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Why were So Many Social Scientists Wrong about the Green Revolution? Learning from Bangladesh

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ABSTRACT *Most social scientists once took a negative view of the socio-economic consequences of the Green Revolution. Events have since proved them wrong. Using Bangladesh as an example, we offer three reasons why social scientists were mistaken. One is the focus on village studies at the expense of nationally representative surveys. Another is insufficient appreciation of the technical limits of the new rice technology. The third is a misleading model of agrarian change. The inability of village studies to validate generalisations, the reluctance to abandon the historical model of de-peasantisation, and opposing beliefs about how to evaluate socio-economic consequences created a Rashomon Effect that made the controversy hard to resolve.*

Convictions are greater enemies of truth than lies. (Nietzsche)

Debate over the Green Revolution – the spread of high-yielding varieties of rice and wheat – once dominated writing on rural development. At the centre of this debate were the economic and social consequences of new varieties of rice in south Asia. Initial optimism about 'miracle seeds' was short-lived (Brown, 1970). For the next 20 years, most social science writing about the consequences of the Green Revolution was critical (Farmer, 1977; Griffin, 1979; Pearse, 1980). Defenders of the Green Revolution came chiefly from the International Rice Research Institute (IRRI) that developed the new varieties (IRRI, 1975).[1] Only in the late 1980s did some critics have second thoughts. Return visits showed that earlier fears were largely unjustified (Hazell and Ramaswamy, 1991). With the recantation by a prominent critic (Lipton with Longhurst, 1989), mainstream social science finally took a positive view of the Green Revolution.

Summarised, the critics' arguments went as follows.[2] True, there was nothing in the new seeds themselves that favoured big farmers. But to produce higher yields, they needed expensive inputs like fertiliser and irrigation. Big farmers could afford these inputs, but small farmers needed credit. Attempts to provide small farmers with credit through cooperative societies failed, however, because these were captured by big farmers. Hence, small farmers were denied access to the new rice technology. Sharecroppers, who shared half the yield with their landlord yet paid the full cost of inputs, had even less incentive to adopt the new seeds. As a result, the main users of the new technology were big farmers. To maximise profits from the new rice technology, big farmers evicted their sharecroppers and started to farm for themselves with hired labour.

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Sharecroppers became full time labourers. The new rice technology required more labour than before. To reduce labour costs, big farmers invested in machinery but this also reduced employment among the poor. Finally, big farmers expanded their farms at the expense of smaller farmers, who gradually became landless. Thus, the rich got richer and the poor got poorer. Given an unequal distribution of land and income, how could it be otherwise? Expecting the Green Revolution to benefit small farmers and the landless was like expecting water to run uphill.

In Bangladesh most of these predictions have turned out to be false. By 2000, new varieties covered 64 per cent of the area planted to rice. Yet small farmers had adopted the new rice varieties and even planted them on a greater share of their land. Sharecroppers had adopted as readily as owner-operators. Far from evicting their tenants, big farmers had increased the area they rented to them. Mechanised land preparation was now widespread, which reduced employment, but power tillers were also used by small farmers. Likewise, there had been no increase in big farms. Over time, both the number and average size of big farms had shrunk. True, both land and income were distributed more unequally than before. But there was no increase in poverty. Indeed, the share of people living in poverty had fallen. Water was running uphill.[3]

The aim of this article is not to explain why these predictions were wrong, but to explain why social scientists made them.[4] Although we discuss research results, the primary focus is on research questions and the research process. Others have addressed these topics, but in general terms (Chambers, 1984; Farmer, 1986). The current furore over transgenic crops has sparked interest in the lessons of the Green Revolution (Ruttan, 2004). What can we learn from past experience that is still relevant today?

Specifically, we ask three questions:

1. What methods did social scientists use and how appropriate were these methods?
2. How well did social scientists understand the new technology itself?
3. What were the models that social scientists used and why?

Bangladesh has several merits as a case study. As a modern-day Malthusia, it epitomised the challenge that the Green Revolution was designed to meet (Robinson, 1974). Bangladesh also had a high proportion of small farmers, sharecroppers, and landless households. The struggle to reconcile production and equity objectives made the debate over the Green Revolution particularly intense. This is not to claim that Bangladesh was typical. Elsewhere, the trajectory of the Green Revolution and the accompanying debate may have been different. The article offers a critique of the debate in Bangladesh, rather than of social science writing on the Green Revolution as a whole. Reference is made to the wider literature where this sheds light on the debate in Bangladesh.

The literature on the Green Revolution in Bangladesh is voluminous. Our analysis relies principally on 14 studies selected for their relevance, influence, and accessibility (Table 1). Other studies were used to provide additional evidence. The studies cover a 29-year period between 1973 and 2001. The publication of *Green Revolution* (Hossain, 1989) effectively ended the debate.

I. Mistaken Methods?

One reason why social scientists got it wrong may have lain in their choice of methods. What were these methods and how effective were they?

Table 1 shows that 10 of our 14 sample sources consisted of village studies.[5] The global literature on the Green Revolution coincided with a golden age for village studies (Figure 1). By 1988, no fewer than 127 'mainstream' village studies had been made in Bangladesh, more than half of them in the 1970s (Adnan, 1990). The approach used by village studies varied according to research objective. Studies of technology adoption compared adopters and non-adopters in

Table 1. Sample studies of the Green Revolution in Bangladesh, 1974–2007

No.	Author and year of publication	Year of fieldwork/data	Method	Rice environment	Sample size			PhD theses
					Villages	Households	Districts	
1	Asaduzzaman (1979)	1973–1974	Village study	Rainfed	2	275	Rangpur, Noakhali	Sussex (1980)
2	Wood (1978)	1974	Village study	Irrigated	1	76	Comilla	–
3	Ahmed (1981)	1974–1975	Village study	Irrigated, rainfed	3	459	Bogra, Noakhali, Sylhet	Cambridge (1979)
4	Hartmann and Boyce (1988)	1975	Village study	Irrigated	1	–	Rangpur	–
5	van Schendel (1981a)	1977–1978	Village study	Irrigated, rainfed	8	228	Rangpur, Bogra, Comilla	Amsterdam (1980)
6	Boyce (1987)	1977–1978	National statistics	Irrigated, rainfed	–	–	19 'old' districts	Oxford (1988)
7	Alam (1984)	1978–1979	Village study	Irrigated	2	69	Comilla, Rajshahi	Sussex (1982)
8	Jones (1984)	1978–1980	Village study	Irrigated, rainfed	1	125	Dhaka	Cambridge (unfinished)
9	Howes (1985a)	1979–1980	Village study	Irrigated	1	400	Tangail	–
10	Rahman (1986)	1981	Village study	Irrigated	2	239	Comilla, Mymensingh	London (1983)
11	Glaser (1989)	1985	Village study	Irrigated	8	951	Tanore	Bath (1989)
12	Hossain (1989)	1981–1983	National cross-section survey	Irrigated, rainfed	16	634	16 districts	–
13	Hossain et al. (1994)	1987–1988	National cross-section survey	Irrigated, rainfed	62	1,245	62 districts	–
14	Hossain et al. (2007)	2001	National panel survey	Irrigated, rainfed	62	1,888	62 districts	–

