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# Developing Technologies for the Rural Poor

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# I. INTRODUCTION

This paper is a selective review of case studies of where government and non-government organisations (NGOs) have been involved in rural/agricultural technology programmes specifically directed at benefiting the rural poor. The purpose of the review is to try to identify specific institutional features which characterise organisations and agencies which appear to have benefited poor client groups in the short and long run. It is not a 'state-of-the-art' review and does not claim to give a representative coverage of relevant literature. Rather, it is a presentation of case study material aimed at illustrating and supporting what are felt to be the important institutional issues concerning the generation and diffusion of rural/agricultural technology.

The report is structured into five main technology areas, namely: crops, irrigation, post-harvest, draught animal technologies and livestock. Within each of these, case studies are divided into different types of institution, namely: universities and research organisations, government agricultural departments, non-governmental organisations, international development agencies, and the 'informal' sector. In the last category, situations are described where individual local artisans and farmers have, through purposive selection, trial and error, developed useful technologies without the major involvement of a formal agency.

As one might expect, the distinction between types of agencies becomes blurred at the edges. In addition, there is a very real problem of how to characterise and draw lessons from situations where two types of agencies interact. For example, it is open to subjective judgement as to whether the recent development of 'successful' types of on-farm research methods is seen as primarily a result of the inputs of international agricultural research institutes, or mainly as the result of the help and other inputs given to international scientists by local scientists in developing countries. The implications of this type of analysis are important

as they can affect where and how funds might be best allocated in the future.

In each case study, the focus is on lessons which relate to important issues. This could not have been done universally across the board because, quite frequently, the required information was not available.

Further, some of the information must be treated with caution, as, understandably, agencies often publish information which portrays themselves in a favourable light. The issues looked at include: the identification of intended poor client groups; the dynamic process by which agencies went about designing, implementing, monitoring and changing activities over time; the short term effects of agency programmes on the intended client groups and on other poor people; and the long term effects on strengthening local poverty focused research and extension capabilities.

The paper is concerned with looking at those programmes where the agency has defined its clients as some group of poor people. These may be poor small farmers, poor rural women, malnourished children, landless labourers, etc. Some agencies call these programmes 'target' group programmes. However, it is preferable to think of 'client' groups rather than 'target' groups. The term 'client' is a more neutral professional term which does not carry with it some of the top-down, elitist connotations sometimes associated with the 'target' approach. For example, when an agency is targeting resources at the poor there is often an implicit assertion that 'we' know what your problems are, and now we are delivering the solution.

As so many poverty programmes have missed their 'target' it is clear that agencies should be less confident that they are able to correctly diagnose the problems of the poor and effectively deliver the goods and services needed.

This is more than just a matter of semantics. It reflects a whole way of thinking about technology generation and diffusion. The conclusions that project staff drew at the end of the first year of the Caqueza Project illustrate a change from a target approach to a more humble client approach:

> . . . field work and the increased contact with farmers allowed the project staff to identify several unforeseen areas of activity that, if neglected, appeared likely to substantially limit the

project's progress. Given these circumstances, they requested a substantial increase in staff for 1972. The old extension approach that considered the communication of the new technology to farmers as the only activity required was being forgotten and being replaced by the idea that more had to be known about the farmers' present production system before anything could be done about changing it. But agronomic knowledge alone was not enough; socio-economic knowledge was required as well. This was a year of observing the requirements for rural development to occur. The project staff began to comprehend that no surefire methodology existed, and that a long process of trial and error lay ahead of them.[1]

Sections II to VI of the paper contain the case studies by major technology area. Each case study ends with a summary of the major issues raised. General conclusions derived from the review are presented in Section VII.

