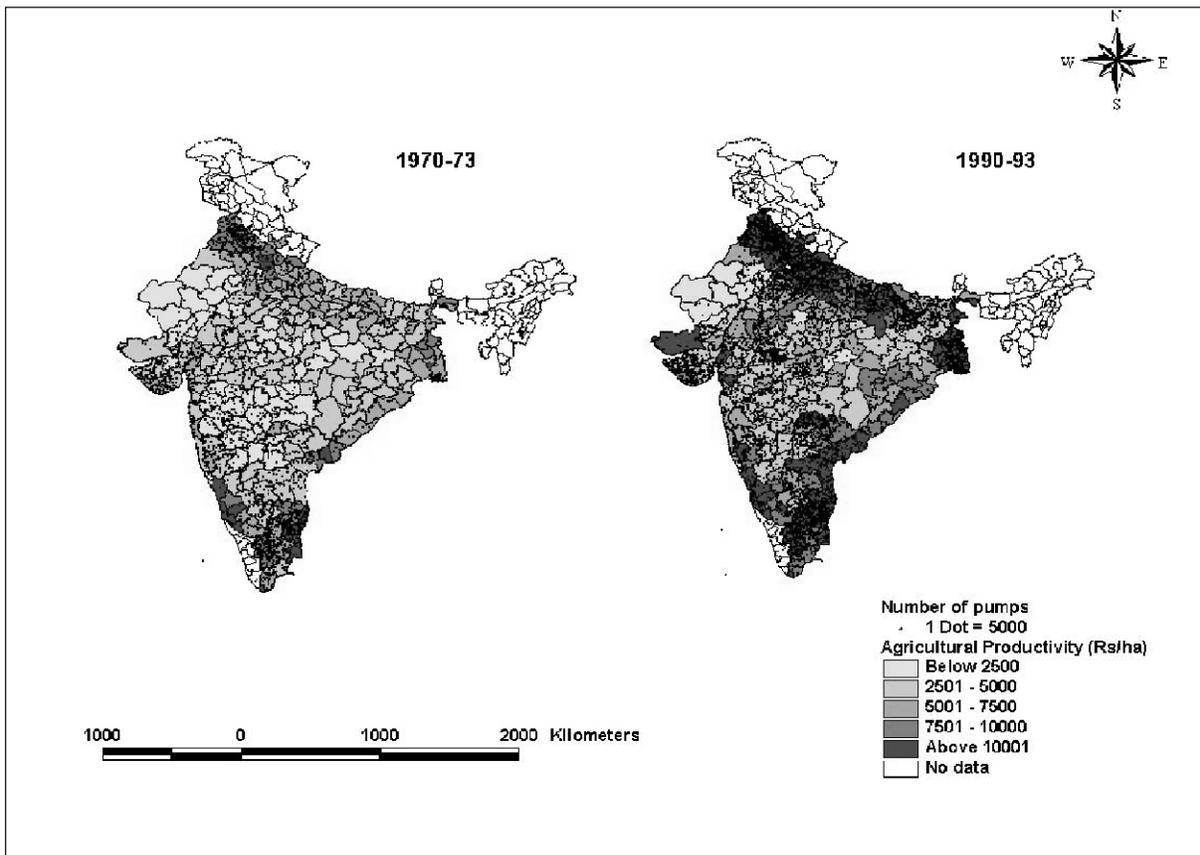
Ballabh *et al.* (2002) have attempted to study the differences in agricultural performance in three eastern Indian states and have in the process correlated it with groundwater development. They noted wide variation even within eastern states, with West Bengal and eastern Uttar Pradesh having performed better than Bihar in terms of total production and yields. However, agricultural growth rates accelerated in all these states after the late 1980s, which the authors attribute to rapid

expansion of groundwater irrigation. Tubewell densities went up from less than 1 tubewell per 1000 ha to as high as 130 tubewells per 1000 ha in West Bengal. West Bengal also recorded the highest rice yields in the region during 1999-2000. Primary level data collected by the authors from six carefully chosen villages in eastern India confirms the general trend of rapid expansion in groundwater irrigated area in the last few years or so. But, there exists wide variation in each village with respect to pump capital. I have tried to explain this in terms of the agrarian structure prevalent in the village.

