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Participatory Learning For Sustainable Agriculture

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Summary. — Emerging evidence for the success on farms of resource-conserving technologies and practices must not tempt agricultural professionals into making prescriptions about what constitutes sustainable agriculture. Sustainability is a complex and contested concept, and so precise definitions are impossible. The dominant scientific paradigm of positivism has served us well over three to four centuries, but it is not well suited to contexts where uncertainties are high, and problems are open to interpretation. Many methodological and philosophical alternatives to positivism have arisen from both the "hard" and "soft" sciences. These indicate that new understanding and solutions can only arise with wide public and scientific participation. But the term "participation" has become fashionable with many different interpretations, some hindering rather than supporting sustainability. New systems of learning are needed, using participatory methods and criteria for trustworthiness. These have profound implications for agricultural professionals, who must now actively create a whole new professionalism.

1. RECENT IMPACTS OF SUSTAINABLE AGRICULTURE

During the past 50 years, agricultural development policies and practices have successfully emphasized external inputs as the means to increase food production. This has led to growth in global consumption of pesticides, inorganic fertilizer, animal feedstuffs, and tractors and other machinery.

These external inputs have, however, tended to substitute for natural processes and resources, rendering them more vulnerable. Pesticides have replaced biological, cultural and mechanical methods for controlling pests, weeds and diseases; inorganic fertilizers have been substituted for livestock manures, composts and nitrogen-fixing crops; information for management decisions comes from input suppliers, researchers and extensionists rather than from local sources; machines have replaced labor; and fossil fuels have been substituted for local energy sources. The basic technical challenge for those concerned with sustainable agriculture is to make better use of these internal resources. This can be done by minimizing the external inputs used, by regenerating internal resources more effectively, or by combinations of both.

There is now emerging evidence that regenerative and resource-conserving technologies and practices can bring both environmental and economic benefits for farmers, communities and nations. The best evidence comes from countries of Africa, Asia and Latin America, where the concern is to increase food production in the areas where farming has been largely untouched by the modern packages of externally supplied technologies. In these complex and remote lands, some farming communities adopting regenerative technologies have substantially improved agricultural yields, often only using few or no external inputs (Bunch, 1991, 1993; GTZ, 1992; UNDP, 1992; Lobo and Kochendörfer-Lucius, 1992; Krishna, 1993; Shah, 1994; SWCB, 1994; Balbarino and Alcober, 1994; Pretty, 1995).

These are not, however, the only sites for successful sustainable agriculture. In the high-input and generally irrigated lands, farmers adopting regenerative technologies have maintained yields while substantially reducing their use of inputs (Bagadion and Korten, 1991; Kenmore, 1991; van der Werf and de Jager, 1992; UNDP, 1992; Kamp, Gregory and Chowhan, 1993; Pretty, 1995). Moreover, in the very high input lands of the industrialized countries, farmers have been able to maintain profitability, even though input use has been cut dramatically, such as in

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the United States (Liebhardt *et al.*, 1989; NRC, 1989; Hanson *et al.*, 1990; Faeth, 1993; NAF, 1994); and in Europe (El Titi and Landes, 1990; Vereijken, 1990; Jordan, Hutcheon and Glen, 1993; Pretty and Howes, 1993; Reus, Weckseler and Pak, 1994).

All of these successes have elements in common. Farmers have made use of resource-conserving technologies, such as integrated pest management, soil and water conservation, integrated plant nutrition and recycling, multiple cropping, water harvesting, and waste recycling. There has been action by groups and communities at local level, with farmers becoming experts at managing farms as ecosystems, and at collectively managing the watersheds or other resource units of which their farms form part. Moreover, there have been supportive and enabling external government and/or nongovernment institutions, often working in new partnerships with new participatory methodologies, which have reoriented their activities to focus on local needs and capabilities.

2. SUSTAINABILITY AS A CONTESTED TERM

Although it is relatively easy to describe goals for a more sustainable agriculture, things become much more problematic when it comes to attempts to define sustainability: "everyone assumes that agriculture must be sustainable. But we differ in the interpretations of conditions and assumptions under which this can be made to occur" (Francis and Hildebrand, 1989, p. 8).

A great deal of effort has gone into trying to define sustainability in absolute terms. Since the Brundtland Commission's definition of sustainable development (WCED, 1987), there have been at least 70 more definitions constructed, each different in subtle ways, each emphasizing different values, priorities and goals. The implicit assumption in many is that it is possible to come up with a single correct definition. Each author presumably regards his or her effort as the best.

But precise and absolute definitions of sustainability, and therefore of sustainable agriculture, are impossible. Sustainability itself is a complex and contested concept. To some it implies persistence and the capacity of something to continue for a long time. To others, it implies resilience, and the ability to bounce back after unexpected difficulties. With regard to the environment, it is used to imply not damaging or degrading natural resources. Others see it as a concept that means developmental activities that simply take account of the environment. Economies are sometimes said to be sustainable if economic activities do not harm the natural resource base; to others, sustainability simply implies continuing to grow at the same rate.

In any discussions of sustainability, it is important to clarify what is being sustained, for how long, for whose benefit and at whose cost, over what area and measured by what criteria. Answering these questions is difficult, as it means assessing and trading off values and beliefs (Campbell, 1994a). It also means that we can never be certain about sustainability. The "undecidability theorem," proved by the logician Alan Turing in the 1930s, captures this essence: the theorem says that no matter how clever we think we are, there will always be algorithms (sets of rules) that do things we cannot predict in advance. The only way to find out what will happen is to run them (in Waldrop, 1992, p. 234).

Nonetheless, when specific parameters or criteria are selected, it is possible to say whether certain trends are steady, going up or going down. At the farm or community level, it is possible for actors to weigh up, trade off and agree on these criteria for measuring trends in sustainability. But as we move to higher levels of the hierarchy, to districts, regions and countries, it becomes increasingly difficult to do this in any meaningful way.

