PN-AAT-825 42178

PILOT PRODUCTION PROGRAMS

H. G. Zandstra[1/]

The formulation of pilot production programs involves factors related to production technology, the existing institutional structure, and government policy. A summary discussion is included, primarily for the benefit of cropping systems researchers. The successful introduction of improved cropping patterns into the farmers' production system depends substantially on the way production programs are formulated. The esteem of Cropping Systems Research depends eventually on increases in production achieved by farmers adopting the new recommendation. It is, therefore, not surprising that C.S. researchers have a keen interest in ensuring that pilot production programs are successful and can allocate the source of failures if any were to occur. Conversely, cropping systems researchers should be more aware of the consequence a change of technology has for pilot production programs. The changes in institutional support required often take time to implement -- such as for seed production or changes in credit schedules or marketing support -- and early communication between researchers and extension staff is necessary. This discussion paper describes the concepts that underlie production programs and the methods used to provide additional credit, purchased inputs, markets, and some protection against risk. A list of issues is identified for discussion by the working group, to allow a better definition of research needs at IRRI and in network programs in the area of technology delivery methods.

Intervention or submission

Researchers seldom can identify cropping patterns that lead to substantial production improvements while operating entirely within the resource limitations of the small farm. Generally, the production increases that can be achieved relate to the extent to which these limitations are removed. At the time of the design of cropping patterns researchers can decide for which level of institutional support their technology is designed and face the institutional consequences at the technology transfer stage. This is the interventionist approach to technology development.

Alternatively, researchers can attempt to limit their research to technology designs that fit entirely within the existing

---

[1/] Program Leader, Cropping Systems Program, The International Rice Research Institute, P.O. Box 933, Manila, Philippines.

constraints of the farm -- the submissive approach to technology development. This approach requires more sophisticated long-term research and generally results in much smaller short-term production gains than the interventionist approach (Zandstra et al., 1979). Figure 1 shows how the acceptability of new technology can be improved by changing the technology or the production environment.

Production programs

Most recommended cropping patterns demand additional resources, generally in the form of cash, labor, seed, specific agricultural chemicals, types of equipment, added demand for produce, and farmers' capacity to assure risk. An acceptable cropping pattern can readily pay for the extra cost of the resources, but its adoption by farmers will still be conditioned to resource availability.

A production program provides a buffer institution that augments the existing institutional structure to the extent required for the adoption of the recommended cropping pattern (Zulberti et al., 1979). The factors that demand most attention depend on the technology to be introduced. Some common factors that require intervention by the production program are:

- understanding of the recommendation by farmers
- availability of credit
- availability of labor during critical periods of the growing season
- availability and quality of purchased inputs, such as seeds, chemicals and specialized equipment
- demand for product in markets
- price stability for products
- farmers' capacity to assume risk

A production program should attempt to make the additional resources required by the new technology available to the farm community. This requires the structuring and careful coordination of the activities of several public service organizations.

Pilot production programs

A pilot production program is often used to determine the support structure needed in a production program to clearly define the tasks to be completed by several institutions and the time when they should be completed. The pilot production program allows a final evaluation of the performance of the recommended cropping pattern, the cost of its extension to farmers and others and the

benefits derived from it (Nicolas et al., 1980). A pilot production program should be designed to determine:

1. The intervention required by the production program to provide the needed information, credit, purchased inputs, and markets;

2. the management structure needed to ensure the timely delivery of these production factors, including a clear definition of tasks for each of the institutions involved;

3. the performance of the delivery system for the production factors, which requires the evaluation of the farmers' opinion about the clarity and suitability of the recommendation and the timeliness and availability of the needed production factors;

4. measurement of the extent of farmers adoption of recommended practices and reasons for lack of adoption where this occurs;

5. cost of the delivery system in terms of extension and supervisory personnel; and

6. added benefits derived from the adoption of the recommendation as compared to the existing production systems.

The results of the pilot production program should be evaluated yearly (in case of a yearly cropping cycle) and assuming continued success modifications should be made until the program is sufficiently stable and manageable to be extended over a larger area.

