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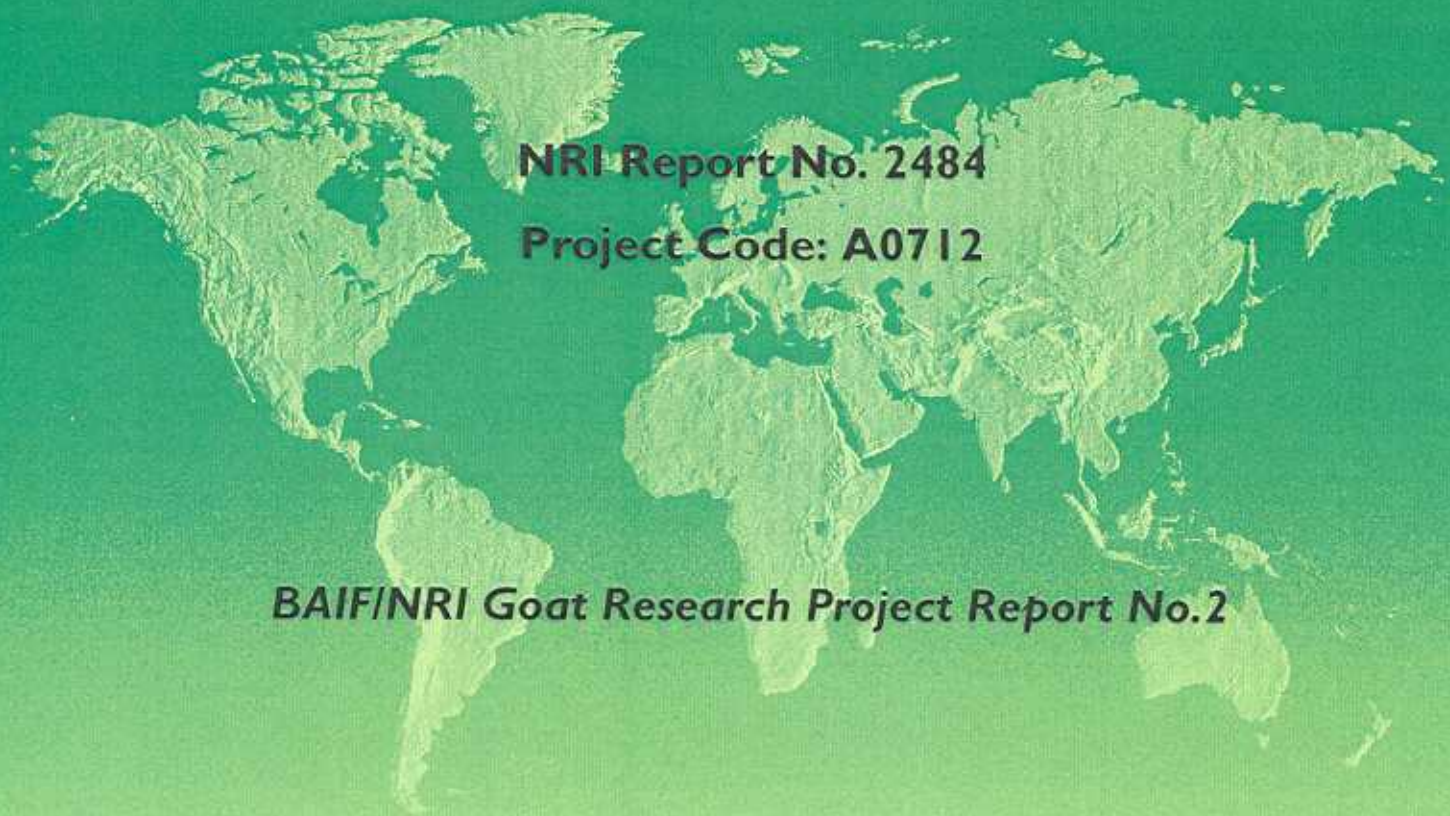

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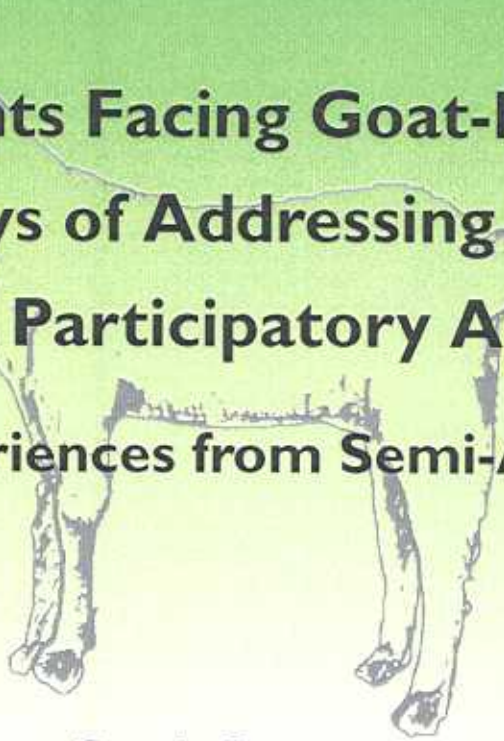
Constraints Facing Goat-Keepers and Ways of Addressing Them Through a Participatory Approach:

Some Experiences from Semi-Arid India



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CONSTRAINTS FACING GOAT-KEEPERS AND WAYS OF ADDRESSING THEM THROUGH A PARTICIPATORY APPROACH: SOME EXPERIENCES FROM SEMI-ARID INDIA

BAIF/NRI Goat Research Project Report No. 2

Czech Conroy and DV Rangnekar

January 2000

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Preface

This document is a progress report on a joint BAIF[1]/NRI[2] applied research project that has been seeking to identify and address feed-related constraints affecting goat production in semi-arid India: it summarises the work done and the progress made during the period 1/10/97 – 31/12/99. The three-year project, which runs from 1/10/97 to 30/9/00, is funded by the Livestock Production Programme[3] of the UK's Department for International Development, whose support we gratefully acknowledge.