It is critical, therefore, that sustainable agriculture does not prescribe a concretely defined set of technologies, practices or policies. This would only serve to restrict the future options of farmers. Although many resource-conserving technologies and practices have been widely proven on research stations to be both productive and environmentally sensitive, the total number of farmers using them is still small. Part of the problem is that scientists experience quite different conditions from those experienced by farmers, and few farmers are able to adopt whole packages of technologies without considerable adjustments. Despite the benefits of resource-conserving technologies, if they are imposed on farmers, then they will not be adopted widely.

One example is alley cropping, an agroforestry system comprising rows of nitrogen-fixing trees or bushes separated by rows of cereals, which has long been the focus of research (Kang, Wilson and Lawson, 1984; Attah-Krah and Francis, 1987; Lal, 1989). Many productive and sustainable systems, needing few or no external inputs, have been developed. They stop erosion, produce food and wood, and can be cropped over long periods. But the problem is that very few, if any, farmers have adopted these alley cropping systems as designed. Despite millions of dollars of research expenditure over many years, systems have been produced suitable only for research stations. Where there has been some success, however, is where farmers have been able to take one or two components of alley cropping, and then adapt them to their own farms. In Kenya, for example, farmers planted rows of leguminous trees next to field boundaries, or single rows through their fields; and in Rwanda, alleys planted by extension workers soon became dispersed through fields (Kerkhof, 1990).

But the prevailing view tends to be that it is farmers who should adapt to the technology. Of the Agroforestry Outreach Project in Haiti, it was said that

> Farmer management of hedgerows does not conform to the extension program...Some farmers prune the hedgerows too early, others too late. Some hedges are not yet pruned by two years of age, when they have already reached heights of 4–5 metres. Other hedges are pruned too early, mainly because animals are let in or the tops are cut and carried to animals...Finally, it is very common for farmers to allow some of the trees in the hedgerow to grow to pole size (Bannister and Nair, 1990, pp. 54–55).

This contrasts starkly with a recent analysis of sustainable agriculture initiatives in Guatemala and Honduras. A learning group from the NGO, COSECHA, returned to areas where projects had ended three, four and 15 years previously, and used participatory methods with local communities to investigate changes (Bunch and López, 1994). They found that those communities in the project areas were substantially better off economically and socially. But, surprisingly, many of the technologies known to be "successful" during the project (those that had increased crop yields without damaging the environment) had been completely replaced by new practices and, in all, some 80–90 innovations were documented. This has led Bunch and López (personal communication, 1994) to conclude that "technologies are not sustainable: what needs to be made sustainable is the process of innovation itself".

As conditions and knowledges change, so must farmers and communities be encouraged and allowed to change and adapt too. Again, this implies that any definitions of sustainability are time- and place-specific. As situations and conditions change, so must our constructions of sustainability also change. Sustainable agriculture is, therefore, not simply an imposed model or package. It must become a process for learning and perpetual novelty.

3. SCIENCE AND SUSTAINABILITY

Although there exist successful applications of sustainable agriculture throughout the world, still relatively few farmers have adopted new technologies and practices. One reason is that sustainable agriculture presents a deeper and more fundamental challenge than many researchers, extensionists and policy makers have yet supposed. Sustainable agriculture needs more than new technologies and practices. It needs agricultural professionals willing and able to learn from farmers and other stakeholders; it needs supportive external institutions; it needs local groups and institutions capable of managing resources effectively; and above all it needs agricultural policies that support these features. It also requires we look closely at the very nature of the way we conceptualize sustainability and how it might be achieved (Pretty, 1994, 1995).

Since the early 17th century, scientific investigation has come to be dominated by the Cartesian paradigm, commonly called positivism or rationalism. This posits that there exists an objective external reality driven by immutable laws. Science seeks to discover the true nature of this reality, the ultimate aim being to discover, predict and control natural phenomena. Investigators proceed in the belief that they are detached from the world. The process of reductionism involves breaking down components of a complex world into discrete parts, analyzing them, and then making predictions about the world based on interpretations of these parts. Knowledge about the world is then summarized in the form of universal, or time- and context-free, generalizations or laws.

This methodology of science has been hugely successful, producing technologies and medicines that have enabled many people to live safer and more comfortable lives than ever before (Funtowicz and Ravetz, 1993). It is an approach that clearly works, and as a consequence, investigation with a high degree of control over the system being studied and where system uncertainties are low has become equated with good science. In addition, such science is readily equated with "true" knowledge, and so the "only proper way" of thinking and doing.

But it is also this positivist approach that has led to the generation of farming technologies that have been applied widely and irrespective of local context. Where it has been possible to influence and control farmers, either directly or through economic incentives or markets, agricultural systems have been transformed. But where neither the technologies have fitted local systems nor farmers been controlled, then agricultural modernization centered on positivist science has passed rural people by.

What the positivist paradigm does not recognize is that all data are constructed within a particular social and professional context. This context affects the outcomes, and can have a profound impact on policy and practice in agricultural development.

Stocking (1993) has described just how the values of the investigators affect the end result when it comes to soil erosion data. Since the 1930s, there have been at least 22 erosion studies conducted in the Upper Mahaweli Catchment in Sri Lanka. These have used visual assessments of soil pedestals and root exposure, erosion pins, sediment traps, run-off plots, river and reservoir sediment sampling, and predictive models. Between the highest and lowest estimates of erosion under midcountry tea, there is an extraordinary variation of some 8,000-fold, from 0.13 t/ha/yr to 1,026 t/ha/yr (El-Swaify, Arsyand and Krishnarajah, 1983; NEDCO, 1984; Krishnarajah, 1985). The highest esti-

mate was in the context of a development agency seeking to show just how serious erosion is in the Third World; the lowest was by a tea research institute seeking to show how safe their land management was. There was, however, nothing wrong with the scientific method; it was more a question of what the researchers defined as a problem, and how they chose to investigate it.

A similar case is described by Delli Priscoli (1989) regarding water and energy in the northwest of the United States. One projection for energy needs showed a steady growth to the year 2000; this was conducted by the utility company. Another showed a steadily downward trend; this was conducted by environmental groups. Other projections by consultancy groups were found toward the center. What does this say about the data?

