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I FARMING SYSTEMS RESEARCH: HITTING A MOVING TARGET

II THE SOCIAL SCIENTIST IN FARMING SYSTEMS RESEARCH

by

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Paper I argues that although targetting is a key element in farming systems research, neither the concepts nor the procedures take sufficient account of the fact that farming systems are in constant flux: the 'target' is not static, but continuously on the move. A framework is presented for the analysis of change and the practical implications for farming systems research are analysed.

The involvement of social scientists in agricultural research institutions has contributed to the improvement of research methods but has often been associated with conflict. Paper II describes the development of such conflict in one composite situation and analyses five explanations: personal inadequacy; interdisciplinary communication barriers; poor group dynamics; inadequate institutional structure; and power struggle. It concludes that structural problems and disputes over power are more important than is usually recognised, and makes some suggestions as to the practical lessons of the analysis for social scientists, for the colleagues of social scientists and for higher level policy-makers.

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Paper I

Farming Systems Research: Hitting a Moving Target

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FARMING SYSTEMS RESEARCH: HITTING A MOVING TARGET

Simon Maxwell[1]

1. Introduction

There is a paradox at the heart of farming systems research (fsr). On the one hand, an extensive literature stresses the iterative, continuous and dynamic nature of the farming systems research process (see, for example, Snaner et al. 1981; Norman 1980; Gilbert, Norman and Winch 1980). On the other hand, fsr in practice has been curiously indifferent to similar characteristics in the rural environment itself. Although targetting is a key element in fsr, neither the concepts nor the procedures take sufficient account of the fact that farming systems are in constant flux: the 'target' is not static, but continuously on the move.

This paper explores the treatment of dynamic change in the literature on farming systems research and finds it to be haphazard and unsystematic (section 2). It then proceeds to develop a more rigorous framework (section 3) and to discuss the practical implications (section 4). It concludes that improvements are needed to fsr procedures in order to encompass and exploit the possibility of dynamic change. These should be adopted even though they imply some cost in terms of the speed with which fsr is able to produce useful results.

It may seem perverse to argue that fsr is ill-equipped to handle the difficulties posed by a moving target. Uncertainty, to take one example, is a common preoccupation of both natural and social scientists; stochastic models have been developed to deal with many dimensions of variation in rainfall, pest population or prices (see, for example, Dillon and Hardaker 1980, esp. chs 4 and 8; MacArthur 1980; Roumasset et al 1979). Similarly, farm development modelling, with its emphasis on medium term change, is an integral part of agricultural project analysis (Brown 1979; Gittinger 1982). However, other kinds of change have not been so well studied and the following examples will surely contain elements familiar to others in the field:

(a) In country A, there was a devaluation of 600 per cent in just over a year. As a result of the devaluation and of government intervention to control food prices, there were dramatic shifts in relative prices, affecting both outputs and inputs and the price ratio of outputs to inputs. These rapid changes affected many of the recommendations made to farmers by the agricultural research and extension system. For example, cotton was not viewed favourably as a small farm crop at the beginning of the year because it offered only a small increase in income, at the expense of a considerable increase in risk. By the end of the year,

however, the relative price of cotton had risen to such an extent that this recommendation was no longer valid. Similarly, recommendations made at the beginning of the year about the desirability of replacing labour with chemicals for weeding became invalid when imported herbicide costs rose much faster than local labour rates.

(b) In country B, farming systems researchers had concentrated their attention on raising the incomes of farmers practising slash and burn agriculture with one major cash crop (rice), but low cash returns. While research was continuing into an exceedingly complex system aimed at improving returns to labour and cash by extending the cropping cycle, agriculture in the area was transformed by the introduction of a new cash crop (cannabis). The high rate of return to this crop ensured its very rapid adoption quite independently of the research and extension system. The assumptions about labour and cash availability on which the research programme had been based were no longer valid.

(c) In country C, dependent on the export of bananas, farmers were unwilling to adopt new technology. A key reason was their perception that the real margin on bananas was falling. Although there was historical evidence to support this, no attempt had been made to forecast future falls and incorporate the results in economic analysis of recommendations to farmers.

These three cases illustrate different problems, but what they have in common is dislocation of a research and extension programme, caused by changes in the characteristics of the farming system to which research was targetted, or the environment in which the system was located. To some extent also, these cases represent a failure of farming systems research, since, in at least two of the three (A and C), the change might have been forecast and acted upon. It is important to investigate whether this resulted from individual (but widespread) failure to apply existing precepts or from a more systematic failure of farming systems method.

2. Fsr: A failure of method?

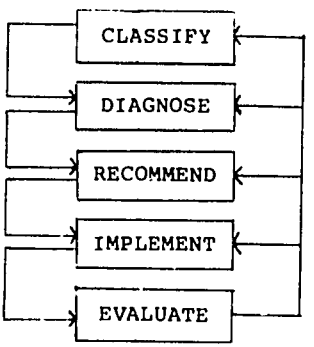
It is necessary to note at the outset that farming systems research has grown to the point where there is no one method, but rather a number of alternative paradigms, designed for different purposes and in response to different institutional, economic or political pressures. Indeed, it is one of the strengths of the movement that it is broad enough to attract around a common set of principles, agricultural research specialists with many different interests: the international system or national systems; individual crops or whole farm improvement; emphasis on on-farm research or more general concern with research priorities.[2] These common principles

include the farmer-centred nature of research; the holistic nature of farming systems; the need for multidisciplinary analysis; the importance of on-farm work; and the iterative, continuous nature of agricultural research.

Embedded in these general principles is a quintessential five step procedure for farming systems research, summarised in Figure 1 (cf Norman 1980:7, Byerlee, Collinson et al. 1980:5).

Figure 1

Steps in the farming systems research method



(i) Classification is concerned with the identification of homogeneous groups of farmers with similar natural and socioeconomic characteristics. It forms the basis for the setting of priorities and for the targetting of research and extension to particular farm types. Its importance is reflected in the economists' concern with 'recommendation domains' and in the agronomists' concern with 'representative trial sites' (Perrin et al. 1976; Harrington and Tripp 1984; Zandstra et al. 1981).