AGRARIAN STRUCTURE AND PUMP CAPITAL: TOWARDS RURAL TRANSFORMATION

Though the present paper (Ballabh *et al.*, 2002) on which we anchor this Research Comment does not directly shed any new understanding on the

Figure 2: Agricultural Productivity and Distribution of Pump Capital, 1970-73 and 1990-93



¹⁰Dhawan, B.D. (1982). 'Development of Tubewell Irrigation in India'. Agricole Publishing Academy, New Delhi.

role of the agrarian structure in encouraging or impeding groundwater development, there is a wealth of past research that deals precisely with this issue in the context of eastern India and Bangladesh. Shah (1997)¹¹ presents a simplified, stage wise, linear model of agrarian transformation in eastern India, much along the contours suggested by Rostow. He proposes that under “initial” conditions of low groundwater development, the share of land in agricultural value added is very high, thereby precluding the poor and landless farmers from benefiting substantially from agriculture.

Initial agrarian structure can indeed be important in determining if groundwater irrigation will spread rampantly and if it will face numerous constraints. However, it does not imply that pattern of agrarian structure in a region is etched in stone and therefore indelible. But it does suggest that different agrarian structures will not necessarily follow the same growth trajectory in terms of emergence of groundwater led irrigated economy.

The next phase is characterized by accumulation of machine capital (particularly pump sets) by rural elite. Water markets or lease market for other assets (except land) does not develop fully at this stage, because large farmers use all the water that their machines pump for self-cultivation. ents such

However, in the later stages, even the small and medium farmers start investing in machine capital in general and pump capital in particular. Now water markets develop because they cannot use all water on their own small fields. Close on the heel follows rental markets for other agricultural equipments such as tractors and threshers. Consequently, the share of land in agricultural value added goes down, while that of machine capital and labour goes up and the rural economy stands transformed. Similar evidences are also obtained from Bangladesh (Crow 1999)¹². While this model more or less draws the broad contours of agrarian transformation in eastern India fuelled by pump capital, it is too simplistic¹³ in that it does not explicitly include agrarian relations as a constraining variable. Bhaduri's (1973)¹⁴ widely contested thesis that rent seeking landlords have little or no incentive in encouraging tenants to make technological innovations certainly assumes importance in eastern India¹⁵. Crow (1999)¹⁶ documents how agricultural development has been very uneven in developed northwest Bangladesh and backward southeastern parts, which he attributes chiefly to agricultural history and agrarian relation. However, equally powerful are the arguments suggested against this and theoretical and empirical evidences are succinctly put forward by Ghose and Saith (1976)¹⁷, Griffin (1974)¹⁸ and Bardhan and Rudra (1978)¹⁹. Recent empirical evidence from Bangladesh (Hossain et al., cited by Sahabuddin 1999)²⁰ indicate that tenancy status has no direct link with the adoption

¹¹ Shah, Tushaar (1997). 'Pump Irrigation and Equity: Machine Reform and Agrarian Transformation in Water abundant Eastern India'. Policy School Working Paper # 6. The Policy School Project, Anand, India

¹² Crow, Ben (1999). 'Why is Agricultural Growth Uneven? Class and Agrarian Structure in Bangladesh', in Rogaly, Ben, Barbara Harriss-White and Sugata Bose (eds) *Sonar Bangla? Agricultural Growth and Agrarian Change in West Bengal and Bangladesh*. Sage Publications, New Delhi.

¹³ I do not mean to criticize a model simply because it is “simplistic”; on the contrary I think that it is a laudable achievement indeed if a simple model can capture complex reality.

¹⁴ Bhaduri, Amit (1973). 'A study in Agricultural Backwardness under Semi-feudalism'. *Economic Journal*, Vol. 83:431-552

¹⁵ Amit Bhaduri in fact has based his conclusions on conditions prevalent in eastern India in particular during the 1960s and 1970s.

¹⁶ Same as footnote 12

¹⁷ Ghosh A K and A Saith (1976). 'Indebtedness, Tenancy and the Adoption of New Technology in Semi-feudal Agriculture'. *World Development*, Vol. 4: 305-319

¹⁸ Griffin K (1974). 'The Political Economy of Agrarian Change'. Harvard University Press, Cambridge, USA

¹⁹ Bardhan, Pranab and Ashok Rudra (1978). 'Interlinkage of Land, Labour and Credit Relations: An analysis of Village Survey Data in East India'. *Economic and Political Weekly*, Vol 15:1477-1484.

