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SOME COMMON SENSE ABOUT FARMER RECOMMENDATIONS AND EXTENSION ADVICE

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In most farming systems research programs, the major emphasis is on adaptive research aimed at providing improved technical information to farmers for using available technology. This information is usually summarized in the form of recommendations for specified groups of farmers (often referred to as recommendation domains (Tripp, 1986). Typically, adaptive research teams meet annually to formulate recommendations that represent the current state of the art with respect to the "best" methods for producing a particular crop or livestock enterprise.

While a good deal of attention has been given to the appropriate methodology for conducting adaptive on-farm research, very few guidelines have been developed for efficiently synthesizing and summarizing the information generated by adaptive research for use by extension and farmers. There has been a tendency to condense the results of perhaps hundreds of experiments conducted over several years into a single "recipe" for cop production. This "recipe" approach does little justice either to the resources invested in the research or the information requirements of farmers in an increasingly dynamic and complex agriculture. A good deal of valuable experimental information is wasted unless ways are found to more efficiently organize its transfer to farmers.

It is of course unrealistic even in developed agriculture to make all experimental data available to extension and farmers. The challenge for researchers is to 1) **synthesize** their results so that the most important findings are available and 2) **simplify** these findings in a form that can be readily understood by extension and farmers. In this note we consider two main outputs of this process; 1) **prescriptive information or recommendations** and 2) **auxiliary information** to help extension and farmers adapt the prescriptive information to their own circumstances.

PRESCRIPTIVE INFORMATION— FARMER RECOMMENDATIONS

Defining a Recommendation

Despite the widespread use of the term "farmer recommendation" it is rarely explicitly defined and in fact, different implicit meanings are often attached to the term. To most it means the "best" production technique, often defined from a researchers' point of view in terms of maximum yields or profits.

Here we adopt a working definition of a good recommendation as **that practice that farmers, given their resources and objectives, would employ if they had all the information available to the researchers.** Note that farmers' decision criteria rather than researchers' criteria are the basis for selecting recommendations. A recommendation assumes the current resources and objectives of farmers and aims **to alleviate only one factor limiting productivity--the imperfect information situation of farmers.**

From this definition a number of other implications follow:

1. A recommendation takes account of the existing capital situation of farmers. If official bank credit is in short supply (which it usually is), recommendations must often be formulated using a relatively high minimum rate of return on capital (e.g. 100%).
2. A recommendation should only be made for **inputs currently available** to farmers. Availability is, of course, a relative concept and researchers may also want to provide information to policy makers and input suppliers to improve the availability of a given input.
3. A recommendation should provide new information that promotes a **change** in current practices. There is little point in recommending a practice that is already widely used by target farmers.
4. A recommendation, since it refers to a future event, must be defined in terms of a time horizon. This means that a recommendation should emphasize a **few priority changes** that can be adopted by a farmer in the immediate future over two or three crop cycles. Farmers do not adopt packages but because of capital constraints and a cautious learning-by-doing approach, adopt improvements in a stepwise manner in a logical sequence (Byerlee and Hesse de Polanco, 1986).

Intra-farm Variability and Conditional Recommendations

In the early stages of an adaptive research program the challenge is 1) to define relatively homogeneous subgroups of farmers or recommendation domains and 2) issue recommendations that are generally applicable to these subgroups. The stratification of

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farmers is a continuous process as research information accumulates and recommendations are made (Tripp, 1986). Stratification recognizes the substantial variability characteristic of most target farm populations. This variability may be attributed to 1) variation in crop response due to agro-climatic site and season effects, 2) variation in prices paid and received by farmers and 3) variation in the resource endowment and objectives of farmers. There is always potential to stratify farmers into smaller more homogeneous groups of farmers in order to reduce between-farmer variability due to all three sources. This process is initially limited by resources available to research and extension. However, as adaptive research programs mature and research information accumulates a point is reached where **between-farm variability is less important than variability between fields and across years within farms.**

Farmers usually face substaintial variation within farms and in fact, traditional management practices reflect adaptation to this variation. They often have different soil or land types or location of a field in relation to the village strongly influences mangement and base fertility levels. Decision making for this field-to-field variation within farms is sometimes referred to as "strategic" since farmers know or can measure this variation and accommodate it in their management strategy.

In addition, farmers commonly face substantial year-to-year variability, especially due to climatic and pest hazards. They often take decisions in response to this environmental variation, e.g. elimination of a second nitrogen application with early season drought or a decision to apply a pesticide based on observed pest incidence in a field. This type of decision making is sometimes referred to as "tactical". Both of these types of decisions—strategic and tactical—provide opportunities for **conditional recommendations.** That is, a recommendation is made conditional on a given event. For example, for wheat after maize apply 50 units of nitrogen and for wheat after sugarcane 100 units. Or if pest infestation exceeds a certain level then spray.

Different types of conditional recommendations are shown in Table 1. Both the conditioning variable and the final recommendation may be discrete or continuous. Examples of **discrete conditional variables** are crop rotation, land type, soil type and pest presence or absence. These are usually known or are easily observable by farmers. **Continuous conditional variables** include soil test results, pest counts and recorded rainfall. These require some effort and costs on the part of farmers to measure. A common example is the threshhold concept in pest management where pest scouting is used to estimate pest population density and to predict pest damage. When predicted damage exceeds a threshhold determined by the cost of spraying a pesticide, a recommendation is made to spray (e.g. Mumford and Norton, 1984). Continuous conditional variables may lead to continuous recommendations. The most common example is soil testing to make fertilizer recommendations, where recommendations are often related to soil test results along a calibration curve.