We would also like to thank the goat-keepers and the colleagues who have been involved in various aspects of the project. The latter include: Mr. Badve, Mr. G. Bausar, Mr P. Choudhry, Dr A Jape, Dr A.L. Joshi, Dr R. Matthewman, Mr Panchal, Dr AB Pande, Mr. Pandya, Mrs S Rangnekar, Mr Rawal, Dr D. Romney, Dr D.N. Shindey, Mr. L.R. Singh, Mr Vadher and Dr C. Wood.

This is the second of several reports that the project will be publishing. Future reports will cover, *inter alia*: on-farm feed supplementation trials; addressing the problem of seasonal water scarcity; and silvi-pasture development on common lands. Copies of this and other reports can be obtained by contacting us at the addresses given below.

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[1] BAIF Development Research Foundation is one of India's leading rural development NGOs. It is a public charitable trust established by the late Dr. Manibhai Desai, a disciple of Mahatma Gandhi; and is a non-political, secular and professionally managed organisation. BAIF's mission is to create opportunities of self-employment for rural families, especially disadvantaged sections, ensuring sustainable livelihoods, enriched environment, improved quality of life and good human values.

[2] The Natural Resources Institute (NRI) is an institute of the University of Greenwich, based in the United Kingdom. The NRI was formerly a scientific and technical organisation of the British Overseas Development Administration (now the Department for International Development). NRI is an internationally recognised centre of expertise on renewable natural resources research and development, with a long history of working in less developed countries.

[3] This document is an output from a project (R6953) funded by the UK Department for International Development (DFID) for the benefit of developing countries. The views expressed are not necessarily those of DFID.

1. INTRODUCTION

BAIF Development Research Foundation (BAIF), India, and the Natural Resources Institute (NRI) of the University of Greenwich, UK, are jointly implementing two complementary projects aimed at alleviating goat production problems caused by seasonal feed shortages in semi-arid India. One is entirely field based and the other is primarily oriented towards laboratory feed evaluation: both started on 1 October 1997 and are due to end on 30 September 2000. The UK's Department for International Development is supporting the projects through its Livestock Production Programme.

The title of the field-based project, the subject of this report, is: "Easing seasonal feed scarcity for small ruminants in semi-arid crop/livestock systems through a process of participatory research". The project is a multi-disciplinary one: the Project Leader for NRI is a socio-economist, whereas the Project Leader for BAIF is a veterinarian; and contributions are made by other staff from both organisations, who are from a variety of disciplines, including ruminant nutrition and agronomy.

Until now the project has been working in three districts of north-west India - two in south Rajasthan (Bhilwara and Udaipur) and one in Gujarat (Bhavnagar). These districts were selected so that different goat production systems would be covered by the project (see Table 1). Limited diagnostic and needs assessment work has also been done in Vidisha District of Madhya Pradesh. During 2000 similar work will be done in two new districts – Dharwad (Karnataka) and Pune (Maharashtra); and if feed scarcity is an important constraint in those districts further trials may be undertaken there.

1.1 Project Rationale

Scientists have acquired a tremendous amount of knowledge about the feed resources and nutrition of ruminants, both large and small (Acharya and Bhattacharyya, 1992). Despite this, the adoption of technologies developed by researchers, for enhancing fodder production and improving grazing management systems, has been poor (*ibid.*; Sidahmed, 1995). This is partly because feed technologies have often been developed without the involvement of the intended users, and without an adequate understanding of their farming systems and constraints: a systems approach "has been singularly lacking in the past" (Devendra, 1999). The BAIF/NRI project is applying a systems-based approach and working closely with goat-keepers.

There is reason to believe that a participatory approach to technology development (PTD) can help to ensure that new technologies are appropriate to farmers' and livestock-keepers' needs and circumstances, and hence increase the likelihood of adoption (Conroy *et al.*, 1999; Reijntjes *et al.*, 1992). Greater participation of the intended users can mean, *inter alia*, that: farmers' knowledge and experience can be incorporated into the search for solutions, and highly inappropriate technologies can be 'weeded out' early on; and researchers receive rapid feedback, enabling promising technologies to be identified, modified and disseminated more quickly.

Livestock research and development work has tended to lag behind crop production work in the development and application of methods for participatory technology development (PTD). There are relatively few documented examples of PTD projects in which livestock are a central focus, particularly ones addressing feed issues. However, there has been

increasing recognition that livestock research needs to give greater emphasis to farmer participation (Devendra, 1999; Sidahmed, 1995). This project, by taking a participatory approach to the development of feed technologies for goats, is seeking to enrich the experience of PTD in the livestock sector and to develop participatory methodologies that are appropriate to the sector.

1.2 Overview of Progress against Project Objectives

The objectives (outputs in the logical framework) of the project are:

1. a better understanding of farmers' current feeding and production systems for goats, and the rationale for them;
2. the development of a set of recommendations for improving local feed resources and feed management strategies;
3. the development of participatory methodologies for the analysis of feed resources and constraints and for the testing of interventions;
4. dissemination of the project's findings and recommendations on feed resources and strategies and participatory methodologies.

Major progress has been made with all four of the project objectives. The project has acquired a reasonable understanding of goat production systems and constraints (Output 1); and where these have been feed-related we have worked with goat-keepers to develop technologies to address them (output 2). Work on output 2 has so far focused on feed supplementation at critical points in time, and on the linkages between water and feed constraints. Towards the end of 1999 the project initiated some studies of protected silvi-pasture areas on common lands, and the effect that they have, or could have, on goat production and feeding systems. The results of these studies will be published in 2000. Most of the dissemination work (output 4) will be done during the last few months of the project. Nevertheless, the project has taken advantage of relevant conferences and workshops to present papers, abstracts and/or posters about the findings so far.

