DEVELOPMENT OF EXTENSION PROGRAMS WITHIN THE CONTEXT OF FSR&E- THE CONSERVATION CROPPING CASE IN QUEENSLAND, AUSTRALIA

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INTRODUCTION

Current literature on FSR&E has emphasized the research process. Extension is implied or assumed to be comparatively easy once the relevant technology is developed. This assumption is contradicted by several studies on the adoption and diffusion process which suggest that extension of technology is not simple when a complex set of inter-related innovations are involved. Adoption studies on packages of improved practices show that they are never accepted as a total package. High selectivity of individual practices and adaptation of these recommendations occurs. To plan an effective extension program it is necessary to understand both the complexities of existing farming systems and the constraints and potentials of the extension network.

The adoption of conservation cropping in Queensland is an example of a complex farming systems change, in which an FSR&E data collection approach was used primarily to identify extension target groups and strategies. It became evident that research priorities could and should also be a product of this approach. The experience with conservation cropping in Queensland has also shown there is a significant development process intermediate between research and extension to try things out and get them working within the complex system.

It is proposed that the extension component needs to figure prominently as a primary objective along with the research and development programs at the information collection stage of FSR&E.

In this paper, a process used to identify socioeconomic factors and cropping practices to assist in extension planning is described. The uses of the process in identifying and overcoming constraints and in improving the cohesiveness of extension and research efforts are discussed. From this a revised model of the FSR&E process is developed which gives appropriate recognition to extension aspects of the process.

Although the importance of this process for extension has been highlighted through experiences in a developed country, it is considered that the process is needed wherever complex changes or a number of changes are involved. Conversely, although the need to use FSR&E to identify research goals first became evident in developing countries, successfully directed research requires it whenever complex system changes are involved.

ADOPTION OF CONSERVATION CROPPING IN QUEENSLAND

a) Research, Extension and Farmer Action before 1980:

Conservation cropping, often called conservation tillage, refers to a way of farming which emphasises long term productivity from the land resource, while recognizing the need for profitability in the short term. Conservation cropping involves the use of practices such as stubble mulching which retain soil cover and store moisture, reduced or zero tillage which minimizes disturbance and exposure of soil, the selection of suitable crops and crop rotations, and suitable use of fertilizers, pesticides and soil moisture in crop management.

Ninety percent of the 2.8m ha of cropping land in Queensland suffers from water erosion (sheet, rill, gully). Most of this land is used for dryland production of wheat and sorghum in areas where average rainfall is only moderate (500-800mm) but mostly comes in storms of variable frequency and high intensity. Intensive cropping of legumes, vegetables, fruit, and sugarcane takes place in generally higher rainfall areas (800-1500m), often on fairly steep slopes.

Because of the variable and often harsh climate farmers have tended to make the most of every opportunity to recoup earlier losses or to minimize future hardship. This has led to continued use of cropping systems which leave an exposed and pulverized soil open to heavy summer rainfall. Although this seriously endangers long term crop production, the introduction of a system which requires not only complex but often unclear changes in practices is not easy. While a few enthusiastic farmers and soil conservationists generated some awareness and evaluated machinery suitable for stubble mulching practices in the 1970's, progress was slow. However, in 1977, the Queensland Department of Primary Industries commenced "upstream" surface management research to provide some answers on the effectiveness of new cropping practices in reducing erosion and to look into potential problems.

Unlike the land grant college system, teaching, research, and extension are not in one organization. State departments conduct applied research and extension. Universities mainly provide teaching, training, and some research and the Commonwealth Scientific and Industrial Research Organization (CSIRO) is mainly involved in research. Cooperation and coordination between these institutions is based on individual initiatives. The joint socioeconomic research project described in this paper is an example of such collaboration between the state department and university.

The activities of the Queensland Department of Primary Industries are organized along disciplinary specialist lines, with fairly independent divisional organization, often containing separate research and extension branches. Hence, agronomic research and extension occur within the Division of Plant Industry, while soil conservation research and extension are separate branch functions within the Division of Land Utilization. Funds and programs tend to be administered separately unless definite steps are taken to ensure coordination.