## II. CROPS

### A. UNIVERSITIES AND RESEARCH ORGANISATIONS

#### 1. CIMMYT (International Maize and Wheat Improvement Centre), Mexico and Kenya.

Kenya's 4th Five-Year Development Plan contains the observation that:

> Research must be of increasing relevance to the farmer's situation. This includes not only the physical environment that confronts him, but also the socio-economic setting of his farm activities.[2]

This statement reflects the concern that CIMMYT had expressed three years earlier when they made their commitment with the Kenyan Agricultural Research Services to Farming Systems Research (FSR). Although not restricted to poor small farmer situations, applications of FSR had been applied primarily to the problems of small farmers. Briefly, the FSR perspective is one that embodies the following characteristics:

(1) Farming systems research views the farm or production unit and the rural household or consumption unit – which in the case of small farmers are often synonymous – in a comprehensive manner. FSR also recognises the interdependencies and inter-relationships between the natural and human environments. The research process devotes explicit attention to the goals of the whole farm/rural household and the constraints on the achievement of these goals.

(2) Priorities for research reflect the holistic perspective of the whole farm/rural household and the natural and human environments.

(3) Research on a sub-system can be considered part of the FSR process if the connections with other sub-systems are recognised and accounted for.

(4) Farming systems research is evaluated in terms of individual sub-systems and the farming system as a whole.[3]

CIMMYT is thus concerned with the development of a technology[4] (a combination of all management practices for producing or storing a given crop or crop mixture) which is (a) appropriate to the circumstances of the farmer client group, and (b) helps to meet the national policy goals of the government. Therefore it attempts to reconcile local and national concerns to enable planning of effective research and development programmes.

Four collaborative regional programmes promoting FSR procedures have been established since 1976 with the funding of UNDP. The Eastern African Economics Programme was initially to focus on Kenya, Ethiopia, Uganda, Tanzania, Zambia and Malawi. Two examples of FSR in Kenya demonstrate the processes of this approach and problems revealed by it:

(1) Exploratory surveys of farmers growing intercropped maize and beans in Eastern Kenya threw new light on the interpretation of experiments in alternative mixture patterns. The surveys identified an acute labour shortage during crop establishment and showed that returns to labour required to establish the crop mixture would be a key criterion in appraising experimental results.

Recommended planting patterns for maize/bean mixtures require five times more planting labour than the simulated farmer pattern which gave almost four times the return to the planting labour used. In the farming systems of target groups growing maize/bean mixtures, which have a short rainy season and where land is not limited, there are often intense labour peaks at the time of crop establishment. For such client groups, return to seasonal peak labour used may be a more appropriate criterion than return per unit area in comparing results from experimental treatments.

(2) Exploratory and Verification Survey work was carried out in an area of Western Kenya with high population density and an acute scarcity of land. The results revealed a marked interaction between crop and livestock enterprises in the use of crop residues as byproducts for feeding local animals kept for milk ... The dominance of maize as a source of cattle feed,

both green and dry material, led to proposals for two adaptive experimental programmes which were designed to examine:

(a) What increase in maize plant population would be possible so that fodder production could increase without penalising grain yields, in both the long and short rains, and

(b) The effects of alternative timing of picking the leaves and tops of maize on grain and fodder yields.

The second major leg of programme strategy was to build up the credibility of the Farm Economist with technical researchers, particularly agronomists. Here the programme has had limited success. Many of the problems encountered in establishing a close working relationship were features of the research organisation, particularly the strong compartmentalisation, upheld by everything from disciplinary loyalty to parallel compartmentalisation in the layout of government estimates and fund votes.[5]

Several important issues are exposed here.

There is a need to place a technological solution in the production environment for which it has been designed, i.e. farm level research is vital in the development and evaluation of the appropriateness of a technology. From the first example researchers learned that labour constraints were as much a pertinent issue to the cropping patterns as the physiological mixture. The logical progression in the articulation of this approach is then that the group for whom the technology is being developed must be clearly identified (a) to determine what is needed, and (b) to enable an evaluation of the impact of the proposed technology on that particular group. A clear definition of the intended client and beneficiary group will also assist researchers and field workers by giving them a point of reference in the monitoring of programmes.