Information. Agricultural production recommendations must be as simple and clear as possible. It is not reasonable to expect farmers to manage detailed information about varietal performance in different conditions, all insect species, symptoms of crop diseases, and mineral deficiencies. In a sense the research structure in the country, the on-site research team, and the extension programs should provide this additional information processing capability to the farm community.

Cropping pattern recommendation as specified by researchers can be complex; they include several crops, the times of operations, and the times, methods, and levels of input allocations for each of the crops involved. Such recommendations contain instructions for three types of actions:

1. Fixed actions, the general recommendations that apply throughout the pilot project area and are independent of land type.

2. Actions conditioned to fixed resources, such as land type or more specifically soil texture, presence or absence of irrigation, or simply location. This leads in effect to a number of simple recommendations, that differ for each land type.

3. Actions conditioned to variable components such as threshold levels of insects or diseases, previous cropping history of the field, soil-water conditions at certain times during the growing season, and the presence or absence of other components of the recommendations.

A recommendation conditioned to a fixed resource:

- "For heavy-textured bottomlands plant a rice-rice cropping pattern, but for light-textured plains and light and heavy textured plateau soils plant rice followed by mungbean."

Recommendation components conditioned to a variable event:

- "Apply 20 kg of P_2O_5/ha as a basal application, but no P-fertilizer after a premonsoon maize crop that received at least 30 kg P_2O_5/ha."

- "Apply 0.75 kg a.i./ha of Endosulfan to control stem borers if there are more than 5% dead hearts at the booting stage."

The communication required for recommendations that are conditioned to variable events is complex and may demand that extension services monitor the conditions with farmers and issue reminders at the appropriate time during the growing season. Communication with farmers depends greatly on the social structure and educational levels in the region. These influence the effectiveness of such communication channels as village billboards, village committees, farmers' group and general meetings, radio listening habits and acceptance of printed materials. An essential first step is assignment of extension workers with communication skills. A next step is adequate communication between researchers and the extension workers. This allows the extension staff to become thoroughly familiar with the structure of the recommendations and capable of identifying the fixed and variable events to which the recommendation is conditioned. This will require training of extension staff by the researchers who formulate the recommendations. For an example of a training schedule used to prepare extension staff for a pilot project that introduced a complete cropping pattern, see Haws and Dilag, Jr. (1980).

Credit. The use of production credit is common even in most underdeveloped, small-farm areas. Credit can be extended and repaid in the form of material services or cash. It may be extended by

relatives, friends, private lenders, farmers' associations, or private or government banks. The terms of credit and the conditions for eligibility vary as widely as the sources.

The credit component of pilot production programs can therefore be structured in innumerable ways. There should be careful analysis of credit year-round needs for the completion of the recommended practices. Credit should generally cover the cost of all purchased material inputs and the services paid for in cash.

The credit repayment schedule should take into account the considerable time lapse between harvest and sale, and that the early sale of produce can cause substantial price reductions for the farmer. Unless these reductions have been realistically reflected in cost and returns calculations, an apparently profitable cropping pattern may become a losing proposition for a farmer. There are scores of aspects associated with the structuring of credit programs for small farms. The following important factors must be considered:

1. Timeliness of credit should be such that farmers have funds available for the first production operations (land preparation) well before the scheduled time. Inputs scheduled to be bought with credit, or provided in lieu of cash, should be available at the farm community level at that time. Storage and packaging should be such that spoilage during the crop season is prevented and sufficiently small amounts can be delivered to allow for the small size of fields.

2. Field credit plans should use realistic time and production measures. This plan should be based on yield levels obtained from the farmers' management of the recommended practice. This is because researcher-managed experiments commonly arrive at yield figures 30 to 60% above those obtained when farmer manage the same technology.

   Because of farmers' multiple cropping practices, credit should be based on the cropping pattern plan for the field and although intermediate repayments may be necessary, the final repayments should not be until well after the completion of the cropping patterns (Gomez, 1977). Provisions should be made to allow rescheduling of credit repayment in the event of damage caused by force majeure.

3. Credit is often obtained from government funds and channelled through government agencies (banks). These agencies should be convinced that access to credit is best determined on the basis of the production potential of the field and the cropping pattern selected for it. Access to credit

based strictly on collateral considerations often increases the disparity in welfare levels between farms and can reduce the allocative efficiency of the credit.

