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FROM GREEN REVOLUTION TO GREEN REVERSALS

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PROFESSIONALISM & CHANGE: TRANSFER-OF-TECHNOLOGY & FARMER-FIRST

It is not only in politics (in the USSR, in Eastern Europe, in South Africa, in Nepal...) but also in professionalism, worldwide, that we are in a period of accelerating and ever more radical change. Change is not what it was : as Charles Handy (1990) has recently argued, change itself has changed. In rural development, all professional activities can be seen in this challenging context. In all domains, conservative professionalism is increasingly challenging itself. Self-doubt, questioning basic assumptions, and searching for new and better approaches and methods have become the order of the day.

In these reappraisals, the normal professionalism and normal bureaucracy which served in the past are now often criticized as too centralized, top-down, standardizing, and designed to disseminate blueprints. In agricultural research and extension, the term "transfer-of-technology" (ToT) has been used to describe this mode. ToT here refers to the classic model of the green revolution, with the identification of research priorities by scientists, the development of technology on research stations and in laboratories, and then its transfer through extension to farmers. In contrast, many advantages are now seen in approaches which are decentralized, bottom-up, and involve a flexible learning process. In agricultural research and extension, such approaches and methods have been described as "farmer-first" (FF). The reference is to approaches in which farmers participate in analysis and in technology development, and carry out much of it themselves.

The rationale for this shift can be understood in terms of the three types of agriculture identified by the Brundtland Commission (WCED 1987, 120-122). These are industrial, green revolution (GR) and the third or CDR (complex, diverse and risk-prone) mainly rainfed agriculture. (See Table 1.)

TABLE 1

Three types of agriculture summarized

	Industrial	Green Revolution	Third/'CDR'
Main locations	Industrialized countries and specialized enclaves in the Third World	Irrigated & stable rain-fall, 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 & small farmers	Small & 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

In India, as elsewhere, CDR agriculture has in the past decade become a higher and higher priority, especially in Eastern India. ToT, evolved in and for the relatively controlled and uniform farming systems of industrial and green revolution agriculture, has had the effect, through its packages and mechanization, of standardizing and simplifying farming systems. It has to its credit the well-known successes of the green revolution in Northwest India. But attempts to use ToT research and extension methods in the more diverse, complex and risk-prone environments, often rainfed, of the third agriculture, worldwide, have often led to frustration. The first reflex has been to intensify efforts, doing more of the same. But trying harder can be "brickwallitis" (If you bash your head against a brick wall and it does not fall down, bash harder), when the need is to question the basic approach itself, and develop a new complementary approach and methods.

The paradigm evolved for and within the third agriculture is, then, different. Farmer first (FF) is used as shorthand to encompass a variety of labels which includes farmer participatory research (Farrington and Martin 1988; Experimental Agriculture 1988; Farrington 1989). There is already a large literature (see e.g. Amanor 1989 who lists 340 sources, and references in Chambers, Pacey and Thrupp 1989).

The contrast between ToT and FF is not absolute. The two paradigms are complementary, not alternative. Their balance of advantage, though, varies by location and activity. For GR agriculture, ToT can still be relatively effective, even though it has run into diminishing returns. For CDR agriculture, FF approaches which allow and encourage diversity and complexity fit better, as will be evident from other presentations at this workshop.

There are, though, many institutional and personal obstacles to the development and adoption of the FF approach. Not least, ToT is enshrined in textbooks and curricula, is taught in universities, and is perhaps doubted by only a minority of university staff; and it is personally gratifying to professionals to believe that their knowledge counts, and that farmers are ignorant. So ToT remains alive and well, deeply embedded in the textbooks, syllabi, procedures and ways of thinking of many agricultural scientists and extensionists, and reproduced through the educational and training process.

Rather than consider the institutional implications of change, which are being covered in other papers to this workshop. I shall pick on three clusters of opportunities. The first concerns "green reversals"; the second, methodology, in the form of participatory rural appraisal; and the third, personal change.

GREEN REVERSALS: FROM HENRY FORD TO TOYOTA

I mention Henry Ford with some trepidation, especially at this workshop, for fear of confusion with the Ford Foundation, which stands for something very different indeed. Henry Ford was a master of the mass production conveyor belt which produced a standard package: the American public, he said, could have its Model T Ford automobile any colour it liked as long as it was black. In contrast, every car that comes off today's Toyota line is different, tailored precisely to the choices of colour, accessories, and options of a particular customer to whom it will be delivered.