1.3 Structure of the Report

Subsequent sections of this report elaborate on various aspects of the project outputs. Section 2 (*Understanding Systems and Constraints*) is linked to Output 1; while Sections 3 and 4 (*Feed Supplementation Trials* and *Addressing Seasonal Water Scarcity*) are related to Output 2. Section 5 reports on progress in developing participatory methodologies (Output 3).

Section 7 (*Dissemination of Project Findings*) describes dissemination activities that have already taken place and those that are envisaged during the remainder of the project. Although not listed as a project output, *capacity development* is another important objective of the project. Progress on this front is described in Section 6.

2. UNDERSTANDING SYSTEMS AND CONSTRAINTS

2.1 Understanding Systems

In each of the three districts where it has been working the project began by conducting surveys in a few villages in areas where BAIF has an operational presence. The three districts represent a range of situations as far as mean annual rainfall and other agro-ecological parameters are concerned (see Table 1).

The surveys, which lasted about 3 days/village, involved rapid rural appraisals with groups of goat-keepers, using semi-structured interviews and mapping and diagramming. The surveys generated descriptions of the farming and livelihood systems, goat production and feeding systems, and the constraints faced by goat-keepers. Descriptions of the farming and livelihood systems are given in Project Report No. 1 (Conroy and Rangnekar, 2000a).

Table 1 Production and Agro-Ecological Characteristics of the Four Survey Districts

District (State)	Production Systems studied	Main product	Mean annual rainfall (mm)	Other Agro-Ecological Characteristics
Bhavnagar (Gujarat)	(a) Extensive, commercial (b) Semi-extensive, subsistence	Milk	550	Little forest. Some areas experiencing groundwater depletion and seawater ingress.
Bhilwara (Rajasthan)	Semi-extensive, semi-commercial	Meat	700	Plains area. Little forest.
Udaipur (Rajasthan)	Extensive, semi-commercial	Meat	624	Hilly area. Some forest.
Vidisha (Madhya Pradesh)	Semi-extensive, semi-commerical	Meat	1000-1200	Plains area. Forest is relatively abundant

2.2 Identifying Constraints

Towards the end of the survey work, the goat-keepers were asked to list *any* problems they considered to be important: and rank them in terms of their relative importance (for example, water scarcity 1st, disease 2nd, feed scarcity 3rd). In villages where people from different castes keep goats for different reasons, or use different production practices, these groups were interviewed separately, as their ranking of problems could also differ. The results of the ranking were generally cross-checked with other survey findings. In some cases, problem ranking was followed by the use of participatory problem tree analysis to deepen understanding of the problems.

Results

Tables 2-6 show the rankings of constraints that were given by male goat-keepers in 16 villages to members of the project team during 1997-1999. (Women were also interviewed, but it was sometimes more difficult to get rankings from them. Their answers are often, but not always, similar to men's.) Disease is an important constraint in all three districts, but otherwise there are some major differences.

diagrammatic tool for analysing problems and gaining a more in-depth understanding of their nature (Peacock, 1996). Their use by the project is described in Section 5.

Sometimes it is necessary to gather more detailed data to quantify the size or timing of a particular constraint – for example, kid mortality in the rainy season. The project has developed a method for obtaining such data, which we call the Participatory Herd History Method. This method is also described in Section 5.

Human dimensions of livestock production problems

Studies of livestock problems and constraints usually describe problems as they affect the animals - for example, in terms of growth rates, mortality or milk production. However, our research has shown that there are often important human or socio-economic dimensions that need to be understood and taken into account. This is illustrated by the water scarcity examples given above, in which two of the groups described the problem in relation to demands on their labour, and the third in relation to expenditure. The *Rabaris* of Kumbhan also complained about how tired they were at the end of the day. A water infrastructure intervention by the BAIF/NRI project reduced their herding distances, and hence their fatigue (see Section 4). Their wives identified another human aspect of the problem: they observed that the reduction in fatigue had lead to less arguments with their husbands and in disagreements being settled amicably.

Summary and Policy Implications

The project's surveys have found that the ranking of constraints tends to vary considerably from village to village, from one production system to another, and between men and women. There are also differences in both the ranking and the nature of constraints between agro-ecological zones. In addition, some of the constraints identified (e.g. theft, predators, water scarcity) are ones that are not conventionally addressed by livestock services agencies. Finally, human or socio-economic dimensions of constraints need to be understood and taken into account.

These findings point to the need for livestock service agencies in India, if they are to be effective in helping goat-keepers address production problems, to: have broad mandates, be flexible, and see things from the goat-keepers' point of view. They also highlight the fact that the major constraints tend to be related to insufficient resources (feed, water, labour, cash etc.) rather than information needs *per se*. Thus, if the needs of poor goat-keepers are to be met, soundly based extension messages, grounded in the production system realities of the groups to which they are addressed, need to be combined with "complementary services to help address the constrains which currently prevent change' (Matthewman and Ashley, 1996).

3. Feed Supplementation Trials

The project aims to develop technologies to ease or remove the constraints identified, based primarily on a *collaborative* relationship with goat-keepers, as described in Table 7. This is more participatory than the *contract* and *consultative* modes, which have probably been the ones most commonly used in on-farm livestock research. (The degree of farmer involvement increases in the modes to the right hand side of the table.) This section

describes the trials conducted by the project, which focused on supplementation of feed at critical points in time to address the problem identified; and assesses to what extent the postulated benefits of PTD have been realised, and the factors affecting this. The methodology used in the trials is described in section 5.3.

Table 7 Four Different Modes of Farmer Participation in Agricultural Research

1. Contract	2. Consultative	3. Collaborative	4. Collegiate
Farmers' land & services are hired or borrowed: e.g. researcher contracts with farmers 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 roughly equal partners in the research process & continuously collaborate in activities	Researchers actively encourage & support farmers' own research & experiments

Source: Biggs, 1989.

Results

Results of treatments in relation to problems identified

Three priority problems were identified that appeared to be (at least potentially) feed-related. The production systems are different in each district, hence the feed-related problems are too (see Table 8).