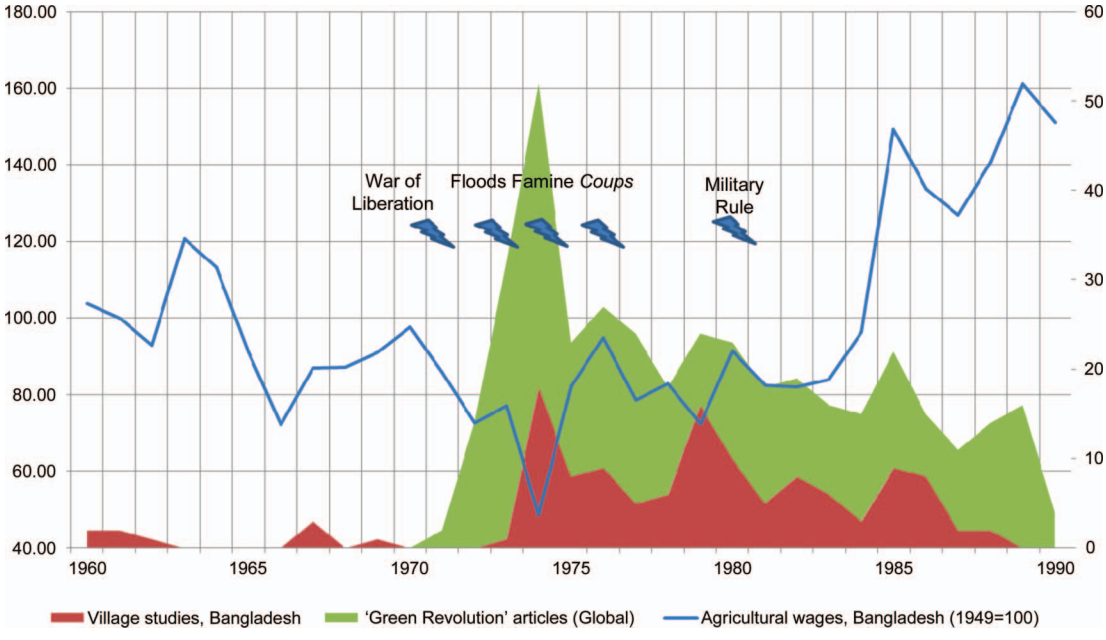

Figure 1. Village studies, the Green Revolution, and poverty in Bangladesh, 1960–1990. *Sources:* Right-hand axis: Village studies: Adnan (1990) (year of fieldwork); Global literature on Green Revolution: Commonwealth Agricultural Bureau International database, journal articles with 'Green Revolution' in title (year of publication). Left-hand axis: real wages for agricultural labourers: Palmer-Jones (1993).

one or two villages (Asaduzzaman, 1979; Alam, 1984) or changes in adoption over time in the same village (Ahmed, 1981; Jones, 1984; Alauddin and Tisdell, 1991). Most village studies of the socio-economic consequences of the Green Revolution used the method of treatment and control (van Schendel, 1981a; Rahman, 1986; Glaser, 1989). This was also the method used by *Green Revolution* (Hossain, 1989) which compared villages with and without irrigation.

How effective were village studies in uncovering the consequences of the Green Revolution? Table 2 compares bivariate rates of technology adoption between village studies and sample surveys. Four village studies in our sample compared adoption rates of the new rice varieties between big and small farmers for a total of eight villages.[6] In five villages, adoption rates were higher for big farmers by a wide margin. By contrast, surveys showed no difference in adoption rates between big and small farmers (Hossain, 1989). Village studies were made in the early years of the Green Revolution, however, and small farmers adopted more slowly because they were more averse to risk. Lags in adoption left room for conflicting views about whether small farmers were adopting the new rice technology.[7] Village studies also showed that, in five villages, adoption rates for tenants were higher than for owners, and that access to irrigation was similar for both big and small farmers. These findings were all confirmed by studies at the macro-level (Hossain, 1989; Hossain et al., 1994). In fact, the finding that small farmers had equal access to irrigation was confirmed by the Agricultural Census in 1977 (GoB, 1981), long before evidence became available from sample surveys.

Village studies had a bias towards specific regions. Of the 127 'mainstream' village studies, 65 per cent were made in just five of Bangladesh's 19 districts (Adnan, 1990).[8] Eight of the 10 village studies in our sample were made in these five districts (Table 1). Studies of the Green Revolution required districts with high rates of irrigation (Howes, 1985a; Glaser, 1989), while the need to understand changes over time forced researchers back to where the technology was first introduced (Lewis, 1991). Another weakness was variability between villages. One study identified land mortgage (*bondhok*) as the mechanism of polarisation by which land was transferred from small to big farmers (Wood, 1978). But in other villages land was mortgaged for

Table 2. Adoption of new rice technology from village studies and national surveys, Bangladesh, 1974–2000

No.	Method	Year of fieldwork	Rice season	MV adopters (%)			MV adopters (%)		Land irrigated (%)		
				Small farms	Large farms	Mean	Owners	Tenants	Small farms	Large farms	Mean
1	Village study	1973–1974	Wet	49	70	51	46	55	–	–	–
1	Village study	1973–1974	Wet	86	75	59	53	74	–	–	–
2	Village study	1975	All	14	73	40	40	52	14	16	10
2	Village study	1975	All	79	100	83	83	76	26	23	22
3	Village study	1974–1975	Wet	43	47	44	50	37	–	–	–
3	Village study	1974–1975	Dry	64	89	66	73	59	51	57	51
4	Village study	1978–1979	Dry	53	86	59	50	66	58	45	47
4	Village study	1978–1979	Dry	100	100	100	19	33	26	12	13
5	Census	1977	All	Na.	Na.	Na.	Na.	Na.	16	10	11
6	Survey	1979–1980	Dry	Na.	Na.	Na.	Na.	Na.	17	11	14
7	Survey	1983–1984	All	75	77	75	77	74	32	28	32
8	Survey	1987–1988	All	70	76	69	68	66	25	22	24
9	Census	1996–1997	All	Na.	Na.	Na.	Na.	Na.	53	44	48
10	Panel survey	2000–2001	All	Na.	Na.	70	72	69	62	48	60

Note: Details of the methods used to derive these figures are available from the author.
Sources: 1. Asaduzzaman (1979). 2. Rahman (1981). 3. Ahmed (1981). 4. Alam (1984). 5. GoB (1981). 6. BIDS (1983). 7. Hossain (1989). 8. Hossain et al. (1994). 9. GoB (1999a). 10. Hossain et al. (2007).

a fixed number of years (a system known as *khai khalashi*) and did not result in the permanent transfer of land (Arens and van Beurden, 1977; Glaser, 1989). With over 65,000 villages in Bangladesh, how was one to know what was typical?

