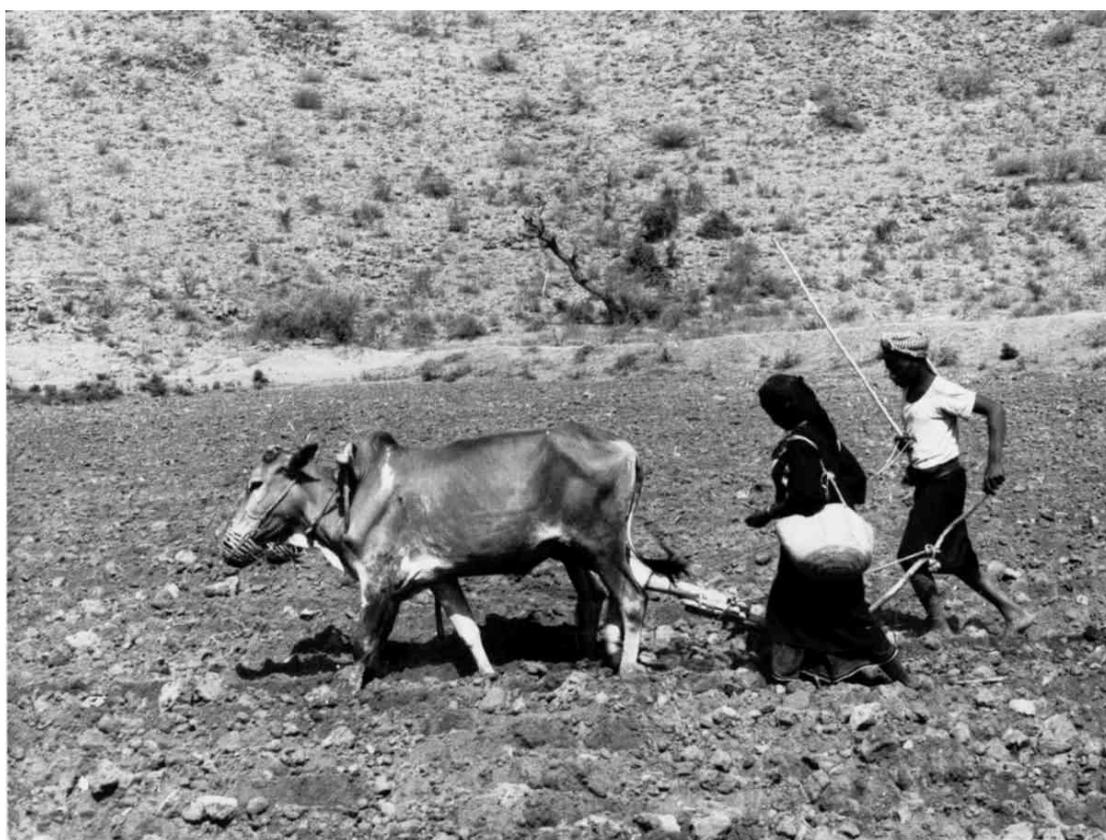




STUPID FARMERS, STUPID AGRONOMISTS, OR STUPID ECONOMISTS?

Some Experience with Theories of Technology Transfer in Agriculture



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1. Introduction

Agriculture is the new black in development. After some years, a strong consensus is building around its importance for growth and poverty reduction. The following statement from a paper by Colin Thirtle and others is typical:

“... research-led technological change has propelled famine-plagued, food insecure Asian countries into food self-sufficiency. Agricultural productivity growth drives pro-poor growth, benefiting poor farmers and landless labourers by increasing both production and employment. It benefits the rural and urban poor through growth in the rural and urban non-farm economy. It leads to access to crops that are high in nutrients and empowers the poor by increasing their access to decision-making processes, increasing their capacity for collective action, and reducing their vulnerability to shocks, through asset accumulation.” Thirtle, Lin & Piesse, Kings College Management Centre, Research Paper 16

The crucial statement is that technological change is research-led. I am not a good enough econometrician to tackle the analysis which demonstrates that this is the case. I have considerable doubts about complex multi-equation models that depend on just two or three years' data, at the aggregate national level and 15 years apart, across 48 different countries. Data and econometrics apart, my problem is two-fold. First, these optimistic conclusions do not chime with 15 years' experience of struggling to promote technological change in poor agricultural communities. Secondly, the case for research and extension depends on received ideas about technology generation and transfer which are also out of line with that experience. It is those ideas that I mostly want to look at today.