Table 1: **Examples of conditional recommendations**

Conditional Variable	Recommendations: Discrete	Recommendations: Continuous
Discrete	1. Fertilizer level x crop rotation, soil/land type (S) 2. Pest control x pest presence/absence (T)	NA
Continuous	1. Pest control x pest count (T) 2. Irrigation x soil moisture % (T)	1. Fertilizer level x soil test level (S)

S = strategic decision. T = tactical decision. NA = not applicable.

The Appropriate Level of Recommendation Specificity

On the basis of the above discussion we can define three levels of recommendations of increasing specificity.

Type I—General recommendations. A single recommendation is made for all farmers in a recommendation domain.

Type II—Recommendations conditional on discrete variables.

Type III—Recommendations conditional on continuous variables.

More specific recommendations entail higher research costs (more experiments), extension costs (more information to transfer) and farmer costs (to measure continuous conditional variables). Hence, an adaptive research program should invest in increasing specificity of recommendations until the value of the additional information exceeds the cost of generating, transferring and using the information. In developed countries, farmers are increasingly provided Type III recommendations (e.g. soil tests and integrated pest management based on pest scoutings) and most studies suggest that the value of the additional information exceeds the cost (Byerlee, 1986). In developing countries, major emphasis must still be placed on useful Type I recommendations. Considerable scope exists for Type II recommendations conditional on variables such as land type and crop rotation, although costs of transferring this information may be higher for farmers lacking literacy and numeracy skills. Many reserach systems have jumped to Type II recommendations such as fertilizer doses based on soil tests even though the appropriate supporting services such as soil test laboratories are not available or are not reliable.[1]

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[1] Although soil testing laboratories are available in many countries, most researchers complain of long delays and inconsistent results. Hence, it will be a long time before small farmers have ready access to soil test results.

AUXILIARY INFORMATION; ADAPTING RECOMMENDATIONS TO INDIVIDUAL FARMER NEEDS

The definition of recommendation domains and conditional recommendations must be made in terms of variables that are easily identifiable by extension workers. In practice, a good deal of variability between farmers is due to factors, especially socio-economic circumstances such as access to capital, that are important in farmers' decisions on technology, but which can not easily be employed in the field by extension agents as delineating variables. This type of variability is often greater in developing agriculture.

In addition, in a dynamic agriculture with a constantly evolving technical and economic environment, it is expensive to continuously update and tranfer very specific recommendations. Hence, recommendations are likely to rapidly become outdated and farmers need to be able to adapt technology to changes in the environment.

For these reasons recommendations, whether general or specific, **are only guidelines which farmers must adapt to their own individual needs.** Adaptive research programs usually generate a good deal of information that is not incorporated into the recommendations but which would be valuable to farmers in their own adaptation of recommendations. Examples of this type of information are:

1. Economic data on costs and returns. For example, the net benefit curve (see Perrin et. al, 1976) provides a set of **efficient treatments for each level of expenditure** and at different minimum marginal rates of return.[2] Optimum combinations of inputs (e.g. nitrogen and phosphorous) can be easily derived for a given expenditure outlay.
2. Data on the sensitivity of the response of recommended technology, especially to the timing and method of application. In the course of conducting adaptive experiments, researchers learn a great deal about factors that affect the efficiency in using a given input under farmers' conditions. Information on downside risks (e.g. phytotoxicity from late herbicide applications) could be particulary important in speeding adoption.
3. Information on feasible sequences for the adoption of two or more technological components. As noted, farmers do not usually adopt a package, but proceed a step at a time. However, there are often interactions between technological components which indicate that one component should be adopted before another (e.g. weed control before fertilizer) while the reverse sequence might not be economic.

Beyond this auxiliary information from adapative research, farmers can more effectively adapt recommendations if **they understand basic principles of crop production and have basic technical and managerial skills.** For example, knowledge of nutrient composition, potential carryover effects and symptoms of nutrient deficiencies should help farmers adapt fertilizer recommendations to their own needs. Indeed some recommendations may depend on farmers' understanding of principles if they are to be widely adopted. Examples include changes in variety to avoid breakdown of pest resistance as new races of a pest evolve, or use of complex pest management practices that depend on survival of beneficial insects. In addition, the **technical efficiency** with which a recommendation is used will depend on farmers' skills in calculating doses, identifying pests, calibrating sprayers etc.

In many cases, extension services themselves are severely deficient in their basic understanding of production principles and technical skills. Initially researchers may want to concentrate on training of extension agents and providing them a wider range of auxiliary information, so that they can help farmers more effectively adapt and use the new technology. Over time, it is desirable that farmers themsevles acquire this knowledge and related skills. In a changing environment this knowledge and related skills will also depreciate more slowly than prescriptive information. This implies that extension give more emphasis to an **educational role** as opposed to its traditional **role in communicating messages.**

CONCLUSION

Farming systems research is largely a process of generating better information for farmers to improve their productivity.[3] There has, however, been a tendency to summarize this information into "recipes" for crop production that does little justice to the complexity of most farmer decisions or to the large amount of useful information generated in on-farm trials. Farmers can be provided access to this information through more specific conditional recommendations. However, in the longer run the challenge is to provide farmers the wider range of information, knowledge of production principles and technical and managerial skills to evaluate and adapt new agricultural technologies to their own needs.■

[2] The net benefit curve is the set of undominated treatments and is equivalent to the expansion path in conventional production economics.

[3] The feedback of information from on-farm research to set priorities for applied on-station research is also an important role.

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