In Zambia it was the small farmer that administrators identified as the client group for CIMMYT's FSR procedures. Partly due to the institutional problems experienced in Kenya a two level hierarchy – Commodity Research Teams and Adaptive Research Teams – was established, trying to train people from the start in this interdisciplinary approach.

This acknowledgement of the interaction of the different variables in a farming system highlights the structural and

institutional problems of FSR, such as:

(a) the apparent difficulty of introducing the economist into an area previously dominated by the technical scientist, and

(b) the increasing emphasis placed on the roles played by the agronomist and the economist, who were 'perceived traditionally as playing service roles to disciplinary researchers' (Collinson, 1982). In the words of the same author 'The establishment feels threatened and the social scientist, seen as the intruder, is rejected.'[6]

There have been attempts to establish FSR procedures throughout East, Central and Southern Africa. However, there generally appears to be a lack of institutional 'acceptance' of the methodology, i.e. that FSR can reveal key areas previously undetected and of importance to the kind of technology that the technical scientist is developing for a specific client group. In concluding his analysis of FSR in Africa Collinson states:

> Lessons have also been learned from working with national research services. The most important is the recognition of the need for a flexible and pragmatic approach to different institutional situations and to the personalities involved in each situation. A major strategy is to focus on research services where there is already a strong awareness that research relevance is a problem. Within such establishments, if authority is strong, it may be helpful to introduce FSR procedures. Where direction is weak or conservative or where organisation is poor, new procedures can be seen as an added source of confusion – a nuisance. In such circumstances, only a bottom-up approach, working through the station and with individual scientists, seems feasible. Ideally, top-down authority and a bottom-up approach working through individual researchers can be complementary.
>
> A clear distinction has emerged between technical and adaptive research. Technical research is the solution of technical problems on research stations organised along disciplinary and commodity lines. Adaptive research is a selection and testing, from the range of potentially relevant technical solutions, of a partial or whole solution to a particular problem that has been established as a priority by a target group of farmers. A revised implementation strategy then is to establish adaptive

on-farm research teams, whose members build up their experience together, drawing on both the existing body of knowledge and on older disciplinary oriented specialists for potential solutions to identified systems problems. Once established, adaptive teams begin to channel unsolved technical problems back to the specialists. This process continues until problems identified on farms preoccupy both adaptive and technical researcher in the research hierarchy.[7]

A programme to develop on-farm research methods with a farming systems perspective (OFR/FSR) evolved in Mexico in the mid-late 1960s.[8] The programme was stimulated by the findings that although new seed varieties and practices were known to give higher yields the rate of adoption among farmers was actually very low (Perrin and Winkelmann, 1976). Partly motivated by this fact and partly by a recognition that all over the world the small farmer was suffering from, if not decreasing, then at least static, living standards, the Rockefeller Foundation in collaboration with CIMMYT and Mexico's Graduate School of Agriculture, set out to design a new programme. Plan Puebla, conceived of as a 'demonstration' rather than 'research' project (Redclift, n. d.) set out to solve the development problems – food shortages and low income in agriculture. However, although these problems were to some extent solved, the conception of the project as being outside the parameters of 'research' had to change. Institutionally it became undeniably obvious that successful technological adoption was unlikely to take place without some adaptive research. That this was done informally by the farmers themselves articulates a lesson that researchers and programme planners cannot ignore.

The client group of Plan Puebla was the traditional, resource-poor peasant or smallholder; the technology was to 'obtain massive increases in yield of the basic crop' (maize) (CIMMYT, 1969). The organisation featured coordinated efforts in agronomy, communications and evaluation, and the methodology, bearing the hallmark of FSR involved:

> . . . research in the farmers' fields, diffusion of technology and inputs through groups of farmers, continuing evaluation and feedback to the professional staff, coordination of the interests of farmers, plan staff and local institutions.[9]