(ii) Diagnosis has to do with identifying the limiting factors and development opportunities of particular target farm types identified at the classification stage.

(iii) The generation of recommendations may simply involve drawing on the existing body of knowledge, but in most field situations is likely to involve experimentation, either at the farm level or at the research station, or both.

(iv) A commitment to implementation is usually found in farming systems programmes, often directly in the form

of seed multiplication, for example, but also indirectly through support to the extension service.

(v) Finally, evaluation is an important component of all programmes, reflecting the importance attached to continuous contact with the farmers. Evaluation will normally lead to reappraisal and therefore to a reinitiation of the cycle.

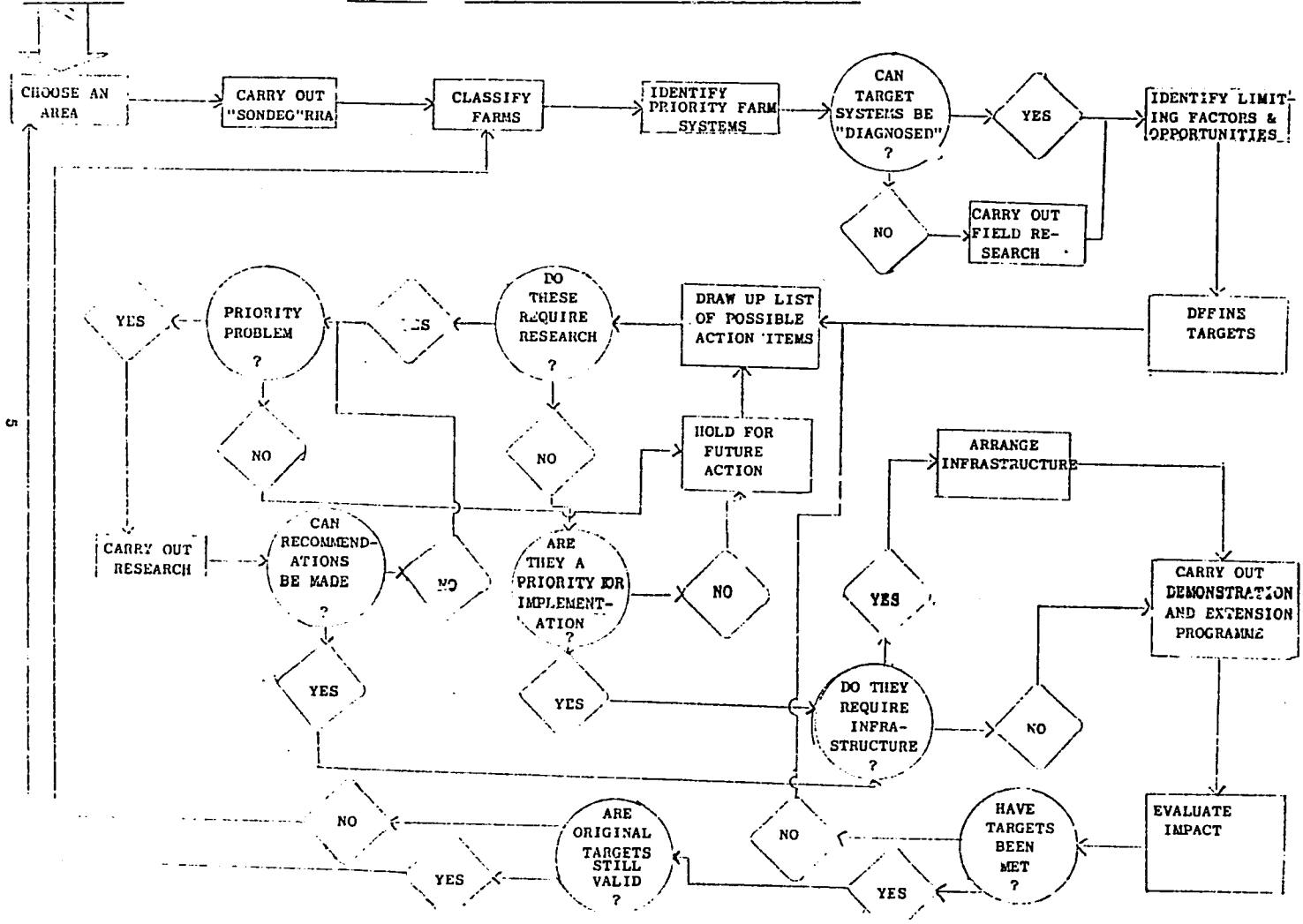
Of course, the schematic five step procedure does not imply that farming systems research must always start from scratch or that each step must be completed fully before subsequent steps can begin. Farming systems research is a much more open-ended and iterative procedure, as the flow chart in Figure 2 attempts to demonstrate. Here, questions are always being asked about the priorities for immediate action and the important next steps.

There is a clear time dimension to this method. In the first place, there are obvious time lags associated with the five step procedure: in particular, between the diagnosis of constraints and opportunities (step 2) and the preparation of suitable recommendations (step 3). There will also be a lag between the time when recommendations become available and the time when they are finally put into effect by a majority of farmers (step 4).

It is difficult to estimate how long these time lags might be. Between steps 2 and 3, that is between diagnosis and the generation of recommendations, the time lag may be very short: a recommendation may be available 'off the shelf' from the stock of knowledge. On the other hand, a full programme of research may be required, involving perhaps two or three years on the research station and as long again on farmers' fields. Between steps 3 and 4 there may again be a lag, shorter if the recommendation is immediately and obviously profitable, if the extension service is able to disseminate the recommendation quickly and if resources for its implementation are available; longer in the case of risky changes to the farming system or if external resources have to be mobilised. Evidence in the case of HYVs suggests that it may take five years before 80 per cent or more of farmers are using a recommendation even when adoption is both simple and profitable (Pinstrup-Andersen 1982). This suggests a total time horizon of up to 10 years in many cases.

There is, however, a further element, because the recommendations to be made may themselves be of short or long duration. Some recommendations (eg 'increase plant density') may commit the farmer for only one crop season, others may commit him or her for many years (eg 'plant cocoa'). The time horizon may therefore be much longer than that required by the simple research process. The time horizon to which fsr should operate will be a matter for debate in any particular circumstance, but as a general rule is unlikely to be less

Figure 2 THE FARMING SYSTEMS RESEARCH METHODOLOGY



than five years and in most cases is likely to be a good deal more. A 10-15 year horizon for most agricultural research work would not be misplaced.