Table 8 Problems, Supplements and Classes of Goats in the On-farm Trials

District (State)	Main product	Feed-related Problem (or opportunity)	Supplement (all given at 250g/day)	Goats targetted
Bhavnagar 1998 (Gujarat)	Milk	Low milk production in dry season	Trial 1. Urea/molasses granules (UMG)	Lactating does
Bhilwara 1998 (Rajasthan)	Meat	Sub-optimal reproductive performance of does	Trial 2.Mixture of *Prosopis juliflora* (PJ) pods and barley	Breeding does
Udaipur 1998 (Rajasthan)	Meat	Disease-related mortality in kids early in the rainy season	Trial 3. Barley Trial 4Urea/molasses granules	Kids
Bhilwara 1999 (Rajasthan)	Meat	Sub-optimal reproductive performance of does	Trial 5.Mixture of *Prosopis juliflora* (PJ) pods and barley Trial 6. PJ pods only	Breeding does
Udaipur 1999 (Rajasthan)	Meat	1 Disease-related mortality? 2 (Rapid maturation of females)	Trial 7. Barley	Kids

The UMG trial in Bhavnagar had the intended effect of increasing milk production, but the size of the increase was limited and goat-keepers said that they would like any further feed supplementation trials to take place around the time of kidding, rather than in the dry season. In both of the Bhilwara trials the treatment was effective, in that the kidding rates of does in the treatment groups were significantly higher than those for does in the control groups (Conroy *et al.*, 2000). In the two Udaipur 1998 trials the effects of the treatments were difficult to isolate, due to confounding factors. Data from the Udaipur 1999 trial have not yet been analysed.

Results in relation to degree of goat-keeper participation

There has been a moderate degree of goat-keeper participation in the design of the trials regarding: (a) relating the trials to priority needs; and (b) the determination of the treatment (see Table 9). The factors influencing the degree of participation are discussed in the concluding section.

Addressing of a priority need To ensure the active involvement of goat-keepers in PTD it is essential that the research is addressing a need that they regard as important. The researchers generally *sought* to address a priority need of the goat-keepers. However, in four of the trials it is questionable whether the project actually *succeeded* in doing so (see Table 9), due to inadequate discussions with goat-keepers about the precise nature of the constraint and/or the suitability of the proposed treatment to address it.

Determination of treatment In all of the trials it was the researchers who identified the type of supplement to be used. However, this was based on knowledge of livestock-keepers' experiences with similar technologies in other localities. In most trials, the participants appeared to agree that the proposed treatment was a sensible one, and contributed 33-50% of the cost of the treatment. In Trials 6 and 7 goat-keepers were more actively involved in determining the treatment, in the latter case having the major say in the daily quantity.

Table 9 Indications of the Degree of Goat-Keeper Participation in the Trials

Trial – number, supplement & year	Overall mode of participation*	Was a Priority Need Addressed?	Who Decided Nature of Treatment?	Joint Evaluation?	Is treatment likely to be adopted?
1. UMG – 98 (Bhavnagar)	1/2	X[2]	R	✓	X
2. PJ pods & barley – 98	2	✓	R, with G-Ks' agreement	✓	✓ (with modification)
3. Barley – 98	2	?	R, with G-Ks' agreement	✓	X
4. UMG – 98	2	?	R, with G-Ks' agreement	✓	X
5. PJ pods & barley – 99	1/2	✓	R	✓	✓ (with modification)
6. PJ pods – 99	3	✓	R/G-K jointly	✓	?
7. Barley – 99	2	?	R/G-K jointly	✓	?

*Code: 1 = Contract 2 = Consultative 3 = Collaborative. R = Researchers. G-Ks = Goat-keepers

[2] The research in Bhavnagar subsequently (in 1999) focused on addressing water scarcity in the dry season, which the goat-keepers had identified as their main constraint – see section 4.

Preliminary Conclusions

Technology development is a gradual and iterative process. Thus, a number of trials may be required before a technology is developed that meets livestock-keepers' priority needs and is suitable for adoption. The experience of this project appears to confirm the widely held view that the more and the sooner farmers and livestock-keepers are involved in the research process, the more rapidly appropriate technologies will be identified.

Factors facilitating increased participation

A high degree of participation (such as type 3 in Table 7) is not usually possible from the outset. However, if researchers are committed to achieving it there is likely to be a gradual shift along the spectrum towards greater participation. In the experience of the BAIF/NRI project this may be due to one or more of the following factors: (a) development of positive rapport between researchers and participants when successive trials are conducted in the same village, as illustrated by Trials 2 and 5; (b) improved understanding of problems (illustrated by the Bhavnagar experience – see Table 3 footnote) or opportunities (e.g. Trial 3 identified an opportunity that was then explored further in Trial 7); (c) the efficacy and profitability of the technologies is demonstrated (Trials 2 and 5), or improved through modifications (the aim of Trials 6 and 7); and technologies found to be ineffective are abandoned (Trial 1).

Factors hindering a participatory approach

The shift towards a collaborative relationship with farmers is not automatic. It is important to be aware of, and to address, factors that may hinder the adoption of a participatory approach. These include (see also Conroy *et al.*, 1999) (a) researchers lacking experience and orientation in PTD; (b) pressure to move quickly from the diagnosis and needs assessment phase to the establishment of trials (due to the short lifetime of some projects), resulting in inadequate needs assessment; (c) small project budget, resulting in insufficient staff time to encourage full farmer involvement; (e) late scheduling of project activities (related to previous point); and (e) staff turnover and involvement of inexperienced staff.

Prospects for adoption

The ultimate test of the appropriateness of the technology is whether or not participants show evidence of adopting it. It is too early to say yet whether the technologies developed will be adopted by goat-keepers. This will become clearer when all of the 1999 trials have been analysed and evaluated, and when a further round of trials has been conducted in the year 2000. However, the PJ pods/barley treatment has proved to be effective and produces net benefits (Conroy *et al.*, 2000); and there is strong evidence of goat-keeper interest in the treatment or a modification of it. The net benefits need to be increased by modifying the treatment to reduce costs: Trial 6 is investigating one approach to this.