> Each projection was done in a statistically 'pedigreed' fashion. Each was logical and internally elegant, if not flawless. The point is, once you know the group, you will know the relative position of their projection. The group, organisation or institution embodies a set of values. The values are visions of the way the world ought to be (Delli Priscoli, 1989, p. 36).

Both cases illustrate that science is not the neat, objective collection of facts about nature and its processes. The data were clearly constructed by people with values and human foibles. As Stocking (1993, p. 12) put it: "What, then, is the right policy response?...Not surprisingly policy makers pick the measurements to suit their needs." The challenge is not just that these differences have to be recognized, but that the competing values need to be mediated so as to produce agreements between actors with very different agendas. This calls for better forms of active participation and new platforms for decision making that engage wider public interests and social movements (Röling, 1994; Woodhill, 1993).

4. ALTERNATIVES AND ADDITIONS TO THE POSITIVIST PARADIGM

One problem with the positivist paradigm is that its absolutist position appears to exclude other methodologies. Yet the important point about positivism is that it is just one of many ways of describing and analyzing the world, and what is needed is pluralistic ways of thinking about the world and acting to change it (Kuhn, 1970; Feyerabend, 1975; Vickers, 1981; Checkland, 1981; Reason and Heron, 1986; Habermas, 1987; Giddens, 1987; Maturana and Varela, 1987; Rorty, 1989; Bawden, 1991; Uphoff, 1992; Wynne, 1992; Chambers, 1993; Funtowicz and Ravetz, 1993; Röling, 1994). Recent years have seen the emergence of a remarkable number of advances in a wide range of disciplines and fields of investigation. The sources include the so-called harder sciences, such as physics, biology, chemistry, meteorology and mathematics, as well as the softer sciences of philosophy, economics, sociology, architecture and organizational management[1].

Despite this wide ranging list, those arguing for the seriousness and importance of developing additions to positivism are still in the minority. Many scientists continue to argue strongly that information is first produced by science, and only then interpreted and applied by the public and policy makers. It is this process of interpretation that is said to introduce values and confuse certainties. Yet the results from any investigation are always going to be open to different interpretations. All actors and stakeholders, and particularly those with a direct social or economic involvement and interest, have different perspectives on what constitutes a problem and/or improvement in an agricultural system.

These advances in alternative paradigms have important implications for how we go about finding out about the world, generating information and so taking action. All hold that "the 'truth' is ultimately a kind of mirage that in principle cannot be achieved because the worlds we know are those crafted by us" (Eisner, 1990, p. 89). All of which suggests that we need to reform the way we think about methodologies for finding out about the world. Although these alternatives are emerging from a wide range of disciplines, there are five principles that differentiate them from positivist science (Pretty, 1994).

The first is that any attempt precisely to define concepts such as sustainability are fundamentally flawed. It is a contested concept, and so represents neither a fixed set of practices or technologies, nor a model to describe or impose on the world. The question of defining what we are trying to achieve is part of the problem, as each individual has different values. Sustainable agriculture is, therefore, not so much a specific farming strategy as it is an approach to learning about the world.

The second is that problems are always open to interpretation. All actors have uniquely different perspectives on what is a problem and what constitutes improvement. As knowledge and understanding are socially constructed, what each of us knows and believes is a function of our own unique contexts and pasts. There is, therefore, no single "correct" understanding. What we take to be true depends on the framework of knowledge and assumptions we bring with us. Thus it is essential to seek multiple perspectives on a problem situation by ensuring the wide involvement of different actors and groups.

The third is that the resolution of one problem inevitably leads to another "problem-situation," as problems are endemic. The reflex of positivist science is to seek to collect sufficient data before declaring

certainty about an issue or problem. As this position is believed to reflect the "real world," then courses of action can become fixed and actors no longer seek information that might give another interpretation. Yet in a complex and changing world, there will always be uncertainties and new interpretations.

The fourth is that the key feature now becomes the capacity of actors (professionals, farmers and the public) to learn continually about these changing conditions, so that they can act quickly to transform existing activities. All should make uncertainties explicit and encourage rather than obstruct wider public debates about pursuing new paths for agricultural development. The world is open to multiple interpretations, and so it is impossible to say which one is true. Different constructed realities can only be related one to another.

The fifth is that systems of learning and action are needed to seek the multiple perspectives of the various interested parties and encourage their greater involvement. The view that there is only one epistemology (that is, the scientific one) has to be rejected. Participation is an essential component of any system of learning, as no change can be affected without the full involvement of all stakeholders and the adequate representation of their views and perspectives. As Sriskandarajah *et al.*, (1991, p. 4) put it:

> ways of researching need to be developed that combine 'finding out' about complex and dynamic situations with 'taking action' to improve them, in such a way that the actors and beneficiaries of the 'action research' are intimately involved as participants in the whole process.

All of this indicates that it is clearly time to break the domination of the old paradigm of positivism for science, and so explore the alternatives. This is not to suggest that there is no place for reductionist and controlled science. This will continue to have an important role to play where system uncertainties are low and problems are well defined and agreed upon. But it will no longer be seen as the sole type of inquiry. The process will inevitably mean huge transformations. Thomas Kuhn's (1970) hugely influential analysis of paradigm changes in science describes the process of revolution for case after case. But the process can bring big shifts in understanding: "During revolutions scientists see new and different things when looking with familiar instruments in places they have looked before" (Kuhn, 1970, p. 111).

The fundamental challenge facing agricultural scientists and development professionals is to find effective ways of involving a wider peer community (Funtowicz and Ravetz, 1993) and a greater breadth of social and cultural institutions (Woodhill, 1993) in the business of developing a more sustainable agriculture. Fortunately, they do not need to start just with theoretical analyses to shift underlying values. From practice, there has emerged a rich experience of the use of participatory methods for just this purpose.

