

Conceptual, methodological and institutional issues in participatory livestock production research

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Abstract

This article discusses major issues that confront attempts to introduce participatory methodologies into livestock production research, based on experiences during two projects in East Africa, and interviews with researchers and others in the region.

The extent to which research can be participatory is strongly influenced by the institutional contexts in which it is carried and used, and some of the institutions involved are briefly surveyed. The article then discusses conceptual issues; including the notion of degrees of participation, the underdevelopment of participatory research in livestock compared to crop science, and the reluctance of existing livestock science to deal with multiple-output systems. The relations between participatory research, whole-farm research and livelihoods research, and the role of economic analysis are also explored. Methodological issues at various points of the project cycle are discussed, including: the need to tailor methods to agreed objectives, the role of "PRA tools", the specific problems relating to participatory trials with livestock, and the role of on-station trials.

Institutional issues such as funding procedures and timescales, and reward systems for researchers are generic to all participatory research, but they are perhaps felt more strongly in the livestock sector where they combine with livestock-specific issues.

Key words: Participatory research, PRA, livestock, farming systems

Introduction

This article discusses certain major issues that confront attempts to introduce participatory methodologies into livestock production research. It is based on information collected from researchers and other stakeholders in Kenya and Tanzania, as part of activities to link two projects, both funded by DFID's Livestock Production Programme: in particular during two workshops that brought together Tanzanian and Kenyan researchers, in Arusha in April 1997 and in Muguga in January 1998, interviews with researchers and donors, and collection of literature during 1998 ([Note 1](#)).

It emerged early in the project that the concerns of researchers lay as much or more with conceptual and institutional issues as with the choice of particular research tools. We have attempted to concentrate on issues specific to livestock research, but many of the issues of most concern to livestock researchers are in fact generic to participatory research including crop research. We have not aimed to produce a manual for participatory research in livestock production. Materials are increasingly appearing that can advise researchers on the conduct of participatory research (in a general agricultural rather than specifically livestock context) (see especially Sutherland 1998; Conroy et al 1999; Sutherland and Martin 1999) and there are also sources that deal with the "PRA tools" suited to a livestock context (PRA being of course only part of the process of participatory research) such as Kirsopp-Reed (1994) and Waters-Bayer and Bayer (1994). Nor has it been possible to review global experience of participatory livestock production research, although we are aware of interesting experiences in India (Conroy and Rangnekar 1999; Conroy 2001; Conroy et al 2002) and

Latin America (Simon Anderson, pers.comm.). Rather, this article attempts to highlight some key issues, conceptual and institutional as well as methodological, out of the diversity of experiences and views gathered.

This introduction carries on to identify the main institutional contexts in which research is carried out and is used; in other words some of the main stakeholders in research. The following three sections highlight three different, though interlinked, sorts of issues: *conceptual*, relating to the objectives and definition of farmer participatory research, in general and in relation to livestock production; *methodological*, relating to methods that can be used at various points of the research project cycle; and *institutional*, relating to the constraints placed on farmer participation by the institutions that fund it, implement it and use it.

Institutional Contexts for Research

Livestock production research, in a narrow sense, is carried out in countries of the South primarily by NARS (National Agricultural Research Services) and local universities, assisted in some cases by universities or other institutes from the North, or international research centres. It may be funded by donors (in some cases using Northern Universities as intermediaries or research managers) who may target their funding in various ways. In a broader sense "research" is also carried out by donor-funded development projects, and by NGOs: these may also be regarded as users or "uptake pathways" for research in the narrower sense. More detail is given below of each of these categories of actor, and of the way they commission, implement, use and interact with research.

National Agricultural Research Services

Developing countries typically have dedicated national agricultural research services (NARS; [Note 2](#)), separate from teaching universities. These services may fall under ministries of science and technology or under ministries of agriculture (as with the Department of Research and Training in Tanzania). Such organisations will have the major mandate for agricultural research. Research priorities may be identified by the scientific interests of researchers, or by consultation with producers or their representatives, or by various combinations of these approaches. In practice NARS are likely to be dependent on donor funding for much of their research activity. Donors may use research funding as a way to build capacity or lever institutional changes in the direction of their own priorities, including at present more client-oriented research and better dissemination of research outputs.

Relations between NARS and southern universities may be synergistic, but also, in certain circumstances, problematic and characterised by conflict over scarce resources. NARS relations with agricultural extension services vary widely; they may require memoranda of understandings to govern relations between the two, especially if they fall under different ministries. Where national extension services have been designed wholly or partly along "Training and Visit" lines, research-extension linkages will probably be formalised and channeled through particular individuals.

Southern Universities

Even where NARS (in the narrow sense) exist, national universities may be major players in agricultural research. It is very hard to generalise about their strengths and weaknesses: they may be less bureaucratic and more innovative than NARS, or more concerned with academic output at the expense of effective dissemination to farmers. They may have less access to research funds from agricultural development donors, but may benefit in other ways from links to northern universities and educational foundations.

Northern Universities

Northern universities and other non-profit research institutions typically carry out agricultural research in developing countries under funding from development donors, less frequently from their own resources or national research funds in their own countries. They may maintain long-term relations with particular southern universities or NARS, which enable, explicitly or otherwise, a degree of "capacity-building". Northern research institutions may display a concentration on academic output and a limited view of their own role in development, and may be subject to funding and other pressures. Northern universities typically include study for a Ph.D. in their research projects - this may have major advantages in providing incentives to scientists and building research skills in the long term, but may also have disadvantages in reducing their flexibility to do more participatory research.