4. ADDRESSING SEASONAL WATER SCARCITY

4.1 Background

Gujarat is a vegetarian state in which meat production nd consumption are socially unacceptable in rural areas. Thus, milk and manure ar the main livestock products. Most of the project's work in Bhavnagar District of Gujarat has been in a village called Kumbhan, where BAIF has an office and is involved i other development activities. The *Rabari*[3] livestock-keepers there told the researchers du ing informal survey work that seasonal water scarcity is a more serious problem for t em than seasonal feed scarcity (see Table 2): mean annual rainfall in Bhavnagar is about 5 00 mm and is concentrated in the period of July-September. They said that they have to walk long distances during the hot dry season (March-June inclusive), because of a lack o water near their main (communal) grazing area, which obliges them to go elsewhere for d inking water, thereby limiting the amount of time they can spend in the grazing area. Th *Rabaris* proposed the construction of a water trough and storage tank near to a privately o vned well, in the vicinity of the main dry season grazing area, whose owner was agree ble to supplying water to the trough. He was already supplying some water to a cha nel in his field, but its capacity was small.

Although the research project is focusing on feed scarc ty, rather than water scarcity, the researchers decided to provide financial support for the construction of the trough, since water scarcity and feed scarcity appeared to be closely nter-related in three ways. First, inadequate water intakes would be expected to have a n egative impact on feed intake *per se*, and hence direct and indirect effects on animal prod ctivity. Second, the longer distances covered by the livestock in search of water w uld increase their energy expenditure, and hence feed requirements; and, third, w alking long distances reduces the amount of time available for grazing.

Before a decision was taken on whether to proceed wit construction of the water trough, the local BAIF staff collected data that would enable a informed but basic appraisal to be made. Once the decision had been made (in November 1998) to proceed with the trough, some more detailed baseline data were collected (in lat 1998 and the first quarter of 1999), regarding animal numbers, types, and daily acti ity patterns. A rudimentary financial cost/benefit analysis and environmental impa t assessment were also undertaken. The trough was constructed in April 1999, and came in o use on 9 May, in the middle of the dry season.

4.2 Methods

Problem identification

The water scarcity issue was first raised during a semi- tructured group interview with *Rabari* men in late 1997, as part of the initial survey w rk on livelihood system characterisation and needs assessment. Livestock prod ction constraints - and the

[3] *Rabaris* are a caste specialising in livestock production, an l tend to own a combination of cattle and goats. For some *Rabari* men herding livestock is a full-t me occupation: they may herd other people's animals as well as their own, for a small fee.

relationships between causes, core problem and effects - were further elucidated through a participatory problem tree analysis undertaken by *Rabaris* men in November 1998 (see Figure 1), in which water scarcity was identified as the core problem.

Initially, the *Rabaris* identified the impact on themselves (i.e. walking considerable distances in the intense heat, with lack of drinking water at times, leading to exhaustion at the end of the day) as being as important as the effect on their animals. In the problem tree analysis, the *Rabaris* identified reduced milk production and susceptibility to disease as two specific effects of water scarcity in the dry season and they expected a general improvement in the performance of their animals due to the saving of energy from the reduction in herding distances.

Monitoring and Evaluation

The monitoring system had a number of elements. From late March to late June there was monitoring for four consecutive days every two weeks of:

- routes and distances covered by herders and their animals;
- the daily activities of the animals (detailed breakdown of time spent on each);
- milk offtake (as an indicator of milk production) of 12 goats and 12 cows; and
- monthly group meetings between researchers and livestock-keepers.

4.3 Results

After the 'trial', in late July 1999, three different group discussions were held – with *Rabari* men, *Rabari* women and scheduled caste men (whose goats were herded by *Rabaris*). All of them were very positive about the effect of the water trough on themselves and on their animals. The monitoring data confirmed the effect of the trough, which is described below.

Herding distances and durations

The *Rabari* women estimated that the amount of time spent herding by the men had decreased by 2-2.5 hours per day. After the trough came into use some men returned home during the day at 14.00-14.30, instead of 12.30-13.00; and in the evening they were returning home at 19.00, instead of 19.30-20.00. The men estimated the time saving as 2-3 hours per day.

Time savings correspond to reductions in the distance covered by the *Rabaris* and their animals. The men estimated that this had decreased by 3-4 kms. The *Rabaris*' estimates of the reduction in distances covered are being checked against the monitoring data, which show the routes covered each day. More precise estimates of the reduction in distances will be derived from the monitoring data.

Time spent grazing

According to the *Rabaris*, the goats' appetites had been suppressed prior to the trough coming into use, and they regarded the animals' increased forage intake as an important factor in the increase in milk production. The monitoring data are being analysed to see

whether they confirm that the amount of time that goats spent grazing (as opposed to walking, resting, drinking etc.) increased after the trough came into use.

Condition of the animals

During the evaluation meetings in late July 1999, goat-keepers said they had observed a substantial improvement in the condition of their animals, as indicated by them having shinier coats. They also mentioned that the goats had experienced less disease than usual. However, this may have been related to the lateness of the monsoon rains.

Milk production

Milk production of 12 goats was monitored every two weeks for two months after the trough came into use. A comparison of the monitoring data with similar data collected during the same period in 1998 from Trial 1 (see Table 9) showed that mean daily milk production was substantially higher in 1999.

4.4 Conclusions and Policy Implications

This case study illustrates how livestock-owners, and not just their animals, can be negatively affected by water scarcity. The research also confirmed that water scarcity had been a core constraint for goats. Three factors related to better availability of water may have contributed to the increase in milk production, and the general improvement in the condition of the animals. These are: increased appetite; reductions in the daily distance walked (and hence energy required); and an increase in the amount of time available for grazing.

