ON THE SYSTEMS DIMENSION IN FSR

Richard Bawden[1]

INTRODUCTION

The trouble with Farming Systems Research (FSR), is the word in the middle. While most of us are pretty clear when it comes to thinking about what 'farming' is, and about what we mean when we talk about 'research', the notion of 'systems' is far more elusive. Farming is what farmers do, and research is what researchers do. And farming research, is research into farming. So where does the systems bit fit in?

This is not, by any means, a trivial question. The demands on agricultural researchers are getting more and more complex, and it is therefore essential that the theories that they hold, and the research and development methods that they practice, are relevant to the situations being faced. The challenge of agriculture of course, is to continue to produce more and better quality food to feed an ever-growing global population, while trying, simultaneously, to improve the welfare of farmers and the rural communities in which they live, and the integrity of the global environment which all of us share. As there are some disturbing signs, that none of these three goals are currently being achieved, it is vital that research approaches to agriculture and rural development, are subjected to critical review with respect to their relevance.

And this brings us back to this issue of the word 'systems' at the heart of FSR, and what it is supposed to be signifying with respect to the nature of the research and development which is conducted in its name. These matters are of significance not just to the researchers themselves, but to policy makers and donors, who have to take decisions with respect to the allocation of scarce R&D resources, to educators, who have to be clear about the nature of the specific research competencies that their students need to acquire, and above all, to farmers everywhere.

The purpose of this paper is to explore this matter of the systems dimension of FSR, in a manner which, hopefully, will add to the clarifications which have been sought about the 'true' nature of FSR, almost since the time of its emergence as a major theme in international agricultural research. The essential argument that I want to put, is that by paying more attention to this

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[1] Professor of Systemic Development, University of Western Sdydney Hawkesbury, Richmond NSW Australia.

issue of 'systems', and what it might mean to both their theory and practice, FSR practitioners could significantly improve the quality and relevance of their approach to research. The systems sciences, which have evolved as the sciences of complexity, have much to offer to agriculture and rural development, and there is a lot to be gained from FSR practitioners learning more about what it means to be systemic.

Attention to the systems dimension, would bring farming systems researchers into closer affinities with other major systemic approaches to agricultural and rural development including agroecosystems analysis and development, systems analysis and simulation, and the emerging critical learning systems approach to development.

THE SEARCH FOR CLARITY

It is generally accepted that the term Farming Systems Research emerged in the mid- 1970s as applied to the development of technologies for small-scale farmers of limited resources (Hildebrand 1982). In response to what was being seen as inappropriate approaches to the technological needs of resource-poor farmers in the Third World, the arguments presented in favour of FSR supported two fundamental propositions: (i) "that development of relevant and viable technology for small farmers must be grounded in a full knowledge of the existing farm system, and (ii) that technology should be evaluated not solely in terms of its technical performance, but in terms of its conformity to the goals, needs and socio-economic circumstances of the targeted small farm system, as well" (Merrill Sands 1986). These two new imperatives for research revealed the farm management and agronomy 'pedigree' of the movement, while also setting it clearly apart from the types of commodity and/or discipline focussed research which characterised the agendas of the international agricultural research centres of the day.

Given that the initiatives for this new, more encompassing, research approach to agricultural development came essentially from the 'ground-up', and concurrently in various locations across the world, FSR evolved into more of an umbrella term for a class of research approaches than a descriptor for a particular research methodology. This was in clear contrast to other approaches to agricultural development which also promoted the merits of approaching whole farms as systems, such as agro-ecosystems analysis (Conway 1985) or the earlier initiatives in agricultural systems analysis (Dent and Anderson 1971). Under these diverse circumstances, it was not surprising that a wide variety of different concepts, approaches and research methods would be grouped under the FSR heading, leading to considerable confusion about what the approach really meant.