International Agricultural Research Centres (IARCs)

IARCs include centres of the Consultative Group for International Agricultural Research (CGIAR) and certain others. Within the field of livestock research in East Africa ILRI is of course pre-eminent, and ICRAF is also significant through its research on multi-purpose trees. IARCs enjoy long-term relationships with NARS and southern universities, especially in the countries where they are headquartered, relationships that can contribute to capacity-building. IARCs are well-resourced and have some degree of core-funding, although they also increasingly have to seek funds for specific projects from donors. From a concern with highly strategic scientific research, the CGIAR centres have moved (not all at the same rate) to include a more systems-based approach, and latterly an interest in participatory research.

Donors

Donors fund livestock research in various ways: through central research funds, through country research programmes or through development projects. Central research funds, of which DFID's Livestock Production Programme (LPP) itself is an example, have a mandate to fund research in a chosen field, in this case livestock production, across a number of countries. While different management arrangements are conceivable, in the case of LPP this has implied:

- competition between research proposals from within one country and between countries,
- a general tendency for projects to be led by a northern institution with collaborators from the South - a NARS or a local university, and
- a lack of emphasis on capacity building within Southern research institutions.

Country programmes, which are dedicated to research within one country, may have less of a formal competitive element and may have a stronger capacity building element for the host institution, in this case the NARS. Examples include DFID's and the Netherland's support to the Kenyan Second National Agricultural Research programme (NARP-II) and DFID support to the Smallholder Dairy Research and Development project. There may be even more specific research projects funded out of bilateral development funds, dedicated to a particular centre of the NARS or a specific university. The Netherlands-funded Lake Zone Farming Systems Research Project in Tanzania is an example.

The development programmes of bilateral and multi-lateral donors may carry out research, either in a relatively narrow sense, or in a broader sense if monitoring and evaluation activities are included (as for example in the GTZ Integrated Small Livestock Project in Kenya). They may also play host to external researchers, supplying data, facilities and support ([Note 3](#)). They may also be users of the outputs of research.

NGOs

Much the same range of relations to research characterises NGOs. NGOs may be carrying out a great deal of "research" in a broad sense, in that they actively investigate the production systems in which they intervene, and may play host to more formal research. However, many NGOs see research in the more traditional sense as something external to and irrelevant to their work (E. Kinsey of HPI, pers comm., see also Morton et al 2002).

Conceptual Issues

This section deals with the most general issues surrounding participatory research, its definition, objectives, and relations to more traditional agricultural research, and whether and why participatory methodologies are less developed in the field of livestock production.

Degrees of Participation and Diverse Routes to Participation

It was clear in the first project workshop at Arusha that the term "participatory research" is a very emotive one, particularly when contrasted, as it often is, with "extractive" research. There is a danger that an unrealistic ideal of participatory research may be seen as unobtainable, and may in fact discourage researchers in NARS and southern universities from increasing farmer participation. The comment by Okali et al (1994) on the sharp either/or dichotomies often found in discussions on participatory research is relevant here:

"a central theme which emerges from our study is that the use of dichotomies....., that characterises

many aspects of the literature and discussion relating to farmer participatory research, has been a major factor hindering both clarity of concepts and effectiveness of implementation.”

It seems more appropriate to use a continuum of research types, such as the by now well-known schema proposed by Biggs (1989). As well as replacing a dichotomy with a continuum, this schema allows for a range of objectives for research, all quite valid in the right contexts. It therefore encourages a characterisation of research projects or programmes, rather than research activities considered in isolation. This is especially important if we accept, as the Arusha workshop did, that there are strong arguments for the continuing importance of on-station research (Table 1).

Table 1: Researcher-farmer relationships

Contract	Consultative	Collaborative	Collegial
Farmers' land and services are hired or borrowed, e.g. the researchers contracts with the farmer to provide specific types of land	There is a doctor-patient relationship. Researchers consult farmers, diagnose their problems and try to find solutions	Researchers and farmers are partners in the research process and continuously collaborate in activities	Researchers actively encourage the informal R&D system in rural areas

Source: Biggs (1989) as presented in Okali et al (1994)

Using this scheme, it is clear that for the projects represented at the workshops, the issues have been whether they as projects are closer to the consultative or collaborative points of Biggs' continuum, what advantages there would be to becoming more collaborative, and how they, and future research projects, might do so.

The objectives of “collegial” research, the most participatory point of Biggs' continuum, can be seen as those of strengthening farmers' own capacity for research and development (Farrington and Nelson 1997). During the research, there did not appear to be any livestock research project in Kenya or Tanzania purely driven by such an objective. For the projects we worked with, and others like them, the advantages of a collaborative over a consultative approach might be summed up in the words of Okali et al (1994):

“At a technological level, the aim of farmer participatory research is to understand the main characteristics and dynamics of the agro-ecosystem within which the community operates, to identify priority problems and opportunities, and to experiment locally with a variety of technological ‘options’ based on ideas and experiences derived from indigenous knowledge and formal science.”