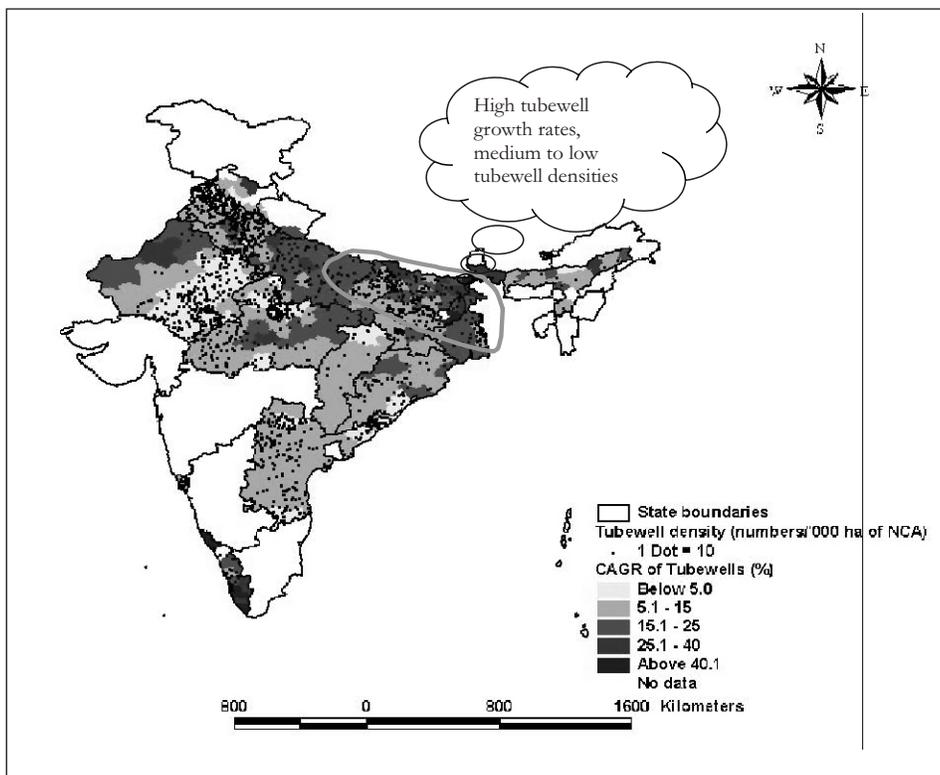
²⁰ Shahabuddin, Quazi (1999). 'Agricultural Performance in Bangladesh: A note on Recent Slowdown', in Rogaly, Ben, Barbara Harriss-White and Sugata Bose (eds) *Sonar Bangla? Agricultural Growth and Agrarian Change in West Bengal and Bangladesh*. Sage Publications, New Delhi.

of modern varieties. Whatever the drift of the argument, the point that I make here is initial agrarian structure can indeed be important in determining if groundwater irrigation will spread rampantly and if it will face numerous constraints. This seems to be the case in two study villages chosen by Ballabh *et al.* (2002) In Hathberia village in West Bengal, groundwater extraction has been monopolized by few landowners who charge large monopoly rent for selling water. This is probably because almost 50 percent of the village population does not own any land and another 41 percent are marginal farmers. These landless and marginal farmers cannot generate enough surplus to purchase pumps. On the other hand, farmers in Fariyani village in Bihar seem to have overcome problems of capital accumulation and this small village of 100 ha boasts of almost 80 tubewells. The reason perhaps is the presence of a large number of medium and small farmers, who having invested in tubewells find it profitable to sell water at a reasonable price given stiff competition from other farmers.

WATER MARKETS AND EQUITY IMPLICATIONS

There already exists a wealth of literature on water markets in India, though there are more such studies on western India (especially Gujarat) than for eastern India²¹. Ballabh *et al.* (2002) add to this existing body of literature by describing the dynamics of water selling in six villages that they have studied. Quite predictably, each of these villages differs from others in a number of ways such as caste composition, land distribution, cropping pattern, number of borewells and pumps, water charges, and occupation structures. However, all of them except one in West Bengal exhibit rampant water selling and buying. The area irrigated by purchased water is more than the area irrigated by own pumps in all the villages studied. Water markets seem to be less developed in villages where agriculture is not the main occupation of the majority of farmers. This is borne out clearly by a Hathberia village very near Calcutta, where owing to its proximity to a large