Calls for greater clarity in the terminology of concepts and methods of FSR, first emerged from major reviews of the enterprise, nearly two decades ago (Dillon et al 1978; Gilbert et al 1980). Despite these appeals however, by the mid-eighties, not only did confusion still exist, but the problem seemed to have got more acute, as the range of activities encompassed by the term FSR, had broadened considerably. This realisation triggered a flurry of responses, and a number of writers sought to reduce some of the confusion by attempting to clarify terms and concepts, and creating classifications of the approach. Fresco (1984) for example, distinguished between Francophone and Anglophone traditions, describing the former as a "more formal, long-term and large-scale research undertaking aimed at developing the potential of a geographical region" while the latter "does not aim at a profound change in traditional agriculture, but rather at incremental changes". Others have suggested more complex schemes. Simmonds (1985), for instance, suggested that one could distinguish between (a) FSR in the strictest sense, (b) on-farm research, and (c) new farming systems developments. Merrill Sands (1986), went further in suggesting that six types were more appropriate, identifying these as (a) farming systems analysis (FSA), (b) farming systems adaptive research (FSAR), (c) farming systems component research (FSCR), (d) farming systems base-line data analysis (FSBDA), (e) new farming systems development (NFSD) and (f) farming systems research and agricultural development (FSRAD).

The variations among these different FSR types of research activity are associated with matters like the intentions of the researcher, the extent to which farmers themselves are involved, the level of innovativeness, and the extent to which researchers from disciplines beyond agriculture, are involved. In spite of their variations, all of the approaches have in common, the fact (a) that they are complementary to conventional commodity and disciplinary research, and (b) that they are, to a greater or lesser degree, what Merrill Sands (1986) refers to as "systems oriented": There are two aspects of this orientation, because of the fact that both the object of FSR "is regarded as a system", and "because of the interdisciplinary way in which it strives after problem solutions" (Brouwer and Jansen 1989).

In other words FSR is 'systems oriented' because both the object to be researched and the methods by which it is researched, can be regarded as 'systems' - the farming system as an 'objective thing' on the one hand, and the inquiry as a 'systems process'on the other. In practice I want to suggest that rather than characterising most FSR endeavours, these two aspects, of research object and research process, actually represent two different traditions: The first could be seen as *research into farming systems* (which I shall refer to as first generation FSR) and the second, *systemsresearch into farming* (or second generation FSR). This distinction is very important, or it emphasises issues concerned with the 'nature of nature' and 'the nature of knowledge' which sit

at the very centre of what we can call the 'systems movement'. They also provide a focus for discussions about how the application of systems thinking and practices can be improved to create a third generation FSR, which combines both first and second, while adding new attributes of its own. This is therefore a useful point at which to jump into the systems dimension of FSR, with an elaboration of what currently seems to characterise it.

THE CURRENT SYSTEMS DIMENSION

A typical definition of a farming system from the 'systems orientation' perspective above, is that offered by Shaner et al (1982): "a unique and reasonably stable arrangement of farming enterprises that the household manages according to well-defined practices in response to physical, biological and socio-economic environments and in accordance with the household's goals, preferences and resources. These factors combine and influence output and production methods."

This definition provides us with an important insight into the matter of the 'systems dimension' of FSR, for it represents a prime example of what Checkland (1988) refers to as the confusion in the use of the word 'system' between "everyday language" and the "language of professional discourse". There is little doubt that the statement above is much more reflective of "everyday language" than of "professional discourse", with very little evidence of any careful formulation of the system as an abstract coherent entity with special properties. FSR practitioners typically talk of farming systems just as they might talk casually about a nation's research system, or its health system, or their institute's pension system. Thus, as emphasised elsewhere (Bawden 1991), the systems model in FSR rarely extends much beyond fairly loose descriptions of sets of relationships between farming enterprises, the household, and the environmental influences under which they both operate. In other words, they really do not express the formality of systems conventions in terms of 'systems organisation', 'structure', 'properties', 'boundary conditions', 'cybernetics' or 'behaviour', in any meaningful manner. Thus even the statement that "the farming system is part of larger systems - e.g. the local community - and can be divided into subsystems e.g. cropping systems" (Shaner et al 1982), gives little evidence of the conceptual significance of such a hierarchy, let alone the characteristics of the systems at each of the different 'levels'. Indeed the use of words like "larger" and "divided into", while quite appropriate for "everyday language", are actually quite misleading in terms of conveying the sense of the concept of the hierarchical relationships between "subsystems", "systems" and "suprasystems", as they would be expressed in "professional discourse". Similar comments can be made about the language used by Fresco (1984) in the following statement about the concept of hierarchy

in a cropping system: "at the lowest level, one finds the cell and the plant organs, followed by the plant itself. Plants combine into crops, crops into fields that may carry crop populations of various species and variety, weeds and pathogens. The farm is situated at the next higher level. Groups of farms combine into villages or land-use units. These in turn combine in regions, which may cover a part of a country, an entire country or even a group of countries"