Farmer participatory research in this area is, quite properly, a means to an end: involving farmers in the sorts of ways under discussion is a means of doing research which is relevant and whose findings will be adopted by farmers. With livestock research as with other research sub-sectors, there is a real feeling that much research to date has not been relevant and has not been adopted (Bangu 1994).

For the two DFID-funded projects, there was a particular need to assess carefully the degree of participation that is required and is practical. It has been argued that farmer participatory research is particularly appropriate to low potential areas (Okali et al 1994). With respect to rainfall and soils, the respective project sites, Kiambu District and Kilimanjaro Region, can be considered ‘high potential’ at least within an East African context. Its vicinity to Nairobi, which represents an enormous market for milk, additionally favours Kiambu.

However, both Kiambu District and Kilimanjaro Region are characterised by very high population densities, small and fragmented holdings and a shortage of agricultural labour. Dairy producers in both areas have not, up to the last few years, been well served by research institutions, particularly the poorer strata that both projects identified and targeted. To this extent we remained confident that some form of participatory approach is both necessary and possible. The fact that both projects were mainly concerned with small-scale dairy production using crossbreds, which have been introduced relatively recently, lessens the importance of indigenous knowledge, but by no means eliminates it. It placed an added burden on the projects to incorporate on-station work into an overall collaborative framework.

The ways in which participatory and on-station activities are ordered and co-ordinated differ considerably

between different projects, which bears out the idea that it is projects or programmes, and not research activities in isolation, that should be evaluated for their “degree of participation”. It was strongly felt at the Arusha workshop that there might be many different combinations of “participatory” and “non-participatory” activities that can deliver research relevant to farmers, modified by farmers and (hopefully) adopted by farmers.

Why are participatory methodologies less developed for livestock research?

The Arusha meeting was premised on the underdevelopment of participatory methodologies in livestock production as compared to crop production and crop protection, and the participants agreed with this premise, as did most other stakeholders interviewed. The main reason put forward for this state of affairs related to the value of livestock. Livestock (particularly dairy cattle) are valuable and ‘lumpy’ assets. The risk to a farmer of using one of his/her cows in an on-farm feeding trial, in terms of foregone production, loss of condition or worse, is likely to be much greater than the foregone production from a relatively small control plot. ICRAF for example do not carry out on-farm feeding trials comparing treatments and a control, only different treatments, partly because of the ethical issues raised.

We can identify additional reasons for the gap between participatory livestock research and participatory crop research. To some extent these are features of on-farm livestock trials whether participatory or not, but exacerbated if a participatory approach is desired:

- the greater time scales involved in livestock research: this is particularly true of breeding research, but also applies to other research, which may, for example, require the entire growing cycle of a fodder crop, followed by the entire lactation cycle of a cow.
- small numbers of livestock, particularly cows, leading to problems in sampling procedures, and in particular problems of replication (non-participatory on-farm research can alleviate these problems by enforcing standard treatments and controls across a range of farms, participatory research cannot). This makes it difficult to deal with the large degree of between-farm and between-animal variability.
- The practicalities of identifying and tagging animals, particularly smallstock, (which, unlike crops, move) and the difficulties for farmers of managing individuals or groups of animals differently on the same farm, especially in feeding trials, if animals are normally fed together.
- Basal diets against which treatments are compared may vary greatly across farms and fluctuate dramatically for any one farm. This reinforces the problem of small sample sizes and difficulties of replication above.

As is discussed below, these problems are felt differently according to the institutional contexts of research, and can be circumvented by a number of methodological strategies (proven or speculative). But in general they still amount to important and inherent difficulties facing participatory livestock research.

In addition, there are a number of more contingent historical reasons for the underdevelopment of participatory methodologies with livestock:

- a smaller global community of researchers, and a lesser probability of a ‘critical mass’ of participatory-minded researchers emerging
- the early contribution to participatory research made by a few of the CGIAR centres with a crop mandate (IRRI, CIAT, CIP)
- the lack of simple, dramatic and popularizable findings, comparable to the vindication of intercropping by participatory crop research.

Beyond all these, Ashley et al (2000) argue that animal production as a discipline is heavily oriented to working with single production objectives and is inherently challenged by the multiple objectives of resource-poor livestock keepers. The discipline has been slow to understand or rise to this challenge, and urgently needs the assistance of other disciplines to do so. This points to the importance of whole-farm, and ultimately of livelihoods, research.

Participatory research, whole-farm research and livelihoods research

We must note here that the vocabulary of participatory research, especially as presented here, is far from universally used, nor is it the only dimension along which research can be evaluated. Netherlands-funded research in particular tends to describe itself as Farming Systems Research or Client-Oriented Research. Dutch researchers and their colleagues also see a tendency for UK-funded research, even at the more participatory end of the spectrum, to remain commodity-focussed and in their view less relevant than research that takes a whole-farm perspective (De Jong, Musikira, pers.comm.).

The argument for a whole-farm perspective is very persuasive (see Schiere undated), and livestock research that successfully addresses livestock problems of mixed farmers (be it in a consultative, collaborative or collegial way) is very likely to have a strong farming systems orientation. The poor, as is now well known, keep livestock for a number of reasons, including contributing to the productivity of cropping through manure and draught power (Powell et al 1998). Many feed sources for livestock are likely also to produce other benefits for poor households (see Lukuyu 2000 on maize as feed and food, see Franzel et al 2001 on calliandra as a fuelwood source and a soil conservation measure) or impact on their ability to achieve such benefits. For the majority of the rural poor, even when crop and livestock production are not "integrated" in the classic sense of draught power utilisation, fodder cultivation and manure management, there will be sufficient positive and negative synergies between livestock production and other farm activities to make a case for adopting a whole farm perspective.