In some cases, of course, fsr is in a position to be flexible and to respond to changes in circumstance over this time period quickly: for example, a programme of research on fertiliser application rates will generate input-output coefficients that can be used to support different recommendations depending on the relative prices of fertiliser and product. In other cases, however, fsr will be less flexible: resources may be committed to research on a constraint that will not be binding by the time the results become available; or worse, may not be committed to research on what will be the binding constraint in 10 or 15 years' time.

FSR must, therefore, look ahead. From the point of view of method, there are two important questions that should be asked: first, is the classification stable? If research resources are to be concentrated on the problems of a representative farm type identified as of high priority, will that farm type continue to be representative and of high priority for the time horizon over which agricultural research must work? Secondly, will the characteristics of the representative farm remain stable, so that the diagnosis of limiting factors and opportunities will have continuing validity?

In general, the literature on fsr does not ask these questions, nor does it provide guidance on the kinds of change to expect over the time-period. There are, however, some exceptions, and it is worth entering the literature at three different points in order to look for help.

First, on the general question of whether the possibility of dynamic change is recognised. The literature is not homogenous. At one extreme, the possibility of dynamic change is almost excluded by definition since a farming system is defined as 'a unique and <u>reasonably stable</u> arrangement of farming enterprises, that the household manages according to <u>well-defined practices</u> ...' (Shaner et al 1981, section 2.3.5, emphasis added). At the other extreme, attention is drawn to changes over time in the external economic environment (Byerlee, Collinson et al. 1980:9) and the fact that 'farmers continually interact with and adapt to their environment' (Jayasuriya and Castillo 1984:110). In one of the strongest statements on this subject, Norman et al. comment, with respect to the semi-arid tropics of West Africa, that

> Our investigations have led us to the conviction that many of the changes in the quantities, characteristics, qualities and distribution of the factors of production can be explained, partially at least, on the basis of (increasing population densities and the gradual emergence

> of the region into the world economy)... The latter has arisen in part due to the continuing development of the communications system throughout the region. This has had two effects. The first is that it makes the commercialisation of agriculture more feasible through the production of export cash crops. The second effect is that there have been changes in the relationships within communities. Ones that were more self-contained and sharing in philosophy have become increasingly dependent upon the outside world and more individualistic in orientation. (Norman et al. 1981:5).

There is clearly, then, an awareness in some parts of the literature of the importance of some aspects of dynamic change. However, if the literature is entered at a second level, this awareness is far less evident. At this point, concern is with what are called the 'determinants' of farming systems, that is to say with the combination of natural and socioeconomic factors that produces a particular configuration of resource availability and factor use at the farm level. Determinants are generally taken to include physical factors such as climate and soils; biological factors such as weeds, pests and diseases; and socioeconomic factors, including markets, institutions, government policies and aspects endogenous to the farm family such as food preference, risk aversion and savings (Hart 1980; Norman 1980; Byerlee, Collinson et al. 1980, Shaner et al. 1981). These are usually presented diagrammatically (see e.g. Appendix 1) and make little allowance for the process of dynamic change; in particular, there is usually insufficient attention to the feed-back between the farming system and its determinants or to processes of accumulation and surplus extraction (see, however, Deere and de Janvry 1979). For example, savings earned in one year may be reinvested in the next, so changing capital availability. Or a failure of food supply may cause malnutrition and reduce labour availability in the following year (Maxwell 1984).

These gaps are important, because if the literature is entered at a third point, it is found that detailed checklists of information to be collected are derived principally from the diagrammatic analyses of farming systems determinants. The various checklists provided, by ,for example, Collinson (1981, 1982), Carruthers (1979), and Shaner et al. (1981) or in manuals by CIMMYT (Byerlee, Collinson et al 1980) and IRRI (1984) are, of course, only a guide to field activity; but it is notable that they devote very little attention either to the historical evolution of the present farming systems found in a study area or to the likely development of such systems over the medium term. There are some exceptions to this: Collinson, for example, includes questions on new agricultural activities and changes in consumption habits; but the general conclusion is that the awareness of the importance of dynamic change is not reflected in practical guidelines for farming systems researchers.

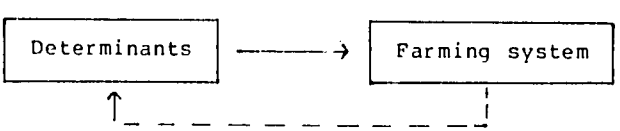
Corroboration for this view can be found in the lack of advice in the fsr manuals on how to handle dynamic change and the consequent adjustment to classification and diagnosis; and in the lack of discussion of dynamic effects in many of the case studies that have been published on fsr in the last few years.[3] It can be concluded, therefore, that the admonition to take account of dynamic processes in farming systems research is honoured more in the breach than in the observance. However, if the conceptual framework were stronger, practical action might follow. It is to the task of strengthening the framework that we now turn.

3. Framework for the analysis of change

It is apparent from the previous discussion that the point to begin is where the existing literature seems to lose its way: that is to say, at the point where the general awareness that conditions are constantly changing is, or rather is not, incorporated into an analysis of the determinants of farming systems. The general model is summarised in Figure 3: it shows the farming system as influenced by a set of determinants which, in turn, can be influenced by the operation of the farming system itself. If the determinants change then so, to a greater or lesser extent, does the farming system. What therefore needs to be done is to identify the determinants, assess the extent to which they are likely to change and estimate the effects these changes will have on the farming system. Of course, there are no general rules: farming systems vary greatly with the climate, the population density and the degree of commercialisation, to name but three factors. The effect of a change in relative prices, for example, will be much greater in a fully commercial system than in a subsistence system. Nevertheless, though the answers are different, the questions are the same and there is need for a general framework.