In many ways this lack of conceptual rigour with regard to the perceived nature of farming systems, is quite predictable and defensible, given the claim that the foundations of FSR were practical rather than theoretical or philosophical (Norman and Collinson 1985). And indeed there are exceptions: Dillon (1984) for instance, presented a relatively formal model of a farm as a "purposeful system" which included the following subsystems: (a) technical, (b) formal structural, (c) psychological or informal structural, (d) goals and values, and (e) managerial. There is little evidence however that this model of a socio-technical system, which clearly reveals a farm management economics perspective of a farming system, has been embraced by FSR practitioners, and "every day language" continues to persist with regard to the systems dimension of this, the first generation FSR movement - research into farming systems. This is not to state that other attempts have not been made to formalise the systems dimension - or the 'systemicity' of the approach as we might refer to it.

Some workers have developed interesting perspectives on farming systems by integrating ecological principles with farm management ones in their attempts to express the systems nature of their endeavours. Approaches such as these, which reflect our second generation FSR through their emphasis on systems research into farming, have allowed the incorporation of quantitative mathematical tools such as computer simulations and optimisation techniques (Hart 1982; Norman and Collinson 1985; Penning de Vries et al 1993). And as has been illustrated by recent conferences on the application of systems approaches to agricultural development (Jones and Street 1990; Penning de Vries et al 1993) and by the emphasis in so many editions of the international journal Agricultural Systems, there is certainly no shortage of base data for use in both biological and socio-economic systems simulations. The sophistication of so-called expert systems for agricultural application, are providing considerable evidence in support of the contention that the second generation of FSR is becoming increasingly robust, and a useful set of five categories has been proposed to differentiate between the increasing variety of approaches in this domain (Jones 1989). These range from "heuristic expert systems" which come closest to approximating the sort of "seat of the pants" decision-making strategies used by recognised experts, to "problem specific skills" which utilise expert data bases.

For all these aspects of the systems dimension of FSR, both 'first' and 'second' generation however, we are still left with the sense that the matter of the application of formal systems concepts, theories and philosophies, remains unaddressed within the approach. There are those who argue that farming systems approaches to research are more systematic than systemic (Holt and Schoorl 1985; Bawden 1990) - more concerned with the rigour and linear logic of the process, than with the systemic interconnections of either the object of the research or the process used. It has even been suggested that "a critical approach to study and to developing farming systems has hardly been developed" with FSR "anything but a lucid concept" (Brouwer and Jansen (1989).

With these provocative statements as our motivation, and the sections above as the context, I must now turn to a critical elaboration of what I mean when I talk of "being systemic" and the conceptual and methodological challenges that that presents to FSR practitioners. In arguing the case for the systemic transformation of FSR, I draw attention to the claim at the start of this paper about the threefold complex challenges that we all face as researchers concerned with sustainable agricultural and rural development. I want to suggest that future improvements at any level of agricultural 'systems' must be evaluated as much for its ethical defensibility as for its social desirability, as much for its ecological responsibility as for its economic viability, and as much for its aesthetic acceptability as for its technical feasibility. And I want to further submit, that all of these aspects of 'development' must be regarded as fundamentally achievable through the research and development methodologies that we use. In this I am calling for a 'third generation FSR'; one which we might call Critical Farming Systems Research, or perhaps more correctly, Critical Systems Farming Research!