4. If agricultural extension staff is responsible for or is involved in encouraging the repayment of loans they should at least be allowed to decide credit eligibility and restructure credits in case of force majeure. There are many arguments against involving technical assistance personnel in credit collection because it emphasizes a supervisory instead of a supportive role to the farmers. This staff is, however, uniquely positioned to evaluate the potential profitability of credit to a farmer and of the farmer's capacity to apply the recommendations.

Labor availability. Labor demands of cropping patterns vary substantially over time. During the pattern testing phase major conflicts of demand and availability should have been identified. Little experience is gained during testing, however, in providing solutions to labor constraints, beyond the introduction of labor saving techniques or equipment. When the adoption of recommended cropping patterns demands the use of additional or new equipment, a rapid demand for such equipment may be created as a consequence of initial partial adoption. The availability of credit for equipment purchases may determine the rate in which this equipment enters the system and the extent to which pattern is adopted.

Markets. A wide variety of institutions influences the performance of markets. It is, therefore, difficult to identify the specific sources of probable deficiencies. Any of the functions performed by marketing systems -- assembly, transportation, processing, distribution, and pricing -- may, if inefficiently conducted, cause difficulties (Smith, 1976). These functions are associated with the market for products as well as the equally important set of markets for improved seeds, fertilizers, machines, chemicals, etc. the purchased input market.

The introduction of recommendations that demand the use of new inputs requires expertise in anticipating the demands and coordinating the advance ordering of these inputs. In the case of pilot production programs such expertise can be provided by the project. Eventually, these activities will have to be taken over by existing institutions and should include quality control for chemical inputs and seeds.

Smith (1976) emphasizes the importance to evaluate the real cost and resources employed in marketing as part of a pilot production program. Specific investigations and governmental action are required to develop markets for many crops that are new to an area.

Integrated production plans. Input-supply bottlenecks can be avoided by carefully planned integrated production programs. These often use a contractual arrangement and assure availability of inputs and a well functioning product market to the farmers. Such programs can be from government or private enterprise. The latter is often the planner for high-value commercial products such as tobacco, coffee and cacao. There is, however, no reason why these approaches cannot be extended to food crops if a sufficiently large marginal benefit-cost ratio exists for the additional inputs required by the recommendations (See Chap. 12, cret; Zandstra et al., 1979). There are no records of such integrative production arrangements for the introduction of technology involving multiple cropping land use during a complete growing season.

Risk. Small farmers assume risk primarily through the allocation of substantial borrowed capital to a single crop. Their capacity to assume risk may be a limit to the adoption of high input technology. There is a large body of literature about measurement of risk and farmers' reaction to risk. There has, however, been little experimentation with methods to share risk among farmers or among farmers and credit agencies or integrated production plans. Where production contracts assure availability of inputs and product markets, a substantial component of the farmers' risk is already assumed by the program. To go beyond this requires complex contractual arrangements and costly estimation of yields (Zandstra et al., op cit).

When cropping patterns have been tested over several years and have shown substantial stability, it is probably sufficient to make appropriate arrangement for the rescheduling of loans in the event of unforeseen natural calamities.

Coordination of institutional activities

The pilot program activities in communication, provision of credit, and assurance of input availability and markets, normally involve several government and private institutions. The pilot production program strongly intervenes in the village community; it often threatens existing institutions or network of social and political dependence relationships in the region. To be successful pilot programs for small farmers must therefore be based on a genuine political committment to improving the condition of small farmers. Planners and managers of pilot production programs, must therefore, take care to involve all groups that are affected by the plan. Where marketing aspects are involved, great care should be taken not to antagonize existing market services.

A useful approach to coordination of activities is to form a management committee that advises on plot program policy (Nicolas et al., 1980). It should be composed of local farmers (leaders, or

representatives of farmer groups), local political leaders (governors, mayors, etc.), regional directors of institutions for extension, credit (bank representatives), and agricultural research and marketing. This committee should define the scope of the program and the tasks for which each participant group assumes responsibility.