A Quiet Violence (Hartmann and Boyce, 1988) illustrates the perils of generalisation. The biggest landlord in the village used a new Deep Tubewell (DTW) to increase yields, raise rents, and buy land from small farmers. 'In thousands of villages throughout north-western Bangladesh', the authors warned, 'the World Bank's aid has similarly strengthened the hand of the rural rich' (Hartmann and Boyce, 1988: 258). But a survey five years later in the same region found no bias towards big farmers in access to DTW irrigation and no adverse effects on sharecroppers (BIDS, 1983).[9] The exception was the district where *A Quiet Violence* was located. *A Quiet Violence* swiftly became one of the best-known accounts of village life in Bangladesh. The BIDS report was never published and lies quietly gathering dust on a library shelf.

Ultimately, village studies were replaced by national surveys. *Green Revolution* (Hossain, 1989) sampled 16 villages drawn from eight districts, representing the principal agro-ecological zones. In *Modern Rice Technology* (David and Otsuka, 1994), the evidence from Bangladesh was based on a random sample of 62 villages, selected from 62 of the 64 districts in the country, and with a random sample of 1245 households. The same households and their descendants were re-surveyed in 2000 to create a national panel survey (Hossain et al., 2007). For the first time, generalisations about the socio-economic consequences of the Green Revolution were based on a nationally-representative sample.

II. Misunderstood Technology?

The Green Revolution in Bangladesh was a slow and uneven process. Bangladesh achieved self sufficiency in rice only in 2000, more than 30 years after the introduction of the first modern rice varieties (MVs) (Deb, 2002). Only one-fifth of the increase in production came from rainfed rice (Hossain, 2009). Most came from irrigated rice, despite its smaller area. How well did social scientists understand the reasons for this difference?

Social scientists recognised that the first MVs were not well-adapted to rainfed rice environments (Brown, 1970) and the need to develop varieties suitable for Bangladesh where the main rice crop was grown in the wet season (Farmer, 1979).[10] Fifty per cent of the Aman crop was grown where water depth was below 30 cm (shallow rainfed), and 40 per cent above 30 cm (deepwater) (Huke, 1988). These two rice environments required varieties that were both tall (to avoid submergence) and sensitive to photoperiod (to flower before winter temperatures reduced yields). The first MVs met neither of these requirements. Some social scientists were optimistic that rice breeders could develop MVs suitable for rainfed environments (Farmer, 1979), while others thought that the only solution was to expand the area under irrigation (Falcon, 1970). Still others took this pessimism a stage further. They believed that slow progress in developing MVs for rainfed environments was no accident but the result of a deliberate research strategy (Anderson et al., 1991).

Summarised, their arguments went as follows. Before 1960, rice research in Bangladesh reflected regional diversity. This strategy, based around regional research stations, resulted in varieties adapted to fit different rice environments. IRRI, by contrast, was based in a single institute and followed a 'universal' strategy to breed varieties with wide adaptation, though in practice these varieties were best grown with irrigation. After Partition in 1947, rice research in Bangladesh experienced a steep decline. Into this vacuum stepped IRRI, imposing a centralised structure and its universal research strategy, backed by a government eager to make Bangladesh self-sufficient in rice in the shortest possible time. Rice research in Bangladesh changed its strategy to focus on irrigated rice. Only in the 1980s when IRRI recognised the limitations of a universal strategy did Bangladesh finally return to its earlier research strategy of breeding for specific rice environments.

How accurate was this assessment? There is strong evidence that Bangladesh did adopt IRRI's centralised model of rice research. But there is equally strong evidence that Bangladesh did not abandon breeding for rainfed rice.

Breeders at the Bangladesh Rice Research Institute (BRRI) still believed in their original strategy. Over the period 1970–1990, they expected only 23 per cent of the increase in production to come from irrigated rice, but 41 per cent from the shallow rainfed environment, and 22 per cent from the deepwater environment (Barker and Herdt, 1979). The results from BRRI's breeding programme reflect this strategy (Table 3). True, 18 (56%) of the varieties released between 1970 and 2000 were for irrigated Boro rice. But a closer look reveals significant differences. Of the 18 Boro varieties, only 10 were BR advanced lines, meaning that they came from crosses made by BRRI ($p > 0.006$). Fourteen of these Boro varieties had IR parents, meaning that they incorporated germplasm from crosses made by IRRI ($p > 0.007$). Thus, most Boro varieties were advanced lines imported, tested, and released without the need for any breeding by BRRI. By contrast, of the 15 varieties released for T. Aman, 14 were BR advanced lines or crosses made by BRRI. Nine T. Aman varieties had one or more BR parents, which meant they incorporated germplasm from previous BR crosses ($p > 0.013$) Thus, the breeding programme for rainfed rice took a greater share of BRRI's research resources. BRRI also promoted rainfed rice by hosting international conferences on deepwater rice in 1974 and photoperiod-sensitive rice in 1977 (BRRI, 1980; Farmer, 1979). A new Cropping Systems Research Division was established in 1974. Four of its six research sites were for rainfed rice. The budget for the Cropping Systems Division was soon second only to that for Plant Breeding (IRRI, 1984). Social scientists can justly claim credit for influencing IRRI's rice breeding objectives in favour of rainfed rice environments (Lipton with Longhurst, 1989: 344–345). But this was not the case in Bangladesh, which already had a long history of breeding for these environments.

Table 3. Bangladesh Rice Research Institute varieties, by decade and season, 1970-2000.

	Year of varietal release				
	1970s	1980s	1990s	Total	p^a
Rice season					
Aus	0	2	3	5	
T. Aman	2	4	9	15	
Boro	7	7	4	18	
Total	8	13	16	38	
BR advanced lines					
Aus	0	2	2	4	0.006
T. Aman	2	4	8	14	
Boro	4	3	3	10	
Total	5	9	13	25	
Varieties with one or more IR parents					
Aus	0	1	2	3	0.007
T. Aman	1	1	2	4	
Boro	6	7	1	14	
Total	6	9	5	21	
Varieties with one or more BR parents					
Aus	0	0	0	0	0.013
T. Aman	1	2	6	9	
Boro	1	2	1	4	
Total	2	4	7	13	

Notes: a = Probability of a significant difference between two groups by Fisher's exact test (Aus + Boro versus T. Aman). Values reported are for 2-tail test.
Sources: Varieties: Hossain et al. (2006). BR advanced lines and parentage: Das (2005).