The experience with the water trough has shown that, although goats are relatively well adapted to surviving during hot, dry periods, water scarcity can also have a negative impact on their condition and productivity. The problems experienced in Kumbhan may be quite common in areas of India with a mean annual rainfall of less than 750 mm. Project staff identified a similar problem in the village of Jodhkakheda in South Rajasthan's Bhilwara District. Peacock (1996) noted that water scarcity may reduce milk production of goats in dryland Africa. This finding highlights the need for livestock development programmes and livestock service agencies in dryland regions to address water scarcity as a constraint on goat (as well as large ruminant) production and also as a human welfare issue.

5. PARTICIPATORY METHODS

A wide range of PRA tools were used during the initial *diagnostic and needs assessment phase*: some of these are briefly mentioned or described below in sections 5.1 and 5.2. A comprehensive description of these methods and how to use them will be given in a forthcoming project publication (Conroy, *in press*), the first of two or more *Guides*. A participatory approach was also taken when preparing for and implementing feed supplementation trials (see sections 3 and 5.3), and the project's experiences in technology development will provide the basis for a second *Guide* to be published later in 2000. Some of the key issues are described in section 5.3.

5.1 Describing Goat Production and Feeding Systems

Matrix ranking was used to determine the relative importance of different contributions that goats and other livestock make to people's livelihoods. Seasonal production calendars provided a valuable overview of the timing of conception, kidding, sales and disease.

The principal tools used to describe goat feeding systems were seasonal calendars, to show temporal aspects; and participatory mapping of forage resources to show spatial ones. Different types of seasonal calendars were used to explore different aspects of feeding systems – some calendars focused on fodder species, while others looked at sources (e.g. common grazing lands, private grazing lands, owners' fields, others' fields).

5.2 Identification of Constraints and Research Issues

Preliminary identification of constraints and needs

In PTD it is essential to focus on people's perceived priority needs. Simple ranking was used to identify major problems and their relative importance, as described in section 2, and the results of the ranking were generally cross-checked with other survey findings. If an important feed-related problem was identified through the group discussions, further information about it was sometimes obtained through two other methods, namely: *participatory problem tree analysis* and *participatory herd histories*.

Obtaining livestock productivity data through participatory herd histories

The project did not have the resources (especially time) to undertake herd monitoring studies. Nevertheless, there was sometimes a need for more detailed, and moderately reliable, livestock productivity data (e.g. on kid mortality) to confirm and quantify constraints identified in the group discussions. During the first year of the project such data were sought through individual interviews. It quickly became apparent, however, that goat-keepers often had difficulty recalling all key events (births, sales etc.) in the herd[4]. Thus, in the second year of the project this kind of data was collected using what the project called the 'participatory herd history' method, based on the owner's recall and use of cards to symbolise each goat in the herd.

The method involves the owner making an inventory of the current herd, and working backwards over 1-2 years to document what changes to the herd have taken place and when, either in terms of acquisitions or removals, and hence the productivity of the animals. Thus, it provides information about births, deaths, slaughter, sales, purchases. It can provide quantitative data on various matters including: productivity issues, such as the incidence of disease-related mortality in kids, or the reproductive performance of does; and the pattern of marketing goats (e.g. seasonality, age of animals at sale).

[4] Other researchers have concluded that recall can be reliable. It may be that reliability is lower for small ruminants than for large ruminants, as one of the former is less valuable and important than one of the latter. In addition, herds of small ruminants tend to be larger than herds of large ruminants, and changes in the herd are more frequent, making accurate recall more difficult.

The herd history method is related to two other methoc s that have been termed "Herder recall" and "Progeny history" (Waters-Bayer and Baye r, 1994). A key difference, however, is that the herd history method uses symbols, and is a f orm of diagramming by the livestock-keeper, which is then copied by the researche r; whereas the other methods are more extractive, with the enumerator recording the dat i in written form.

Participatory problem tree analysis

Participatory problem trees were used to analyse highl y ranked problems identified in group discussions and to gain a more in-depth understa nding of their nature. Problem tree analysis involves identifying a core problem, the factor s causing it, and the effects that it has: the core problem is represented as the trunk of the tree, the causes as its roots and the effects as its branches (Peacock, 1996). For an example of a problem tree see Figure 1. The BAIF/NRI project has found participatory problem tree s to be very useful in revealing how livestock-keepers perceive problems and relationships, which may be different from how outsiders see them.

Participatory problem tree analysis involved the follow ng steps. Participants identified all the factors they can think of that are related to the core problem. Each of these was then symbolised on a largish piece of paper or card. The liv estock owners then discussed the relationships between them, classifying them into cause s and effects, and placed the cards at the appropriate place on the ground. Where a causal relationship was identified between two factors this was indicated by placing a stick, or sim ilarly shaped object, between the relevant cards. (For a more detailed description of PPT A see Conroy, 1999.)

5.3 Participatory On-farm Trials

The process of designing, monitoring and evaluating th e feed supplementation trials was intended to involve goat-keepers actively. The trials, w hich all took place during the dry season, were designed with a treatment and control gro up in the same village, so that a 'with/without' comparison could be made.

The treatments used in the trials have been subsidised t o varying degrees. The basis for this was that the technologies were new to the goat-keepers and that they were therefore taking a risk (financial and potentially to the health of their go ats) in applying them. UMG was the newest of all the treatments, so a 100% grant was g ven for this. The plan has been to reduce the size of the subsidy, year by year, as the goat keepers become familiar with the technologies and see the effects they have on their anim als. In the 1998 trials the project contributed 66% or 100% of the cost of the treatment, a nd the participating goat-keepers contributed the rest. In the 1999 trials this was reduced to 50% or 66%, and the project is planning to reduce subsidies further in 2000.

In most trials there was fortnightly monitoring of goat p roductivity parameters (e.g. milk production), and monthly meetings with participants to discuss how the trials were progressing. Joint evaluation meetings were held at the end of the trials.