Figure 3

Basic model of the determinants of a farming system



(i) The determinants of a farming system

The first step in building a framework is, then, to identify the determinants of a farming system. As noted earlier, these include natural and socioeconomic factors, both on the farm and in the wider environment. A collection of the main determinants is brought together in Figure 4, drawing on literature in the farming systems field (Norman 1980; Byerlee,

Collinson et al 1981, Ruthenberg 1980), as well as literature in the broader rural development field (e.g. Harriss 1982; Thornton 1982; Heyer et al. 1981). The list is inevitably incomplete and makes no attempt to allocate relative priorities among the items listed, but it serves to emphasise the wide range of factors acting on the farming system. main classes of determinants are identified - two natural and two socioeconomic, though there are inevitable interconnections:

(a) Physical factors: climate, soils and topography are obvious physical determinants of what can be produced in a farming system and when, affecting particularly the seasonality of production. Man-made physical infrastructure (roads, irrigation or drainage) is also important: it will affect land quality, production possibilities, market access and price.

Figure 4

Determinants of a farming system

Natural		Socioeconomic	
Physical	Biological	Exogenous	Endogenous
Climate Topography Soils Physical infrastructure	Crop alternatives Livestock alternatives Weeds Pests Diseases	Population Tenure Off farm opportunities Social infrastructure Credit Markets Prices Technology Input supply Extension Savings opportunities	Family composition Health and nutrition status Education Food preferences Risk aversion Attitudes/goals

(b) Biological factors are normally taken to cover weeds, pests and diseases affecting crops or livestock, influencing what enterprises are chosen, the production systems adopted and the yields obtained. These factors are not independent of the farming system, since the level and composition of the pest population may in each case be affected by what is done on farms. Crop and livestock alternatives are included in the list in order to emphasise that farmers choose from a range of options: again, human intervention may affect the range, especially through research.

(c) Exogenous socioeconomic factors are nominally those operating outside the control of the immediate farm family, though the distinction between exogenous and endogenous may be difficult to maintain, especially in communities with a high degree of social interaction. The factors listed will affect the resources held by the farm, the activities open to farms and the margins earned on each. Population growth and tenure arrangements will determine the quantity and quality of land to which a farm has access as well as cost. Off-farm opportunities and the quality of social infrastructure (health, education) will affect the quantity and quality of labour available from different individuals at different times of the year. Credit systems, both formal and informal, will influence the capital available as fixed assets or in the form of working capital. Markets and prices, for products and factors, including labour, will help to determine both what can be produced and what is produced; markets may be local, regional or national in scope and may be subject to differing degrees of government intervention. Technology, input supply and extension will help determine what production systems are used and what levels of output are obtained. And, finally, savings opportunities, along with off-farm enterprises and social security mechanisms, will affect the extent to which any surplus is invested in the farm business.

(d) Endogenous socioeconomic factors affect resources, activities and margins in the same way as exogenous factors. Family size and composition, along with gender roles, determine the amount of family labour available. This will be modified by the health and nutrition status of the family and by the level of education. The activities undertaken will be influenced by food preferences as regards timing and composition of diet as well as by the attitude towards risk. The attitudes and goals of the family may also determine the extent to which stocks are held, diversification is carried out or accumulation pursued.

It should be emphasised again that these determinants will act in a concerted way to produce farming systems of great diversity. Some factors will be important where others are not. Nevertheless, what is striking about the list is how many of the factors are subject to change, even over the 10-15 year period which has been identified as the time span over which fsr should operate. The second step in building a framework is, then, to assess the likelihood of this change and its likely magnitude.

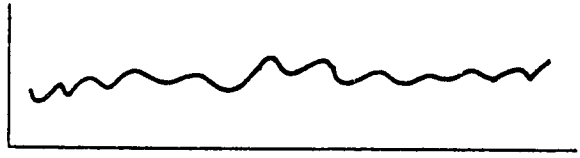
(ii) Dimensions of change

In considering this question, it becomes apparent that change is of different sorts. An analogy is with time series analysis, where changes in observed values result from the interaction between several different components of change. Four of these are illustrated in Figure 5: normal variation, sudden shocks, cycles and trends. These will obviously differ

Figure 5

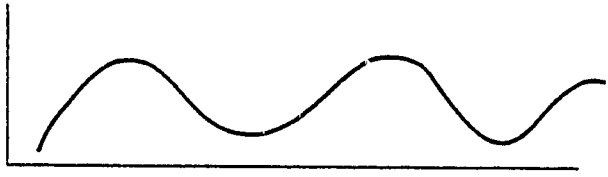
Four Components of Change

NORMAL VARIATION

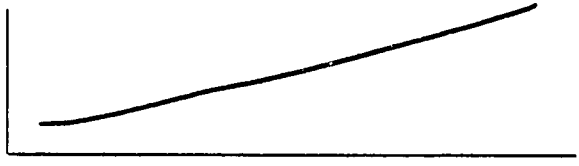


SHOCKS

CYCLES



TRENDS



in their effect on the farm system, not least because they differ in the ease with which farmers can predict them. It therefore makes sense to assess change in the determinants of farming systems in the context of an analysis of the components of change.

This task is carried out in Figure 6, which provides examples of changes for the various determinants listed in Figure 4. Some of the entries in the table are worded positively ('new schools', 'new markets'), othes are worded negatively ('erosion', 'pest resistance'), but in most cases thesign could be reversed: schools close, erosion is reduced. The table shows that there are entries in all four columns:

(a) Normal variation is the kind of variation that occurs on a regular basis, often seasonally, and is expected both by farmers and researchers. Rainfall variation from year to year is a good example, but there are also many seasonal factors to do with access, prices, or health and nutrition status (Chambers et al 1981). This kind of change is important but is outside the main scope of the paper.

(b) Sudden shocks, by contrast, are not usually expected and are not often taken into account in research programmes. As the table shows, shocks may occur in all four categories of determinants. Some may result from government policy, such as land reform programmes or the spread of official credit; others may be 'Acts of God', such as floods or epidemics. Some of the changes (eg settlement schemes) may have a longer lasting effect than others (eg food aid programmes) and the changes clearly vary in the degree to which they can be predicted in a research programme: loss of resistance to insect pests may be predicted when new varieties are introduced, though the precise timing will be difficult to estimate.