How effective was this strategy? In three decades of breeding, BRRI failed to release a single variety of deepwater rice (Islam, 2004). Yields from deepwater MVs had to exceed 3 tonnes per hectare because yields from local varieties were higher than previously thought (Catling, 1992). The requirement of photoperiod sensitivity limited breeding trials to one season per year. The condition by the National Variety Release Committee that new varieties out-yield local varieties for three consecutive seasons was hard to achieve in a flood-prone environment. Breeding for T. Aman was more successful. Generally, it takes 10 years to develop a new rice variety, so the results of the breeding programme were not visible until 1980, with the release of BR11. Thanks to BR11 production of rainfed rice in the 1980s grew faster than that of irrigated rice (Jabbar and Palmer-Jones, 1997). In sum, the evidence does not suggest that BRRI meekly submitted to a universal rice research strategy that neglected rainfed rice environments. However, its breeders underestimated the technical problems involved. Twenty years after its release, BR11 was still the most widely grown MV in the wet season, covering 42 per cent of the area planted to T. Aman rice (Hossain et al., 2006). This testifies to the skill of BRRI's rice breeders but also highlights the challenge of developing new MVs for this rice environment.

Social scientists were slow to grasp the implications for technology adoption. Only four of the 10 village studies in our sample were made in rainfed environments (Table 1). However, a nationwide survey in 1987 concluded that 'technical and environmental factors are more important in determining the adoption of modern varieties than socio-economic factors' (Hossain et al., 1994: 232). Depth of flooding, rainfall, and salinity were more important determinants of adoption in the wet season than farm size, land tenure, or access to credit.

III. Misleading Models?

Fernand Braudel once compared models to ships: built on land, launched in water. What models did social scientists use? How well did they survive contact with the muddy water of the Bengal delta? Why were these models chosen?

Defenders of the Green Revolution accused its critics of using misleading models:

> Students who viewed development through the spectacles of British agricultural history, particularly the lessons that Marxian analysis drew from that history, viewed the new seed-fertiliser technology as a contemporary manifestation of enclosure and clearances. They failed to understand the distinction between biological technology, which is neutral with respect to scale, and the scale economies associated with introduction of mechanical technology. (Ruttan, 1993: 271)

As we shall see, the critics of the Green Revolution were influenced by historical models. In Bangladesh, the critics adopted Lenin's model, seeing the Green Revolution as accelerating the process by which rich peasants became capitalist farmers. Widely accepted by non-Marxists, this remained the dominant view of the Green Revolution in Bangladesh until the end of the 1980s.

The critics focused on the distribution of benefits from irrigated rice. Irrigation required mechanical pumps, which obviously did have economies of scale. Small farmers had access to irrigation through membership of cooperatives. However, the critics argued that cooperatives were 'closed clubs of kulaks' controlled by big farmers. Privatisation of irrigation in the 1980s transformed big farmers into 'water lords' who charged monopoly prices. Big farmers also benefited from subsidies on irrigation and fertiliser. Hence, the benefits from irrigated rice went 'almost exclusively' to big farmers (de Vylder, 1982: 151). This encouraged the growth of a stable class of rich peasants who evicted sharecroppers so they could cultivate directly with hired labour and who re-invested their profits in buying up land from small farmers. In consequence, the Green Revolution accelerated polarisation and increased poverty.[11]

Did the benefits from irrigated rice go primarily to big farmers? Table 4 assembles case-study evidence on the distribution of income from irrigation by DTWs, a high-cost technology that

Table 4. Distribution of benefits from Deep Tubewell (DTW) irrigation in Bangladesh (%)

Source	Howes (1985a)	Chisholm (1984) 'Big-farmer dominated'	Chisholm (1984) 'Small-farmer dominated'	BIDS (1983)	Mott-MacDonald (1990)
Year of fieldwork	1978–1979	1978–1982	1978–1982	1980–1981	1988–1989
Region	North-East	North-West	North-West	North-West	North-East
Sample DTWs (no.)	2	2	2	24	10
Area operated					
Big farmers	28	54	10	56	13
Medium farmers	30	28	53	22	37
Small farmers	38	18	37	20	50
Pure tenants	5	0	0	2	Na.
Area irrigated					
Big farmers	28	23	3	18	12
Medium farmers	31	23	34	45	31
Small farmers	37	39	52	27	58
Pure tenants	5	15	11	10	Na.
Irrigator households					
Big farmers	13	6	2	7	1
Medium farmers	17	16	33	15	17
Small farmers	58	68	49	63	79
Pure tenants	12	10	16	15	
Income					
Big farmers	30	30	3	33	18
Medium farmers	22	19	28	22	16
Small farmers	27	28	50	26	50
Pure tenants	3	4	5	2	0
Hired labour	19	19	14	17	16

Note: Details of the methods used to derive these figures are available from the author.

critics believed favoured big farmers (Howes, 1985b).The studies cover both major regions irrigated by DTWs. Three studies are for a single crop year, but one study collected data for five consecutive years and compared DTWs dominated by large and small farmers (Chisholm, 1984).

Table 4 shows that the share of land irrigated by small farmers was similar to or greater than their share of the total area operated. Hence, small farmers had equal access to irrigation from DTWs. However, Table 4 also shows that, in three cases, the largest share of income from DTW irrigation – 30 per cent or more – did indeed go to big farmers, who accounted for only a small fraction of irrigator households. Yet about 25 per cent (in two cases 50%) of income went to small farmers. This was true even in the north-west, where landholding was dominated by big farmers. Similarly, hired labour received about 15 per cent. Only pure tenants benefited little. Further evidence on the distribution of benefits came from the 1981–1983 sample survey. With irrigation, agricultural income for big farmers rose by 34 per cent while that for small farmers rose by 22 per cent (Hossain, 1989). Did irrigation increase income inequality? Results from the same survey found that irrigation *reduced* inequality, but that inequality increased overall because of inequality in the distribution of non-agricultural income (Hossain, 1989). The sample survey in 1987–1988 also found that irrigation reduced inequality but no evidence that income inequality increased overall (Hossain et al., 1994).

Did big farmers use the profits from irrigated rice to buy land from poorer farmers? If true, then in villages with new rice technology we would expect to find that: (1) downward mobility through loss of land was higher among small and marginal land owners; (2) upward mobility through purchase of land was higher for medium than for marginal and small landowners; and (3) stability was higher among big landowners.

Table 5 tests these three hypotheses using evidence from six village studies. Three compare villages in the same period while three compare the same village at different periods. The results showed statistically significant differences in four village studies (2, 4, 5, 6). In only one village study (2), however, were the results consistent with the original hypotheses.