5. THE MANY INTERPRETATIONS OF PARTICIPATION

There is a long history of participation in agricultural development, and a wide range of development agencies, both national and international, have attempted to involve people in some aspect of planning and implementation. Two overlapping schools of thought and practice have evolved. One views participation as a means to increase efficiency, the central notion being that if people are involved, then they are more likely to agree with and support the new development or service. The other sees participation as a fundamental right, in which the main aim is to initiate mobilization for collective action, empowerment and institution building.

In recent years, there have been an increasing number of comparative studies of development projects showing that "participation" is one of the critical components of success. It has been associated with increased mobilization of stakeholder ownership of policies and projects; greater efficiency, understanding and social cohesion; more cost-effective services; greater transparency and accountability; increased empowering of the poor and disadvantaged; and strengthened capacity of people to learn and act (Montgomery, 1983; Paul, 1987; USAID, 1987; Baker, Knipscheer and Neto, 1988; Reij, 1988; Finsterbusch and van Wicklen, 1989; Bagadion and Korten, 1991; Cernea, 1991; Guijt, 1991; Kottak, 1991; Pretty and Sandbrook, 1991; Uphoff, 1992; Narayan, 1993; World Bank, 1994).

As a result, the terms "people's participation" and "popular participation" are now part of the normal language of many development agencies, including nongovernment organizations (NGOs), government departments and banks (Adnan, Alam and Brustinow, 1992; Bhatnagar and Williams, 1992; World Bank, 1994). It is such a fashion that almost everyone says that participation is part of their work. This has created many paradoxes. The term "participation" has been used to justify the extension of control of the state as well as to build local capacity and self-reliance; it has been used to justify external decisions as well as to devolve power and decision making away from external agencies; it has been used for data collection as well as for interactive analysis. But "more often than not, people are asked or dragged into partaking in operations of no interest to them, in the very name of participation" (Rahnema, 1992, p. 116).

One of the objectives of agricultural support institutions must, therefore, be greater involvement with and empowerment of diverse groups of people, as sustainable agriculture is threatened without it. The

Table 1. *A typology of participation: how people participate in development programs and projects*

Typology	Characteristics of each type
1. Manipulative participation	Participation is simply a pretence, with "people's" representatives on official boards but who are unelected and have no power.
2. Passive participation	People participate by being told what has been decided or has already happened. It involves unilateral announcements by an administration or project management without any listening to people's responses. The information being shared belongs only to external professionals.
3. Participation by consultation	People participate by being consulted or by answering questions. External agents define problems and information gathering processes, and so control analysis. Such a consultative process does not concede any share in decision making, and professionals are under no obligation to take on board people's views.
4. Participation for material incentives	People participate by contributing resources, for example, labor, in return for food, cash or other material incentives. Farmers may provide the fields and labor, but are involved in neither experimentation nor the process of learning. It is very common to see this called participation, yet people have no stake in prolonging technologies or practices when the incentives end.
5. Functional participation	Participation seen by external agencies as a means to achieve project goals, especially reduced costs. People may participate by forming groups to meet predetermined objectives related to the project. Such involvement may be interactive and involve shared decision making, but tends to arise only after major decisions have already been made by external agents. At worst, local people may still only be coopted to serve external goals.
6. Interactive participation	People participate in joint analysis, development of action plans and formation or strengthening of local institutions. Participation is seen as a right, not just the means to achieve project goals. The process involves interdisciplinary methodologies that seek multiple perspectives and make use of systemic and structured learning processes. As groups take control over local decisions and determine how available resources are used, so they have a stake in maintaining structures or practices.
7. Self-mobilization	People participate by taking initiatives independently of external institutions to change systems. They develop contacts with external institutions for resources and technical advice they need, but retain control over how resources are used. Self-mobilization can spread if governments and NGOs provide an enabling framework of support. Such self-initiated mobilization may or may not challenge existing distributions of wealth and power.

Source: adapted from Pretty (1994), Satterthwaite (1995), Adnan, Alam and Brustnow (1992), and Hart (1992).

dilemma for many authorities is they both need and fear people's participation. They need people's agreements and support, but they fear that this wider involvement is less controllable, less precise and so likely to slow down planning processes. But if this fear permits only stage-managed forms of participation, then distrust and greater alienation are the most likely outcomes. This makes it all the more crucial that judgements can be made on the type of participation in use.

In conventional rural development, participation has commonly centered on encouraging local people to sell their labor in return for food, cash or materials. Yet these material incentives distort perceptions, create dependencies, and give the misleading impression that local people are supportive of externally driven initiatives. This paternalism undermines sustainability goals and produces impacts which rarely persist once the project ceases (Bunch, 1983; Reij, 1988; Pretty and Shah, 1994; Kerr, 1994). Despite this, development programs continue to justify subsidies and incentives, on the grounds that they are faster, that

they can win over more people, or they provide a mechanism for disbursing food to poor people. As little effort is made to build local skills, interests and capacity, local people have no stake in maintaining structures or practices once the flow of incentives stops.

The many ways that development organizations interpret and use the term participation can be resolved into seven clear types. These range from manipulative and passive participation, where people are told what is to happen and act out predetermined roles, to self-mobilization, where people take initiatives largely independent of external institutions (Table 1). This typology suggests that the term "participation" should not be accepted without appropriate clarification. The World Bank's internal "Learning Group on Participatory Development," in seeking to clarify the benefits and costs of participation, distinguished between different types of participation: "many Bank activities which are termed 'participatory' do not conform to [our] definition, because they provide stakeholders with little or no influence, such as when [they] are involved simply as passive recipients, informants or labourers in a development effort" (World Bank, 1994, p. 6). The problem with participation as used in types one to four is that any achievements are likely to have no positive lasting effect on people's lives (Rahnema, 1992). The term participation can be used, knowing it will not lead to action. Indeed, some suggest that the manipulation that is often central to types one to four mean they should be seen as types of nonparticipation (Hart, 1992).

A recent study of 230 rural development institutions employing some 30,000 staff in 41 countries of Africa found that participation for local people was most likely to mean simply having discussions or providing information to external agencies (Guijt, 1991). Government and nongovernment agencies rarely permitted local groups to work alone, some even acting without any local involvement. These external agencies did permit some joint decisions, but usually controlled all the funding.

