Participation of Zulu Farmers in a Goat Health Research and Extension Project in South Africa

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Abstract

This study took place in a small-scale goat farming community, where farmers considered that the major problems affecting goat health and productivity (diarrhea, gastrointestinal helminth infection, and poor reproductive performance) were exacerbated by a lack of information on goat health and management. The objective was to collaborate with the farmers and develop a flexible framework for the acquisition of skills and knowledge which could ameliorate these problems. Promulgation of such knowledge and skills, if successfully accomplished, would nurture “champions” in the local farming community. These farmer champions would then constitute important role models and a local source of advice and encouragement for other farmers. This paper describes the resultant on-farm goat health research and the development of a “Goatkeepers’ Animal Health Care Manual”. The approach taken exemplifies how the engagement and participation of farmers in such a process may be enhanced, a departure from that of traditional transfer of technology. The methodology involved a “hands-on” approach and encompassed a thorough preparatory phase, on-farm experimentation, and regular meetings with farmers geared to their current levels of expertise, a process which is equally applicable to other similar agro-ecological zones. There is also scope for universities, researchers, and extensionists to assist with the development of farmers’ analytical and record-keeping skills, with the strengthening of farmer associations, and with the training of community animal health workers. A case is made for the organizations involved to continue to cross the institutional divides so that the long-term sustainability and development of small-scale farming communities is ensured.

Keywords: Farmer Participation, Goat Research, South Africa
Introduction

The small-scale farming sector in South Africa is characterized by poverty, dependency on the state, a lack of entrepreneurship (Ngomane, Thomson, & Radhakrishna, 2002), and poor access to basic information on animal diseases and their management (Getchell et al., 2002; Letsoalo, Krecek, Botha, & Ngetu, 2000; Masika, Sonandi, & Van Averbeke, 1997a; Masika, Sonandi, & Van Averbeke, 1997b). KwaZulu-Natal (KZN) Province, characterized by a predominantly rural population (Ntsime, Jennings, & Dube, 2003), has a high density of small-scale livestock keepers (Thornton et al., 2002).

The farming communities of Nkwezela, Hlafuna, and Njobokazi, near Bulwer, southwestern KZN Province, are typical examples of this small-scale farming sector (De Villiers & Letty, 2001). Essentially all of Zulu origin, the population grew substantially between 1996 and 2001, and unemployment rose from 26% to 39% (Jennings, 2004; Ntsime et al., 2003). Most individuals (>90%) had at least very basic primary education. Earlier studies in the area indicated that chickens, goats, and cattle are the most prevalent livestock and that cattle, goats, sheep, and horses are all communally grazed (De Villiers & Letty, 2001). The farmers expressed a need for information on livestock diseases, the potential causes of livestock mortality, and the use of medication. Goat health problems included diarrhea, gastro-intestinal helminths, poor reproduction, deaths due to unknown causes, and coughing. Other problems encountered were theft, poor livestock productivity, and a shortage of grazing (De Villiers & Letty, 2001; Mapeyi, Gumede, & Letty, 2006).

In February 2003, two focus group meetings centered on goat farming were conducted in the target area (see Ntsime et al., 2003). The meetings confirmed the important cultural role that goats play in the communities, for example, for the payment of the bride price, or lobola, and during traditional ancestral rituals. Goats were also kept for sale and for food, which indicated their importance to the livelihoods of the farmers. The attendees at the focus groups were, however, reluctant to organize into a structure to assist them in selling or buying goats.

In the present study, the aims were to develop cost-effective and sustainable strategies to control gastro-intestinal nematode infections in goats and to improve feed utilization, using a participatory methodology. Conventional station-based approaches to agricultural research, technology development, and extension have failed to achieve the expected results in the small-scale farming sector of the developing world (Stroud & Kirkby, 2000). The technologies developed were often inappropriate for small-scale farmers, as the conditions on-farm, including the farmers’ own management type and priorities, were not adequately considered. Participatory processes were then developed whereby the farmers’ contribution received greater recognition and researchers assumed a more supportive role (Conroy, 2005). Research on-farm, where the involvement of the farmer is much stronger, received greater preference to on-station experimentation. Extension increasingly came to be seen as an integral part of a human development program (Worth, 2006).