The "surface management research" program was one such case. Research being undertaken includes: assessment of erosion and crop yields under different fallow management practices; determination of the effects

of surface condition on infiltration; measurement of sediment concentrations under different field conditions; measurement of effect of the cover on evaporation and soil moisture, and development of a model integrating aspects of crop production, soil water and soil erosion in grainlands.

Although considerable general awareness had been generated through the media, little planned extension had been undertaken by 1980.

Some constraints to successful planned extension were:

- lack of clearly definable systems. Only in one agro-ecological area there was a neat package to promote. Elsewhere extension officers had little more than the principles that stubble gives soil cover, and that soil moisture improvements might be achievable with stubble.

- lack of knowledge by departmental officers on practical problems with the new approaches.

- a high workload of requests for advice on conventional systems of contour bank and waterway surveys (for soil conservationists) and crop husbandry advice (for extension agronomists).

- insufficient teamwork and concurrence on goals between extension staff from different specialist areas.

b) Socioeconomic research to stimulate action in the Darling Downs Region:

To find the answer to some of the problems facing extension officers and to understand why farmers are more responsive to commercial innovations (such as improved cultivars, machinery, fertilizers, pest, and disease control) and not so responsive to soil conservation methods (contour banks, waterways, stubble mulching, minimum or zero tillage, grass strips, and contour cultivation), a joint research project between the University of Queensland and Queensland Department of Primary Industries was initiated in 1980. The study also examined the farmers' exposure to various kinds of innovations and their attitude to adoption of various practices. (Chamala et al. 1982.)

This was followed in 1982 by a closer examination of one homogeneous area - the Eastern Uplands of the Darling Downs where the erosion problem was more severe and adoption of agronomic soil conservation methods was slow. The joint project's objectives were formulated by the research team and senior administrators but the regional and district field officers specified the focus on farmers' cultivation practices and patterns of fallowing croplands. The aim was to have a more successful planned extension program and this involved intervention into staff and organizational matters as well as farmers' practices, attitudes, and knowledge.

A brief description of the study area will provide the situational context to appreciate the study.

The Darling Downs region as a whole covers some 700,000 ha with about 7500 farms on fertile, but erodible black self mulching clays. A large low sloping alluvial plain area experiences erosive flooding, while severe soil erosion occurs on the cropped uplands areas. The project under discussion concentrated on the eastern uplands area where cropped land has slopes generally ranging from 2-12% and both deep and shallow soils. Severe summer storms occur inflicting serious damage on areas of bare soil. The area sustains a wide range of summer and winter crops and also supports dairy and beef enterprises.

The joint project process involved: (a) meetings at field and head office to clarify goals; (b) preparation and carrying out of a farmer survey using a team approach; (c) a survey of extension staff; (d) a workshop to consider information collected and look at targets and strategies; and (e) a meeting of regional project leaders with their head office supervisors to discuss priorities and resources. The full process is illustrated in Figure 1.

The problem identification phase from goal clarification, through the preparation, conduct and analysis of surveys, to resources negotiation took just over three months, culminating in the June 1982 workshop.

Soon after the workshop and management meetings, district teams of extension agronomists and soil conservationists planned initial extension approaches. Pilot trials were set up and information collection continued. Team members participated in 'hands-on' training workshops to improve skills in handling new farm equipment.

Follow-up meetings with head office management helped to generate organizational support for inter-branch coordination and necessary funds for training activities for field officers. Management also provided funds for developing and testing a Conservation Cropping Information Package. Here again, the research team which developed the package included field extension personnel as well as the original coordinators of the joint project, departmental and university personnel. The information package consisted of two video programs, one pamphlet, and an extension officers' guide. The guide provided a conceptual framework of conservation cropping practices, extension principles, and practical strategies in targeting the audience and using the videos in group situations. This package was pretested using market research methodology in which field extension workers, farmers, and high school students were involved in its evaluation. (The entire package was modified, including re-editing of the videos, incorporating major suggestions of all these respondents. (Chamala et al. 1984, a, b & c.) This was followed by training workshops to familiarize field staff with the package for inclusion in their extension planning and implementation.

c) Development and Extension in Other Parts of Queensland

Conservation cropping programs developed in two other agricultural

areas; viz. South Burnett region and Central Highlands in Queensland used some FSR&E processes in a less deliberate manner. They suggest that tne FSR&E process is appropriate for intensive and mixed farming situations but less relevant for broadacre restricted enterprise situations. One case is worth mentioning here.