In Dhoneshor, irrigation was associated with higher downward mobility among small landowners. However, the evidence that irrigation *caused* downward mobility is not conclusive. First, the period before 1960 saw higher downward mobility among small owners than in 1960–1971. This is attributed to 'higher land productivity after introduction of HYVs'

Table 5. The Green Revolution and household mobility in Bangladesh

	Village	Area irrigated (%)	Period(s)	Treatment/ control	Land owned	Change in land owned			P^c
						Down	Up	Stable	
1	Gopinathpur (T)[a]	75	1951–1981	T	Small	43	8	19	0.171
	Hatshahar (C)[b]	17	1951–1981	C	Small	17	15	1	
				T	Medium	19	2	5	0.547
				C	Medium	17	1	5	
				T	Large	17	0	5	0.588
				C	Large	12	0	3	
2	Dhoneshor (T)	17	1971–1978	T	Small	8	5	18	0.002
	Dhoneshor (C)	Na.	1960–1961	C	Small	23	0	15	
				T	Medium	8	5	17	0.415
				C	Medium	16	6	10	
				T	Large	0	0	20	0.394
				C	Large	1	0	12	
3	Goborgari (T)	67	1970–1977	T	Small	4	7	12	0.150
	Goborgari (C)	0	1960–1970	C	Small	9	4	13	
				T	Medium	9	1	4	0.621
				C	Medium	15	3	12	
				T	Large	7	0	4	0.115
				C	Large	2	0	6	
4	Nakugaon (T)	57	?–1981	T	Small	16	25	23	0.069
	Aschipachkania (C)	1	?–1981	C	Small	5	12	22	
				T	Medium	10	2	3	0.563
				C	Medium	2	3	12	
				T	Large	6	0	3	0.029
				C	Large	2	0	10	
5	Boringram (T)	80	1975–1995	T	Small	84	10	18	0.099
	Boringram (C)	0	?–1975	C	Small	36	7	12	
				T	Medium	39	0	2	0.000
				C	Medium	7	6	1	
				T	Large	7	0	3	0.566
				C	Large	2	1	2	
6	Parbalach (T)	High	1972–1986	T	Small	12	10	53	0.067
	Hasanpur (C)	Na.	1972–1986	C	Small	24	12	58	
				T	Medium	4	8	6	0.448
				C	Medium	3	13	12	
				T	Large	0	0	8	Not computed
				C	Large	0	0	6	

Notes: a = Treatment. b = Control. c = Probability of a significant difference between groups by Chi-square test where fewer than 20 per cent of cells had expected frequency of less than 5, otherwise Fisher's exact test. Values reported are for 1-tail test.

Sources: 1. Rahman (1986); 2. 3. Van Schendel (1981a); 4. Islam (1985); 5. Westergaard (1980); Westergaard and Hossain (2005); 6. Ullah (1996).

(van Schendel, 1981a: 254). It is unclear why the Green Revolution should reduce downward mobility in 1960–1971 and increase it in 1971–1978. Higher downward mobility in the second period may have been due to the 1974 famine. Second, Dhoneshor may not be a fair test of the new rice technology since the DTW was poorly managed and the area under irrigated rice was small (17%).[12] Third, the household classification is based on income, so household mobility may not reflect changes in ownership of land. Van Schendel (1981b: 30) notes that 'the surpluses of the 1960s and 1970s enabled most well-off households to start lucrative businesses or take well-paying jobs'. This suggests that income from irrigated rice was invested in non-farm activities rather than in buying land from small farmers.

The defects in historical models prompted critics to develop alternatives. One was the 'semi-feudal' model whereby big farmers lacked the incentive to become capitalist farmers because they found money-lending or renting land to sharecroppers more profitable (Bhaduri, 1973).[13] Thus, the agrarian structure acted as a 'built-in depressor' that explained the slow progress of the Green Revolution (Thorner, 1976). A second model argued that although small farmers retained their land, effective control passed to providers of new services like irrigation, tillage, and pest management (Wood, 1999). Space does not allow us to review the evidence for these models here. Suffice to say that, by 2000, villages once described as semi-feudal had embraced the new technology (Westergaard, 1980; Westergaard and Hossain, 2005; Harriss, 1992). Similarly, the growth of small-farmer irrigation groups and competitive service-providers kept control in the hands of the family farm (Glaser, 1989; Lewis, 1991).

Why were such models so influential? External factors were probably decisive. The Green Revolution was a child of American foreign policy.[14] The establishment of IRRI in 1962 was designed to prove that hunger in Asia could be solved by technology rather than by revolution (Anderson, 1991). In Bangladesh, the 1971 Liberation War led to a radicalisation of politics (Maniruzzaman, 1988). The Constitution envisaged a society 'free from the exploitation of man by man'. In reality, the new state was an 'intermediate regime' for which socialism meant personal enrichment (Bertocci, 1982). As disillusionment with reform set in, militants split to form a revolutionary socialist party while others went underground, roaming the countryside killing rich peasants and moneylenders. Thus, the Green Revolution in Bangladesh coincided with hopes for land reform or for a social revolution and state ownership of land. Many social scientists in Bangladesh judged the Green Revolution in terms of these wider ideological objectives.

The evidence from village studies supported the need for radical solutions. They portrayed the village as 'a sordid world of ruthless exploitation, violence and inhumanity' (Siddiqui, 1985: 141), a 'jungle' (van Beurden, 2007: 17), and the extended family as 'a façade' concealing 'a bitter struggle for survival' (Wood, 1978: 116). First-hand experience of rural poverty had a traumatic effect on the authors of our sample village studies, the majority of them from the affluent West.[15] Most village studies were made in the 1970s, a decade marked by falling real wages, famine, floods, and military coups (Figure 1), which encouraged some to believe that only social revolution could prevent future famines (van Schendel, 1981a: 298).

An internalist explanation would emphasise a different set of factors. A striking feature of the debate over the Green Revolution was the use of historical models. Lenin's model, based on his analysis of nineteenth century Russia, saw capitalist agriculture as the outcome of a process of differentiation in which rich peasants were transformed into a class of capitalist farmers (Lenin, 1964). This model was widely applied to the Green Revolution in India (Byres, 1972, 1982; Pearse, 1980) and in Bangladesh (Rahman, 1986).

The classical Marxist model, although not directly applicable to the Green Revolution, was influential in other ways. Based on his analysis of the English agricultural revolution, Marx saw capitalist agriculture as led by landlords who enclosed common fields, expanded their holdings, and cultivated through tenant farmers employing landless labourers (Marx, 1962). In Britain, the impact of this model was far-reaching. Agrarian history was re-written by R. H. Tawney and the Hammonds to understand the historical roots of poverty and to justify welfare reforms. The

Enclosure Acts were seen as 'the archetypal act of capitalist expropriation . . . and the central national tragedy' (Samuel, 1980: 38).[16] This 'catastrophic' version of British history reached across the political spectrum (Collini, 2004), providing an historical identity for the Labour movement (Samuel, 1980) and justifying the anti-industrialism that rationalised Britain's economic decline (Weiner, 1985). This interpretation was challenged in the 1960s by revisionist historians (Collins, 1967; Kerridge, 1969). Nevertheless, the orthodox view of the English agricultural revolution was that, for the rural majority, the experience was one of material and cultural impoverishment. This view was also reflected in the critique of the Green Revolution.[17]

A historical perspective on the Green Revolution was promoted by the Peasants Seminar at the University of London and its journal *Peasant Studies*. For 17 years (1972–1989), the Peasants Seminar provided a stable institutional platform for the debate on the Green Revolution.[18] The founders aligned its work squarely with that of British Marxist historians. The understanding of the Green Revolution lay through history, 'seeking the historical roots' of the agrarian transition (Byres, 2001: 348). The Seminar provided social scientists with a conceptual framework – the transition from feudalism to capitalism – and with historical models for their PhD theses (Rahman, 1986). This fusion of history and Marxism 'was the kind of social science taken up by critics of the "green revolution"' (Harriss, 2005: 28). They saw the new rice technology as accelerating a broader process of agrarian change, whose consequences were best understood through the use of models based on historical experience.

