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REACHING THE UNREACHED

BIOTECHNOLOGY IN AGRICULTURE

A Dialogue

Edited by
M.S. SWAMINATHAN

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SESSION - 6

PROBLEMS OF PARADIGMS

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PROBLEMS OF PARADIGMS
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PROBLEMS OF PARADIGMS

Robert Chambers

I am going to talk about practical paradigms. This is in three contexts: of reaching the unreached; of blending traditional and frontier technology; and of blending methodologies—those of biotechnology as they have been presented during this workshop, and those new participatory methodologies which have developed rapidly in India over the past 15 months. This will lead to five questions concerning biocentres and biovillages, which are among the proposed outcomes of this dialogue.

I use the term "paradigm" to mean a pattern of mutually reinforcing concepts, values, methods and behaviour. In the world we now live in, paradigms are changing faster and faster. This includes scientific paradigms, especially their methodological component. In such a world, whatever is done by the majority is liable to be out of date and no longer the best. So in the realm of the professions, "normal", meaning whatever is common current practice, is almost a pejorative term, almost by definition behind the times and second or third best. But nor does this mean that whatever is new is necessarily the best either. It is simply that where the frontiers are moving ever faster, it is ever more of a struggle to keep up and to do as well as possible. This has been clear, in biotechnology, from what Richard Jefferson and others have been saying about recent developments. It is also the case with the explosion of innovations with participatory methods which has been taking place recently in India, and to a lesser extent in other parts of the world.

One way of contrasting paradigms of development is between the blueprint and the learning process approaches. Most of us have been trained and socialised professionally to work on the left hand side, in the mode of blueprints. This is the side which carries the higher status and the greater professional respectability. Social scientists have often tried to work in the precise blueprint mode, by generating numbers through questionnaire surveys, and through stressing quantification. Blueprinting belongs to the dominant professions—engineering and economics

TABLE 1. *Development paradigms*

	Blueprint	Process
Point of Departure	Things	People
Goals	Predetermined (closed)	Evolving adaptive (open)
Keyword	Planning	Participation
Loans of decision-making	Centralised	Decentralised
Analytical assumptions	Reductionist	Systems, holistic
Methods, rules	Standardised Universal	Diverse Local
Technology for clients	Fixed package (table d'hôte)	Varied basket (a la carte)
Relationship with clients	Controlling Inducing "Motivating"	Enabling Supporting Empowering
Clients seen as	Beneficiaries	Actors
Outputs	Uniform Infrastructure	Diverse Competence

—and in many development agencies, such as the World Bank.

The top-down blueprint mode has its strengths. Engineers, quite properly, operate on that side: they have to if their bridges and other structures are not to fall down. This is also the mode Dr Ramachandran was talking about on the first day, when he mentioned the development and use of vaccines. Top-down blueprinting can work quite well when there is a stable or controllable and uniform receiving environment. Vaccinations work quite well because animal or human bodies are predictable environments homeostatically controlled within narrow tolerances. A standard input can then work reliably. Similarly, with Green Revolution agriculture, the environment could be controlled and modified—through irrigation, fertiliser and pesticides—to fit the genotype, the high-yielding variety.

In the past ten years, though, some of the limitations of this approach have become more evident, more and more development professionals have shifted their thinking, methods and behaviour to the righthand side, to the learning process. The World Bank has even published a book entitled *Putting People First*, edited by Michael Cernea, and shortly to reappear in a second edition. "People-centred development" is a phrase more

TABLE 2.

	Industrial and green revolution agriculture	The third (CDR) agriculture
Main locations	Industrialised north, Asian 'core' areas of irrigation	Rainfed tropics, Hinterland, hills, swamps, undulating land, drought and risk-prone
Farming systems relatively	Simple	Complex
Environmental variation relatively	Uniform	Diverse
Stability relatively	Low risk	Risky
Similarity of research station and farmers' conditions	High	Low
No. of scientists and extensionists per farming system	Many more	Many fewer
Farmers consulted about research priorities	Richer farmers sometimes	Rarely
Priorities for anti-poverty and production	IND: Reduce production GR: Maintain production	Raise and stabilise production
Current production as percentage of sustainable production	IND: Far too high GR: Near limit	Low
Applicability of TOT approaches	Fairly good in the past	Poor

and more heard.