BEING SYSTEMIC

Whenever we approach issues in the name of something or another, we are bringing to bear certain ways of thinking and acting, as well as certain values and assumptions which characterise that way of being. When we are *being scientific*, for instance, we approach the world through deductive or inductive ways of thinking, and we test our thoughts by creating and testing hypotheses about the world about us, in a very systematic, value-neutral and methodical manner. In being scientific, we are also holding on to certain assumptions about the nature of the world, including the humans within it, and about how knowledge about both can be acquired. What we do in this world when we are being scientific then, strongly reflects particular ways of thinking and particular views of the world which we have learned, somehow and somewhere along the line of our education and training as scientists. We rarely, if ever, think about the composition of these worldviews, nor about the way they 'frame' the way

we think about, or act in, the world. If we refer to these characteristics of thinking and acting and assuming, as paradigms, we can submit that for most of us most of the time, our paradigms remain tacit. I use the plural here, because we do not necessarily think or act in the same way, or hold to the same assumptions of beliefs, when we are being something other than being scientific, like being superstitious, for instance, or being mystical, or being parental! Thus each one of us can use different paradigms for different occasions. There are even differences between particular paradigms within science, as was first argued strongly by Thomas Kuhn (1970).

Following Burrell and Morgan (1979), and using now the language of professional discourse, we can refer to four particular sets of assumptions in order to discriminate between different paradigms:

- assumptions about the nature of reality (ontology)
- assumptions about the nature of knowing about reality (epistemology)
- assumptions about ways of inqyiry into the nature of reality (methodology)
- assumptions about the way human beings are (human nature)

To rewrite our descriptions on *being scientific* in these terms, and choosing the paradigm of science that a research agronomist would probably hold, we can argue that when such a researcher approaches a technical problem he or she assumes (believes) that:

- there is a reality 'out there' which exists independently of anyone observing it (a realist ontology);
- objective, knowledge about that reality can be acquired as scientific, value-neutral truth (an objectivist epistemology);
- explanations (hypotheses) about the nature of reality and generated in response to objective observations in it, can be validated through experimentation (an empirical methodology); and
- humans are rational, objective, interest-seeking, goal-setting beings (a rationalist interpretation of human nature).

It does not take much imagination to realise that a farmer brought up in a culture in which magic imbues all of nature with a soul or 'animus' (animism), with myth and legend the source of knowledge about it, holds very different assumptions about the world and how we can come to know about it, to our agronomist. But the differences do not have to be so extreme as this for there to be very significant differences in paradigms, with a systemic paradigm for instance, being very different from a non-systemic one.

It is now appropriate to turn our attention to a discussion of the way we are when we are *being systemic,* and explore what this might mean through reference to the four sets of assumptions above. As might be expected by now, the situation is by no means straightforward, even if again we confine our descriptions to the language of professional discourse; for the trouble is that there are two essentially different *schools of systemics* which are often differentiated by being termed 'hard' and soft' respectively. Let's start with the 'hard' case and explore the assumptions held by a 'hard' systems researcher, for in most respects, he or she holds the same beliefs as the agronomist described above, with one very notable exception.

It hasn't been mentioned yet, but there can be very important differences within the same category of assumptions above. It is one such 'within-category' difference that allows us to highlight the essential difference between a conventional agronomist and a systems researcher. Thus, within a realist ontology, there are two very different belief positions which we can refer to as *holism* on the one hand, and *reductionism* on the other, with our systems researcher holding to the former set of beliefs and our agronomist, the latter.

For our immediate purposes, holism refers to the belief that the world about us is structured in the form of whole entities (which we will call systems) with each system having properties different from the sum of its own parts, as well as from other systems around it. All systems are part of other systems, just as they themselves are composed of (sub)systems. Reductionism, on the other hand presents the absolute opposite belief position: the world is not structured into whole entities with special properties, but consists instead of a mass of elements and events which may or not be causally related to each other. Any whole entity that does seem to exist, will be equal to nothing more than the sum of its parts, and if it should appear otherwise, that is merely a reflection of the ignorance of the observer rather than any innate property of the entity itself.

