REACHING THE UNREACHED: A PROBLEM OF PARADIGMS?

A Note and Questions for the Dialogue: New technologies:reaching the unreached. 1. Biotechnology, to be held near Madras, 22-26 January 1991

The images conjured up by the phrase "reaching the unreached" belong to the transfer-of-technology (TOT) paradigm. "We" have, or can produce, something, which we then want to pass on to "them", to their benefit. To do this well in agriculture or aquaculture we need to know three things: who "they" are; their location and conditions; and what they want and need.

Who they are and where they are not entirely straightforward questions: "the poorest billion in the world" includes many urban dwellers; the unreached are not necessarily the poorest - there are many very poor people in zones reached by green revolution technologies; and many who have been reached have not been served well by what has reached them.

For the purposes of this note, I will treat the unreached as the households whose livelihoods depend partly or entirely on what has been called the third, or complex, diverse and risk-prone (CDR), agriculture. This is the rainfed agriculture of hinterlands, of mountains and hills, of undulating plains, of wetlands. Directly and indirectly it supports well over a billion people. As the table suggests, it contrasts both with industrial (rich country and plantation) agriculture, and with green revolution (largely irrigated and well-watered) agriculture. Compared with industrial and green revolution agriculture, it is complex and diverse.

Advances with CDR agriculture also take a different form. Whereas with industrial and green revolution agriculture, what are considered advances have often come from simplifying and standardising farming systems (with mechanisation, monocultures, irrigation, fertilisers, pesticides etc), with CDR agriculture, reduced risk and higher production tend to come from complicating and diversifying farming systems. This complication and diversification have many elements - the creation, protection and exploitation of microenvironments which concentrate water, soils and nutrients; agroforestry of many sorts; multiple cropping in space and time; aquaculture; the addition of enterprises - root crops, fodder legumes, grasses and trees, smallstock etc; multispecies hedge management; horticultural trees and crops; [redacted] and so on. It is through enterprises and combinations like these that CDR farm families seek to reduce risk and increase food production and incomes by complicating their farming systems. Instead of converging on a standard model, they diverge into diversity. Instead of the Model T paradigm of the green revolution ("any colour as long as it is black", any variety as long as it is IR8 and packaged), the third agriculture to a Toyota paradigm (each car is different, you can choose what fits your needs).

The research and extension paradigm for this third, CDR, agriculture differs from that which has scored so many successes with the first (industrial) and second (green revolution) agricultures. With them, the single HYV and the package of practices can fit an environment which can be controlled and managed, to make E fit G, as on the research station; in contrast, the third agriculture requires many varieties, presenting farm families with a basket of choices, to find Gs to fit Es, where many of the Es are not found on the research station. In these conditions, the big single variety breakthroughs of the green revolution are unlikely. Instead, gains are made more by widespread availability to farmers of a range of genetic material and practices which they can tr out in their own experiments, and adapt and develop to fit their far systems.

Are there features inherent in the different forms of biotechnology which tend to produce uniform model T packages rather than diverse Toyota choices? Or vice versa?

The contrast between the paradigms could be overdrawn, but it does highlight a reality which requires new approaches. The natural tendency for scientists has been to transfer their own research and extension model from work with irrigated green revolution conditions, to work with rainfed CDR conditions; and by and large that transfer, seeking high-yielding packages which will do well over wide areas, has not worked.

If this analysis is correct, the challenge to agricultural science is formidable. Given complexity, diversity and risk, the balance of advantage in analysis of farming systems shifts from scientists to farmers. So the third question, concerning what farm families want and need, is best answered by them. The technology needed by "us", is how to interact with them to enhance their analysis and identification of what they want and need. Unfortunately, that "soft" technology has received little attention. ICRISAT, for example, has perhaps 180 senior scientists and yet not a single social (sociologist or social anthropologist) scientist. Talking to farmers is like teaching and management; we assume that we know how to do it without having to learn. But in each case the skill or art is partly a personal trait, and partly an aptitude which can be taught and learnt. Yet the technology for scientist-farmer interaction is but poorly developed. Technology to enable and support farmers' own analysis and specification of priorities, may be the biggest lacuna in agricultural science today.