South Burnett region:

The South Burnett area of about 1300 farms contains about 150,000 ha of red friable soils used mainly for peanuts and other summer crops. About 100,000 ha has been protected by contour banks but additional conservation measures are needed. A suitable cropping system has been developed and extension is taking place through demonstration farms. The development involved a great deal of farmer cooperation with most of the development taking place on two pilot farms on a subcommercial then commercial scale after preliminary trials on an experiment station.

Many features of the FSR&E system presented by Norman (1982) can be seen in the following framework (Figure 2) drawn up following the South Burnett experience to illustrate the very significant "development" component (as distinct from pure research or extension) in getting a new cropping system on the ground.

Apart from its heavy detailing of the development component, the process illustrates that useful extension can usually take place even before the system is fully developed. The Burnett case was fortunate in that, because of the homogeneity of the area and limited cropping options, a neat system could be tested. The greater range of enterprises and diverse cropping choices on the Darling Downs produced a very complex situation making it difficult to draw up and test straight forward systems.

d) Linkage with FSR&E:

To what extent does the process described mesh with Farming Systems Research and Extension?

In Shaner et al. (1982), F.S.R. & E. is summarized as being "farmer based, problem solving, comprehensive, interdisciplinary, complementary, iterative, dynamic, and responsible to society".

These qualities are found in Queensland's conservation cropping program in the following ways:

- farmer based in that (a) innovative farmers were influential in acquiring suitable stubble handling machinery for evaluation in the early 1970's; (b) most development work has taken place on farms rather than research stations, with the interested cooperation of innovative farmers; (c) farmer- based information has been sought throughout the extension planning process described earlier.

- problem solving in that (a) it was focussed on farmers' tillage practices during different fallows and its relationship to soil

erosion problems; (b) it examined the constraints of extension personnel in embarking on planned extension activities on conservation cropping; (c) the approach used in development trials has been to make a start in cooperation with farmers and handle problems as they arise rather than waiting for a complete package to be developed.

- interdisciplinary in that technical research and development involves agronomists, soil physicists, soil conservationists, biologists, agricultural engineers, and economists; while teamwork between extension agronomists, soil conservationists, machinery advisers, and economists, together with rural sociologists and extension educationists, was essential in preparing extension programs. Agronomists and sales representatives from chemical companies, and engineers from local machinery firms also have significant roles in the development and promotion of practices and equipment in Queensland.

- complementary in that a tertiary institution and government agency acted jointly in contributing skills from various disciplines. The collaboration between teaching or training institutions and the government agriculture department will make training more practical and inject fresh thinking into field extension and research work.

- iterative in that extension officers recognize the need to enable farmers to move a step at a time towards adequate conservation cropping practices in accord with resources available to them and the extent to which technology is known.

- dynamic in that the development of technology and the relative operating costs of chemicals and fuel are very mobile, with a potential to alter in ways that could make large changes acceptable of new practices.

- responsible to society in that a basic premise of the conservation cropping program is that land should be protected for future productive use.

There are some ways in which the conservation cropping program to date falls short of the FSR&E model. Although livestock enterprises have been encountered in the study, the emphasis has been on the cropping component because it is the area where the erosion problem is most significant. In areas almost entirely devoted to cropping, the approach could be considered comprehensive. In other districts, where livestock enterprises are significant, a broader conservation farming perspective needs to be taken to enable the comprehensive view of the whole farm as required by Norman (1982).