Another study of 121 rural water supply projects in 49 countries of Africa, Asia and Latin America found that participation was the most significant factor contributing to project effectiveness and maintenance of water systems (Narayan, 1993). Most of the projects referred to community participation or made it a specific project component, but only 21% scored high on interactive participation. Clearly, intentions did not translate into practice. It was when people were involved in decision making during all stages of the project, from design to maintenance, that the best results occurred. If they were just involved in information sharing and consultations, then results were much poorer. According to the analysis, it was quite clear that moving down the typology moved a project from a medium to highly effective category.

Great care must, therefore, be taken over both using and interpreting the term participation. It should always be qualified by reference to the type of participation, as most types will threaten rather than support the goals of sustainable agriculture. What will be important is for institutions and individuals to define better ways of shifting from the more common passive, consultative and incentive-driven participation toward the interactive end of the spectrum.

6. ALTERNATIVE SYSTEMS OF LEARNING AND ACTION

Recent years have seen a rapid expansion in new participatory methods and approaches to learning in the context of agricultural development (see *PLA Notes* (formerly *RRA Notes*), 1988–present; Pretty *et al.*, 1995; IDS/IIED, 1994; Chambers, 1994a, 1994b, 1994c; Campbell and Gill, 1991; Mascarenhas *et al.*, 1991; NES/CU/EU/WRI, 1990; Rhoades, 1990; Rocheleau *et al.*, 1989; Grandin, 1987; KKU, 1987; Scrimshaw and Hurtado, 1987; Conway, 1987; Rahman, 1984; SPRA, 1982[2]). Many have been drawn from a wide range of nonagricultural contexts, and were adapted to new needs. Others are innovations arising out of situations where practitioners have applied the methods in a new setting, the context and people themselves giving rise to the novelty.

There are now more than 30 different terms for these systems of learning and action, some more widely used than others[3]. Participatory Rural Appraisal (PRA), for example, is now practiced in at least 130 countries, but Samuhik Brahman is associated just with research institutions in Nepal, and REFLECT just with adult literacy programs. But this diversity and complexity is a strength. It is a sign of both innovation and ownership. Despite the different contexts in which these approaches are used, there are important common principles uniting most of them. These systems emphasize the following six elements:

— A Defined Methodology and Systematic Learning Process — the focus is on cumulative learning by all the participants and, given the nature of these approaches as systems of inquiry and interaction, their use has to be participative. It is the emphasis on visualization which democratizes and deepens analysis.

— Multiple Perspectives — a central objective is to seek diversity, rather than characterize complexity in terms of average values. The assumption is that different individuals and groups make different evaluations of situations, which lead to different actions. All views of activity or purpose are heavy with interpretation, bias and prejudice, and this implies that there are multiple possible descriptions of any real-world activity.

— Group Learning Process — all involve the

recognition that the complexity of the world will only be revealed through group inquiry and interaction. This implies three possible mixes of investigators, namely those from different disciplines, from different sectors, and from outsiders (professionals) and insiders (local people).

— Context Specific — the approaches are flexible enough to be adapted to suit each new set of conditions and actors, and so there are multiple variants.

— Facilitating Experts and Stakeholders — the methodology is concerned with the transformation of existing activities to try to bring about changes which people in this situation regard as improvements. The role of the "expert" is best thought of as helping people in their situation carry out their own study and so achieve something.

— Leading to Sustained Action — the learning process leads to debate about change, and debate changes the perceptions of the actors and their readiness to contemplate action. Action is agreed, and implementable changes will therefore represent an accommodation between the different conflicting views. The debate and/or analysis both defines changes which would bring about improvement and seeks to motivate people to take action to implement the defined changes. This action includes local institution building or strengthening, so increasing the capacity of people to initiate action on their own.

The participatory methods (sometimes called tools, techniques or instruments[4]) used in these systems of learning and action can be structured into four classes: methods for group and team dynamics, for sampling, for interviewing and dialogue, and for visualization and diagramming (Table 2). It is the collection of these methods into unique approaches, or assemblages of methods, that constitute different systems of learning and action.

Participation calls for collective analysis. Even a sole researcher must work closely with local people (often called "beneficiaries," "subjects," "respondents" or "informants"). Ideally, though, teams of investigators work together in interdisciplinary and intersectoral teams. By working as a group, the investigators can approach a situation from different perspectives, carefully monitor one another's work, and carry out a variety of tasks simultaneously. Groups can be powerful when they function well, as performance and output is likely to be greater than the sum of its individual members. Many assume that simply putting together a group of people in the same place is enough to make an effective team. This is not the case. Shared perceptions, essential for group or community action, have to be negotiated and tested. Yet, the complexity of multidisciplinary team work is generally poorly understood. A range of workshop and field methods can be used to facilitate this process of group formation.

In order to ensure that multiple perspectives are both investigated and represented, practitioners must be clear about who is participating in the data-gathering, analysis and construction of these perspectives. Communities are not homogenous entities, and there is always the danger of assuming that those participating are representative of all views. There are always differences between women and men, between poor and wealthy, between young and old. Those missing, though, are usually the socially marginalized

Table 2. *Participatory methods for alternative systems of learning and action*

Group and team dynamics methods	Sampling methods	Interviewing and dialogue	Visualization and diagramming methods
Team contracts	Transect walks	Semi-structured interviewing	Mapping and modeling
Team reviews and discussions	Wealth ranking and well-being ranking	Direct observation	Social maps and wealth rankings
Interview guides and checklists	Social maps	Focus groups	Transects
Rapid report writing	Interview maps	Key informants	Mobility maps
Energizers		Ethnohistories and biographies	Seasonal calendars
Work sharing (taking part in local activities)		Oral histories	Daily routines and activity profiles
Villager and shared presentations		Local stories, portraits and case studies	Historical profiles
Process notes and personal diaries			Trend analyses and time lines
			Matrix scoring
			Preference or pairwise ranking
			Venn diagrams
			Network diagrams
			Systems diagrams
			Flow diagrams
			Pie diagrams

(see Rocheleau, 1991; Guijt and Kaul Shah, 1995). Rigorous sampling is, therefore, an essential part of these participatory approaches, and a range of field methods is available.