IV. Facts, Evidence, Beliefs

In Akira Kurosawa's film *Rashomon* four characters give different versions of the same event. The Rashomon Effect has become a metaphor to explain controversies in social science (Heider, 1988). This section explores three ways in which the Rashomon Effect influenced the controversy over the Green Revolution in Bangladesh.

Facts

> . . . the toughest thing to establish for the Indian countryside is a simple fact.
> (Thorner, 1976: 4)

For almost a quarter-century, the facts about the Green Revolution in Bangladesh came from village studies. This was part of a wider trend. The Village Studies Programme, launched by the Institute of Development Studies in 1970 and championed by Michael Lipton, was an ambitious 'attempt to construct a new, multidisciplinary theory of development, based on systematic comparison of micro-studies' (Harriss, 2005: 22). Bangladesh had its own Village Studies Group (Adnan et al., nd). Villages became social science laboratories. Knowledge required personal observation. Critics of the Green Revolution built reputations by making 'field trips' to see with their own eyes (Thorner, 1980; Walinsky, 1977).

The vogue for village studies reflected widespread distrust of official statistics. Epitomised by national surveys in India, their flaws were mercilessly exposed by the Thorners (Thorner and Thorner, 1962). Anthropologists revealed the problem of defining concepts like farm size, debt, occupation, and wages (Hill, 1984; Harriss, 1989). Wolf Ladejinsky 'avoided local officials and spent no time collecting official statistics' (Walinsky, 1977: 432). Often, however, official statistics were all that was available. Economists left fieldwork to anthropologists (Srinivas, 1978) and mocked village studies as 'cowdung economics' (Parthasarthy, 1978). How else, then, were social scientists to determine the 'facts' if not through immersion in fieldwork and village studies?

Critics of the Green Revolution have been accused of 'guilt by association' or blaming the new technology for consequences caused by other factors like population growth (Rigg, 1989). In practice, village studies carefully distinguished between different causes. In Katni, for

example, 'The main reason for the shift to hired labour is not that yields are going up, but rather that wages are going down' (Hartmann and Boyce, 1988: 197–198). To avoid guilt by association, many village studies used the method of treatment and control. Sadly, this method was no guarantee that critics would get it right. Rahman (1986: 257) concluded that 'the gains of rapid expansion of productive forces have been expropriated by the rich peasantry, leaving the other half into utter ruin'. However, his results showed no significant differences between the treatment and control villages (Table 5, village 1). Reluctance to make greater use of treatment and control often reflected time and budget constraints. Eight of the 10 village studies in our sample were PhD theses (Table 1). Shortage of time often determined the choice of where to work (Lewis, 1991) and of research tools (Howes, 1981). Others rejected treatment and control on theoretical grounds, arguing that it cast farmers as passive recipients of the 'impact' of new technology (Lewis, 1991; McGregor, 1991).

As we have seen, village studies gave an accurate picture of small farmer adoption.[19] But their real value was to illuminate social processes not general trends. Recognition grew that they were an inadequate method for understanding the Green Revolution. Sobhan (1980: 122) lamented the 'indiscriminate generalisations based on micro-level village studies' and urged the need for 'pooling together the proliferating micro-studies of villages in Bangladesh to see whether enough diversity of experience is at hand to permit more durable generalisations'. Arguments over the relative merits of village studies and surveys grew in intensity. *Conversations Between Economists and Anthropologists* (dedicated to Daniel Thorner, that scourge of the official survey) explored ways to combine the two methods (Bardhan, 1989).

The fundamental problem with village studies was their inability to say whether the picture they gave was typical. Village studies produced multiple realities, reflected in the fictional names researchers gave to their villages, each emphasising what they perceived as important. Village studies bred scepticism about generalisations. 'In India, nothing is typical' (Farmer, 1979: 310). Village studies could not generate generalisations, only question the quality of the evidence on which generalisations were based (Harriss, 1989). Thus, village studies could neither prove nor disprove alternative theories of the Green Revolution.[20] This problem was only resolved by the introduction of carefully-designed, nationwide surveys. Ultimately, the choice of methods came down to resources. The switch from village studies to national surveys was led by the international agricultural research centres with their expanding budgets and network of research partners.[21]

Evidence

Historians distinguish between facts and evidence, where facts are selected to test a model (Evans, 1997). The facts amassed by village studies provided meagre evidence for Lenin's model of polarisation. What features of this model proved so misleading?

Critics of the Green Revolution saw the distribution of benefits as predetermined by the agrarian structure. Attempts to circumvent this structure through cooperatives were 'futile' (Khan, 1979: 414), and their failure was 'inevitable' (Blair, 1978: 77). Similarly, the agrarian structure determined technology adoption. In the semi-feudal model, big farmers preferred to extract the surplus through money-lending and trade (Hartmann and Boyce, 1988). Historians invoked the agrarian structure to trace the roots of agricultural stagnation into the distant past – a sort of Whig history in reverse (Bose, 1986). Only through land reform would small farmers share the benefits of the Green Revolution (Januzzi and Peach, 1980). Technology played a subordinate role. The Green Revolution was not the parent of capitalist agriculture but merely the 'midwife', assisting at the birth (Byres, 1972). Adoption of new technology was determined by the demand from big farmers.

Both the Leninist and semi-feudal models overlooked evidence that policy and technology could evolve to overcome constraints imposed by the agrarian structure. Bangladesh was an 'intermediate' regime heavily reliant on foreign aid. Policies did not automatically favour big

farmers. The state resisted demands for tractorisation, which critics argued would hasten polarisation (Gill, 1983; Lewis, 1991). Again, the state imposed restrictions on the import of engines for Shallow Tubewells (STWs). When these were lifted in 1987, the result was an influx of cheap Chinese engines that effectively killed the 'built-in depressor'. By 2000, one in six farmers owned an STW (Hossain, 2009). Similarly, aid donors influenced the priorities for rice research. The establishment in 1971 of the Consultative Group for International Agricultural Research (CGIAR) made IRRI accountable to donor agencies that prioritised equity and poverty. The result was a new focus on rainfed rice environments and resource-poor farmers. Critics rightly saw this as 'an attempt to resist rural proletarianization' (Oasa, 1987: 24).