The 'Eastern Downs' case we have described has used many elements of the FSR&E approach. Some differences between this case and most applications of FSR&E are:

- Although usually family based, Queensland's agriculture involves high capital inputs and mechanization compared with developing

countries where it has usually been applied. Queensland farmers also probably have more opportunity to voice their needs through formal and informal systems than farmers in many countries. Grower associations such as the Queensland Graingrowers Association, the Queensland Dairymen's Organization, the Fruit and Vegetable Growers Association and the Cattlemen's Union act as a voice for farmers who are interested in being heard. Advisory committees on soil conservation, and on agricultural research also exist. Landowners also have reasonably direct access to politicians in the case of any strong complaint.

- Changes in the interests of long term productivity are being attempted, as distinct from the priority in many programs for changes in farming systems which increase short term productivity.

- The process was primarily introduced to give direction to the extension program, whereas other programs have concentrated on its benefits to directing research. This obverse view highlights its value for both research and the extension which is conducted in parallel with ongoing research.

IMPLICATIONS FOR THE PLACE OF EXTENSION IN THE FSR&E FRAMEWORK

Some implications which can be drawn from the Queensland conservation cropping studies to show how the extension and development components can be better represented in the FSR&E framework are that:

- Detailed farming practices information for the whole farming system (including social aspects of the farm family) is useful in delineating target groups (based on their resources, knowledge gaps, and attitudes) for extension of improved systems as well as for designing them.

- Extension goes on in parallel with research. It does not wait until researchers and developers have tried and proved a neat package for each domain.

- Difficiencies in organizational cooperation and the motivation and competence of extension agency staff are very real factors in the implementation of farming systems changes.

- The diverse nature of rural industry means that innovative developments and extension "research" (socioeconomic studies) may need to be conducted by extension workers who are cut off from proximity to researchers in experiment stations. This calls for a high level of practical and scientific skills.

Figure 3 is an amended version of the Shaner et al. (1982) FSR&E model.

The major addition to Shaner's model is in expanding the extension collaboration which was nominally shown in the original model.

The following points may be worth noting:

1. In the first phase, extension activities, like research, should start in defining the target areas through situation analysis of farming systems and communities. Hence, defining extension targets should be an integral part of the first activity shown in Shaner's model. In the figure 4, 'Target Area Identification' (Stage 1) is shown as a common stage for both extension and research cycle and in practice this should be one joint or integrated activity directed at both programs.

   The number of research stations involved in on-farm research in a region is understandably limited, whereas extension planning and implementation occurs in every part of the country. Therefore, extension situational analysis results could be combined and fed back to research stations.

2. Similarly, in the second phase, problem identification needs to focus on both research and extension aspects. It requires a multidisciplinary team which should include both research and extension expertise.

   Extension and management also need a systematic investigation involving the social sciences (rural sociologists, management specialists, extension educationalists).

   Organizational limitations such as staff training needs, information support to field extension staff, potentials for inter-branch coordination, staff motivation, and supervision needs to be identified.

3. In the third phase of activities, just as planning on-farm research calls for elaborate organization of data, inputs, locations, and personnel, so planning extension strategies also relies on knowing:

   (i) Farm-based problems which can be resolved by extension of current knowledge;
   (ii) Farm-based problems which can only be rectified by extension after some research;
   (iii) Some organizational constraints which cannot be removed and some approaches will not be feasible;
   (iv) Some organizational limitations which can be rectified and must be attended to before the extension strategy is implemented.

4. In the fourth phase is administration of extension for effective delivery of inputs and information. This may call for coordination with commercial agencies, extension services, farmers organizations, and other groups.

   New or improved methods or packages are developed as the body of knowledge improves due to on-farm and off-farm research. Any new extension strategies or information packages need to be pretested

using social science methods.

5. The final implementation of extension strategies draws information and knowledge from all three processes the extension and management process, the on-farm research process, and the research station results.

Issues for Discussion:

1. Should extension personnel be actively involved in technical and socioeconomic research?

2. Can the needs of extension and research programs be served by the same problem identification process?

3. How should demonstrations be linked to on-farm research trials?

4. What are the appropriate training facilities required to upgrade extension to take on new roles?

5. To what extent should extension personnel be recognized and rewarded in implementing these new roles?

6. Should universities and agricultural training institutes be involved in research into the transfer of technology phase?