I believe it to be particularly important to test the case for '*research-led technological change*' because this is far from the first time that agriculture has been the fashionable black of development models. From the days of the Tanzanian groundnut scheme, we have been there and got this T-shirt quite a number of times. It would be unforgivable to start of down this road again unless we are sure.

There are lots of theories to play with. At least since the days of Lenin and Chayanov, economists and others have sought to identify the features of smallholder farming – I deliberately avoid the word subsistence – which prevent its taking off into an agricultural or green revolution.

A congenital weakness for provocative titles leads me to sum up the many versions of the thesis that smallholder agriculture is special as the 'stupid farmers' hypothesis: the idea that somehow farmers are unable to make their own agricultural revolution.

Since the 1980s a competing thesis has appeared. Given the recognition that farmers are not stupid, it must be the limitations of technical research that is blocking change. Obsessed with statistical methods and on-station trials, agronomists and others fail to understand farmers' needs. Robert Chambers' seductive analysis of the biases of the different researcher communities is the classic statement of the 'stupid agronomist' thesis: the idea that scientists may be able to generate technologies but they are useless at generating useful ones. The vast apparatus of Farming Systems Research, Farmer Participatory Research and Livelihoods approaches is all designed to overcome the perceived stupidity of traditional research.



Most of the ‘stupid farmer’ theories come from the economists. The most important of them concerns two parallel ideas. One is that agricultural technology is uniquely difficult to learn – in Muscat’s phrase, it is not ‘amenable to transfer. Publicly funded extension services are therefore needed to assist the transfer. The second is that agricultural technologies are a public good. Because the private sector cannot capture all the profits from genetic improvements, it will not invest enough in research which must also be publicly funded. [As a by-the-way, there is a clear incompatibility between the two ideas which is never noted. It is precisely because genetic material is easy to transfer that the private sector cannot capture all the profits. But that is for another day.] Other ‘stupid farmer’ hypotheses include smallholder risk aversion and various complex ideas about the evils of tenancy and sharecropping.

I am an economist myself but my experience leaves me convinced that these ‘stupid farmer’ theses are irrelevant – note I do not say incorrect. As models they are fine but the range of situations in which they are applicable is narrow. If you test them with real world numbers they are just not relevant. I believe, for example, that the social and economic value of the public good element of research is small and vastly less than the public funds spent on R&D. In other words, my thesis is Stupid Economists, not Stupid Economics.

Moving rapidly on, before the economists lynch me for the arrogance of that statement, what I want to do today is talk about three cases where scientists and economists completely misread a situation, while farmers demonstrated they knew exactly what they were doing and why. What is more, they acquired agricultural technologies and adapted them to their needs in almost no time.

This is not an entirely optimistic conclusion. The logical consequence is that there is much less that we can do to help farmers than we would like to think – but that might be a good discussion point for later.

2. Tractors in Wadi Rima¹

In the mid-1970s a large team of specialists completed a very detailed farming systems study in the Wadi Rima area of Yemen. This section of the Red Sea lowlands had 1,100 farm households in some 50 villages north and south of the seasonal wadi which irrigated the area. At the time of the survey there were nine tractors in the area but they were used rarely and inefficiently. My picture shows the traditional planting technique. The woman is dropping seed down a tube tied to the ploughshare. Note that this is a two-ox span being driven by the ploughman – something which needs well trained livestock and a skilled operator. The survey team were highly impressed by all aspects of the farming system, not just the cultivation. Water distribution was based on centuries old documents and 60% of the wadi flow was captured: far from easy in a spate wadi. For ploughing, it was stated that there was no likelihood of mechanisation.