(c) Cyclical changes are unusual in this field, but two examples are given in the table. International commodity price cycles are an important factor in assessing the profitability of certain enterprises and changes in family size over time may affect area sown.

(d) Trend changes are clearly important and easier to predict than shocks. The table again contains entries from all four classes of determinants, ranging from the gradual spread of salinity in some irrigation schemes to the effect of declining infant mortality on labour and cash availability.
What the table in Figure 6 provides is an outline framework for assessing the likely magnitude of change in a particular situation: in effect a list of questions designed to test assumptions about the medium term stability of the determinants of farming systems. There remains the question of whether instability matters and of how it affects the farming system.

Figure 6 Sources of change in a farming system

Determinant	Component of change			
	Normal variation	Sudden shocks	Cycles	Trends
Physical				
Climate	Rainfall variation, frosts	Drought, flood, cyclone	-	Desertification
Topography	-	Land levelling	-	-
Soils	-	Drainage, lining	-	Erosion, salinity, compaction, capping
Physical infrastructure	Seasonal access	New roads, irrigation systems, market centres	-	Deterioration of roads, canals
Biological				
Crop alternatives	Year to year yield variation	New crops or varieties	-	Gradual crop improvement
Livestock alternatives	-	New livestock enterprises or breeds	-	Gradual breed improvement
Weeds	Population dynamics	New weed species	-	Spread of weeds, grass invasion
Pests	Population dynamics	Susceptibility/loss of resistance/new pests	-	Resistance to chemicals. Increase in population with Green Revolution
Diseases	Population dynamics	Susceptibility/loss of resistance/new diseases	-	Resistance
Exogenous socio-economic				
Population	-	Epidemic or famine	-	Change in man-land ratio
Tenure	-	Land reform, settlement	-	Resumption of tenancies, changes in share
Off-farm	Seasonal employment	New migration opportunities, commercial openings	-	Migration
Social infrastructure	-	New schools or curricula. New clinics or treatments	-	Gradual improvement
Credit	Interest rates, availability	New credit programmes	-	Increased gearing ratio
Markets	-	New markets	-	Expanding markets
Prices	Seasonal variation	Devaluation, 'incentive' prices	Commodity price cycles	Urban bias, declining terms of trade, inflation
Technology	-	New techniques, pieces of equipment	-	Improvements in efficiency, technical progress
Input supply	Seasonal availability	New chemicals, supply mechanisms	-	Gradual spread. Mechanisation
Extension	Dry season bias, large farm bias	New programmes	-	More/better extension
Savings	Good and bad years	Coops or bank branches Remittances	-	Capitalisation or decapitalisation
Endogenous socio-economic				
Family composition	Births and deaths	Premature death, migration	Chayanov cycles	Changes in gender relationships
Health and nutrition status	Minor illness, malnutrition	Major illness, malnutrition	-	Declining mortality, improving nutrition
Education	-	-	-	Improving managerial ability
Food preferences	Seasonal preferences	Food aid programmes	-	Changing tastes
Risk aversion	Caution in innovation	Good or bad experience with new technology	-	Effect of capitalisation
Attitudes/goals	-	Development of off-farm enterprises	-	Greater commercialisation

Available Document

(iii) Effects on the farming system

A farming system consists of resources (land, labour, capital) used in activities (crops, livestock, off-farm) which produce a flow of outputs (food, raw materials, cash). There are clearly many ways in which the changes discussed above could influence these characteristics of the farming system and therefore the analysis of scarce resources and opportunities on which research is based.

(a) Resources include both the quantity and quality of land, labour and capital used in farming. Whatever resources a farm has, it is possible that the factors in Figure 6 could change the situation within the space of 10-15 years. For example, increasing population associated with increasing social differentiation could reduce average farm size: the 'representative' farm might have five acres at the beginning of the period but only three by the end. There is evidence of this process in the literature on the 'disappearance of the peasantry' in Latin America (de Janvry 1981) and in work on rapid rural polarisation in Bangladesh (Briscoe 1978, Hartmann and Boyce 1983). As another example, gradual capitalisation of farmers on settlement schemes might mean that over a 10-15 year period assumptions about the shortage of equipment and cash might gradually become invalid: there is evidence of this from colonisation of areas in Bolivia (Maxwell 1980). Again, increased migration possibilities might reduce family labour availability, either seasonally or throughout the year: there is evidence of this in Africa (Eicher and Baker 1982). These are random examples, in each case, the effect on the farm system could be significant, upsetting the assumptions on which research was based.

(b) Activities encompasses the selection of enterprises, the choice of production technique and decisions about the disposition of products. Here again, there is a strong case for saying that changes in determinants may have a significant effect on the system in the relatively short term. For example, the introduction of new HYV wheat varieties is likely to lead to greater areas of wheat being sown and to greater use of inputs; at the same time, the adoption of this new technology may set off a process of accumulation which may reduce the need or desire to grow subsistence crops. There is evidence to support this hypothesis from studies of the Green Revolution in India (Lipton 1978, Dasgupta 1977). Changes in relative prices and in terms of trade will have major effects, influencing enterprise patterns, input use and storage policy: some of these may be gradual changes in line with accepted price elasticities, others may be more abrupt in response to shifts in foreign exchange regimes or the degree of 'urban bias' (Lipton 1977). Cropping patterns may alter in response to new markets or government policy, for instance as a result of Government controls to increase food production: this appears to have happened in Rwanda (Langley 1984). If the

pattern of normal activities changes, even if the change is in response to research, then research priorities may also change.

(c) Outputs will be susceptible to change also, particularly as regards the flow of food to the family and the pattern of cash availability. In turn, these will affect the ability to accumulate and diversify. For example, savings or credit changes may have the effect of evening out cash availability and reducing the need to reach the same objective by adjustments to the farming system (cf Chambers et al 1981:229). Or a change in food preferences may influence the allocation of output between consumption and sale.

As before, what is described here is a method, not a set of conclusions. However, it should be obvious from the examples given that the potential for significant changes to the characteristics of the farming system exists. And if this is so, there are practical implications for farming systems research.