The green revolution was Henry Fordist: it produced model Ts with little choice, very good as far as they went, in one direction. In contrast, green reversals make available Toyotas with much more choice, able to go much further, in many directions.

The term "reversal" describes the fact, evident from a scrutiny of Table 2, that the normal professional practice is reversed or stood on its head. The opposite of the "normal" is done. The adjective "green" is justified, because with the third of CDR agriculture, the reversal is needed for the greenness to be achieved. These reversals have been described elsewhere (see e.g. Chambers and Ghildyal 1985). Roles are reversed: it is farmers, instead of scientists, who do most of the analysis, choice and experimenting. Scientists' roles are to generate a range of choices, to search for and supply what farmers want and need, and to support farmers' own experiments and trials. There is also a basic reversal in supply and demand: the green revolution's supply-push is replaced by the green reversal of demand-pull. "Green reversals" is one way of describing some of the innovations in Eastern India which will be presented to this workshop.

One basic aspect of reversals concerns the relationship of genotype (G) and environment (E). The green revolution was based on a standard package for uniform, simple, and controllable environments; E was to fit G. With a green reversal, there is no package, but a basket of choices for farmers to select from for their diverse, complex and risk-prone environments; Gs are chosen to fit E. (See Figure-1)

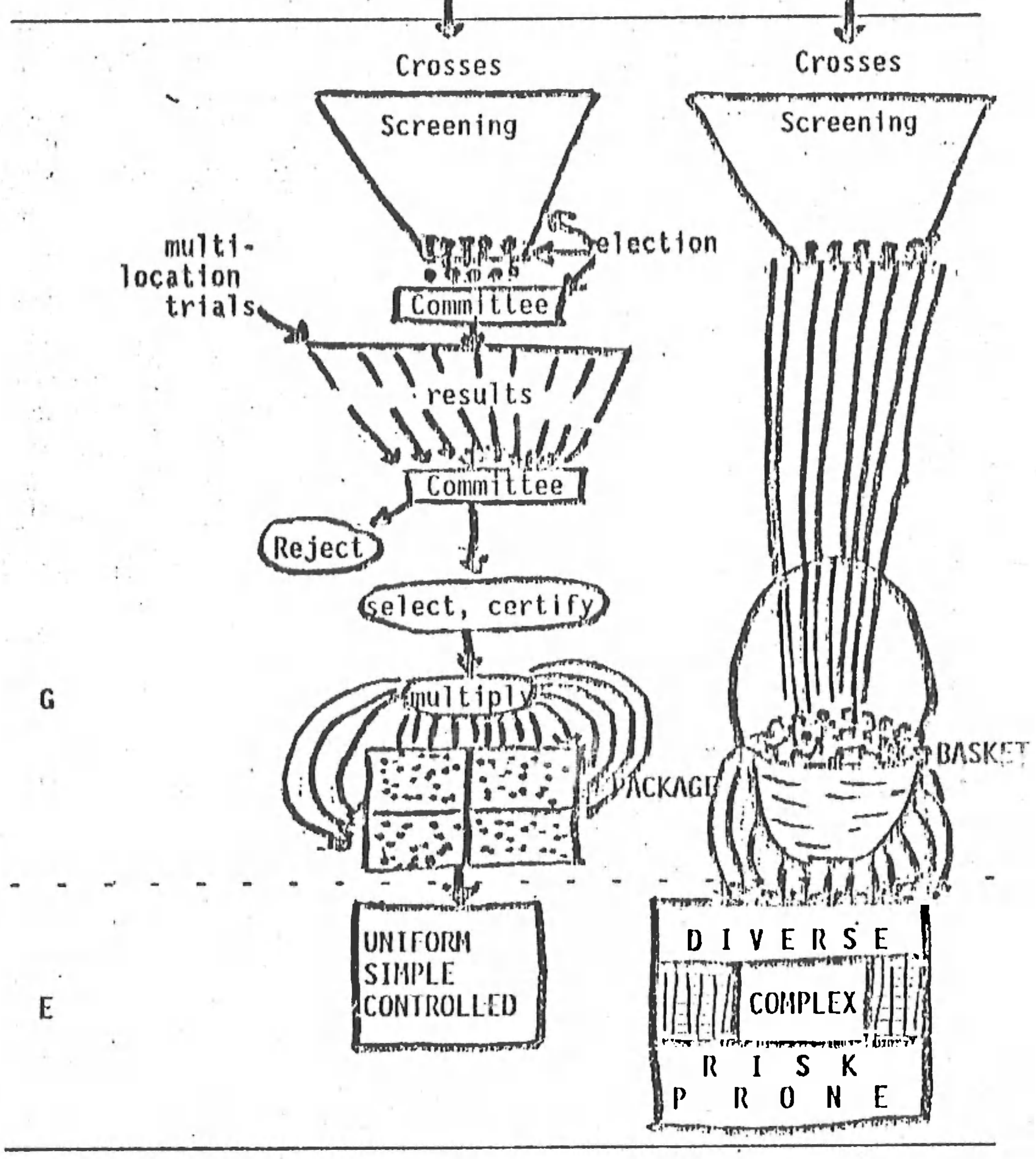
TABLE 2

From Green Revolution to Green Reversals

TITLE	GREEN REVOLUTION	GREEN REVERSALS
MODE	ToT (Transfer-of-technology)	FF (Farmer first)
Main Objectives	Generate and transfer technology	Enhance farmers' choices and capabilities
Diagnosis by	Scientists	Farmers assisted by scientists
Main location of technology development	Research station and laboratory	Farmers' fields
What is passed to farmers	Precepts Messages Package of practices	Principles Methods Basket of choices
The Menu	Fixed table d' hôte	à la carte
Process driven by	Standardized supply	Diverse demand
Industrial parallel	Henry Ford	Toyota
Suitable for environments which are	Uniform Simple Controllable	Diverse Complex Risk-prone

FIGURE 1
STRATEGIES FOR BREEDING, SELECTION AND SPREAD

	ToT	FF
Type of Ag	Ind. and GR	Third, CDR
Analysis and criteria of	Scientists	Farmers with scientists



STRATEGY	E MADE TO FIT G	G CHOSEN TO FIT Es
MENU	FIXED, TABLE D'HôTE	'A LA CARTE
INDUSTRIAL PARALLEL	HENRY FORD SUPPLY PUSH	TOYOTA DEMAND PULL