However, the critique of livestock research from a farming systems perspective can and should be broadened. Livestock production has to be seen not only in a whole-farm perspective, but in a livelihoods perspective. Livestock production is one possible livelihood strategy that the poor can adopt, given their endowment in the various forms of capital, and the institutions that shape their lives. There are trade-offs in the use of those assets; the farming systems approach clearly indicates trade-offs in land (natural capital) between fodder and other crops, but there are equally trade-offs in the use of labour (human capital) and financial capital between livestock production and a variety of non-agricultural livelihood strategies. Similarly there are synergies. Livestock can serve as a form of investment, an asset used for consumption-smoothing during seasonal troughs in cash-income, or can be marketed following links established in the course of other livelihood strategies.

The adoption of livestock production technologies is influenced not only by the farming system and other livelihood strategies, but also by policies, institutions and incentives (Franzel et al 2001). Land tenure and milk marketing institutions and pricing policies are obvious examples. Awareness of such issues should be introduced into the research cycle at various points:

- Researchers should be generally aware of the sorts of policies and institutions that affect livestock producers
- Policy and institutional factors likely to affect adoption can be explored during initial PRAs
- Such factors can be incorporated informally or formally (this applies particularly to pricing) into ex-ante sensitivity analyses
- As Franzel et al (2001) point out, farmer-designed and -managed on-farm trials can yield valuable information on policy constraints, in combination with technical interventions or in their own right.

A related issue is that, if overall circumstances (including policies and institutions) are favourable, adoption of livestock technologies may have "downstream" benefits not only on producer household income, but on nutrition, gender relations, and secondary employment. Some livestock development projects (e.g. the Kenya-Finland Livestock Development Project) make such downstream benefits very much part of their project rationales. The extent to which such benefits should be monitored depends very much on the overall objectives of a project, but even research projects funded as such should be aware of such benefits and the extent to which they may be uncovered in farmer-managed trials.

Economic analysis

Another issue raised by Netherlands-funded researchers during consultations was the relative absence of *ex-ante* economic analysis in DFID-funded research. Netherlands-funded research has a greater tendency to use ex-ante analysis, including sensitivity analyses, to screen interventions for testing - for example, work on molasses-urea blocks was dropped after such analysis. The comment can be broadened to include economic analysis at various points in the project cycle. While adoption in the course of participatory trials is itself an

important indicator of sustainability, economic analysis can be very important in establishing the prospects for broader adoption across locations or strata of farmers. There are however many obvious problems in conducting economic analyses in this way: the unreliability of quantitative data obtained from farmers, the necessity to impute values to "free" resources such as open grazing, family labour or manure, the problems of heterogeneity within farming communities and of seasonality. The trick must be to use economic analyses in the most appropriate and focused way, and not beyond the limits of the available data. "Participatory farm management" tools (Dorward et al 1997), which lie somewhere between PRA tools and traditional quantified economic surveys, may be of value here.

Methodological issues

In this section we want to look at the issues that arise for participatory research in relation to various stages of the project cycle - project identification, baseline research, trials, evaluation, dissemination - and some of the strategies advanced to make research more participatory at these various stages.

Identification of research problems

At the "collegial" end of the continuum (see above) research problems would be identified in each target community through participatory methodologies, ideally a leisurely and well-resourced participatory rural appraisal (PRA). For most research projects, direct investigation of the needs of livestock producers will be only one element in a process that also includes:

- the pre-determined priorities of research programmes and those who fund them,
- researchers' perceptions of what is scientifically interesting,
- secondary information on producers' needs at a national or regional level (for a particularly systematic and quantitative example of the latter see McLeod et al 1998).

These elements can be of varying importance, and combined in different ways. In addition, an understanding of the needs of livestock keepers is likely itself to include:

- a general 'systems understanding' on the part of the researcher, *and*
- needs explicitly articulated by farmers.

In the Tanzanian project the choice of research topic was left very open in scientific terms, within certain constraints: that it should focus on feeding for smallholder milk production, and accommodate the needs of an animal production PhD (Ashley et al 2000). PRAs were conducted in three locations to understand local livestock production systems and their problems. The combination of this process with desk studies of scientific literature was designed to identify scientific "missing links" suitable for research, which could then be refined through further PRAs. This combination proved surprisingly difficult and involved an element of compromise.

In the Kenyan project the broad technical area for investigation - intake - was identified in advance through a general reflection on the needs of Kenyan smallholder dairy systems. However, there was sufficient flexibility within the project to look at feed resource use more generally when the PRAs highlighted that options to improve intake were limited, since feed was scarce even during rainy season when fodder was relatively plentiful. Precise topics within this area were then developed through a compromise between PRA findings and what was scientifically interesting and feasible with the financial and human resources involved. Initially this resulted in a "purely" scientific research design, on alternation of diets, carried out on station. This area of research arose from observations that farmers were forced to alter feeds offered abruptly and frequently as available labour and the seasonal nature of the cropping pattern determined the feeds available. The research was aimed at quantifying the negative effects of these practices and to develop strategies to alleviate these effects. Later in the project new possibilities of financial and human resources allowed a second and more participatory sub-project of research on the trade-offs between production of grain and production of fodder from the maize crop.