Contrary to the popular view of science as complicated, it often has to simplify and standardise in order to study phenomena which are complex and diverse. The contrast here is between the reductionism of science, which separates out a few variables from a complex whole, and the holism of social and biological reality in which the system is much more than the sum of its separable parts. Scientific reductionism is manifestly powerful, but less so with the complex, diverse and risk-prone (CDR) agriculture of rainfed and undulating lands than with the simpler, more uniform and more controllable agriculture of flat and irrigated lands. We, as scientists, economists, or other professionals, tend to reduce complexity to measurable scales,

TABLE 3. *Transfer-of-technology and farmer-first compared*

	TOT	FF
Main objective	Transfer technology	Empower farmers
Analysis of needs and priorities by	Outsiders	Farmers assisted by outsiders
Transferred by outsiders to farmers	Precepts Messages Package of practices	Principles Methods Basket of choices
The 'Menu'	Fixed	A la carte
Farmers' behaviour	Act on precepts Adopt, adapt or reject package	Apply principles use methods Choose from basket Experiment
Outsiders' desired outcomes emphasise	Widespread adoption of package	Wider choices for farmers Farmers' enhanced adaptability
Main mode of extension	Agent-to-farmer	Farmer-to-farmer
Roles of extension agent	Teacher Trainer	Facilitator searcher for and provider of choice

often giving primacy to one single measure or criterion: for economists, an example is the poverty line, a single measure or income or consumption which contrasts with the many criteria of wellbeing of poor people themselves; for agricultural scientists, an example is productivity, meaning yield per unit area of land, which contrasts with the many other criteria of poor farmers in judging varieties and practices. Reductionist agricultural science produces a few varieties. In contrast, CDR farmers want many varieties. There is a difference of fit here between types of agriculture. There is first, industrial agriculture—of the first world and of plantations, and second Green Revolution agriculture. Industrial and Green Revolution farming systems have been simplified and standardised in response to mechanisation, high inputs and large and distant markets. In contrast, in the third, or CDR agriculture, farmers try to complicate and diversify their farming systems in order to increase total production and to reduce risk. Whereas large, rich farmers substitute capital for management, small poor farmers, especially where labour is abundant, substitute labour and management for capital. They introduce new enterprises, such as aquaculture, which multiply

the internal linkages of their farming systems. They adapt and adjust their practices continuously, their farming cannot be blueprinted; it is a dynamically adaptive process.

There is a contrast, too, between appropriate modes of research and extension for the different types of agriculture. Transfer-of-technology (TOT) fits least badly with industrial and Green Revolution agriculture. Its packages of practices have a chance because receiving environments can be better controlled and standardised and made similar to the research stations where the technology was developed. CDR agriculture, however, often has sharply different conditions to research stations, and farmers want a basket of choices which will enable them to be more nimble, agile and adaptable according to changing conditions.

The implications for research and extension are major, and are relevant for the idea of biocentres. In a "farmer-first" model, roles are reversed: farmers do much more of the analysis of their conditions and needs. Instead of receiving messages, they make demands, requesting extension and research for material, practices and principles. Extension and research then search to find what farmers need and want to try out. The contrast is, though, not absolute, and the choices are not "either-or" TOT and farmer first are complementary, but with CDR agriculture the balance of advantage shifts further towards farmer first.

In this context we have two methodological explosions, highly polarised. In biotechnology, we have the controlled conditions of the laboratory. In participatory appraisal, we have the complex and varied conditions of farming systems, especially of the poor people. With biotechnology, "they"—the unreached—are even further from those who make the decisions and generate the technology than they were in the past. As the technology has become "higher", it, and the scientists, have been further away—in style, perceptions, and priorities. Viewing these two worlds, of laboratory biotechnology, and of farmer participation, one can feel schizoid: it is easy to feel that they are incompatible. But this is also a challenge, to see what they have in common and whether and how they can be combined. That, I take it, is the enterprise we are engaged in. The question is whether from these two sets of methodologies we can create some sort of stable but also vigorous and versatile hybrid, and whether the biocentres and biovillages could provide the opportunity for that.