This basic reversal raises many institutional and methodological issues, not least in seed-breeding. A major development here has been the pioneering work over a number of years by the Narendra Dev University of Science and Technology near Faizabad in Eastern U.P. The normal procedure of crossing, screening, submission, multi-location testing, selection, certification, and multiplication can be seen as Henry Fordist, belonging to a era of standard batch production. Diversity is eliminated. Breeders submit only a small proportion of the genetic material they have generated and which remains after screening; this further reduced in selection for multi-location trials, by the trials themselves, and sometimes after subsequent mini-kit trials. By the time the Central Variety Release Committee has made it selections, only a minuscule proportion of the diverse material originally available is accepted and becomes accessible to farmers.

The green reversal pioneered by scientists at NDUAT (Maurya et al 1988; Maurya 1989) entails analysis of genetic material grown by farmers, matching the characteristics of farmers' varieties with those of pre-release breeding lines available from on-station programmes, distribution of small batches of improved material to farmers for trials under their own management, and then evaluation by farmers. By short-circuiting procedures in this way, at least nine distinctly promising lines were identified by farmers within a much shorter period than normally necessary to produce only one standard release; moreover, farmers' own evaluation guaranteed adoption.

The rationale underlying this approach is that

"in rainfed conditions farmers' goals, constraints and agro-ecological conditions are very heterogeneous. It would be a very expensive process for researchers to become as fully acquainted with them as farmers are, and impossible to replicate them on-station. On-farm trials managed by farmers are therefore crucial to the screening process, and the approach, by recognizing the need for diverse varieties within villages, and even within farms, reverses breeders' conventional aspirations to supply a single variety to as wide a "recommendation domain" as possible" (ibid 318-319).

In other professions and disciplines, removing restrictions, encouraging diversity, and widening the choices available, are increasingly seen as ways of helping the poor (Chambers, Saxena and Shah 1989). For poor rainfed farmers, it would seem that a liberalization or green reversal of Henry Fordist variety selection procedures, encouraging breeders to follow the NDUAT practice, working closely with farmers, might bring big benefits by filling up the basket of choices presented to rainfed farmers, giving them a Toyota-like range of options, and sharply increasingly the adoption rate of new technology.