Sensitive interviewing and dialogue are a third element of these systems of participatory learning. For the reconstructions of reality to be revealed, the conventional dichotomy between the interviewer and respondent should not be permitted to develop. Interviewing is, therefore, structured around a series of methods that promote a sensitive dialogue. This should appear more like a structured conversation than an interview.

The fourth element is the emphasis on diagramming and visual construction. In formal surveys, information is taken by interviewers, who transform what people say into their own language. By contrast, diagramming can give local people a share in the creation and analysis of knowledge, providing a focus for dialogue which can be sequentially modified and extended. Local categories, criteria and symbols are used during diagramming, which include mapping and modeling, comparative analyses of seasonal, daily and historical trends, ranking and scoring methods to understand decision making, and diagrammatic representations of household and livelihood systems. Rather than answering questions which are directed by the values of the researcher, local people are encouraged to explore their own versions of their worlds. Visualizations, therefore, help to balance dialogue and increase the depth and intensity of discussion.

These alternative methodologies imply a process of learning leading to action. A more sustainable agriculture, with all its uncertainties and complexities, cannot be envisaged without a wide range of actors being involved in continuing processes of learning. Some of the changes underway are remarkable. In a growing number of government and nongovernment institutions, extractive research is being supplemented by investigation by local people themselves. Participatory methods are being used not just for local people to inform outsiders, but also for people's own analyses of their own conditions (Chambers, 1994a, 1994b, 1994c; Pretty and Chambers, 1993).

The contrast between systems of learning that involve a wider community than just scientists is illustrated by a recent example from the development of the Landcare movement in Australia (Woodhill, 1993; Campbell, 1994b). Woodhill (1993, p.1) put it this way:

> Scientists had been monitoring the problem [salinity] for a long time and producing a range of publications to inform farmers. What was now significant was the way the farmers talked about the dramatic impact "doing their own science" had on their understanding, motivation to act, and willingness to engage in more fruitful ways with the "experts".

7. THE TRUSTWORTHINESS OF FINDINGS

It is common for users who have presented findings arising from the use of participatory methods to be asked a question along the lines of "but how does it compare with the real data?" (see Gill, 1991, p. 5). It is commonly asserted that participatory methods constitute inquiry that is undisciplined and sloppy. It is said to involve only subjective observations and so reflect just selected members of communities. Terms such as informal and qualitative are used to imply poorer quality or second-rate work. Rigor and accuracy are assumed, therefore, to be in contradiction with participatory methods.

This means that it is the investigators relying on participatory methods who are called upon to prove the utility of their approach, not the conventional investigator. Conventional research uses four criteria in order to persuade their audiences that the findings of an inquiry can be trusted (see Lincoln and Guba, 1985; Guba and Lincoln, 1989). How can we be confident about the "truth" of the findings (internal validity)? Can we apply these findings to other contexts or with other groups of people (external validity)? Would the findings be repeated if the inquiry were replicated with the same (or similar) subjects in the same or similar context (reliability)? How can we be certain that the findings have been determined by the subjects and context of the inquiry, rather than the biases, motivations and perspectives of the investigators (objectivity)? These four criteria, though, are dependent for their meaning on the core assumptions of the conventional research paradigm (Lincoln and Guba, 1985; Kirk and Miller, 1986; Cook and Campbell, 1979).

Trustworthiness criteria were first developed by Guba (1981) to judge whether any given inquiry was methodologically sound. Four alternative, but parallel, criteria were developed: credibility, transferability, dependability and conformability. But these "had their foundation in concerns indigenous to the conventional, or positivist, paradigm" (Lincoln, 1990, p. 71). To distinguish between elements of inquiry that were not derived from the conventional paradigm, further "authenticity"criteria have been suggested to help in judging the impact of the process inquiry on the people involved (Lincoln, 1990). Have people been changed by the process? Have they a heightened sense of their own constructed realities? Do they have an increased awareness and appreciation of the constructions of other stakeholders? To what extent did the investigation prompt action?

Drawing on these, and other suggestions for "goodness" criteria (Marshall, 1990; Smith, 1990), a frame-

work of 12 criteria for establishing trustworthiness have been identified (Pretty, 1994).

(a) *Prolonged and/or intense engagement between the various actors*
For building trust and rapport, learning the particulars of the context, and keeping the investigator(s) open to multiple influences. Trust takes a long time to build, but can be destroyed overnight. It is increased by confirming that participants will have an input into, and so influence, the learning process.

(b) *Persistent and critical observation*
For understanding both a phenomenon and its context. Observation increases the depth of understanding and breadth of realities encountered.

(c) *Parallel investigations and team communications*
If subgroups of the same team proceed with investigations in parallel using the same methodology, and come up with the same or similar findings, then these findings are trustworthy. This requires regular formal meetings and agreed group norms of behavior.

(d) *Triangulation by multiple sources, methods and investigators*
For crosschecking information and increasing the range of people's realities encountered, including multiple copies of one type of source or different copies of the same information; comparing the results from a range of methods; and having teams with a diversity of personal, professional and disciplinary backgrounds.

(e) *Analysis and expression of difference*
For ensuring that a wide range of different actors are involved in the analysis, and that their perspectives are accurately represented. These perspectives will not be resolved to a single consensus position.

(f) *Negative case analysis*
For sequential revision of hypotheses as insight grows, so as to revise until one set of hypotheses accounts for all known cases.

(g) *Participant checking*
For testing the data, interpretations and conclusions with people with whom the original information was constructed and analyzed. Participants have the opportunity to investigate discrepancies and challenge findings, to volunteer additional information, and to hear a summary of what investigators have learning and constructed. Without participant checks, investigators can make no claims that they are representing participants' views.

(h) *Peer or colleague checking*
Periodical reviews with peers or colleagues not directly involved in the learning process, so as to expose investigators to searching questions.