Clarity of objectives

Research projects, as discussed above, can take their place along a continuum of degrees of participation, a place determined by the problem they identify to solve, but also in part by their funding and institutional context. Their place in the continuum in turn has implications for overall research design and for particular

methodologies. Given all this, we feel it is very important for research projects to be clear and consistent about their objectives, and about what they are *not* intending to do. The objectives of research will influence the internal design of the project, its mix of on-station/on-farm activities and of quantitative/qualitative methodologies (see also Franzel et al 1998), its relations with extension (see below) and possibly with policy makers, and the most appropriate forms of dissemination. A clear statement of objectives also has implications for how a research project's success should be monitored and evaluated (Note 4). Emphasising this clarity of objectives does not exclude the possibility of changing project objectives, provided this is done in as transparent and participatory way as possible and the methodological implications thought through.

PRA as tools and as a worldview

Many discussions of PRA by its best-known proponents consider it as an approach to, or a worldview of, development work. Such a view stresses long-term engagement, and participation of farmers in planning development activities as well as in information gathering. In practice, in both research and development, PRA is mostly used as a collection of tools, mainly concerned with visualisation, and used instrumentally (Note 5) to gain information for a particular purpose over a fixed and relatively short time-scale. Rather than take sides in such a debate, or spend time policing the boundaries of RRA and PRA, we note that the contrast corresponds quite closely to the different ends of the research continuum, with PRA as a worldview being associated with collegial research, and PRA as a set of field methods with contractual and consultative research. Researchers seeking to move their research from a consultative to a collaborative style would do well to consider the broader purpose of PRA as a critique of existing approaches, but this does not preclude a careful consideration of the methods that have become known as "PRA tools".

The different field methods used within PRA are well-described in a number of places, and methods for use in livestock research and development are described in Kirsopp-Reed (1994), Waters-Bayer and Bayer (1994), Roeleveld and van den Broek (1996), and from the Tanzania research project under consideration (Ashley 1997). A brief discussion will be adequate here:

Semi-structured interview must be the backbone of any PRA activity, including that for livestock research. "Semi-structured" is the key: checklists should be used flexibly to aid the interviewers and to ensure that nothing relevant is missed out, rather than as questionnaires.

Participatory mapping is a technique that proves very useful with livestock producers. This is perhaps more the case with semi-extensive and extensive systems than with intensive dairy systems, but maps can also be used to explore fodder resources, marketing, input supply and service provision linkages.

Ranking and scoring techniques can be used to evaluate constraints to livestock production, the comparative value of different feeds, and the different objectives/outputs of a livestock species. In the first case care needs to be taken in interpreting results: constraints operate in combination and the one that is most obviously limiting is not necessarily the most fundamentally important. "Lack of information" if cited as a constraint does not necessarily imply that available or potentially available information would solve the current problems.

Ranking of feeds is also problematic, and needs considerable care in communicating with interviewees. Are they being asked to compare feeds in the quantities available to them, or per unit weight or volume? Can there be meaningful comparison between cut and carried fodders, purchased feeds and grazing? Are feeds being evaluated on only one axis or on more than one axis representing different purposes such as energy and milk production [see also Thorne and Herrero (1998) and references cited therein]? Matrix ranking of feeds against several criteria is one partial solution here, but these questions need to be faced. What is being asked of producers must be communicated with precision and if possible in a standardised way across individual interviews. Franzel (1993) discusses the use of the traditional *baobab* game for evaluating tree species against different criteria (one of which is used as fodder) and gives some practical guidelines for using the game in a standardised way.

Ranking of production objectives/outputs of different livestock species (for instance using cards with drawings of a bucket of milk, a plough, a currency note) can be a very useful tool, though perhaps less so in

dairy systems where production objectives are relatively clear. Again, care has to be taken in specifying whether objectives are being compared for each species or vice versa. For a more quantified version of this approach see Bennison et al (1997). Even more than the other tools mentioned here, ranking should be carried out wherever possible separately for male and female farmers, and for farms of different sizes.

Calendars are a crucial tool in participatory livestock research. Calendars can be used to obtain information on seasonal labour demands and on seasonal feed availability and use. For this purpose they can be combined with ranking and scoring techniques. If this is done, the remarks on ranking and scoring of feeds above need to be taken into account, and it also needs to be made clear whether feeds available within a particular month are being compared against each other, or whether the use or value of feed is being compared across months (in which case, it must be clear if the comparison is of quality or of quantity and of availability or use) (see Morton and Romney 2001).

Pile sorting "proportional piling" can be used in various ways, some of them similar to the uses of ranking or scoring, bearing in mind the difficulties of quantification, particularly of unlike things. Pile sorting might have particular uses in prioritisation of research topics.