Simple though this distinction between holism and reductionism might sound, it represents very powerful differences in terms of paradigms, and this means that the arguments in this paper for more attention to be paid to the systems dimension of FSR, is actually a call for a profound shift in paradigms. Let me add emphasis to this statement, by further exploring the nature of systems and relating this to the notion of holism and to the concept of *being systemic.*

THE NATURE OF SYSTEMS

The two notions that are central to holistic beliefs, and which therefore shape the 'systems movement' are: that systems are coherent whole entities, and that as coherent entities, they possess properties distinct from either their component sub-systems or the suprasystems of which they themselves are part. These unique characteristics are referred to as *emergent properties* as they

emerge at each level of any systems hierarchy as a result of what we might refer to as 'recursive interrelationships' - mutual relationships between subsystems and systems and suprasystems in which each level of system influences the others. From a holist perspective, surprise is anticipated, but never predictable. No matter how comprehensive the studies of the relationships between component subsystems, or between the system and its suprasystem are, they can never reveal emergent properties.

As a whole entity, a system must have some way of staying whole. It must therefore have a boundary which not only keeps it as a coherent whole, but separates it from other systems and from its environment (which is itself of course, a (supra)system). One way by which the bounded system retains its coherence, is through the inter-relationships between its component sub-systems, which because they are necessarily different from each other, are often in tension with each other. It is the tension of these differences which gives rise to the oneness and to the uniqueness of the entity. Thus as one of the pioneers of systems thinking put it, "there is a glorious unity of difference" (Bertalanffy 1981).

The tension of difference that occurs within systems, is replicated between them too; and especially between systems at different levels within systems hierarchies. Systems need to have sufficient (requisite) variety and redundancy to be able to deal with these inter-system tensions, just as they must have sensitive mechanisms for communication and feedback (cybernetics) within themselves, and between themselves and their environments. Another way of putting this, is that systems must be flexible enough to deal with the changes in their environment to which they are coupled through cybernetic processes. As is being increasingly recognised with respect to the 'natural' environment (Hollings 1995), these changes are often discontinuous and non-linear, and therefore non-predictable. As chaos theory and systemic studies of complexity are revealing, a small change in one system can often result in a very significant (and most surprising) change in other systems far removed from it, in either space or time, and occurring through processes of amplification that probably can never be understood. This has enormous implications with respect to the 'globalisation' of 'local' effects such as pollution, or biocide resistance, or micro-climatic change, or market dynamics. The opposite situation can also occur, with similar comments to be made about the processes of attenuation, in this case.

As this latter discussion reveals, systems, in addition to their wholeness, and to their emergent properties, also have dynamics, and assumptions about these are also of prime importance to researchers of systems. Matters of systems dynamics are central to notions about their capacities for stability and sustainability, and these in turn, are obviously of central importance to farming systems and the nature of their relationships with other systems with which they inter-relate.

There are many other characteristics of systems that are fundamental to their nature, but the three we have just elaborated - the coherence of wholeness, the emergence of properties, and their dynamics - are sufficient to indicate the significance of renewing the focus on the systems dimension of farming systems research.

So far we have been concentrating on concepts from the 'hard' systems school, with its realist assumptions about the nature of reality. In other words we have been talking about systems as they are presumed to exist in nature. As has been pointed out elsewhere (Bawden et al 1985), inasmuch as FSR practitioners are systemic in their research approaches to the development of farming systems, they largely follow the traditions of the 'hard' systems school. In other words, they approach cropping enterprises, whole farms, groups of farms, or even entire rural communities, with a sense of their respective wholeness' as if they believed that each level of organisation actually exists as a 'real' system within a hierarchy of systems, ranging from the cropping enterprise right up to the community. Typically however, their interest in what we might call formal systemics does not proceed much beyond this point. There are very few studies indeed of the emergent properties of farming systems for instance, or of their cybernetics, or of their 'tensions of difference', or their requisite varieties or redundancies, or of systemic insights into the inter-relationships of farming systems with their environments as suprasystems. Principles of systems dynamics are rarely if ever invoked in debates about the crucial issues of stability or sustainability of agricultural systems in first generation FSR circumstances, although this is one of the potential transformations that the second generation can bring - and where of course, the tools of systems simulation hold such promise.