4. Practical implications

So what, actually, is to be done? How can the method outlined above be incorporated into fsr? There are at least five answers to this question:

(i) Improve data collection. The various checklists cited in Section 2 provide between them an extensive list of what needs to be known about the farming system. The additional determinants listed in Figure 4 may suggest some additional questions. All these lists could be improved in two ways to deal with the dynamic considerations discussed in this paper. First of all, it would be useful to add to each of the questions in the checklists two additional points: 'Was it always like this?' and 'Will it always be like this?' These sound trivial, but are not: they are a cue to farmers and other respondents to talk about the way in which farming has changed and the way they see it as likely to change in the future. They also provide a cue to the investigators to check secondary data sources for useful historical facts and encourage them to establish closer contact with planners and policy-makers. This should already be standard practice, but it is remarkable how few research stations have copies of national economic plans and statistical summaries and how few monitor, on a systematic basis, changes in input and output prices and other developments of relevance to their client farmers.

The second improvement to existing checklists would be to begin by focusing not on the farming systems but on the characteristics of the areas or villages in which

farming systems are located, collecting information not only about their present state but also about the influences which act upon them. This would serve to focus attention on the relationship between farmers, for example on changes in population pressure, degree of social differentiation or incorporation into the market (cf Norman et al. 1981).

As an example of how checklists might be adapted, an alternative to those cited is to be found in Maxwell and Pozo (1981). This begins as an area profile rather than a description of farming systems and includes information on history, population movements and government development programmes as well as on the characteristics of the farming system. As a result of applying this checklist at an early stage of farming systems investigations, it was possible to relate later work to an evolutionary process in colonisation areas which led farmers into a crisis caused by the exhaustion of high forest and then out again through capitalisation and diversification (Maxwell 1980). The better management of this change process became the prime objective of farming systems research (Maxwell and Pozo 1981, Maxwell, Stutley and Bojanic 1982).

(ii) Improve classification procedures. Farm classification serves both to encompass variation in a study area and to provide a basis for deciding on research priorities (eg concentrate on farm type x because it accounts for 60 per cent of the population, rather than farm type y which only accounts for 10 per cent). If a dynamic element is to be introduced into the classification exercise, then two questions should be asked: 'will the basic classification still be valid in 10 or 15 years time?' and 'will the criteria used to decide priorities still produce the same ordering in the future?' Again, this stipulation requires a certain amount of futurology to be built into the farming systems method as an explicit requirement. Consideration should be given to likely changes in the physical, biological and socioeconomic factors used to establish the classification and estimates should be made of overall changes in the farm population. At the same time, questions should be asked about how far development of the systems will affect their relative priority ranking; such changes should include those brought about by the agricultural research process itself.

An example may be given of how this would work in practice. A classification exercise carried out in 1979 in a colonisation area in Bolivia identified six priority farm types, which accounted for approximately 85 per cent of the population. However, it was known that immigration into the area was continuing, that farms were continually developing, that social

differentiation was associated with land accumulation by certain farmers and that government development programmes were likely to result in better access, greater capitalisation and a greater use of inputs. The classification exercise was therefore extrapolated over a five year period in order to see whether or not significant changes would take place. It was found that there was a great deal of movement in and out of certain categories, but that the overall classification remained valid with only one major change (Maxwell and Pozo 1981:61ff). Since it was assumed that overall priority would continue to be given to the study area over the period, this dynamic classification enabled farming systems work to proceed with some assurance that its results would be valid in the medium term.

(iii) Improve diagnosis. As with classification, diagnosis can commit an agricultural research programme some years ahead, since research resources are targetted to the solving of particular problems. It is necessary to be sure that these problems will not be eliminated by some outside change. For example, will an increase in cash availability enable farmers to mechanise or make use of chemical inputs, thus eliminating a labour bottleneck regarded as constant in agronomic research? If a farm development programme takes place, how will this affect the limiting factors operating within the farm system? What effect will improved access, communications, infrastructure or input supply have on the characteristics of the farming system over a five or ten year period? And how does this then change the research priorities?

Again, an example from work carried out in Bolivia. It was discovered during diagnostic work that a particular group of farmers pursuing mechanisation strategies were running into cash flow difficulties (Maxwell et al 1982). Since this was likely to lead to long term decapitalisation, the problem became one for further study and research (Stutley et al. 1983).

(iv) Improve recommendations. There are two things that might be done here. The first is to aim recommendations not at where the farming system is now but, so to speak, at where it will be when the recommendations are implemented and for the duration of the time they will be implemented. This means that research stations should carry out economic analysis using estimates of future input and output prices, including future opportunity costs for inputs and outputs where appropriate. How many research stations for example, regularly make use of World Bank commodity price forecasts? Further, how many research stations regularly review and update their recommendations to farmers based on changing price relativities?

The second thing that research stations might do is to pay greater attention to the probability of change and its likely direction and magnitude in preparing recommendations. Given that some changes can be forecast and others cannot, what this probably means is giving greater weight to uncertainty in farm system modelling. There is probably a stronger case than is usually made for diversification, risk spreading and the accumulation of capital assets that can be liquidated in an emergency (eg livestock).

(v) Strengthen monitoring and evaluation. If farming systems, as has been suggested, are constantly on the move, reacting both to their own internal dynamic and to the external environment, then it is more than ever necessary to monitor and evaluate changes. Classification, diagnosis and the preparation of recommendations are continuous processes, not one-off exercises. The progress of farming systems work needs constantly to be re-evaluated in the light of changing conditions on the ground. This requires an institutional commitment to monitoring and evaluation which should not only be asking what has happened but also why.

None of these is an earthshaking proposal in itself. What is needed is to take the awareness of the importance of dynamic change in rural areas and turn this into a practical concern for the sources of change in farming systems research. A commitment is then needed not only in intellectual terms, but also in terms of resources, in order to carry out the more detailed fieldwork that is necessary.

5. Conclusion

This paper has argued that farming systems research has a 10-15 year time horizon. During this time the determinants of farming systems may change and the characteristics of the systems themselves may change. In turn research priorities may change. Fsr should be aware of this possibility and take greater account in its procedures of changes in the rural environment. Indeed, this conclusion may be particularly appropriate at a time when the impact of the recession is forcing many developing countries into adjustment policies which have a marked effect on the socioeconomic environment in rural areas.