PARTICIPATORY RURAL APPRAISAL (PRA)

During the past year in India, there has been an explosion of innovation in the approach and methods of what has come to be known as participatory rural appraisal (PRA) (MYRADA 1990). Developments are currently so rapid that it is difficult to keep abreast of them. PRA is a development of rapid rural appraisal, including agro-ecosystems analysis (Conway 1985). It is part of and overlaps with some of the approaches reported on at this workshop.

In PRA, rural people do much of the investigation and analysis themselves, including quantification, ranking, diagramming, transects, mapping, modelling, seasonal analysis, and social, economic and institutional analysis. Pioneers include James Mascarenhas, Vidya Ramachandran and Premkumar of MYRADA, based in Bangalore, Sam Joseph of Action Aid, and Parmesh Shah of Aga Khan Rural Support Programme in Gujarat. More Government organizations have requested training than can be served by the very few competent trainers. Although PRA is being increasingly used by FSR practitioners in eastern India (Lightfoot et al. 1989a), many of the potential applications in agriculture are yet to be realized.

Preliminary findings are that rural people, whether literate or illiterate, have a far greater capacity to map, diagram, model, quantify, rank and analyze than professionals have believed or know. What has been missing, it seems, is the approach and methods to enable them to express and develop these capacities. Even those predisposed to recognize the knowledge, wisdom and skill of many farmers and other rural people - women and men - can be surprised (as I have been) at the capabilities, creativity and analytical capacity which have been expressed through PRA. Through many decades, it seems, we (professional outsiders) have failed to behave in ways, or to provide the conditions and materials, which allow and enable those capabilities to be manifest.

The PRA approach requires reversals in the fullest sense, including a desire to learn from and with rural people, and a self-restraint which abjures lecturing, interrupting, or "knowing best". PRA has worked well where a team camps in a village, shares food with villagers, and facilitates villagers' own analysis. However, the methods can be used without this full approach, especially where good rapport has already been established. All this suggests that if the approach and methods can be truly participatory, rural people, and especially farm families, have a greater capacity to do their own farming systems analysis than we have supposed. And if they do it, without all the knowledge having to be gathered into "our" system of knowledge and analyzed by "us", there are five potential advantaged.

i. farmers' priorities are expressed

ii. much that is infeasible is screened out

iii. more farming systems can be served

iv. farmers will be encouraged to make demands on the extension and research system, providing the basis for reversals including search by agricultural professionals on their behalf for what they want and need

v. farmers who wish to experiment and try out innovations will identify themselves.

Four contributing sets of methods can be mentioned by way of illustration:

1. **Participatory mapping and modelling**

In other countries (including Ethiopia, Kenya, Nepal, New Zealand, Papua New Guinea, and the United States) aerial photographs (usually at 1:5000) are used in a participatory mode for agro-ecological mapping. Recently in Nepal, illiterate farmers not only had no difficulty in interpreting aerial photographs, but corrected them by bringing them up to date, noticing for example a missing house that had been built since the photograph had been taken. Since aerial photographs are not available in India, participatory mapping and modelling (PMM) have been evolved. Interestingly they have shown strengths and advantages in their own right. Even if aerial photographs now became available, PMM would still be desirable.

Agro-ecosystem mapping has been an established activity for some years. A recent state of the art manual has been based on experience in Eastern India (Lightfoot et al 1989a). What is now striking is how competently and enthusiastically farmers can themselves map and model to show natural resources and other features of their environments (see e.g. Gupta et al 1989).

In recent PMM, especially that facilitated by James Mascarenhas and Premkumar of MYRADA, materials provided and used have included coloured chalks and rangoli powders. Participants have also often found their own additional or alternative materials. Villagers have made three dimensional models of watersheds, and these have provided a focus and basis for discussion of watershed development and management. In some cases, villagers have made models which show conditions 50 years ago, conditions now, conditions in 20 years time without and then with action taken now. Similarly, maps have been drawn either direct onto paper or, usually better, on the ground or on large flat surfaces, and coloured to represent different features and categories of land.