Design issues

The project has learned various lessons from implementing the on-farm trials. Some of these will now be described.

Control group The 1998 Udaipur trials illustrated the importance of having both a treatment and a control group, as this can help to separate the influence of *inter-annual variability* (in this case, with regard to rainfall patterns) from that of the treatment. These trials were aiming to reduce disease-related kid mortality during the rainy season, which goat-keepers said had been about 25% in the previous year. There was no such mortality in the treatment groups, which could have been interpreted as demonstrating the effectiveness of the treatment. However, there was also no kid mortality in the control groups, which shows that absence of disease-related mortality must have been due to other factors. One likely factor is the pattern of rainfall in 1998, which was far lower than usual at the start of the rainy season when most deaths occur. Another factor suggested by goat-keepers was that they had increased their application of disease-control measures, following the discussions with the project team in 1997, which had raised their awareness of the problem and the need to address it.

Selection of participants The project's experience highlights the need to ensure that households in the treatment and control groups are similar, so that differences in non-experimental variables (such as grazing areas) are minimised. For example, in one of the Udaipur trials (in Khakad village) the control group participants were from a different hamlet to those in the treatment group, and this confounded the trial results in two ways. First, the two groups used different grazing areas, and the one used by the control group members was superior to that used by the treatment group[5] (it was only after the trial that the project staff discovered this). Second, people in the control group were generally better off than those in the treatment group, so when they saw the young goats of the latter growing faster they regarded this as socially unacceptable and started giving the supplement to their own goats.

Selection of goats The goats need to be reasonably similar. For example, in the first trials in Udaipur the age spread of the young goats was quite large, creating unnecessary variability and making the use of a standard treatment for all of them questionable. In the 1999 trial the age of the goats was more homogeneous. In addition, the goats used in the trials should belong to many different owners, otherwise the practices of someone owning a large number of goats could become confounded with the comparison between treatment and control groups. For example, in the first Bhilwara trial 13 of the 25 goats in the treatment group were owned by one person. Thus, although the treatment group does produced more kids than those in the control group, the difference could have been due to this one goat-keeper having superior goats or feeding practices, rather than to the treatment itself.

Subsidies Subsidies should be avoided or minimised, as they can distort farmers' behaviour and encourage their involvement in trials and treatments that they would not normally consider to be worthwhile. Eliminating subsidies is easier said than done,

[5] In planning the trials the project team had concluded that the treatment and control groups should be in the same village, partly to avoid this kind of problem.

however. This is particularly the case in India, where many rural people have a dependency mentality, having become accustomed to receiving government handouts.

Participatory monitoring The project staff have encouraged participating goat-keepers to monitor the effect of the treatment themselves. Since most are illiterate, we have developed a monitoring form that they can understand that is based on symbols rather than words and numbers. However, the goat-keepers did not see any need to quantify or record changes in their animals, and were content to rely on their observations and their recall.

The need for 'real-time' monitoring by researchers One area where the project has experienced some difficulty with a participatory approach is in joint monitoring. The difficulty is that there has been a time lag of weeks, if not months, before the data collected by the field staff has been entered into a computer and analysed by the researchers. Goat-keepers, on the other hand, are doing real-time monitoring, observing changes in their animals week by week, if not day by day. Thus, when joint monitoring meetings have taken place the researchers have not always been aware of important trends, and hence they have not been able to make the most of the meetings and to investigate certain issues promptly. Examples of issues only identified after completion of trials include:

- convergence in the weights of kids in the treatment and control groups, due to various factors including (a) control group members starting to apply the treatment and (b) treatment group members starting to give the treatment to the whole herd; and
- some goats producing more milk after construction of the water trough, while others' milk production was unaffected.

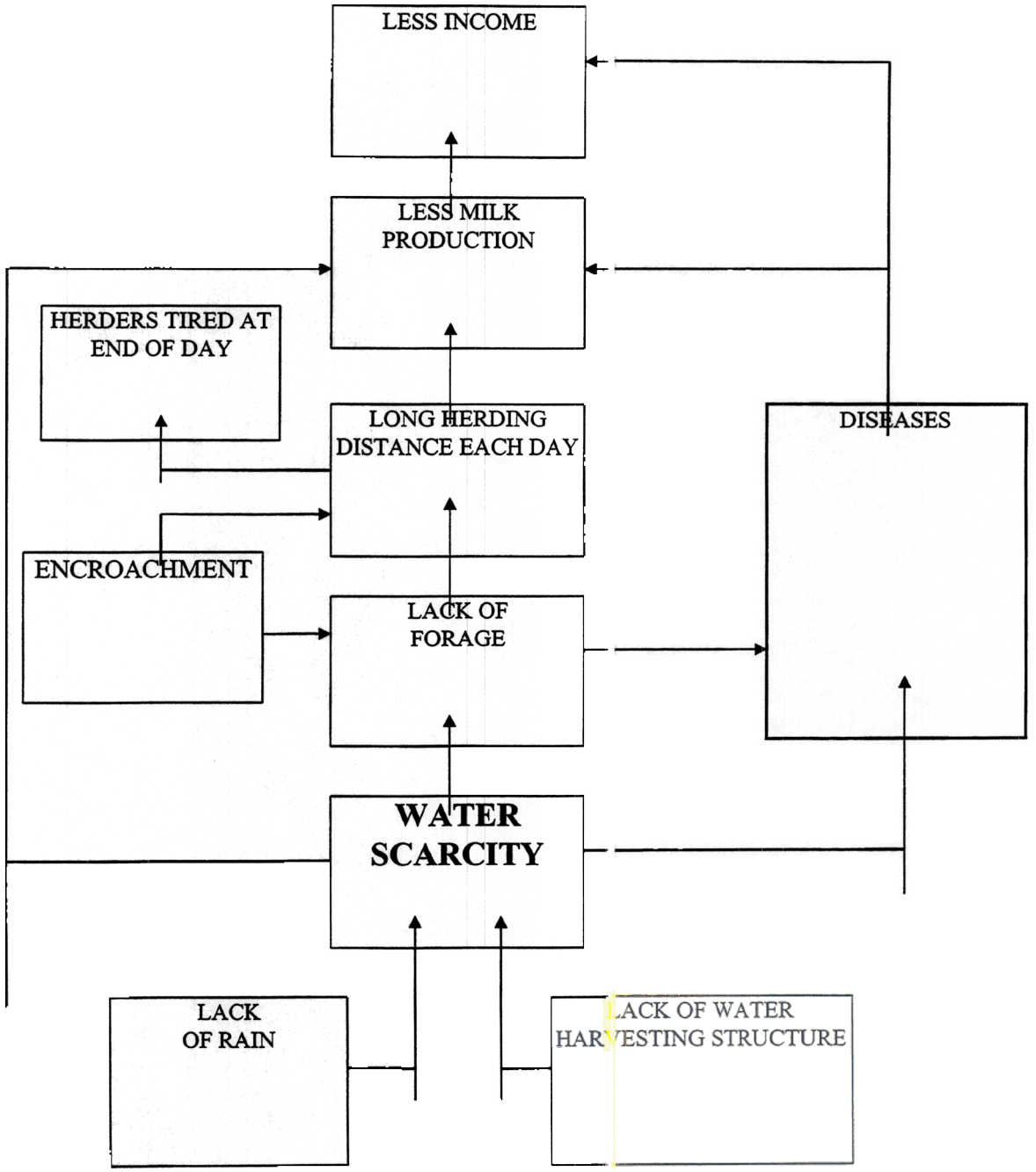
This problem is not insuperable, however. Junior field staff can be trained to enter data into computers, or to do simple mathematical exercises (e.g determining means) using calculators. They can also be trained to convert data into media that are amenable to visual inspection, such as graphs or histograms.