However, this is an argument that goes somewhat against the grain in farming systems research. As an applied, practical movement, fsr has been concerned with quick, cost-effective solutions. It has had a particular interest in rapid rural appraisal and in institutional arrangements to ensure that research priorities can be identified quickly and solutions

provided to farmers as soon as possible (eg see Collinson 1982). It was never clear that this could be done very easily in most circumstances (Maxwell 1984); but if it is true that farming systems are in a constant state of flux, this reinforces the case for an approach to farming systems research that is continuous, dynamic and interactive. Better to take slightly longer and hit the moving target than to assume it is stationary, act quickly and fail to hit it at all.

Notes

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2. Compare, for example, the work of CIMMYT and IRRI who are mostly concerned with individual crops and with the links between national and international research systems (Byerlee, Collinson et al. 1980; Zandstra et al. 1981), with others who are more concerned with whole farm systems or with national research establishments (Galt et al. 1982; Kean and Chibasa 1982; Biggs 1983).

3. There are now very many case studies available in the farming systems field. For an early review, see Gibert, Norman and Winch (1980). More recent bibliographies are Biggs (1982), Casey and Barker (1982), Farming Systems Research Group (1981) and Winrock International (1982).

References

Biggs, S.D., 1982, 'Agricultural Research: a Review of Social Science Analysis', Discussion Paper 115, University of East Anglia, October

Briscoe, J., 1978, 'Labour and Organic Resources in the Indian Subcontinent'in A. Pacey (ed), Sanitation in Developing Countries, John Wiley & Sons, Chichester

Brown, M.L., 1979, 'Farm Budgets: from farm income analysis to agricultural project analysis' World Bank staff occasional papers No 29 John Hopkins for the World Bank, Baltimore

Byerlee, D., M. Collinson et al, 1980, Planning Technologies Appropriate to Farmers: Concepts and Procedures, CIMMYT, Mexico

Carruthers, I., 1979, 'A Mental Construct for Unstructured On-farm Interviews', Rapid Rural Appraisal conference paper, IDS, Sussex, mimeo

Casey, F. and R. Barker, 1982, 'A course in farming systems research: the Cornell experience', Cornell International Agriculture mimeograph 93, Department of Agricultural Economics, Cornell University, New York, July

Chambers, R., R. Longhurst and A. Pacey (eds), 1981, Seasonal Dimensions to Rural Poverty, Frances Pinter, London

Collinson, M., 1981, 'A low-cost approach to understanding small farmers', Agricultural Administration vol 8 no 6, November

Collinson, M.P., 1982, 'Farming Systems Research in E. Africa: The experience of CIMMYT and some national agric. research services 1976-81', MSU International Development Paper 3, Department of Agricultural Economics, Michigan State University, East Lansing, Michigan

Dasgupta, B., 1977, Agrarian Change and the New Technology in India, UNRISD, Geneva

De Janvry, A., 1981, The Agrarian Question and Reformism in Latin America, Johns Hopkins University Press, Baltimore and London

Deere, C.D. and A. de Janvry, 1979, 'A conceptual framework for the empirical analysis of peasants', in American Journal of Agricultural Economics vol 61 no 4, November

Dillon, J.L. and J.B. Hardaker, 1980, 'Farm Management Research for Small Farmer Development', Agricultural Services Bulletin No 41, FAO, Rome

Eicher, C.K. and D.C. Baker, 1982, 'Research on Agricultural Development in Sub-Saharan Africa: A Critical Survey', MSU International Development Paper no 1, Department of Agricultural Economics, Michigan State University, East Lansing

Farming Systems Research Group, 1981, 'A Working Bibliography on Farming Systems Research', Farming Systems Research Group Working Paper 12, Michigan State University, East Lansing, August

Galt, D., A. Diaz, M. Conteras, F. Peairs, J. Posner and F. Rosales, 1982, 'Farming Systems Research (FSR) in Honduras, 1977-81: A Case Study', MSU International Development Paper Working Paper no 1, Department of Agricultural Economics, Michigan State University, East Lansing

Gilbert, E.H., D.W. Norman and F.E. Winch, 1980, 'Farming Systems Research: a critical appraisal', MSU Rural Development Paper 6, Department of Agricultural Economics, Michigan State University, East Lansing, Michigan

Gittinger, J. P., 1982 Economic Analysis of Agricultural Projects 2nd ed. Johns Hopkins, Baltimore

Harriss, J. (ed) 1982, Rural Development: theories of peasant economy and rural change, Hutchinson, London

Hart, R.D., 1980, 'A farm in Honduras as a system: a case study', CATIE V:1, September

Harrington, L. and R. Tripp, 1984, Recommendation Domains: a framework for on-farm research, CIMMYT Economics Program Working Paper.

Hartmann, B. and J. Boyce, 1983, A Quiet Violence: View from a Bangladesh Village, Zed Press, London

Heyer, J., P. Roberts and G. Williams (eds.), 1981 Rural Development in Tropical Africa, Macmillan, London

IRRI, 1984, Basic Procedures for Agroeconomic Research, International Rice Research Institute, Manila

Jayasuriya, S.K. and L. Castillo, 1984, 'Farm Household Systems', IRRI, Basic Procedures for Agroeconomic Research, International Rice Research Institute, Manila

Kean, S.A. and W.M. Chibasa, 1982, Institutionalising Farming Systems Research in Zambia, Adaptive Research Planning Team, Department of Agriculture, Zambia

Langley, Philip, 1984, 'Linking Agriculture and Nutrition: Conversion of Extension Services to "Share and Support" Activities ...', unpublished paper for Study Course 1, IDS, Sussex

Lipton, M., 1977, Why Poor People Stay Poor: Urban Bias in World Development, Temple Smith, London

_____, 1978, 'Inter-farm, inter-regional and farm-non farm income distribution: the impact of the new cereal varieties', World Development vol 6 no 3, March, pp.319-38

Macarthur, J.D., 1980, 'Some Characteristics of Farming in a Tropical Environment', Hans Ruthenberg, Farming Systems in the Tropics, third edition, Clarendon Press, Oxford

Maxwell, S.J., 1980, 'Marginalized colonists to the north of Santa Cruz: avenues of escape from the barbecho crisis' in F. Barbira-Scazzocchio (ed), Land, People and Planning in Contemporary Amazonia, Occasional Publication No 3, Centre of Latin American Studies, Cambridge University

_____, 1984, 'Health, nutrition and agriculture: linkages in farming systems research', Discussion Paper, IDS, Sussex, (forthcoming).