Going beyond the discussion of particular tools, the Arusha workshop and others contacted during this study were concerned with issues of 'good practice' in PRA (not specific to livestock research), such as:

- the appropriate size for a PRA team, and the importance of team-building around agreed objectives. The dangers of too many specialists pursuing their own agendas, leading to overlong and unfocussed sessions were recognised. At the same time, the pressures to have all the sponsoring organisations represented were seen as sometimes unavoidable, but manageable through splitting the team.
- language: PRA reports seldom make much reference to the language in which they were conducted, and which of the participants (researchers or farmers) were fluent in that language.
- "beneficiary fatigue": the possibility of tiring informants through overlong and/or repeated sessions was mentioned repeatedly. In truly participatory research this danger can be minimised by building trust between researchers and farmers over time, but even then must continue to be borne in mind.
- the longer-term issues of trust and communication: the presentation at Arusha of the Lake Zone FSR project showed the lengthy time scale necessary to build up the trust needed for participatory research, which inevitably raised once more the issues of constrained timescales for research projects. The importance of learning communication skills for bridging the researcher-farmer divide (which often exists even with researchers themselves one generation from the land) was also stressed, and there were calls for donors to fund short courses in these skills for African researchers. This issue needs to be considered in a much broader context than that of PRA training (see also Okali et al 1994).
- the need in many circumstances to have separate sessions for different categories of farmers: male/female, small/large, rich/poor farmers, of different ethnic groups.

On-farm trials

Participatory on-farm trials are usually regarded as central to participatory research. As discussed above, the particular difficulties of carrying out participatory on-farm trials with livestock can be seen as a key reason why participatory research in general has not developed in the livestock sector.

One issue that is generic to both livestock and crop research is the trade-off (real or supposed) between participation and scientific rigour in on-farm trials. Put simply, the greater the degree of control that farmers have over trials, the less the experiments are likely to produce data that conforms to normal scientific standards. Farmers' control of experiments is likely to lead to: distribution of farms or animals between treatments being unbalanced; parameters other than those focused on not being held constant; farmers modifying treatments during the trial; "control" farmers adopting one of the treatments half-way through the trial and many similar occurrences that make the production of easily analyzable datasets difficult.

The most important point to make about this trade-off is that it is closely linked to the objective of the research. If the objective is to develop technology that will be adopted by farmers in the project area, it will not be necessary to produce scientifically valid data. If the objective is purely the production of scientific knowledge, then farmer participation will be seen as wholly negative. In between these two poles lie the majority of on-farm trials, where the development of adoptable technology is the overall aim, but combined with factors such as:

- the sorts of institutional and professional concerns discussed elsewhere in this paper,
- a desire to increase understanding of the scientific factors involved, which in turn is likely to be linked to
- a concern for the adoption of the technology to be replicable over larger areas and varying conditions.

It is in these cases where the trade-offs between participatory and scientific objectives will be most felt, and modifying research methods to increase scientific rigour is likely to impact negatively on participation. In each case the extent to which methodologies are "scientific" or "participatory" will depend on the exact combination and hierarchy of objectives. This is not to say that nothing can be done to mitigate these trade-offs. At least three distinct mitigating strategies can be identified:

Training: There are real possibilities for developing with farmers a shared understanding of the basic scientific concepts involved and why they are useful in producing new knowledge. This applies especially to the concept of control treatment. There are well known anecdotal examples of livestock keepers spontaneously adopting controls in order to assure themselves that positive results they saw in their livestock were definitely the result of specific treatments (see for example, Swift cited in Chambers 1983). With training, and equally importantly, *time*, such understanding can be widely shared. However, as discussed elsewhere in this paper, time is likely to be at a premium in projects funded on research budgets.

A group approach: if the basic concepts that underlie the research design can be understood in this way, the adherence of farmers to trial design can be increased by encouraging them to view it as a collective responsibility. In this way, treatments and controls can be divided up between farmers. Assuming that farmers accept the overall importance of the trial, they may be more likely to accept that it is necessary to adhere to the application of a specific treatment (or control) if such adherence is seen as a service to the group as a whole. Under certain circumstances (if other factors are constant across farms or can be accounted for in analysis) group approaches also help to overcome the problem of very small sample sizes, or one-cow herds. Again however, forming, training and managing groups to accept such collective responsibility is a time consuming task.

Innovative statistical methodologies: Many of the problems associated with the analysis of participatory on-farm trial data are statistical and increasingly have statistical solutions. The major problems specific to livestock research are associated with the presence of only one or two animals per farm, leading to large variations within the sample, particularly as regards management practices. A generic set of problems with participatory research is that of unbalanced datasets. The first set of problems are discussed in the booklet by the University of Reading (2000), with particular discussion of the pros and cons of "within-animal" experiments - crossover and switchback designs. The second set of problems is touched on by Martin and Sherington (1997), who observe that software and hardware are now available for researchers to carry out analysis of variance on unbalanced, multi-factor data sets.

A separate major issue with participatory on-farm trials, that does present itself more acutely with livestock trials, is that of risk. While the sorts of feeding interventions our projects were most concerned with – uses of forage already available on farm – were not highly risky, any experiment carries some degree of risk, if only that of loss of condition. It has been pointed out that some research on tree fodders may pose risks of toxicity (Paterson et al 1996), and this should be an example where on-station trials should be carried out in the first instance to ensure that new forages farmers are offered are not toxic.

If an intervention begins to prove successful, not adopting it, in other words adhering to a control regime, also begins to become a risk. Where the risk is to a large household capital asset such as a dairy cow (rather than just the annual yield from a small trial plot), it becomes an important practical and ethical issue.