Critics saw the Green Revolution as part of an 'agrarian transition'. The idea of 'transition' was potentially misleading. Transition implied that the destination was known in advance, but the definition of the capitalist mode of production was the subject of lengthy debate. Again, the development of capitalist agriculture was a long process 'stretching over centuries' (Byres, 1977: 259). Detecting the same trends over a very short period was difficult if not impossible. Transition also implied the co-existence of old and new. Pockets of genuine capitalist agriculture might exist near Dhaka (Jahangir, 1979), but experienced observers saw no evidence of capitalism even in Comilla district, where the Green Revolution began (Thorner, 1976). The critics recognised these difficulties and stressed the need to test the model through careful empirical research (Byres, 1982). What was insufficiently recognised, however, was the variety of forms that the agrarian transition could take. Marx's model was based on the specific historical experience of eighteenth century England. But in other countries and even in other parts of Britain the transition to capitalist agriculture took very different forms. As they themselves admitted, the critics were slow to recognise the diversity of historical experience and the limitations of a universal model (Byres, 1991).

One reason Lenin's model proved so durable was its apparent relevance for the wheat growing areas of north-west India. There, experience seemed to follow Lenin's model, including the emergence of a new class of capitalist farmers (Thorner, 1980), class polarisation, eviction of tenants, and mechanisation (Walinsky, 1977). This was where the Green Revolution was first introduced. Simple path-dependence meant that it became the template for understanding the Green Revolution in rice-growing regions.[22] In Bangladesh, the critics tried to replace the 'Punjab model' of agrarian change (Wood, 1994: 164) with one more relevant for Bangladesh. Wood's (1978) 'minifundist' model was an original attempt for a specific region, based on field observation. But it remained wedded to the view that land was passing from small to big farmers. Only when the critics abandoned the concept of 'de-peasantisation' did they begin to produce plausible alternative models (Wood, 1999; Harriss, 2006; Bhaduri et al., 1986).

Beliefs

The critics of the Green Revolution focused on the distribution of benefits. Their concern was whether the Green Revolution had made income more unequal. By contrast, what mattered to IRRI's economists was access to the new technology. These contrasting views also reflected disagreement over the causes of poverty. The critics saw poverty as the result of inequality. If the Green Revolution made income more unequal, poverty would also increase. The defenders of the Green Revolution saw poverty as the result of low productivity. If the Green Revolution raised rice yields, it would simultaneously reduce poverty.

This disagreement reflected opposing beliefs. For some critics, the focus on inequality reflected personal experience of apartheid or of racism in the American South (van Schendel, 1985; Briscoe, 2001). Researchers had preconceived ideas: 'I expected to be investigating new forms of exploitation which further enriched the wealthy and impoverished the poor' (Glaser, 1989: 51). These ideas were 'sometimes more convictions than clear understandings'

(van Beurden, 2007: 41). Changing one's mind was 'difficult because of my initial conviction about the validity of the "Marxist" thesis' (Khan, 1989: xi). According to Thorner (1976: 2) the semi-feudal model was 'a conviction still so firmly held that no data, analysis, or argument can shake it'. Similarly, the focus on access to new technology by the defenders of the Green Revolution reflected their academic training. Social science at IRRI was dominated by agricultural economics, which believed that traditional agriculture was poor because it lacked access to profitable technology (Schultz, 1968). This reflected the conviction that science could provide practical solutions to complex political problems (Anderson, 1991). The Green Revolution seemed to vindicate this belief. The first MV, IR8, became a visible symbol of modernity, promising developing nations a new world of abundance (Cullather, 2004).

On many occasions, therefore, the protagonists were talking past each other. IRRI defended the Green Revolution by showing that the new technology had also been adopted by small farmers. But as the critics pointed out,

> Saying that their data 'do not support the hypothesis that small farmers have generally lagged behind largely *in the use of new technology* that would increase their yields, income, and employment' is not the same as saying that the small farmers have not lagged behind in yields, income, and employment. Their answer does not go to the core of the issue. (Feder, 1983: 22)

Similarly, the problem of whether the Green Revolution increased income inequality could not be resolved by evidence on relative yields from new technology:

> . . . a comparison of yields per hectare on large and small farms is not enough to address the question . . . whether or not large farms are gaining an economic advantage. This is but one small example where a broad question, such as income per hectare, was 'reduced' to some related but narrower question, such as yield per hectare. (Anderson et al., 1991: 95, 98)

IRRI's economists interpreted equity as equal access to new technology (Barker and Herdt, 1978). Only later did they seriously address the same question as the critics. This reflected pressure from the CGIAR, where IRRI's donors echoed the critics and demanded that research address issues of equity and the problems of resource-poor farmers (Oasa, 1987). Consequently, the defence of the Green Revolution shifted from technology adoption to the direct effects on income distribution and poverty, both for farmers and the landless (Hossain, 1989; David and Otsuka, 1994). For the critics this was a Pyrrhic victory since the evidence showed the Green Revolution had not increased income inequality.

From a present perspective, a striking feature of the debate is the lack of interest in what villagers themselves thought about the Green Revolution. Social reportage came from villages untouched by the new rice technology (Arens and van Beurden, 1977; Hartmann and Boyce, 1988). Arguably, what mattered for the majority of Bangladeshis was not the impact of the Green Revolution on inequality or productivity but its impact on poverty. In the words of one landless labourer, 'Without the *Boro* we would all have died!' (Glaser, 1989: 159). But the question never came up, because poverty did not yet dominate the research agenda. Reflecting on his experience in Bangladesh, one IRRI scientist wrote:

> As I reflect I am puzzled on the one hand by the vehemence of some of the critics of Green Revolution technology and on the other hand that a marginal farm family like Kalam's wants the same technology. Obviously Kalam does not see a social determinism in which his family will become dispossessed because of the Green Revolution technology. He perceives it as an opportunity. It leads me to conclude that there must be something missing in our understanding of technology and its impact. Does Kalam see the Green Revolution

> technology as more than mechanical and biochemical inputs? Does he see a shift in status in which his family has access to credit, fertiliser, pump repairs and so on, and with that shift greater security? I do not know because I never thought to explore what a marginal farm family perceived its gain to be from embracing the irrigated Green Revolution technology. (Magor, 1996: 217–218)

This recalls the psychology experiment where, told to count how many times people pass a basketball, the subjects concentrate so hard that they fail to notice a prancing gorilla (Simons and Chablis, 1999).[23] A similar 'inattentional blindness' affected many social scientists, on both sides of the debate.

V. Conclusion

Why were so many social scientists wrong about the Green Revolution? In the case of Bangladesh the answer lies in a combination of errors, at several levels.

Village studies were no substitute for generalisations based on nationally-representative sample surveys. They fuelled the controversy without being able to resolve it. In this sense, they were a mistaken method. Critics also misunderstood the technology itself. The slow progress of the Green Revolution reflected the technical challenge of developing MVs for rainfed rice environments rather than socio-economic constraints. The critique of the Green Revolution was based on a misleading model of the agrarian transition that required de-peasantisation and the transfer of land from small to big farmers. In Britain, the critics of the Green Revolution inherited a historical narrative central to a wider critique of 'industrialism' that equated the agrarian transition with impoverishment. In Bangladesh, Lenin's model became a political weapon in an ideological struggle to complete the 'unfinished revolution'. The dominance of this model in Bangladesh is explained as much by the cultural and political context as by its relevance for understanding the Green Revolution.