_____ and M. Pozo, 1981, 'Farm Systems in the colonization crescent of Sant a Cruz, Bolivia: results of a survey', Working Paper No 22, CIAT, Santa Cruz, Bolivia

_____, C. Stutley and A. Bojanic, 1982, 'Report on a case study programme in San Pedro', Working Paper No 27 CIAT, Santa Cruz, Bolivia, July

Norman, D.W., 1980, 'The Farming Systems Approach: Relevancy for the Small Farmer', MSU Rural Development Paper 5, Department of Agricultural Economics, Michigan State University, East Lansing, Michigan

Norman, D.W., M.D. Newman and I. Ouedraogo, 1981, 'Farm and Village Production Systems in the Semi-arid Tropics of West Africa: An Interpretive Review of Research', Research Bulletin vol 4 no 1, ICRISAT, India

Perrin, R.K., D.L.Winkelmann, E.R.Moscardi and J.R.Anderson, 1976, 'From Agronomic Data to Farmer Recommendations: An Economics Training Manual', Information Bulletin 27, CIMMYT, Mexico

Pinstrup-Anderson, P., 1982, Agricultural Research and Technology in Economic Development, Longman, London

Roumasset J.A., J-M. Boussard and J. Singh, 1979, Risk Uncertainty and Agricultural Development, ADC, New York

Ruthenberg, H., 1980, Farming Systems in the Tropics, 3rd edition, The Clarendon Press, Oxford

Shaner, W.W., P.F. Philipp and W.R. Schmehl, 1982, Farming Systems Research and Development: Guidelines for Developing Countries, Prepared for USAID by the Consortium for International Development (CID), International Development Series, Westview Press, Boulder, Colorado

Stutley, C., 1982, 'A Study of the Problems of Destumping in the Chane-Piray Colonization Area of Santa Cruz', Working Paper No.34, CIAT, Santa Cruz

Thornton, D.S., 1982, The study of Rural Development: changing perspective Development Study No 24, University of Reading, Dept. of Agricultural Economics and Management

Winrock International, 1982, Bibliography on Crop-Animal Systems, Winrock International Livestock Research and Training Center, Morrilton, Arkansas, June

Zandstra, H.G., E.C. Price, J.A. Litsinger and R.A. Morris, 1981, A Methodology for On-Farm Cropping Systems Research, IRRI, Los Banos, Philippines

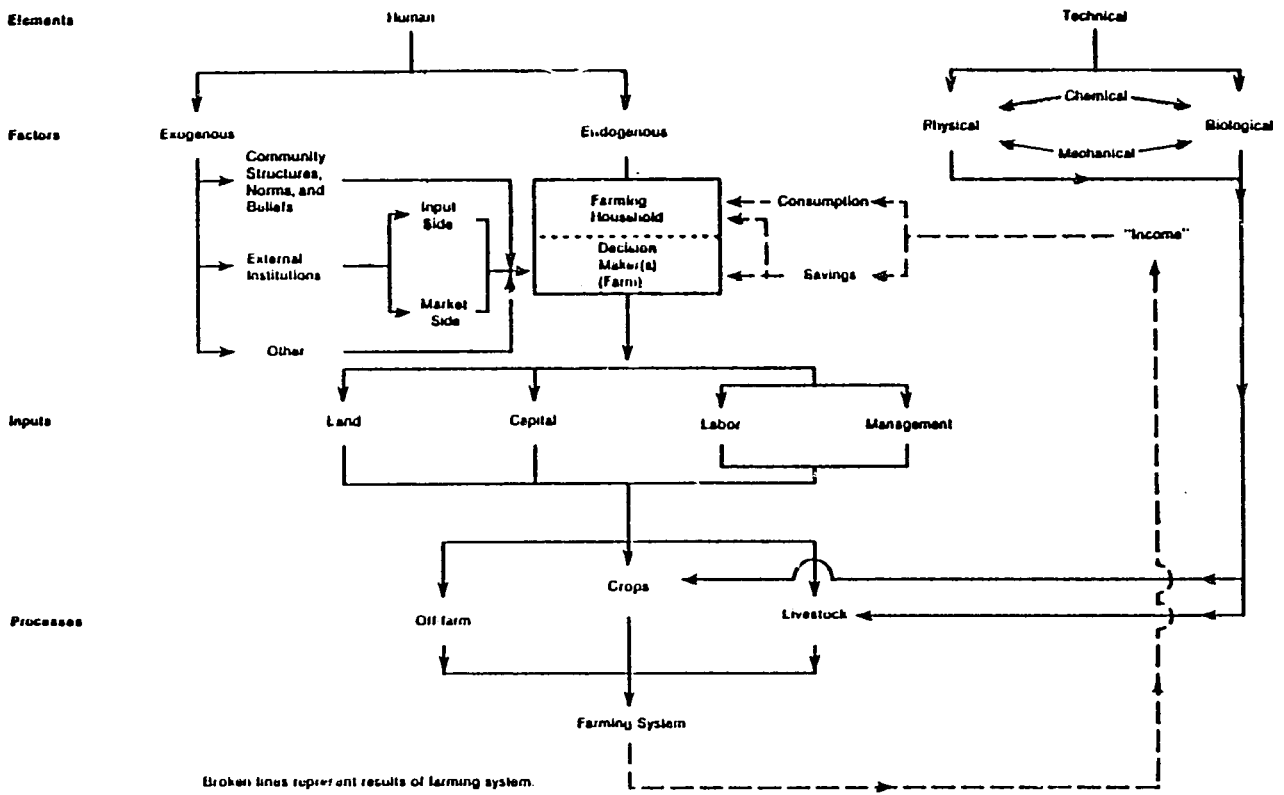

Figure 1 Schematic Representation of Some Determinants of the Farming System

Source: Norman 1980, p.4.