The overall activity of the pilot program should be presented in the form of a time schedule -- if possible graphically, as a PERT diagram. By careful analysis, all actions required to be completed at certain times need to be identified. The extension group should determine the number of contact points between the program and the farmers and classify these into four types:

1. contacts required with farmers individually at the farm field;

2. contacts required with a farmers' group in village areas (group meeting or posters);

3. contacts required with individual farmers at offices (bank or extension office); and

4. contacts with a sample of individual farmers at the field (inspection).

Note that a contact point should include any visit of project personnel (extension, credit, marketing, or political) to the farm community and any village or town level visit of the farmer to the project that is associated with the pilot production project.

Contacts should be minimized to those necessary to insure a smooth transfer of information and goods. Care must be taken to avoid unnecessary travel of farmers to the offices and several activities should be combined at each contact point. For each contact point a list of actions to be completed should be drawn up together with a list of perquisites (Table 1). From this outline and the earlier mentioned time schedule (PERT or Date-line plot) of contact points, an agenda (actions and deadline dates) can be drawn up for farmers, extension staff, the credit institution, and the group responsible for the availability of inputs at the suppliers.

Implementation of pilot production programs at times requires the use of special incentives to motivate extension staff (Haws and Dilag, Jr., 1980). Where possible these should be provided in a way that encourages field visits, such as provisions for staff mobility and expense coverage during field visits. Incentives in the form of extra pay can be difficult to maintain once the program is extended beyond the pilot phase. At this time the danger exists that extension staff will not get the attention, support and financial incentives that they received during the pilot phase. This

dilution effect often leads to reduced project impact at later stages.

The implementation phase must be accompanied by a monitoring and evaluation process that allows corrective action to problems such as untimely release of loans, and lack of inputs and transportation. The monitoring should also allow evaluation of the performance of the recommendation, as measured by yield estimates and of the extent of farmers' adoption or modification of recommended practices. For a comparison of farmers' adoption associated with different production programs, see Table 2 (Zandstra et al., 1979, pp. 226-228).

Coordination of pilot production program requires enthusiastic support by staff from local agencies and this must be generated by giving them full recognition in reports and meetings.

At present IRRI's cropping systems program is formulating its plans to study technology delivery. The following outline was prepared by Mr. Glen Denning for that purpose:

METHOD

1. Study the history of existing (and past) pilot production programs to identify the components of the technology delivery system which were important, either in the success or failure of such programs.

2. Develop initial formulation of a methodology for design and execution of technology delivery systems.

   a. for site description of the institutional environment

   b. for deciding on the "appropriate" level of intervention. This is probably a difficult task, maybe requiring economists to cost alternatives levels of intervention against expected benefits of particular cropping systems.

   c. for monitoring, evaluation and restructuring components of the technology delivery systems during pilot and full production phases.

   d. for monitoring and evaluation of crop production technology and for revising recommendations where necessary.

3. Test this methodology. Ideally, a long term study should start from scratch i.e. a new site. However, given that a number of cropping systems research sites are approaching the pilot production stage, these may be the appropriate targets for initial study.

4. Produce improved version of the methodology if necessary. Consider the need to experiment with delivery system components, where the best solution is not clear.

END RESULT

A complete cropping systems research and development procedure which would enable national governments to systematically develop areas/regions through site based cropping systems research to production program status.

Issues for consideration by the Working Group

1. The monitoring of pilot projects requires determination of the effectiveness of the delivery system and of the technology. Failure of the delivery system can be because of errors in design of pilot project or because of incomplete or faulty execution.

   Common reasons for such failures are:

   - Extension agents do not understand the recommendation, e.g. the importance of timing of an insect control activity.
   - Farmers do not understand the recommendation.
   - Farmers do not understand limits of their obligation.
   - Farmers fear the credit system; risks involved the social stigma to being indebted, submission to outsiders (government), loss of land in case of default, etc.
   - Farmers are intimidated by landowners, private lenders that hold sway in the community.
   - Project threatens existing interests, retailers, market intermediaries, money lenders.
   - Inputs are of inferior quality.
   - Timing of credit release is poor.
   - Extension agents favor subgroups of farmers.
   - Banks favor large loans.