Figure 3: Growth Rate of Tubewells (CAGR %) and Tubewell Density, 1986-87 to 1993-94



²¹ Perhaps this shows that water markets are more important in western India, but again it might also reflect the fact that water markets have developed relatively recently in much of eastern India and scholars always take some time to catch up upon recent phenomenon. In the last 10 years or so, lot of work has been done of water markets in this region, at least in eastern Uttar Pradesh and to a large extent in Bangladesh.

metropolitan city, most people prefer non-agricultural livelihoods (service and others) over farming. In this village, there are only two tubewells catering to over 75 farmers and consequently charging high monopoly rent. Water prices vary across the villages, ranging from Rs. 20 per hour for electric tubewell to as high as Rs. 60 per hour for a diesel one. Though they do not clearly bring out the buyer-seller dynamic in their study, but they do observe that water prices are affected by kith and kin relationships, thereby indicating that markets have not developed to a competitive level as has in many parts of Gujarat. Similarly, the mode of payment varies from hourly basis to fixed payment per acre to share arrangements, though the later form is becoming scarce by the day. Water markets seem to have developed more in agriculturally vibrant districts such as Maharajganj in eastern Uttar Pradesh and Bardhaman in West Bengal. This study clearly brings out the fact that water markets have made it possible for those who do not own pumps to practice irrigated agriculture through purchased water.

In a water abundant region such as eastern India, groundwater markets can transform a stagnant agricultural economy into a vibrant one, with positive productivity and equity impacts.

Debating the desirability of water markets, researchers have time and again revisited the mer

question of equity implications of water markets. Janakarajan (1994)²² and Adnan (1999)²³ working on two entirely different geo-hydrological regimes of Deccan plateau and Bangladesh plains respectively, have contended that groundwater markets are a vehicle for “few farmers [to] emerge with power to exercise control over this precious resource and extract surplus” (Janakarajan, 1994:45)²⁴. But a host of other scholars (Shah 1993²⁵, Shah and Raju 1988²⁶, Dubash 2002²⁷, Fujita and Hossain 1995²⁸, Palmer Jones 2001)²⁹ forcefully argue that water markets have been very crucial in alleviating rural poverty. Palmer Jones goes on to say that water markets “... are far more important institutions for human welfare than the 'community irrigation', 'community forestry', or even ...the group savings and credit examples...” (Palmer Jones 2001:3)³⁰. Equity implications are not always clear, but, what is more important: poverty alleviation or equity? All in all, I believe that there is enough empirical evidence to show that in a water abundant region such as eastern India, groundwater markets can transform a stagnant agricultural economy into a vibrant one, with positive productivity and equity impacts.

There is a further scope for proliferation of water markets at least for a decade to come as eastern India still has low tubewell density compared to other parts of India. However, growth rates registered by tubewells in this region are one of the highest in the country (Figure 3).

²² Janakarajan S (1994). 'Trading in Groundwater: A source of Power and Accumulation', in Moench, Marcus (ed), Selling water: Conceptual and Policy Debates over Groundwater Markets in India. VIKSAT and others, Ahmedabad, India

²³ Adnan, Shapan (1999). 'Agrarian structure and Agricultural Growth Trends in Bangladesh: The political economy of technological change and Policy Interventions' in Rogaly, Ben, Barbara Harriss-White and Sugata Bose (eds) Sonar Bangla? Agricultural Growth and Agrarian Change in West Bengal and Bangladesh. Sage Publications. New Delhi.

²⁴ Same as footnote 22

²⁵ Shah, Tushaar. 1993. 'Groundwater Markets and Irrigation Development: Political Economy and Practical Policy'. Oxford University Press Bombay. India.

²⁶ Shah, Tushaar and KV Raju (1988). 'Groundwater markets and small farmer development'. Economic and Political Weekly, Vol. 19: A23-A28

²⁷ Dubash, Navroz K (2002). 'Tubewell Capitalism: Groundwater development and Agrarian Change in Gujarat'. Oxford University Press, New Delhi

²⁸ Fujita, K and F Hossain (1995). 'Role of Groundwater Market in Agricultural Development and Income Distribution: A Case Study in a Northwest Bangladesh Village'. The Developing Economies, Vol. 33(4):442-463