The implications for biotechnology research are profound. Currently, the literature reads as though priorities are determined by scientists, not farmers; as though the crops that receive most attention are the main line food crops (maize, wheat, rice, potatoes, sorghum...); and as though the problem is transferring technologies from the shelf to farmers' ground. The biological technology is in danger of being a given, to be transferred in the TOT mode.

In attempting to reach the unreached of CDR agriculture, then, questions to be asked include:

* how can the priorities and needs of many dispersed and diverse farming families and farming systems be identified? Is the answer by empowering them to do the analysis and identification?

* how can those diverse priorities and needs be met? Is the answer through searching for varieties, principles, practices, and making these available for farmers to experiment with? And by generating diverse genetic material, and filling the basket with it?

For biotechnology, these questions can be sharpened:

* how can the priorities and needs of farm families be learnt about and acted on by scientists? Is the answer - through direct personal interaction in the field with farm families, using the approach and methods variously described as participatory agricultural research and participatory rural appraisal? But are scientists engaged in biotechnology research precisely least likely to meet, or even to wish to meet, farm families, and to listen to and learn from them? And are CDR agriculture's farm families precisely those least likely to be met and learnt from?

* having learnt the priorities and needs, what biotechnologies can best provide farm families with material and with baskets of choice to meet them?

There are dangers of assuming that we know what "their" priorities are. Careful probing can reveal surprises. But for the purposes of this dialogue, some working assumptions have to be and can be made - let us say, that CDR agriculuture's farm families tend to seek to reduce risk, to ensure food supplies, and to increase their incomes. Further, it can be assumed that they have only limited access to purchased inputs. This implies priority for technology which is sustainable with low or zero inputs.

Do priorities and opportunities for biotechnology for the third agriculture include, then, for crops and trees:

* genetic engineering of pest and disease resistance (reducing risk, enhancing yield)

* ditto for tolerance of bad conditions, including drought, salinity, waterlogging, etc

* ditto for nutrient enhancement, especially nitrogen fixation

* somaclonal variation to add to the choice in the basket

* tissue culture for rapid propagation with a range of variance, but caution if tissue culture leads to widespread uniformity

* search for, finding, and then through tissue culture rapidly propagating and disseminating, a wide variety of crops besides the main cereals and tubers?

For invertebrates, fish and mammals, are there similar opportunities for increasing pest and disease resistance, enhancing productivity, and adding to diversity?

Does the third agriculture/basket of choices/Toyota paradigm, contrasted with the green revolution/ package of practices/Model T paradigm, give rise in the minds of participants in this dialogue to other needs and opportunities?

And what are the implications for organisation of research, the setting of priorities, and the training, incentives and behaviour of scientists?

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Three types of agriculture summarized

	Industrial	*Green Revolution*	*Third/'CDR'*
Main locations	Industrialized countries and specialized enclaves in the Third World	Irrigated and stable rainfall, high potential areas in the Third World	Rainfed areas, hinterlands, most of sub-Saharan Africa, etc
Main climatic zone	Temperate	Tropical	Tropical
Major type of farmer	Highly capitalized family farms and plantations	Large and small farmers	Small and poor farm households
Use of purchased inputs	Very high	High	Low
Farming system, relatively	Simple	Simple	Complex
Environmental diversity, relatively	Uniform	Uniform	Diverse
Production stability	Moderate risk	Moderate risk	High risk
Current production as percentage of sustainable production	Far too high	Near the limit	Low
Priority for production	Reduce production	Maintain production	Raise production

CDR: complex, diverse and risk-prone

A2 TWO PARADIGMS

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	À 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