The new participatory approach and methods come from my work in UP, Bihar, Gujarat, Karnataka and Tamil Nadu. I mention this because the phenomena are not one-off; they are examples of what, improbable though it may seem, occurs again and again.

The first is that to enable rural people to express and analyse what they know requires changes in our behaviour as outsiders. Our behaviour and attitudes are crucial. When these are right, and the new methods are used, rural people demonstrate that they have much more knowledge, and more ability to express and analyse it, than we as outsiders have supposed. I have been astonished by what has been revealed in India over the past 15 months, and by the creativity and analytical ability of rural people, and how readily this is expressed when our behaviour changes and rapport is good.

The second point is that we have to assume that people can do something until proved otherwise. One after another, like falling dominoes, people have shown that in the right conditions, and when we show we are interested in and respect their knowledge and believe in their abilities, they can do what earlier we believed only we could do; and they can often do it better than we can. This applies to mapping, three-dimensional modelling, ranking, scoring, estimating, causal diagramming, interviewing, analysing and planning. Nor do there appear to be significant differences with visual diagrams between the capabilities of the literate and illiterate.

The participatory methods discussed and still being developed rapidly, fit a complex, diverse and risk-prone agriculture. Farmers are experts on their own farming systems. The more complex and risk-prone their farming systems, the more their comparative advantage vis-a-vis scientists. The question raised is whether these participatory methods can be combined with those of biotechnology.

Despite their contrasts, we can start by asking what they have in common.

First, they are both knowledge-intensive, but the knowledge is different, and is owned by different sorts of people. A major problem is a dominant-recessive characteristic, that the scientist's or biotechnologist's knowledge is dominant, and that of the farmer recessive. Reversing this, and ensuring free and egal-

itarian communication not just within each system, but between them, is the important thing.

A second characteristic in common is the rate of change. It is as though change itself has changed. In both biotechnology and participatory rural appraisal, the rate of invention of new methods appears exponential. Their similarity in style and culture is striking, and extends also to recent developments in business. On the first day, Umberto Colombo spoke of flexibility, open-endedness, and agility in small enterprise development in Italy. Much the same is being advocated for business in the USA. In his recent book *Thriving on Chaos* Tom Peters is referring to thriving by being able to keep up with and exploiting conditions which change rapidly and unpredictably. He advocates "pursue fast-paced innovation", "encourage pilots of everything", "learn to love change". Injunctions such as these for American business resonate with what is emerging in both biotechnology and in participatory rural appraisal.

The third similarity is the potential for empowering more people. Participatory appraisal passes the initiative, to the poor. With biotechnology, in a different way, there are impressive new potentials for empowerment of these people. Plant tolerance of the stress of difficult conditions, resistance, to pests, nitrogen-fixation, improved micro-organisms in animals' guts—these are attractive not least because they are self-sustaining. If incorporated genetically in a stable manner, they empower whoever has those seeds or animals, variously reducing risk and enhancing fertility, and doing so without reliance on purchased inputs which tends to disadvantage the poorer. The question is how the priority of these empowering technologies could be raised, and whether participatory appraisal can be adopted and developed by scientists to enable the unreached to identify their priorities as they see them.

Reversals of the normal are needed here. One reversal concerns which farmers we learn from and serve. We tend to interact with and serve those who are better off. Robert Herdt emphasises in his paper the importance, in terms of who benefits, of the choice of crops to work on. What may be easiest to do, as illustrated by Dr Prakash's example of tissue culture with bananas and potatoes may benefit the better off farmers who are more able to grow those crops rather than the poorer who are

less able to do so. Conversely, work on the crops of the poorer may serve them better.

Another question of reversals is whether we truly learn the priorities of poor people. We are so often wrong, even with better off farmers, as was shown in the example of 15 month bananas as against 9 month bananas. We are even more likely to be wrong with the poorer. So often when we assume that we know what they want and need. We do not know. The reversal of learning is, though, part of a worldwide trend.