(i) *Reports with working hypotheses, contextual descriptions and visualizations*
These are "thick" descriptions of complex reality, with working hypotheses, visualizations and quotations capturing peoples' personal perspectives and experiences.

(j) *Reflexive journals*
These are diaries individuals keep on a daily basis to record a variety of information about themselves and sequential changes in methodology.

(k) *Inquiry audit*
The team should be able to provide sufficient information for a disinterested person to examine the processes and product in such a way as to confirm that the findings are not figments of their imaginations.

(l) *Impact on stakeholders' capacity to know and act*
For demonstrating that the investigation has had an impact, including participants having a heightened sense of their own realities, as well as an increased appreciation of those of other people. The report could also prompt action on the part of readers who have not been directly involved.

These criteria can be used to judge quality, just as statistical analyses provide the grounds for judgement in positivist or conventional science. An application of an alternative system of learning without, for example, triangulation of sources, methods and investigators and participant checking of the constructed outputs, should be judged as untrustworthy. It will never be possible, however, to be certain about the trustworthiness critieria. Certainty is only possible if we fully accept the positivist paradigm. The criteria themselves are value-bound, and so we cannot say that "x has a trustworthiness score of y points," but we can say that x is trustworthy because certain things happened during and after the investigation. The trustworthiness criteria should be used to identify what has been part of the process of generating information, and whether key elements have been omitted. Knowing this should make it possible for any observer, be they reader of a report or policy maker using the information to make a decision, also to make a judgement on whether they trust the findings. In this context, it becomes possible to state that the "data no longer speak for themselves."

8. TOWARD A NEW PROFESSIONALISM

The elements of these systems of participatory learning, the values, principles, methods and trustworthiness criteria, will not be sufficient to provoke widespread change in institutions and individuals. The methods themselves are not neutral of historical, social and political context. They may be used to lead to genuine local capacity building and organization, or they may be used to satisfy external objectives alone.

These systems of learning are centered on approaches that are alternatives to positivism. They are more likely to generate information already agreed

Table 3. *Toward a new professionalism for sustainable agriculture*

Elements	Components of the new professionalism
Assumptions about reality	The assumption is that realities are socially constructed, and so participatory methodologies are required to relate these many and varied perspectives one to another.
Underlying values	Underlying values are not presupposed, but are made explicit; old dichotomies of facts and values, and knowledge and ignorance, are transcended.
Scientific method(s)	The many scientific methods are accepted as complementary; with reductionist science for well-defined problems and when system uncertainties are low; and holistic and constructivist science when problem situations are complex and uncertain.
Who sets priorities and whose criteria count?	A wide range of stakeholders and professionals set priorities together; local people's criteria and perceptions are emphasized.
Context of researching process	Investigators accept that they do not know where research will lead; it has to be an open-ended learning process; historical and spatial context of inquiry is fundamentally important.
Relationship between actors and groups in the process	Professionals shift from controlling to enabling mode; they attempt to build trust through joint analyses and negotiation; understanding arises through this interaction, resulting in deeper relationships between investigator(s), the 'objects' of research, and the wider communities of interest.
Mode of professional working	More multidisciplinary than single disciplinary when problems difficult to define; so attention is needed on the interactions between members of groups working together.
Institutional involvement	No longer just scientific or higher-level institutions involved; process inevitably comprises a broad range of societal and cultural institutions and movements at all levels.
Quality assurance and evaluation	There are no simple, objective critieria for quality assurance; criteria for trustworthiness replace internal validity, external validity, objectivity, and reliability when methods is non-reductionist; evaluation is no longer by professionals or scientists alone, but by a wide range of affected and interested parties (the extended peer community).

Source: adapted from Pretty and Chambers (1993).

and negotiated by various interest groups. As a result, the likelihood of conflicts is reduced. For these reasons, they can be good for decision makers, as the needs and values are explicit: "inquiry that purports to be value-free is probably the most insidious form of inquiry available because its inherent but unexamined values influence policy without ever being scrutinized themselves" (Lincoln, 1990, p. 82, quoting Beardsley, 1980). There will never, however, be any final, correct answers. There is no absolute trustworthiness, only trustworthiness for a given time in a given context. Furthermore, because all the actors can be said to trust a particular body of information at a particular time, this does not mean to say they will always do so. As external conditions change, so their values and criteria for judging will also change. The information may then come to be judged as untrustworthy, with various people no longer having confidence in it.

It will be important to ensure the construction and generation of timely, relevant, agreed-upon information and knowledge that will support the quest toward a sustainable agriculture. This raises two challenges: finding ways of developing both new institutional arrangements and alliances to encourage greater learning and wider peer involvement; and a whole new professionalism with greater understanding of the range of scientific methodologies and an emphasis on the process of learning (and unlearning) itself.

The central concept of sustainable agriculture is that it must enshrine new ways of learning about the world. Such learning should not be confused with "teaching." Teaching implies the transfer of knowledge from someone who knows to someone who does not know, and is the normal mode of educational cur-

ricula (Ison, 1990; Argyris, 1991; Russell and Ison, 1991; Bawden, 1992, 1994; Pretty and Chambers, 1993). Universities and other professional institutions reinforce the teaching paradigm by giving the impression that they are custodians of knowledge which can be dispensed or given (usually by lecture) to a recipient (a student). Where teaching does not include a focus on self-development and enhancing the ability to learn, then "teaching threatens sustainable agriculture" (Ison, 1990).

A move from a teaching to a learning style has profound implications for agricultural development institutions. The focus is less on what we learn, and more on how we learn and with whom. This implies new roles for development professionals, leading to a whole new professionalism with new concepts, values, methods and behavior (Table 3). Typically, normal professionals have a background in a single discipline, work largely in ways remote from people, are insensitive to diversity of context, and are concerned with themselves generating and transferring technologies. Their beliefs about people's conditions and priorities often differ from people's own views. The new professionals, by contrast, make explicit their underlying values, select methodologies to suit needs, are more multidisciplinary and work closely with other disciplines, and are not intimidated by the complexities and uncertainties of dialogue and action with a wide range of nonscientific people (Pretty and Chambers, 1993).