In a recent example in Haryana, villagers classified forest land into four conditions (from good to degraded) as against the Forest Department's three categories. In north Bihar, farmers and fishermen accurately mapped on the ground an area of 40 km^2 of chaur land, and subsequent checking confirmed the accuracy of their map (pers.comm. K.C. John). In Andhra Pradesh, mapping direct onto paper, a village natural resources map was made by a group of farmers in less than half and hour, showing all the agricultural wells, and differentiating between them according to the quality of the water supply. In a recent exercise near Durgapur in West Bengal, staff of the HFC Rainfed Project facilitated no less than 10 participatory maps simultaneously in a large village and a hamlet. Many other examples could now be given. Interestingly, no map of which I am aware has yet had north at the top. With true participation, it emerges that villagers see things different ways round from outsiders, and that "our" maps can unnecessarily confuse them.

2. Quantification, including seasonal analysis

Seeds, fruits, stones, goat droppings and lengths of stick have been used for estimating and quantifying. Seasonal analysis by women and by men has now been diagrammed many times using large stones for the months, and either seeds or other counters for aspects such as food availability, labour requirement in agriculture, income, expenditure, indebtedness, rainfall, disease, and other dimensions, by month. In Nepal, two farmers used seeds to show the number of days of rainfall expected by month, and then sticks separately to show the total amount of rain that fell in each month, since this was not in proportion to the number of days of rain. They then went on to indicate how one year in five followed another pattern. Nepalese scientists thought such information would be useful to identify local patterns of rainfall, rainguage stations being scattered and local variation being high.

3. Ranking

Several methods of participatory ranking are now well tested, including pairwise comparisons and direct matrix ranking (see RRA Notes No 1). These have the virtue of forcing the outsider to elicit the criteria and judgements of rural people rather than imposing them from outside. These methods should be good for training scientists and extension staff in learning from farmers. They can also be adapted to enable farmers to make choices between alternatives, or to say how much they would like of each of a number of alternatives (e.g. horticultural trees).

Wealth ranking (Grandin 1988) in which a respondent groups villagers according to wealth and poverty (or it could be according to land size, farming system etc) is another participatory ranking method with wide application.

4. Analytical diagramming

Participatory analytical diagramming is perhaps the most surprising discovery. Farmers have analyzed problems and causal linkages using systems diagramming, and then used the diagrams to discuss and identify experimental interventions to deal with a problem (e.g. Lightfoot et al 1989b). In another example, in a recent field practical of a workshop held at the Narendra Dev University of Agriculture and Technology, a farmer who had started rice/fish farming used diagrams on the ground to demonstrate how and why he intended to introduce six simultaneous changes in the system in his second year - 3 in layout, one in the duration of paddy, one in the duration of fish, and one by growing wheat on the residual moisture. He also diagrammed nutrient flows on his farm as these linked the rice, fish, wheat, and livestock.

The potential of such analytical diagramming is yet to be known. At the least, it deserves early exploration.

Conclusion

PRA has much more to it than these four types of activities. Among many others are transects, group interviews and discussions, negotiations and agreements, and identifying and ranking options for action. All these methods have the advantage of being popular and of generating and sharing much information quickly. They are often fun, besides being useful. Applying the principles of optimal ignorance, and of triangulation (cross-checking with different methods and sources), they promise cost-effective ways of interacting with and learning from and with rural people. In the sense that they shift the initiative to villagers and farmers, they are green reversals of prime potential.

FARMER AND SCIENTIST FACE-TO-FACE

In green reversals, the most crucial, least recognized, and weakest link is the interaction of farmer and scientist face-to-face. In PRA exercises, we have found again and again that the knowledge and creativity of rural people is smothered and buried by outsiders' dominating demeanour and speech. Rural people appear ignorant because they are repeatedly "put down" by outsiders. It is only when outsiders shut up, and sit down, listen and learn, as genuinely interested students, and when they provide the right conditions and materials, that the knowledge and analytical abilities of rural people can be expressed.

The implication is that personal interaction and learning, enabling self-insight, should be a part in all teaching and training of agricultural scientists and extensionists. Unfortunately, much training in the ToT mode teaches attitudes of superiority: "they are the problems and we are the solution;" they are ignorant and we know. But these views have been changing fast. Listening and learning from farmers is now part of the rhetoric; to make it personal reality is the most important and difficult reversal of all.

Having pioneered the green revolution, will India now pioneer green reversals ?

APPENDIX: REFERENCES AND SOME SOURCES

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