7. Who should monitor the performance of research and extension?

8. How can inter-departmental or branch linkages and inter-institutional linkages be resolved to achieve a better standard of life for farmers?

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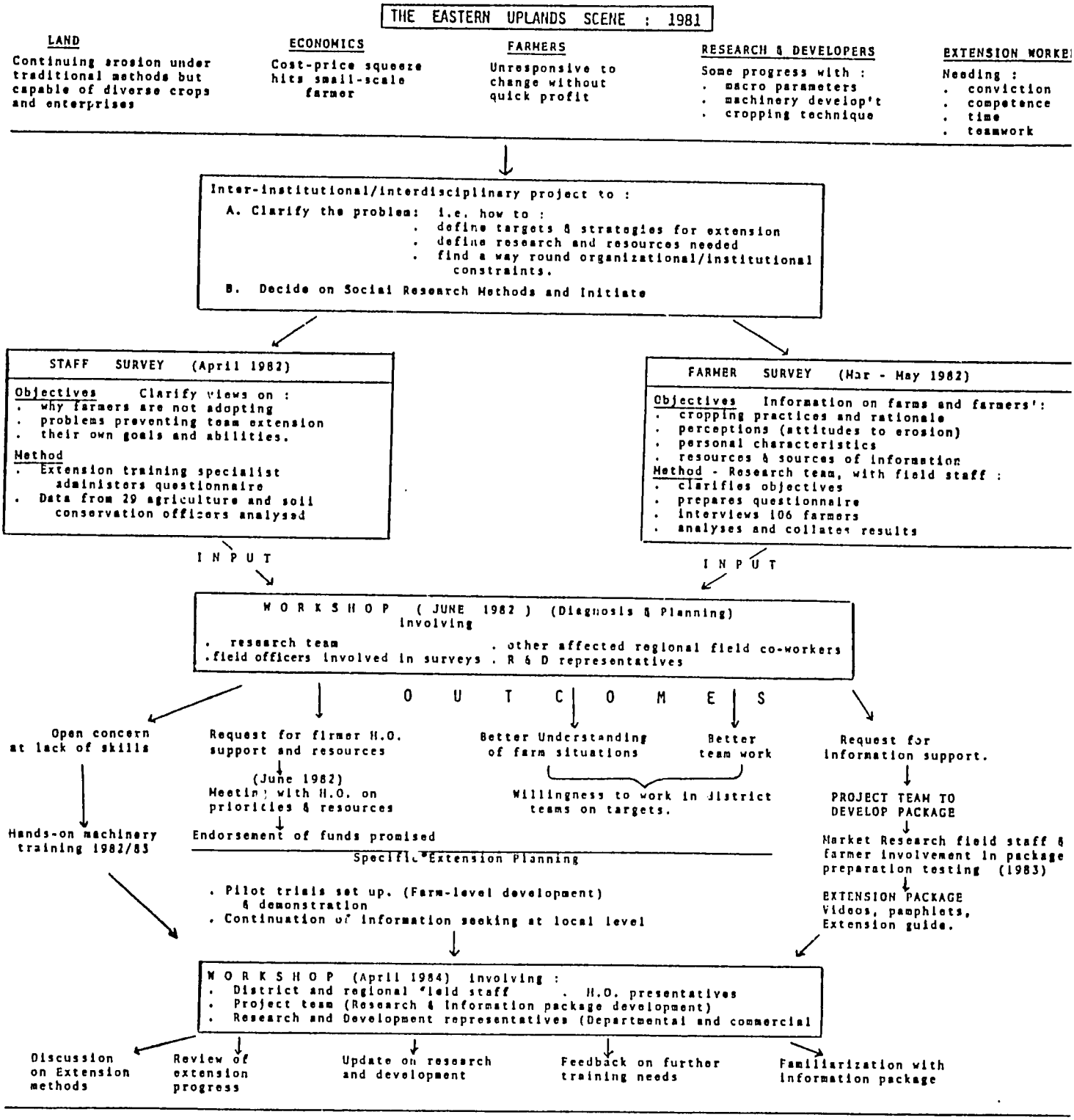

FIGURE 1 Flow diagram of socio-economic Research & Extension Process Eastern Darling Downs.