²⁹ Palmer Jones, Richard (2001). 'Irrigation Service Markets in Bangladesh: Private Provision of Local Public Goods and Community Regulation'. Paper presented at Symposium on Managing Common Resources: What is the solution?, held at Lund University Sweden, 10-11 September 2001, < http://www.sasnet.lu.se/palmer_jonespdf>

³⁰ Same as footnote 29

PUBLIC POLICIES AND PRIVATE INITIATIVES

What the ambitious policy of constructing public tubewells could not do, the private initiative of water markets has done, *viz.* it has led to a rapid development of groundwater which in turn propelled the green revolution in eastern India. However, this does not imply that private initiative can work in a void. The very fact that tubewells proliferated so rapidly can be partly explained in terms of generous rural credit (at least in the 1970s and 80s, if not in the 1990s) as well as numerous subsidies offered from time to time. But not all public policies have been conducive to groundwater development in eastern India. Even within the eastern states, some like Uttar Pradesh have garnered the lion's share of rural refinance provided by NABARD. Ballabh et al. (2002) delve in detail about the institutional and financial aspects of procuring pump capital. They contend that, more than government subsidies *per se*, technological innovations in the form of new and cheap boring equipment have made rapid proliferation of groundwater structures possible. For example, in nominal terms, the cost of boring a shallow tubewell has stagnated at the level of Rs 2000 since the 1960s, which means that the real

Cheap Boring Equipments have Accelerated Groundwater Development in Eastern India



Expensive Diesel Operated Pumps Limit Farmer's Ability to Increased Irrigated Area



cost of boring has gone down several times. Credit and government subsidy played very limited role in sample villages in West Bengal and Bihar, where 100 percent and 80 percent of respondents reported self-finance as the source of finance. According to figures quoted by the authors, NABARD's refinance for Uttar Pradesh was five times and seven times that of West Bengal and Bihar respectively. This has hindered groundwater development, especially in Bihar. Another example of well intentioned policy having gone all awry is that of pump subsidies. All eastern Indian states have pump subsidy schemes, but except for Uttar Pradesh which had modified and simplified it considerably, none of the other states seem to be doing well. In Uttar Pradesh, in the early to middle 1980s, pump subsidy (through free boring scheme) was simplified and pump dealers were involved in such a way that it created what Shah (2001)³¹ calls "positive dealer dynamic". This created a "win-win" situation whereby a farmer got his pump and bore within 10 days of application, the dealer got his profit,

³¹ Same as footnote 5

and the banker was assured of his loan recovery through the dealer. However, in West Bengal and Orissa, the same scheme failed to produce comparable results, either due to long procedural delay and political clout as in West Bengal or due to “negative subsidies” as in Orissa. Ballabh *et al.* (2002) note that Muzzaffarpur in Bihar and Bardhaman in West Bengal have very few pump distributors and dealers compared to Maharajganj in Uttar Pradesh. Similarly, there is also less number of intermediaries in Uttar Pradesh compared to Bihar and West Bengal, which makes transaction costs much higher for a farmer in Bihar or West Bengal.

CONCLUSIONS AND POLICY IMPLICATIONS

The very reason that private initiatives have failed to catch up in these regions indicates a greater need for “right” public policies. Perhaps, some policy level changes could go a long way in unleashing an unprecedented boom in the emerging groundwater-based agrarian economy of eastern India.

Discussions so far based on recent research done by Ballabh *et al.* (2002) and others make us acutely aware of the complexities involved in analyzing the “eastern Indian” situation within any one given framework, be it the constraining feudal agrarian relations or liberating technological innovations such as shallow tubewell technology. All said and done, no one can deny that a turn-about in agricultural productivity did take place in this part of the world and this has been possible because of increased and intensive groundwater irrigation. However, regional disparity stares wide and stark at our face. The regions within eastern India that have lagged behind the “pump” race need to be taken care of through thoughtful public policies or private initiatives. The very reason that private initiatives have failed to catch up in these regions perhaps indicates a greater need for “right” public

Policies that can Boost Agrarian Economy of Eastern India

- Redesigning public food procurement policies so that it benefits eastern Indian farmers as much as it does their Punjab and Haryana counterparts
- Providing incentives and infrastructure for high value crops so as to make groundwater irrigated agriculture more profitable and viable
- Allowing free import of pumpsets and redesigning pump subsidies
- Using poverty reduction funds to provide good quality power supply to farmers at subsidized rates
- Improving institutional lending for agriculture

policies which could go a long way in unleashing an unprecedented boom in emerging groundwater-based agrarian economy of eastern India.