Much could also be learnt from those involved in agroecological studies, where formal systems concepts have been adopted, and used in the measurement of flows of energy and material cycling through agricultural ecosystems (Hart 1982). Of particular significance is the work of agroecosystem analysis and its connection with development. Here agroecosystems have been conceptualised as "well-defined systems of cybernetic nature" (Conway 1987) and their properties explored specifically from perspectives of their productivity, sustainablity and sustainability as well as equitability and autonomy (Marten 1988). Conway (1990) has used these concepts to make the point that agricultural development represents trade-offs between systems properties, and it is to such matters that second generation FSR practitioners are increasingly turning. Yet trying to model matters of equitability and autonomy - of ethics and social justice and symmetry of power relationships - as if they were objective and quantifiabe aspects of human nature, is clearly not possible.

So it is important to now turn our attention to forms of being systemic which move us beyond objectivism and allows us to explore situations using

systemic concepts, but from a notion of 'human activity systems', and the 'soft' school.

SOFT SYSTEMS PRAXIS

So far our systems focus has been on what we identified earlier as a perspective which differed from conventional (reductionist) agricultural research only in its holist assumptions, significant enough though these are. We now need to take two more steps into the systemic world, which will move us very significantly from this position into radically new territory - yet territory demanded by our need to focus on the sustainability of farming systems in ways which include matters of ethics, aesthetics, and social justice as much as productivity, economic viability and social desirability.

The first of these steps is to move from objectivist assumptions about how things are known (epistemologies) to what we will refer to as relativist. Drawing on Berstein (1983), we make this distinction in the following manner: *Objectivism* means that there is some unchanging standard which we can use as a framework to determine the nature of truth, and reality, and goodness or rightness. Thus in our 'hard' farming systems above, nature is taken as an objective reality about which scientific 'truth' can be discovered, and it is 'right' and 'good' to seek more productivity through the application of such truths, in the name of progress. In contrast, *relativism* is the basic belief that all of these concepts can only be as relative to some context or another such as societal or cultural norms, or a particular set of theories.

The notion of 'systems' now takes on quite a different meaning from that which we have been using so far: When we assume a relativist position on holism, we are shifting from beliefs about how the world is in reality, to plausible descriptions of it from different perspectives - from system as 'objectively knowable thing', to system as 'an abstract concept'. In this manner we can now talk about a system of inquiry *as if* it were a 'real' system with all the characteristics of systems that we have described, while in fact, we know that it is nothing but an abstract idea. Thus this is not the same as slipping back into 'everyday language' for this time we hold on to the rigours of the characteristics of systems as coherent wholes, which display emergence through recursions, and which are dynamic in the face of environmental change.

Conversations between people can now be considered to be inquiry systems, if they focus on how those people go about improving their own situations by explicitly thinking and acting in systemic ways. In other words, sets of ideas and communications can shaped in such ways that they become systems of inquiry through the systemic actions of these involved in them! The concept of wholeness through 'tension of difference' now takes on a very human face, as

the FSR practitioner faces up to the 'new reality' that different people can have very different views indeed about the same situation. When stakeholders are invited to participate in the development process and contribute to discussions about what constitutes improvements, differences of opinion and conflict are the norm rather than the exception.

To exemplify what all this means in FSR practice, let us turn to the vital matter of citizen participation in the process of sustainable agricultural and rural development, and about who decides what it is that constitutes improvements to agricultural and rural situations, and what perspectives guide them in their choice. Cornwall et al (1994), while remarking on the enormous surge of interest in participation in the process of agricultural research and extension, have also claimed that "most FSR/E scientists continue to investigate for or sometimes on their farmer 'clients' rather than with them". In other words, the farm continues to be regarded as a researched system rather than a researching one; a system which is able to 'learn its way forward into better futures' as a result of those who are participants in it, learning themselves to think and act in systemic ways.

'Soft' systems thinking can liberate this situation in a systemic manner with FSR scientists construing participation as essential to the way they think and act systemically - their systemic praxis, if you will - for the process of participation is a fundamental systemic issue. As Skowlimowski (1985) has it, "wholeness means that that all parts belong together, and that means they partake in each other. Thus from the central idea that all is connected, that each is part of the whole, comes the idea that each participate in the whole. Thus participation is an implicit aspect of wholeness".