A FRAMEWORK TO FACILITATE THE ADOPTION OF CHANGE TO FARMING SYSTEMS

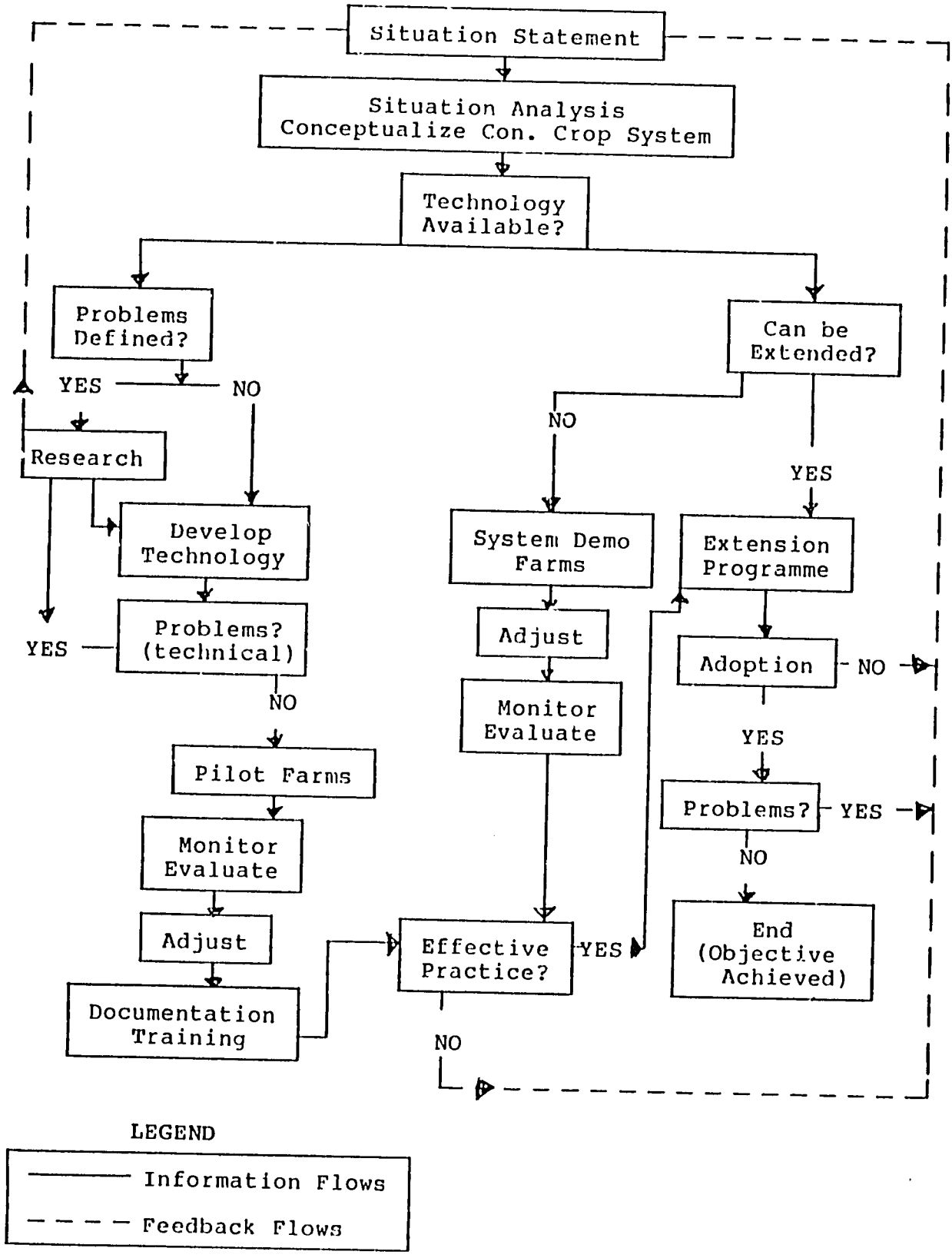

FIG. 2 From Bateman, R.J., (1984)
The Development Process - a Framework to Bring About Change in Farming Systems