I worked on that team. Five years later I went back to look again at the possibility of a tractor hire scheme. I identified 75 tractors, most of which I saw myself. There was an active market in tractor hire services using just the techniques that would have been recommended by the Agricultural Engineering Project I was working for. The

¹ A detailed analysis of Wadi Rima’ agriculture and mechanisation in 1980 can be found in Morton, J, June 1981 - Tractor Usage in Wadi Rima’, Yemeni British Agricultural Engineering Project, Taiz. Available on www.jfmorton.co.uk.



project wanted to know if it would be sensible to set up a tractor hire scheme. The fact was that the tractor operators still had things to learn, but there was no prospect that the planned scheme could compete with them on price, or possibly even quality. The agricultural engineers felt the tractors farmers had bought were too powerful, but even that was probably overlooking the need for emergency power when the wadi flooded.

To sum up two teams of specialists misread the situation totally. The first saw no need for tractors. By the time the second saw the need for tractors, they were too late. The farmers were way ahead of them. What had happened was that emigration to Saudi Arabia in the mid and late 1970s had changed the shape of Yemeni agriculture. By 1981, labour was short and fodder for oxen very expensive, while remittance capital had made machinery easily affordable. And transferring the technology and adapting it to the highly specific needs of the area was no problem whatsoever.

I mentioned earlier the skill needed to train and manage draft oxen. I throw it out as a thought that almost all modern agricultural technologies are an awful lot easier to use than that. I can drive a car, for example, but was hopeless when I tried to learn to manage horses.

3. Tubewell Irrigation in Bangladesh²

In the early 1980s, the World Bank, the Asian Development Bank, ODA and other donors sponsored some very large programmes to install deep tubewells (DTW) for rice irrigation in Bangladesh. The IDA/ODA funded project on which I worked, was for more than 1,000 DTW. Deep wells need relatively sophisticated submersible pumps, they must be designed to match the hydrogeology and they are expensive. To make it viable, each well needs to serve some 100 acres of boro rice, involving user groups of up to 100 farmers. The reality was that few DTW managed more than 20 acres. There were possible causes: the institutional framework for the tubewell cooperatives and credit arrangements were badly thought out, the quality of the well construction was variable, and water distribution was more difficult on some soils than others. There were lots of pointers to this being an agricultural technology that was genuinely difficult to transfer.

The true answer was simpler. The deep tubewells were just not competitive with a much cheaper technology: shallow-tubewells. We found many examples of shallow wells irrigating 5 to 10 acres inside the expected command area of a 100 acre DTW. This was not supposed to happen. Highly sophisticated models of the Bangladesh watertable appeared to show that there was not enough groundwater accessible to the shallow wells, which cannot pump from more than 20 foot below ground level. This was in 1985. Twenty years later, Bangladesh is self-sufficient in rice almost entirely irrigated from shallow tubewells. And I have not heard that there is any sign that groundwater is going out of reach across large areas. There is a right time and a wrong time for every technology and the late 20th century was not the right time for deep tubewells.

² This section is based on Morton, James, Tubewell Irrigation in Bangladesh (December 1, 1989). ODI-IIMI Irrigation Management Network Paper 89/2d . Available at SSRN: <http://ssrn.com/abstract=2157533>



Shallow tubewell technology was subsidised in Bangladesh for long periods and I would be surprised to find that there were no technical assistance and other projects that supported its introduction. Nevertheless, the fact remains that once started it spread to become the dominant technology with little or no specialist support. From almost none at the beginning of the 1980s, there were tens of thousands in operation by 1985. Bangladeshi contractors learnt how to drill the wells using very lo-tech methods. I was even told that some used mosquito netting to screen the wells. Bangladeshi mechanics learnt to look after small petrol and diesel engines and centrifugal pumps. And, Bangladeshi farmers learnt to grow irrigated boro rice with medium and high yielding varieties and fertiliser. Yes, research made a contribution in developing the new varieties, and the large Department of Agricultural Extension must also have helped, but I believe that the farmers were well ahead of them most of the time.