There are of course many different degrees of participation, ranging from mere tokenism to the true emancipation of citizens (Arnstein 1969), and this matter will be an important one when we finally turn to the issue of criticality. For now we can simply recognise that the higher the extent to which participation occurs in the development process, the greater the range of interpretations of what it is that constitutes improvements to specific situations. Even within farming itself, it has long been recognised that there are a multitude of purposes with which any farm can be endowed, with farmers holding to complex sets of reasons for doing what it is that they do, and involving instrumental, social, expressive, and intrinsic goals (Gasson 1973). This purposeful nature of farming, presents such a complex mosaic for discussions about what it is that constitutes improvements precisely because people have such different values and worldviews from each other, and even within themselves at different stages of their lives. Thus, as there will be different notions of what constitutes truth, and justice, and fairness, and goodness, and rightness, under such relativistic circumstances, it is vital that the methods of systemic research include ways by which these differences can

be made explicit and accommodated in the search for agreement about improvements.

The major insight of Peter Checkland, who is regarded as the 'father' of the soft systems school, is that the exploration of any messy or complex situation will reveal a number of different perspectives on that situation which can be modelled as 'human activity systems', each of which reflects a specific worldview, which therefore need to be made explicit through the process of systemic inquiry. This need to qualify purposeful human activities by the worldviews that support them in the search for improvements to situations by participants in that situation, is very different from the ability to name a single pursuit like productivity growth by an observer who is presumed to be independent of that system. Herein then lies the essential distinction between the 'soft' and the 'hard'. As Checkland (1995) has recently put it "the crucial difference is between on the one hand an approach which assumes the world to be a complex of systems, some of which may be malfunctioning, and on the other an approach which makes no assumptions about the nature of the world, beyond assuming it to be complex, but assumes that the process of enquiry can be organised as a system of learning".

The methodology which Checkland developed from his systemic thinking about messy, complex and purposeful situations, is thus itself approached as if it were a learning system (Checkland 1981) with each of its stages being a sub-system of the system of inquiry itself. In its use, it will reveal a host of issues of significance to a range of stakeholders who are committed to coherent debates about accommodating conflicting interests within political and social contexts, and which enable action to be taken to improve problematic situations. As Jackson (1995) has recently described this process, "the purpose is to generate a systemic learning process in which the various participants in a learning situation come to appreciate more fully, each other's world views and the possibilities for change, and a consensus or at least accommodation (however temporary) becomes possible between those who started with and may still hold divergent views".

There are a number of key issues of importance to FSR practitioners, from this 'soft' systemic perspective. The most obvious of these is that it provides a systemic framework for the vital first step in FSR, of including the farmers themselves in the process of decisions about what constitutes improvements. It allows differences of opinion between researcher and farmer, and between different farmers who might be participating together in a development project, to be identified, and most crucially, linked to different worldviews, which are made explicit. It also provides a vehicle for including other stakeholders in the development process, and exploring the posible social, cultural and economic impacts - both positive and negative - that changes at the level of individual farms might have on the region as a whole. In this manner, some of the basic

concepts of systemic thinking, in terms of interrelationships, coherence, hierarchy, etc are revealed and highlighted.

It follows from this that one of the key actions to be taken to improve the problematic situation of FSR itself as a participative research approach, is the improvement of the capacity of its practitioners to think and act systemically. An important thesis in this regard, has been developed by Marcia Salner who submits that individuals are only able to develop an effective systemic capability once they have reached, what she refers to as a particular "epistemic competence" associated with the acceptance of an epistemology of "contextual relativism" (Salner 1986). In other words, what she is calling for, is equivalent to a basic shift in one's pesonal assumptions from 'objectivism' to 'relativism', as we have defined these above. This is no light matter, for what she is demanding is that we not only learn to question some of the most fundamental beliefs that we hold, but that we are prepared, under certain circumstances, to suspend and even change them to accommodate different circumstances. Knowing what epistemological (and ontological) assumptions one is making under any circumstance, is a critical first step in knowing the advantages of also embracing other worldviews, and this means, in the present context that FSR practitioners need to learn how to learn about being systemic (Bawden and Packham 1993). Yet there is a fundamental paradox here: FSR practitioners need to reach a particular level of 'epistemic' development before they are able to really see the merits of thinking and acting in systemic ways. However they are only likely to reach this stage of development if they are self critical of their present approaches, and the assumptions upon which they are based. They need to be able to think in systemic ways in order to appreciate the advantages of thinking in systemic ways!