- High productivity, coupled with good market prices for crops, sustains a groundwater irrigated agrarian economy. Evidence from Bangladesh (Palmer Jones 1999)³² suggests that fall in *boro* paddy prices in the early 1990s was directly related to fall in the number of shallow tubewells installed, which in turn led to overall decline in agricultural growth rates, leading Adnan (1999)³³ to decry Bangladesh's agricultural liberalization policies. In most of eastern India, groundwater is used to grow *rabi* crop of either wheat (in eastern Uttar Pradesh and Bihar) or paddy (in West Bengal). Both are food crops and come within the food procurement basket of the Government of India which announces a yearly minimum support price (MSP) for both. But, as it is widely known, the public procurement system is very lax in all eastern states. In much of eastern India, farmers are still forced to sell off

³² Same as footnote 2

³³ Same as footnote 23

Farmers In Eastern India are Forced to Sell their Produce in Distress Right after Harvest at Very Low Prices



their produce in distress right after harvest when the going prices are low. This seems especially inequitable when seen from the perspective of water productivity. Wheat production in Bihar is highly water efficient as compared to groundwater scarce Punjab and Haryana. Given the overall concern about long term sustainability of groundwater irrigated agriculture, it makes a lot of sense to encourage irrigated production in areas where water productivity is higher as in eastern India. However, the public procurement policy is not only perverse, but positively discriminates against the eastern states. The options for rectifying this are two. Either, the whole public procurement policy should be dismantled which would lead to market forces determining food prices. If this is too radical a measure, at least procurement policies could be geared in such a way that the eastern states benefit

substantially from them as do the farmers of Punjab and Haryana.

- In a recent article published in the Economic and Political Weekly, a host of Bengali scholars have deliberated upon future of West Bengal, which by extension can be applied to other eastern states as well (Banerjee et al. 2002)³⁴. Their argument that much of West Bengal needs to move away from *boro* cultivation, which is becoming unprofitable due to depressed prices, is worth considering. Not only West Bengal, but even Bihar and eastern Uttar Pradesh must contemplate providing incentives to farmers to cultivate high value crops on the one hand and invest in necessary infrastructure on the other hand to make this transition from food crops to high value crops possible.
- Widely perverse pump subsidies and restriction on free imports have artificially raised pump

³⁴ Banerjee, A, P Bardhan, K Basu, M Datta Chaudhuri, M Ghatak, A S Guha, M Majumdar, D Mookherjee and D Ray (2002). 'Strategy for economic reforms in West Bengal'. Economic and Political Weekly, Vol. 37(41):4203-4218

prices by 30-40%. If these two were to be eliminated, pump density in eastern India will go up rapidly (Shah, 2001)³⁵. Again, if these seem too radical a measure, there is always the possibility of redesigning pump subsidies (as done by Uttar Pradesh) so as to make the market more competitive and more of a buyers market.

- Much of eastern India has been progressively de-electrified, thanks to the huge losses incurred by the state electricity boards (SEBs)³⁶. As a result, more and more farmers rely on expensive diesel operated pumps, which seriously limits their ability to increase area under irrigation. Groundwater irrigation has positive externality in many parts of eastern

India where water-logging is common. Therefore, improving electricity supply will go a long way in boosting groundwater economy in this region. It can be possibly well argued that spending a large chunk of poverty reduction funds³⁷ towards providing “good” quality subsidized electricity in eastern India will have a much larger impact than many other conventional poverty reduction programmes.

- Finally, boosting institutional lending for agriculture in eastern states (especially, West Bengal and Bihar) will positively affect pump capital in this region. Again, emphasis must be on easy credit availability and an effective mechanism to ensure timely repayment of loans.



³⁵ Same as footnote 5

³⁶ For more details, see, Shah, Tushaar, Christopher Scott, Avinash Kishore, Abhishek Sharma. (2002). 'Energy-Irrigation Nexus in South Asia: Approaches to Agrarian Prosperity with Viable Power Industry'. (unpublished), Presented at IWMI-ICAR conference titled: Forward-Thinking Policies for Groundwater Management: Energy, Water Resources, and Economic Approaches, 2-6 September, New

³⁷ eastern India is home to nearly one third of India's poor people.