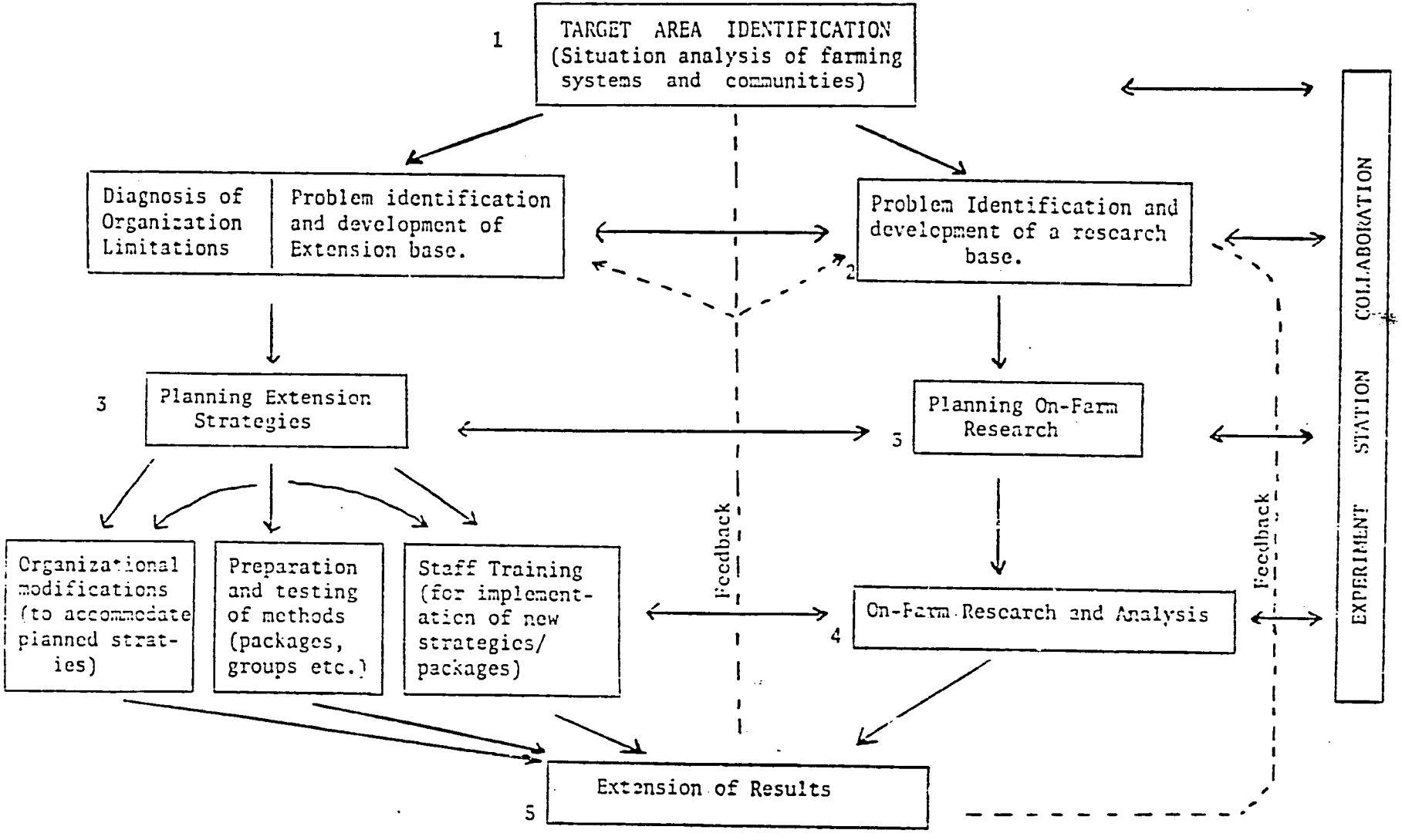

Fig. 3 Modified Model of FSR & D incorporating Extension and Monitoring Feedback.