Conclusions and implications

The project's experience has shown that on-farm trials can 'work' for goats, and goat-keepers, provided steps are taken to avoid common pitfalls. A number of factors make goats more amenable to on-farm trials than large ruminants are. First, the life cycle duration of goats is shorter, enabling the project to conduct trials on an annual basis and generate results within a few months. Second, most households with which the project has worked own several goats, and the number of observation units has been reasonable. Third, the owners have not generally been averse to involving their goats in experiments, which is likely to be related to their relatively low unit value, as well as the good rapport that BAIF staff had with them from the outset.

However, the project's experience highlights how difficult it can be, even for NGOs, to achieve a high degree of farmer participation (see Conclusions in Section 3); and the importance of having an organisational environment that is conducive to PTD. PTD should only be attempted, therefore, where there is a high degree of organisational commitment, and a reasonable amount of expertise in participatory approaches.

FIGURE 1 PROBLEM TREE CONSTRUCTED BY *RABARIS* IN GUJARAT, SHOWING WATER SCARCITY AS THE CORE PROBLEM



6. CAPACITY DEVELOPMENT

Implementation of the project has been a valuable learning experience for all members of the project team in both BAIF and NRI. Most of the BAIF field staff had previous experience of participatory rural appraisal, but not of participatory technology development (PTD) and on-farm trials.

Most of the learning experience has come from learning by doing, as with the testing and development of the participatory herd history and problem tree methods described in section 5.2. In addition, in November 1997, Czech Conroy gave a one-week course in PTD to field staff involved in the project, which was also attended by two NRI staff. It is envisaged that
a similar course will be run again in March 2000, as there have been staff changes and the project is expanding its geographical coverage.

BAIF sees the project contributing to the strengthening of its capabilities in the following ways:

- orientation and training of its staff, including field functionaries, in participatory research and technology development in livestock production;
- developing approach and techniques of participatory research and technology development in livestock production, while implementing a project;

  developing in-depth understanding of goat production systems, constraints and perceptions of goat owners under rainfed conditions;
- evolving appropriate feeding and feed utilisation recommendations through field studies and laboratory evaluation of feed material; and
- refinement of on-farm research and field recording with goats.

7. DISSEMINATION OF PROJECT FINDINGS

During the last few months the project staff have contributed papers, abstracts and/or posters to three conferences and two workshops. Details of these are given below. This progress report is the second Project Report, and several more will be published in 2000. There will also be two or more Project Guides published later in the year, of which the first is (Conroy, in press). A project workshop will be held in Rajasthan in September 1999, at which the findings of this project and the related laboratory one will be presented to a wide range of livestock specialists from the extension and research communities.

7.1 Conferences

IXth Animal Nutrition Conference of the Animal Nutrition Society of India, Hyderabad, 2-4 December, 1999

Three abstracts describing different aspects of the project's work were reproduced in the

Conference's volume of abstracts. Three members of the project team attended the conference, and presented three posters there. The confe ence provided a valuable opportunity to publicise the project's work among the Indian researcl community, and also to find out about other, related work.

VIIth International Conference on Goats, France, May 2)00

The project submitted four papers to the organisers of the seventh International Conference on Goats, which takes place in France in May 2000. One wi l be the subject of a presentation by Czech Conroy in the session on *Economic and Social Iss ues*, and the others will be considered in relation to the ICG's Round Table 16 on *F eeding Strategies in Arid Range Lands*.

7.2 Workshops

Joint CGIAR/NRI Workshop on Participatory Research for Natural Resource Management, 1-3 September, 1999

This workshop was hosted by NRI, and took place in C natham, England. Czech Conroy and DV Rangnekar prepared a case study paper (Conro / and Rangnekar, 1999) for the workshop about the Kumbhan water trough experience (see Section 4).

Promoting Interorganisational Linkages for Sustainable Livestock Development in Rajasthan

BAIF organised this workshop, which took place in Udai)ur, Rajasthan, on 13 &14 December 1999. Czech Conroy presented a paper on the)roject's on-farm trials, which will be reproduced in the workshop proceedings.

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