HEADQUARTERS

127 Sunil Mawatha, Pelawatte, Battaramulla, Sri Lanka
Mailing Address : P. O. Box 2075, Colombo, Sri Lanka
Telephone : +94 1 787404,784080 ; Fax : +94 1 786854
E mail : iwmi@cgiar.org

REGIONAL OFFICE FOR ASIA

(Bangladesh, China, Nepal and Sri Lanka)
127 Sunil Mawatha, Pelawatte, Battaramulla, Sri Lanka
Mailing Address : P. O. Box 2075, Colombo, Sri Lanka
Telephone : +94 1 787404,784080,1 ; Fax : +94 1 786854
E mail : iwmi-asia@cgiar.org

CHINA

Center for Chinese Agricultural Policy,
Chinese Academy of Sciences
Building 917, Datun Road, Anwai, Beijing, 100 101, China
Telephone : +86 -10 64889440,64856535,64856837
Fax : +86 -10 64856533
E mail : j.wang@cgiar.org

NEPAL

GPO 8975 EPC 416, Kathmandu, Nepal
Telephone : +977-1 535382 (Ext. 486)
Mobile Tel : 9810 - 22573 ; Fax : +977-1 523996
E Mail : d.pant@cgiar.org

REGIONAL OFFICE FOR AFRICA

141, Cresswell Street, 0184 Silverton, Pretoria, South Africa
Mailing Address: Private Bag X813, Silverton 0127, South Africa
Telephone : +27-12 - 845 9100 ; Fax : +27-12 - 845 -9110
E Mail : iwmi-africa@cgiar.org

KENYA

C/o. ICRAF, United Nations Avenue, P. O. Box 30677, Nairobi, Kenya
Telephone : +254 - 2 - 524751,524000 ; Fax : + 254 -2 - 524001
E Mail : f.gichuki@cgiar.org

GHANA

IWMI Ghana, CSIR campus, Odei Block,
Airport Res. Area, Accra
IWMI Ghana, PMB CT 112, Cantoments, Accra, Ghana
Telephone : +233-(0) 21-784752/53/54 ; Fax : +233-(0) 21-784752
E mail : iwmi-ghana@cgiar.org

REGIONAL OFFICE FOR INDIA

C/o. ICRISAT, Patancheru, AP 502 324, India
Telephone : +91-40 -329-6161 ; Fax : +91-40 - 324-1239
E mail : iwmi-india@cgiar.org

REGIONAL OFFICE FOR PAKISTAN, CENTRAL ASIA AND MIDDLE EAST

12KM Multan Road, Chowk Thokar Niaz Baig,
Lahore 53700, Pakistan
Telephone : +92 - 42 - 5410050-53(4 lines) ; Fax : +92-42-5410054
E mail : iwmi-pak@cgiar.org

UZBEKISTAN

Apartment NO.103, Home No.6, Murtazaeva Street,
Tashkent 700000, Uzbekistan
Telephone : +998 - 71-1370445 ; Fax : +998 -71-1370317
E mail : v.hornikova@cgiar.org

REGIONAL OFFICE FOR SOUTHEAST ASIA

(Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam)
P. O. Box 1025, Kasetsart University Jatujak,
Bangkok 10903, Thailand
Telephone : +66 2 561- 4433 ; Fax : +66 2 561-1230
E mail : iwmi-sea@cgiar.org

IWMI-Tata Water Policy Program

The IWMI-Tata Water Policy Program was launched in 2000 with the support of Sir Ratan Tata Trust, Mumbai. The program presents new perspectives and practical solutions derived from the wealth of research done in India on water resource management. Its objective is to help policy makers at the central, state and local levels address their water challenges – in areas such as sustainable groundwater management, water scarcity, and rural poverty – by translating research findings into practical policy recommendations.

Through this program, IWMI collaborates with a range of partners across India to identify, analyse and document relevant water-management approaches and current practices. These practices are assessed and synthesised for maximum policy impact in the series on Water Policy Research Highlights and IWMI-Tata Comments.

The policy program's website promotes the exchange of knowledge on water-resources management, within the research community and between researchers and policy makers in India.

IWMI-Tata WATER POLICY PROGRAM

Elecon, Anand-Sojitra Road
Vallabh Vidyanagar, 388120, Gujarat, India
Telephone: 91-2692-229311-12-13
Fax : 91-2692-229310
E-mail: iwmi-tata@cgiar.org
Website: <http://www.iwmi.org/iwmi-tata>



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