Disagreement over facts, evidence, and beliefs created a Rashomon Effect. Village studies produced facts that could neither prove nor disprove claims about what was happening at the national level. Critics of the Green Revolution emphasised the determining role of the agrarian structure in technology adoption and the distribution of benefits, but overlooked evidence on how policy and technology could change to overcome these constraints. Finally, there were differences in convictions between the protagonists. Social scientists disagreed over whether to evaluate the Green Revolution by its impact on inequality or on productivity. For all these reasons, the controversy was hard to resolve.

These themes still echo in the contemporary literature on rural development. In Africa, village studies have exposed the weakness of official statistics (Wiggins, 2000). In Asia, re-studies of villages first studied during the Green Revolution now focus on understanding development processes (Rao and Charyulu, 2007). Social scientists continue to rely on historical models. The Green Revolution has itself become a historical model for understanding the Gene Revolution in transgenic crops (Lipton, 2007). Again, some have questioned the relevance of the 'Asian model' of the Green Revolution for Africa, while others see universal principles (Otsuka and Kalirajan, 2005). Finally, beliefs remain influential. There is a shared focus on poverty. But debates over the role of the market and the state in eliminating poverty reflect ideological convictions. Similarly, the debate over transgenic crops reflects conflicting beliefs about science (Herring, 2007). Pandora's Box remains as divisive a symbol for social scientists today as it was during the Green Revolution.

What are the lessons of this debate for the research process? They can be summarised as follows: A balance between micro-research and carefully-designed national surveys; a clear understanding of what new technology can and cannot do; greater awareness of the internal and external factors that influence the choice of research models and methods; a suspicion of universal models; above all, the willingness to challenge one's own convictions.

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Notes

1. Initially, IRRI's economists believed the critics. 'My *specific* objective [in joining IRRI in 1973] was to try to understand why small farmers weren't using the new semi-dwarf rice … Because that's what all the journal articles were talking about … and we went to central Luzon … and went there to see, *why* aren't these small farmers using this miracle rice? Well, it turned out that they *were* …! Well, why does everybody have it wrong? So that became a theme of inquiry.' (Herdt, 2009).
2. This paragraph is based on the results of the Global II Project on the social and economic implications of large-scale introduction of new varieties of foodgrains, conducted by the United Nations Research Institute for Social Development (UNRISD) which conducted research in 15 developing countries between 1970 and 1974. A summary of results appeared in 1974 (UNRISD, 1974) and a synthesis in 1980 (Pearse, 1980). Griffin's *Political Economy of Agrarian Change* (1979), which became the most widely read critique of the Green Revolution, was an outcome of this Project.
3. For area planted, sharecropping, and changes in farm size see Hossain et al. (2002): 373–377; for mechanisation, see GoB (1999b: Table 01); for income distribution and poverty, see Mujeri and Sen (2006: Tables A2.10, A2.11).
4. For an analysis of why the predictions were wrong, see Osmani (1998).
5. Our definition includes both anthropological village studies based on participant observation and 'studies at the village level' on the adoption of new rice varieties. Only four of the 10 village studies in Table 1 are classed as village studies by Adnan (1990).
6. A fifth village study reached similar conclusions on adoption but the data are not comparable with those from our other sample studies (Jones, 1984).
7. One study of two villages in different districts showed that, to begin with, small farmers were slower than big farmers to adopt new rice varieties, but eventually caught up. In one village this took two years, but in the other it took more than 15 years (Alauddin and Tisdell, 1991).
8. These refer to the 19 old districts before independence in 1971 (Adnan, 1990).
9. The survey was commissioned by the Bangladesh Agricultural Development Corporation (BADC) in response to criticisms of the Deep Tubewell Project in north-west Bangladesh by 'anthropological studies', a veiled reference to Hartmann and Boyce (1979).
10. Bangladesh has three overlapping rice seasons. Aus rice is direct-seeded or transplanted between April/May and harvested in July/August before the monsoon. T. Aman rice is transplanted in July/August and harvested in November/December, while B. Aman is direct-seeded on lower-lying land in March/April before the seasonal floods and harvested in November/December after the floods have receded. Boro is grown with irrigation in the dry season, and transplanted in January/February and harvested in April/May.
11. This paragraph is based on Blair (1978); Wood (1978); Jones (1982); de Vylder (1982); and Khan (1989).
12. Another critique was based on a village with only 10 per cent of land under irrigation (Wood, 1978: 104).
13. Of the 14 sample studies in Table 1, seven cited Bhaduri (1973), while 10 cited Griffin (1979).
14. The first public use of the term 'Green Revolution' was in a speech on 8 March 1968 in Washington, DC by William S. Gaud, the administrator for the United States Agency for International Development (USAID) (Chandler, 1982: 117). The implicit comparison was with the Red Revolution that threatened south-east Asia.
15. 'My stay in Fatehpur was a profound and radicalising experience … what I saw and learned changed the course of my life' (Briscoe, 2001: 3823). 'We ourselves went through a process of radicalisation' (Arens and van Beurden, 1977: 1). Revolutionary enthusiasm was also 'driven by moral reactions to the experience of the 1974–5 floods and famine' (Wood, 1994: 557).
16. The mythic quality of this history is illustrated by R.H. Tawney who characterised himself as 'a peasant displaced from the soil' (Turriff, 1973: 71).
17. Thus, optimistic views of the Green Revolution were condemned as unhistorical ('In other societies at other times such changes have been accompanied by stress and disadvantaged groups' (Byres, 1972: 101–102)), while others emphasised the importance of '"the lessons of history" for what rapid agricultural change does to poor people' (Lipton with Longhurst, 1989: 23).
18. Participants in the Peasants Seminar who presented papers on Bangladesh included Geoffrey Wood (twice), Kamal Siddiqui, Atiur Rahman, James Boyce, and Ben Crow (Byres, 2001: Appendix B).
19. For a rare counter-example, see Abdullah (1989).
20. By contrast, Casley and Lury (1981: 70) state that 'One may not be able to generalise from it [a case study] but one may be able to reject existing generalisations'. This seems to confuse generalisations and laws. A law (for example,

'the history of all hitherto existing societies is the history of class struggles') can be falsified by a single case study because it admits no exceptions. A generalisation, however, refers to the majority of cases, which implies the existence of exceptions. See Evans (1997: 58–59).

21. IRRI's budget quadrupled in real terms between 1972 and 1980, averaging $50 million per year throughout the 1980s (Barker, 2010: 35).
22. The terms of the debate on the Green Revolution were largely set by the Global II project. The Cambridge Project on Agrarian Change was designed to test the Global II findings for rice-growing areas in south India and Sri Lanka (Harriss-White and Harriss, 2007).
23. For the video, see http://viscog.beckman.illinois.edu/flashmovie/15.php.

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