   As far as the technology is concerned there can be the following failures:

- Technology does not produce expected yields.

- Technology is cumbersome and hence unacceptable. Where this is the case, the cropping systems researchers have not realistically evaluated the quality of the technology. In this respect, it is important to recall that for a production program:

  Benefit = net benefit of yield increase x frequency of adoption

  Claims made about the benefit of the technology are not realistic because:

  a. crop losses were ignored in original yield estimates

  b. crop quality was poor, which led to price reductions

  c. market potential was limited, which led to price reductions

  d. competition of component crops in mixed cropping was ignored (hopefully this does not occur nowadays)

  e. costs were underestimated as in often the case with seed costs for tuber crops, transport for chemicals and produce, cost of acquiring a loan, cost of receiving attention of the extension agent.

Obviously, monitoring pilot projects requires development of a measurement schedule and a framework for interpreting results and ensuring feedback to the project for corrective action.

- Should the network embark on research activities in a selected number of locations to develop this evaluation system?

- What is the role of IRRI's c.s. program, which has already decided to study such projects for guidance of interested parties?

- What locations lend themselves to studying pilot production methods?

- Should there be a small workshop to iron out the measurement methods and analytical framework?

- Who would be the counterparts of IRRI if the c.s. program were to help coordinate studies in technology delivery methods?

2. Pilot production program studies question institutional roles and their boundaries. They often lead to an awareness of the

need for changing these roles -- e.g. to insure that rural bankers are "awarded" on the basis of the number of credits, not the total amount of credit allocated; or, to insure that credit worthiness is based on production of technology (not all enterprises should receive credit, as some are losing propositions) and the farmer and not on farmers' collateral. These study results are difficult to implement and require support of higher level government groups.

- Should these studies be cleared -- in intent and design --, with institutions involved and with planning groups that can help support institutional change required in the future.

3. There are few extension agents, most of which have no transportation and many of which are not fairly reimbursed for their costs of meals while out in the villages. The deployment of these agents and their support is important.

   - Should the study of pilot production programs consider the cost of delivery systems?

4. Local power structures and capabilities exist for handling information, loans, sale of inputs and purchase of produce. Often cooperatives exist. Strong village councils can have say over land use decisions (e.g. tanks in Sri Lanka). This opens up the possibility of structuring technology delivery systems by using these institutions -- with all the advantages and dangers that go with it.

   - Should the study of pilot production programs consider alternative institutional frameworks and if so, should it approach this by the experimental method (treatment differences) or by exploiting opportunities offered.

5. What should be the role of national and site c.s. program staff be in the formulation of pilot projects?

Committee: Hubert Zandstra

Tun Saing

REFERENCES

Gomez, A.A. 1977. Cropping systems approach to production program: the Philippine experience: In Symposium on Cropping Systems Research and Development for the Asian Rice Farmer. IRRI, Los Baños, Philippines.

Haws, L.D. and R.T. Dilag, Jr. 1980. Development and implementation of pilot production programs. Cropping Systems Conference, 3-7 March, 1980. IRRI, Los Baños, Philippines.

Nicolas, J.S., E.C. Price, R.T. Dilag, Jr. and L.D. Haws. 1980. An evaluation of the Iloilo Province Kabsaka Program for 1978-1979. IRRI, Los Baños, Philippines (mimeo).

Smith, E.D. 1976. Assessment of the capacity of national institutions to introduce and service new technology. Pages 425-441 In Symposium on cropping systems research and development for the Asian rice farmer. 21-24, September 1976. IRRI, Los Baños Philippines.

Zandstra, H.G. 1979. Cropping systems research for the Asian rice farmer. Agricultural Systems 4:135-152.

Zandstra, H.G., K.G. Swanberg, C.A. Zulberti, and B.L. Nestel. 1979 Experiences in rural development, the Cacqueza Project. International Development Research Centre, Ottawa, Canada.

Zulberti, C.A., K.G. Swanberg, and H.G. Zandstra. 1979. Technology adaptation in a Colombian rural development project. Pages 143-165. In Valdez, A.G., G.M. Scobie and J.A. Dillon (editors) Economics and the design of small farm technology. Iowa State University Press, Ames, Iowa.