It would be wrong, however, to characterize this as a simple polarization between old and new professionalism, implying in some way the bad and the good. True sensibility lies in the way opposites are synthesized. It is clearly time to add to the paradigm of positivism for science, and embrace the new alternatives. This will not be easy. Professionals will need to be able to select appropriate methodologies for particular tasks (Funtowicz and Ravetz, 1993). Where the problem situation is well defined, system uncertainties are low, and decision stakes are low, then positivist and reductionist science will work well. But where the problems are poorly defined and there are great uncertainties potentially involving many actors and interests, then the methodology will have to comprise these alternative methods of learning. Many existing agricultural professionals will resist such paradigmatic changes, as they will see this as a deprofessionalization of research. But Hart (1992, p. 19) has put it differently: "I see it as a 're-professionalization', with new roles for the researcher as a democratic participant."

A systematic challenge for agricultural and rural institutions, whether government or nongovernment, is to institutionalize these approaches and structures that encourage learning. Most organizations have mechanisms for identifying departures from normal operating procedures. This is what Argyris (1991) calls single-loop learning. But most institutions are very resistant to double-loop learning, as this involves the questioning of, and possible changes in, the wider values and procedures under which they operate. For organizations to become learning organizations, they must ensure that people become aware of the way they learn, both from mistakes and from successes.

Institutions can, therefore, improve learning by encouraging systems that develop a better awareness of information. The best way to do this is to be in close touch with external environments, and to have a genuine commitment to participative decision making, combined with participatory analysis of performance. Learning organizations will, therefore, have to be more decentralized, with an open multidisciplinarity, and heterogeneous outputs responding to the demands and needs of farmers. These multiple realities and complexities will have to be understood through multiple linkages and alliances, with regular participation between professional and public actors. It is only when some of these new professional norms and practices are in place that widespread changes in the livelihoods of farmers and their natural environments are likely to be achieved.

NOTES

1. Alternatives, additions and challenges to the positivist paradigm have emerged from a very wide range of disciplines, including from chaos theory and nonlinear science (Prigogine and Stengers, 1984; Gleick, 1987; Gould, 1989); fractal geometry and mathematics (Family and Vicsek, 1991; Lorenz, 1993); quantum physics (see many sources, but especially theories of Schrödinger and Heisenberg); neural networks (Holland *et al.*, 1986); soft-systems science (Checkland, 1981, 1989; Checkland and Scholes, 1990; Röling, 1994); postnormal science (Funtowicz and Ravetz, 1993); philosophy of symbiosis (Kurokawa, 1991); historical sociology (Abrams, 1982), morphic resonance (Sheldrake, 1988); popular epidemiology (Brown, 1987); complexity theory (Waldrop, 1992; Santa Fe Institute, *passim*); Gaia hypothesis (Lovelock, 1979); alternative economics (Arthur, 1989; Daly and Cobb, 1989; Douthwaite, 1992; Ekins, 1992); postpositivism (Phillips, 1990); critical systems theory (Jackson, 1991; Popkewitz, 1990; Tsoukas, 1992); constructivist inquiry (Lincoln and Guba, 1985; Denzin, 1984; Guba, 1990; Röling and Jiggins, 1994; Engel, 1995); communicative action (Habermas, 1987); postmodernism (Harvey, 1989); adaptive management and operationality in turbulence (Holling, 1978; Norgaard, 1989; Mearns, 1991; Roche, 1992; Uphoff, 1992); learning organizations and clumsy institutions (Argyris and Schön, 1978; Peters, 1987; Handy, 1989; Shapiro, 1988; Thompson and Trisoglio, 1993); and social ecology (Bawden, 1991, 1994; Woodhill, 1993).

2. This list of references cannot possibly be comprehensive, as the antecedents and actors involved are too numerous to mention. The informal journal *PLA Notes* (formerly *RRA Notes*) (in issues 1–22) has alone published 240 articles since 1988 based on field experiences in rural and urban communities in some 55 countries; and the IDS/IIED (1994) annotated bibliography contains a listing of some 600 references relating to PRA and RRA.

3. A selection of recently emerged terms alternative systems of learning and action include Agroecosystems Analysis (AEA), Beneficiary Assessment, Development Education Leadership Teams (DELTA), Diagnóstico Rurale Participativo (DRP), Farmer Participatory Research, Farming Systems Research, Groupe de Recherche et d'Appui pour l'Auto-Promotion Paysanne (GRAAP), Méthode Accélérée de Recherche Participative (MARP), Participatory Analysis and Learning Methods (PALM), Participatory Action Research (PAR), Participatory Research Methodology (PRM), Participatory Rural Appraisal (PRA), Participatory Rural Appraisal and Planning (PRAP), Participatory Technology Department (PTD), Participatory Urban Appraisal (PUA), Planning for Real, Process Documentation, Rapid Appraisal (RA), Rapid Assessment of Agricultural Knowledge Systems (RAAKS), Rapid Assessment Procedures (RAP), Rapid Assessment Techniques (RAT), Rapid Catchment Analysis (RCA), Rapid Ethnographic Assessment (REA), Rapid Food Security Assessment (RFSA), Rapid Multi-perspective Appraisal (RMA), Rapid Organisational Assessment (ROA), Rapid Rural Appraisal (RRA), Regenerated Freiréan Literacy through Empowering Community Techniques (REFLECT), Samuhik Brahman (Joint trek), Soft Systems Methodology (SSM), Theatre for Development, Training for Transformation, and Visualisation in Participatory Programmes (VIPP).

4. These terms, "tool," "technique" and "instrument," imply a functionality that does not exist in practice. A tool, such as a screwdriver, guarantees an output from an input; a technique, such as how to join together two pieces of wood, is something that can be repeated by skilled practitioners; an instrument, such as a compass, unerringly measures and indicates. No participatory methods can guarantee outputs from given inputs as they involve the activities of diverse social actors, whose interests and concerns cannot be predicted in advance (see Checkland, 1989).

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