Again, there are strategies for mitigating this element of risk, or making risk more acceptable to farmers. The first, obviously, is observing principles of information sharing and voluntarism. Farmers need to be told what the risks of interventions are, and what the limits of researchers' knowledge about those risks are. When such information is shared, farmers must be free to choose whether to participate in trials, and ultimately whether to withdraw from trials in progress. In order to limit the ethical and practical problems associated with enforcing a control regime on some farmers, ICRAF have tended to run trials comparing different treatments, rather than comparing a treatment and a control (Franzel, pers.comm).

There are also possibilities of researchers sharing farmers' risks through financial means; cost-sharing, financial guarantees against loss of animal value. One interesting example is the research on concentrate feeding (Romney et al 2000), where increased credit was provided through the co-operative (where the participating farmers delivered milk) to allow farmers to feed high levels of concentrate in early lactation. In this case there was a very close fit between the intervention being tested and the need for a financial mechanism. Cost-sharing and similar approaches may raise problems of appearing to give handouts, and making the research less participatory because farmers have financial incentives, but should be explored. One speculative possibility for mitigating risk that was mentioned during the research was that of using commercial insurance (D M Njuru pers comm.), although it is unlikely that insurers would insure particularly risky interventions.

On-station trials

Researchers in the Arusha workshop, and others contacted during the project, tended to support vigorously the continuing necessity of on-station trials in the sort of research under discussion. The workshop participants also tended to disagree with what they understood as the current position of one major donor to the dairy sector in East Africa, the Netherlands government, against on-station research ([Note 6](#)). The support for on-station work stemmed partly from the sorts of institutional issues discussed elsewhere, and partly from fears that on-farm trials would be problematic and difficult in themselves. The methodological problems of on-farm research suggest that the objectives of on-farm work need to be defined very carefully and simply and point back to the necessity for good on-station work. Researchers feel the need to reduce complexity through 'scientific' investigation before taking a small number of options to on-farm trials. On-station work can help to generate a few "best-bets" that can be tested by farmers rather than relying on on-farm trials to explore relations between many combinations of options. In as much as participatory on-farm livestock trials are seen as especially problematic (because of small and indivisible samples, risk, timescales etc.) livestock researchers can justifiably point to a continued need for on-station research. We also found a strong commitment to on-station trials, carefully identified and managed as part of an overall participatory process, among proponents of participatory livestock research elsewhere in the world (Simon Anderson, pers. comm.).

On-station work can be seen as particularly relevant to the subject of both the projects considered: very small-scale commercial dairying in areas of high population density. This system is relatively new to the farmers, so the store of indigenous knowledge can be assumed not to be great, and the sorts of strategies that are or could be available to the poorest producers are not well understood by researchers. The Tanzanian project in particular justified on-station work by reference to 'missing links' in both farmer and researcher knowledge.

If on-station trials can therefore be seen as part of an overall participatory process, it highlights both general problems of identifying research priorities (see above) and specific problems of obtaining farmer feedback on on-station trials. Ideally perhaps, the process should be iterative and incremental, with each refinement of on-station trials taken back for farmer comment, but the timescale of livestock feeding trials and the time constraints imposed by donors militate against this.

Dissemination

The dissemination of research was seen as an important issue throughout the project. One aspect of this was publication and professional reward systems, discussed below; another was described under the rubric of "research-extension linkages". In many ways, discussion of these issues has been overtaken by the new discussions on dissemination, at least within DFID-funded research. What was clear, however, was that participatory research, which by its nature is localised, is not exempt from the obligation to think through

ways of achieving wider-scale uptake. In Arusha the assumption was that wider uptake would typically involve national extension services, and the talk was of the different institutional and financial contexts in which such services exist, the necessity of their early involvement of such services in research, and the need for an understanding of their preferred form of message. A few years on, with further evidence of the collapse of national extension services (with the partial exception of Kenya) the terms of the debate may have altered towards NGOs and civil society organisations, but many of the principles remain.

Institutional Issues

During the course of the study, and especially at the Arusha workshop, it became clear that some of the greatest concerns that livestock researchers had about participatory research related to its institutional context. To a great extent these concerns are generic to all participatory research, but they are perhaps felt more strongly in the livestock sector because they combine with livestock-specific issues such as long research timescales and problems of small samples. Two sets of issues in particular arose: funding procedures and timescales, and reward systems for researchers.

There was a strong feeling at the Arusha workshop that the timescale and funding of the projects represented were major constraints on the degree of farmer participation that could be achieved. This was exacerbated by the greater timescales needed for livestock research. A leisurely timescale greatly facilitates the proper communication and the building-up of trust between researcher and farmer that is necessary for participatory research. Accepting that on-station research has a role in the overall research process, the process of obtaining feedback from farmers' plans for on-station work is problematic. There is no consensus on how to do this, and it was felt that the ideal approach would be iterative and incremental: going back to farmers frequently to discuss relatively small packages of research findings or research plans. A short timescale limits the number of iterations that are possible between on-farm and on-station work. There was also a feeling that the *flexibility* necessary for truly participatory work, for example the flexibility to make radical switches in research topics, is difficult for donor-funded projects.

More specifically, however, the constraints on timescale, funding and responsiveness were seen as relating to the two projects' place in *a research programme, funded centrally by a donor*, and targeted at a number of countries. There was a strong contrast here with a project funded under Netherlands bilateral aid to Tanzania.