I do not see this as a research-led green revolution. At least, two thirds of the increased productivity came from what were effectively off-the-shelf technologies: shallow tubewell irrigation and fertiliser. I would also suggest that the real driving force for adoption came from urbanisation and rising incomes – ie from market demand and not from the sudden appearance of new technologies capable of raising productivity. But that is wider discussion for another day.

Slightly by the way, reports that Bangladeshi farmers are now using hybrid rice seed smuggled in from India is, to me, just another example of how farmers seem to have almost no problems with transferring agricultural technologies when it suits them.

4. Natural Resource Management in Darfur

My last case is a more negative story with a similar starting point to the Yemeni one. During the late 1970s, ODA funded very wide-ranging studies of farming systems in South Darfur. Shifts in population and land-use appeared to be driven by drought. They also appeared to threaten a classic case of the Tragedy of the Commons: that economists' theory that where land is common property or an open access resource, farmers and herders will be forced to compete with each other without control. This will drive down returns and exhaust the land. At the extreme, the result is desertification.

The theory is clear. Allocating stronger property rights will allow farmers to conserve their land and so raise productivity; and the World Bank and ODA committed to a very major programme to support this change by establishing settlements on which farmers would have firm title to their land and grazing reserves which communities would be able to protect from overgrazing.

The results were also clear. Farmers were not interested in following the recommended rotation to conserve soil fertility and communities were not interested in making the effort needed to manage their grazing reserves as expected.

I have written extensively about Darfur and it is impossible to summarise all the evidence.³ My interpretation is, however, that the Tragedy of the Commons thesis failed spectacularly for a number of reasons:

³ These arguments are developed at length in Morton, James, Agricultural Development in Darfur Region, Sudan with Special Reference to Innovation, Technical Change and Open Access Resources (March 1, 1993). Available at SSRN: <http://ssrn.com/abstract=2426987>



- The agronomists and other specialists failed to demonstrate anything like the level of productivity improvement from better land management that would have been needed to cover the extra costs involved;
- And, as the converse of this, they failed to show that the perceived land degradation was in any way relevant, in the sense of causing tangible economic loss;
- Although there was ample evidence of shifting cultivation, the driver behind this was weed infestation and not soil exhaustion;
- The economists failed to highlight the fact that millet and groundnut production in an economy failing as badly as the Sudanese was most unlikely to cover the costs of any kind of intensification.

And the sad thing is that there was quite a lot of earlier research that could have been taken as a warning. (Although hindsight is of course a wonderful thing.)

5. Conclusion

What do I conclude. Clearly, and first of all, farmers as a group are never stupid. Following from that, any theory or development recommendation which explicitly or implicitly depends on some special problem that only affects smallholder farmers in developing countries should be treated with fierce suspicion. Agronomists and economists are not stupid either. However the will to find a development solution – the desire we all have to ‘make a difference’ – does blind many of us scientists and economists to the need to reject all attractive theories, almost on principle, and even to look at the data with suspicion. I used to tell my staff in Sudan when checking data ‘not to trust anyone, not even yourself’. Sadly, that is how I now approach most ideas about helping smallholder farmers.

To explain why I am so wary, I would like to finish by quoting a paragraph I wrote in 1993. “ The failures of ‘off-the shelf’ technology transfer have been recognised for at least 20 years and agricultural research has been making strenuous efforts to adapt new technologies to African circumstances for almost as long. As early as 1964, Schultz argued that poor Third World farmers are economically efficient but face especial difficulties in acquiring new, more profitable technologies. Agricultural technology is not, he argued ‘amenable to transfer’ and that is why off-the-shelf transfers did not work. Research and farmer training would, however, overcome the difficulty and so ‘transform traditional agriculture’. In the years since then, vast sums have been spent on research in sub-saharan Africa, more than anywhere else in the developing world: \$360 million in 1980 as against \$190 million in S. Asia. But the result has been little more productive than the earlier off-the-shelf transfers. Many, many attempts have been made to break perceived lacks of labour, capital or land, to little avail; and ever more complex systems of extension have rarely managed to speed up the rate at which farmers have adapted to modern inputs and equipment.”

But the good news is that farmers will sort it for themselves if we give them half a chance. Thank you.