Questions for biotechnology are also raised by the basket of choices approach. Tissue culture at first sounds like a Model T Ford approach. In Henry Ford's famous remark—the American public could have its model T Ford any colour it liked as long as it was black. Tissue culture similarly produces large numbers of the same genotype without diversity and choice. There are questions whether tissue culture can be used to multiply, not simplify, choice, and whether somaclonal variation has a part to play here. Stable material may be preferable for farmers, but they experiment so much, on a small scale, that they may be prepared to run risks even with material which is not stable. The issue is whether biotechnology can, in various ways, add to their repertoire, choices and adaptability.

The central question that follows from this discussion is whether, besides and beyond the blueprint and the learning process, there is a third paradigm, whether the new methods of biotechnology and of participatory appraisal can be linked and can fuse in practical approaches and methods which can be used in the real world by villages and scientists. One hopeful trend, is the prescriptions and philosophy for American business. Tom Peters' *Thriving on Chaos* contains "prescriptions for a world turned upside down" and talks of "becoming obsessed with listening". The advice also often fits reversals for the needs of CDR agriculture—"make sales and service forces into horoes", "delegate and decentralise information". Perhaps, worldwide, we have here a convergent evolution of a new paradigm of reversals, decentralisation and diversity.

This leads us to the proposals for biocentres and biovillages. Relating this to our earlier discussions, it is notable that the sites proposed are all, it would seem, in "third" CDR areas—the Nilgiris, the tribal villages in AP and HP, the UP Terai, and Ranchi.

This makes them especially appropriate for methdological innovation, since they represent the type of agriculture which normal science has had more difficulty in serving. Against this background, let me throw out five questions.

First, with biocentres and biovillages, could the identification of priorities be participatory, in processes in which farmers are the dominant actors? Can our attempt be to reach them to enable them to do their own analysis and to generate their own priorities, and then to inform us and make demands on us, so that we then search for, and work on things which could help them? This is a key and difficult reversal.

Second, can the approach be one of "baskets of choice", or of a "cafeteria", to increase farmers' repertoire, so that they can adapt and manage better in their difficult and unpredictable environments? So that instead of simplifying and standardising, as in the Green Revolution package approach, they can make their farming systems more complicated and diverse.

Third, can this initiative push the frontier of discovering what people can themselves do, of those activities we thought we had to do? This could be one of the most important contributions. Could it be explored and shown just how much people can do their own analysis and generate their own priorities for biotechnology, how much they can manage their own tissue culture or mist chambers, how much they can carry out their own local trials and experiments?

The fourth question concerns livelihood, security and population. The basic question comes up again and again as to who gains and who loses from changes which are introduced. To what extent is it possible not to destroy or diminish livelihoods but to enhance them? This can be asked not just for the young and educated, but also for the older and the illiterate, for women and for the landless. Is it possible that where there is a new introduction, or the exploitation of a new resource, that the benefits can be appropriated to poor people, as in the case of some aquaculture for prawns in Tamil Nadu?

Fifth, is it possible with these biocentres and biovillages to avoid the "Island of Salvation" syndrome—that is the treatment that is so special that everything works but lessons cannot be learnt, but what has been achieved can be repeated elsewhere in more normal conditions? Can the emphasis be on sustainability and spread, including spontaneous spread of parts and elements, of materials and methods, of what does well rather than on replication of the whole approach?

The biocentres and biovillages could contribute to reaching the unreached in many ways. But perhaps the most significant in the long-term, and the most easily overlooked, could be through the socialisation of scientists into participatory approaches. If the scientists engaged in these villages were able to set an example to others, it would be impressive. Because of the high status and visibility of this programme, other scientists would take their cues from it. In this respect, the challenge which faces the scientists is formidable but not insuperable. It is to overcome the polarisation between high technology and participation. To do this, and to achieve anything like an optimal balance, means to step down, to offset the dominance and prestige of our knowledge and methods, and to put their knowledge, analysis and priorities first. The challenge is not just to science; it is to scientists as people.

DISCUSSION

SWAMINATHAN:

Thank you very much for this very incisive and important analysis which we will come back to. May I now request Dr K.N. Raj to give his comments.

RAJ:

I have been listening the last three days and am fascinated by the range of issues. I am not sure whether I have anything particular to contribute but the central point of Dr Chambers intervention about the interaction necessary between the givers, so to say if new ideas of technology and the ultimate absorbers or takers, is certainly very central to the whole process and