And this brings us to the last of our areas of exploration; criticality.

THE ESSENCE OF CRITICALITY

Perhaps the easiest way of introducing the essence of *being critical*, is to focus on the issue of assumptions about human nature that were introduced earlier. In the discussion about being scientific, it was proposed that human beings were rational in an objective way. Experience tells us however, that that is often not the case, nor is it confined only to situations referring to an objective world for there are other worlds too; thus Jurgen Habermas (1985) refers to "the social world of legitimately regulated interpersonal relations", and each person's "own subjective world of experience", in addition to an objective world. The search for agreement about what needs to be done in the name of improvements must therefore take account of all three of these worlds. For the FSR practitioner, this means that the objective world of the 'hard farming system' is set within the 'soft' relativist world of social difference, which itself is set within interpretations posed by personal subjective experience.

According to Habermas, action oriented to reach shared understanding - what he terms communicative action - occurs through a common endeavour to achieve consensus in situations where participants are free to state their views and have an equal chance to do so (Habermas 1984). Unequal distributions of power, lead to distortions in such communication (Habermas 1984) and thus the ultimate goal of communicative action is one of emancipation.

A number of workers have taken these key ideas and incorporated them into what they call 'critical systems' approaches, where the practitioners assume positions of criticality of everything they think and do: from the epistemological / ontological / methodological / ethical assumptions that they and others in the situation hold, as well as of the contexts of power and communication that prevail (eg Flood 1990; Jackson and Jackson 1991; Ulrich 1983). None of these endeavours have directly involved matters of agriculture or rural development, although recent proposals by Ulrich (1996) to extend critical systems thinking and actions to "citizens", is particularly pertinent to the situation that we face in agriculture, given the fact that our constituency for sustainable food production is essentially everyone in every community across the globe!

There is no doubt that critical systemic approaches would be entirely appropriate to agricultural and rural development situations, and represent systems dimensions that need to be urgently explored in the next phase of development of FSR as it moves into its third generation.

A SYSTEM OF FSR SYSTEMS

Following the logic established during the discussion about the 'soft' school, it will now be apparent that what has been presented here as critical systemics, soft systemics and hard systemics, itself represents a system of inquiry systems which would be entirely appropriate for FSR. Each of these three 'levels' of inquiry would reveal quite different emergent properties about situations in which improvements were sought in the name of the sustainable agricultural and rural development. And there will frequently be different interpretations and conflicts both within each domain as well as between them. What seems relatively straightforward as an improvement in the technical performance of a 'farming' system, is clearly much less so when considered from the point of view of who might benefit from changes made, and who might be penalised, and who decides which is which. And this in turn is further complicated by the fact that discussions with participants about the 'best' strategies for development, give a highly biased picture as a result of the distortions of communication that are occurring within the community as a function of the asymmetry of power relationships within it. Critical inquiry aims to clarify the third of these matters, soft systemics are appropriate for exploring human activities, and hard systems methodologies are needed to explore strategies for

change at the technical level. Clearly, each level of inquiy is critically dependent on the other two.

As has been argued, the multi-facets of responsible development dictate the need for FSR practitioners to consider the ethical, aesthetic, social, and ecological aspects of their activities, in addition to those economic and technical ones which are conventionally included. There is little hope of this being achieved in the absence of a systemic perspective which portrays the sense of wholeness in all of this and which allows for the participation of relevant stakeholders in conversations which are as free from communicative distortions as possible.

The case has been made elsewhere (Bawden and Packham 1993; Bawden 1995) that this in turn, demands particular forms of education and training which allow epistemic capabilities relevant to systemic competence, to be developed.

To those who would be dismayed by the theoretical / philosophical focus of this article, I conclude with two observations: firstly that there is nothing so practical as a good theory, and secondly, that any approach which claims to embrace 'systems' in its title, needs to be able to defend that position.

In the face of the daunting challenges of the need for continuing growth of global food production without compromise to environment or community, we have little choice but to continually seek ways of improving our praxis as responsible, ethically defensible and hopefully systemic practitioners.

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