Participants also saw problems relating to the projects' status as centred on three-year PhD projects. While there are strong arguments for donor-funded scientific research to be based on PhD projects (arguments principally relating to incentives for developing country researchers), the three-year PhD project is a very short timescale for participatory research. The requirements of a PhD also steer researchers towards safer, more scientific, on-station activities and limit their ability to switch topics and approaches in mid-project. They give little incentive for researchers to work on design of extension materials and liaison with extension services. There is a need for co-ordinated thinking by donors, NARS and universities to address these problems.

There was some interest at the workshop in the funding of separate project identification exercises, or longer projects subject to review points, to allow the understanding of systems and the participatory choice of research topics before the formal beginning of a PhD programme, as happened in the Kenyan project. The workshop also recognised the risk of such an exercise creating farmer expectations, which would be disappointed if the longer project was not funded or was subject to delays. We nevertheless feel that participatory research projects that are also PhD projects should be funded over four years.

A further, more speculative suggestion is that universities should be more imaginative in their choice of external examiners (or co-examiners) for PhDs, using non-academic professionals such as senior extensionists, representatives of formal farmer organisations or co-operative officers.

In addition, it was a very important concern of the workshop, and of livestock researchers visited subsequently in both countries, that on-farm data is not considered suitable for publication in the peer-reviewed academic journals on which professional reward systems for researchers are based. It is certainly the case that reward systems in NARS give very heavy weight to peer-reviewed publications, to the possible detriment of other forms of output, and that many journal editors are suspicious of the "scientific" value of on-

farm, and particularly participatory, data ([Note 7](#)). However, there are dissenting voices. International researchers associated with Netherlands funding (Rijk De Jong pers.comm., J B Schiere pers.comm and updated) tended to downplay this concern, by pointing out that there are 'softer' but no less esteemed journals that will publish participatory research, and that many researchers in NARS will not achieve a high publication rate in either participatory or conventional research. There are also signs of change in the reward systems themselves, particularly in Tanzania.

Conclusions

This paper has been exploratory, rather than aiming to reach firm conclusions or guidelines for participatory livestock research, but some concluding remarks are in order.

Firstly, clarity of objectives was a constant theme. In the real world, objectives are set by many stakeholders with varying degrees of influence, for reasons developmentally good or bad. We can seek to increase the influence of farmers on research objectives, but we have also to recognise that participatorily-defined objectives do not always imply participatory research. Not all research can, or should be, highly participatory: what is important is to match methodologies to objectives. For much research, particularly funded by research budgets, this is likely to mean nudging research slightly from a consultative towards a collaborative mode.

Secondly, there are important reasons why participatory methodologies are less developed for livestock research, and these must be understood.

Thirdly, however, many of the most important constraints to participatory research are institutional, are shared with participatory research in any sub-sector, but also vary greatly between the institutional hosts of research and the funding sources.

Fourthly, our project was not able to say a great deal about participatory livestock trials. There therefore remains important work to be done in reflecting further on analytical techniques that can be used with participatory data, and most importantly in documenting participatory methodologies for on-farm livestock trials from around the world.

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Note (1)

The projects concerned were: "Husbandry strategies for improving the sustainable utilisation of forages to increase profitable milk production from cows and goats on smallholder farms in Tanzania", carried out by Reading University, in collaboration with Sokoine University of Agriculture, Livestock in Development and NRI (see Ashley *et al.* 2000); and "Evaluation and improvement of feeding strategies for optimising feed intake in crop/livestock systems", carried out by NRI, ILRI and the Kenyan Agricultural Research Institute (see Morton and Romney 2001, Lukuyu *et al.* 2001).

Note (2)

The acronym can be used more broadly for National Agricultural Research *Systems*, including Universities and some parts or aspects of extension systems. It will be used in the narrower sense here.

Note (3)

For example, the Netherlands-funded Tanga Dairy Development Project hosted and provided key long-term data to the LPP-funded research project on "The development of feeding strategies to improve reproductive performance and milk yields of cows in high potential, mixed farming systems". ISLP played host to researchers from German Universities

Note (4)

These issues, and the relations between logical frameworks and participatory research, are explored in detail by Farrington and Nelson (1997).

Note (5)

Using PRA or more traditional data-collection methods in this way is sometimes labelled extractive as contrasted with participatory. We prefer to avoid this terminology; creating knowledge by surveys, even if that knowledge is not returned directly to the community, is a valid activity and hardly needs to be compared with strip-mining.

Note (6)

More accurately, the position of Dutch Development Aid is one that sees on-station trials as a last resort (Rijk De Jong, pers. comm). It should also be noted that the Netherlands-funded Tanga Dairy Development Project in Tanzania has been happy to collaborate with on-station research carried out at the Tanga Livestock Research Station.

Note (7)

A brief paper by one of the authors (Morton 1997) sets out the views of some major livestock journals on on-farm and participatory research. Editors were generally welcoming of on-farm research, but cautious about research that did not meet "normal" canons of experimental design and statistical rigour. However, few indicated a total refusal to accept papers based on the latter form of research. As some Tanzanian researchers pointed out, international and regional journals of farming systems, or agricultural social science, which are peer-reviewed, may be a possible outlet for papers on participatory livestock production research.

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