One participatory methodology is the farming systems research (FSR) approach and this approach was applied in the present work (Collinson, 1987). It consisted of a diagnostic phase, which has essentially been described in the introductory paragraphs to this article. Following on this phase, an on-station experiment was carried out at Onderstepoort (see Vatta et al., in press). To validate and assess the potential applicability of the results of this experiment under small-scale management conditions, an on-farm experiment was then conducted.
in Bulwer. Recommendations were developed and extended to farmers. Supporting the farmers’ need for information on goat health and management, such information was also packaged, tested, and revised for relevance, clarity and usefulness.

Purpose and Objectives
This article describes how small-scale farmers were engaged in an on-farm goat health research project, how appropriate extension materials were developed, and how an awareness of the potential to improve goat production was created in the study area and the wider goat farming community. A further objective is to describe how, during the course of the study, the effectiveness and relevance of the approach was continually assessed and appropriately modified by monitoring the uptake of the goat health and management information within the study community.

Methodology
The communities of Nkwezela, Hlafuna, and Njobokazi were engaged through a number of participatory activities. A goatkeepers’ interest group had been formed from farmers from Nkwezela, Hlafuna, and Njobokazi who had agreed at a meeting in August 2002 (recorded in Mapeyi et al., 2006) to be interviewed by the FSR Section of the KZN Department of Agriculture and Environmental Affairs about their goat farming practices. Towards the end of 2003, 10 farmers of the goatkeepers’ interest group that had at least 7 weaned does were invited to make their goats available for an on-farm experiment. One of these decided not to participate. The experiment examined the effects of nutritional supplementation by means of urea-molasses blocks (Voermol Protein Blocks, Voermol, South Africa) and of anthelmintic (deworming) treatments with ivermectin (Ivomec Liquid, Merial South Africa) on goat health and productivity (see Vatta et al., 2007). The farmers’ role in the work was to assume the risk of undertaking the experiments and to provide time and labor to assist with the handling of the goats.

The homesteads of the 9 participating farmers were visited every 4 weeks from January 2004 to December 2005. The visits provided the opportunity to train the farmers in the correct recognition of sick animals, the correct administration of drenches and injections for the treatment of disease, and the correct feeding of urea-molasses blocks. The blocks and health-care treatments were provided free of charge. The farmers were also trained in the FAMACHA© system, in which the color of the conjunctival (eye) mucous membranes of individual sheep and goats are examined (see Malan, Van Wyk, & Wessels, 2001). Those animals that are scored as being anemic, as evidenced by a pale mucous membrane color, are treated with an effective anthelmintic. In the present study, ivermectin was used. The system may only be used where the predominant cause of anemia is wireworm (Haemonchus contortus) infection. In the study area, wireworm is the predominant helminth in the goats during the warm, wet summer months. The farmers examined the goats for anemia at the 4-weekly visits and drenched the anemic individuals. The goats had been ear-tagged to identify them individually. Written records of individual goats treated were kept by the researchers.

A “Goatkeepers’ Animal Health Care Manual” (Vatta et al., 2006) was compiled to include information on disease and management problems of goats. The aim was to achieve a format and level of language that farmers could easily understand and use so that they could learn about, recognize, and manage diseases in their goats. The manual was produced in English and then translated into the local language of IsiZulu, printed as spiral-wire-bound copies with weather-proof laminated pages in A3 and A4 format, and printed as laminated A0 posters. Using the posters in IsiZulu, the information they contained was
presented to the goatkeepers’ interest group at 10 information sessions held at a local community hall during the period December 2002 to May 2004. The farmers of this interest group (including the farmers involved in the on-farm experiments) were personally invited to attend these sessions; however, the meetings were open to all livestock owners who wished to attend. The meetings, limited to discussion around one or two topics, were conducted in IsiZulu with translation into English where necessary. The attendees were encouraged to ask questions on each topic and to give comments on, for example, the prevalence of these diseases and problems in their area, but the farmers were also encouraged to ask questions about any other problems in their animals (not only goats).

After each session, the researchers completed a self-assessment questionnaire to evaluate the relevance, usefulness, and clarity of the topics discussed by the farmer group. Comments and questions of the farmers were recorded by the researchers. In addition, inputs from various experts in the field of goat health and production and in agricultural extension were sought. These comments were all addressed during the revision of the manual.

Workshops and meetings were held with the farmers to report back on the results of the research. At a workshop in June 2004, participants were divided into a number of groups at the beginning of the meeting. An extension officer, acting as a facilitator, asked the farmers: (a) whether they were aware of the goat research which was being conducted in the area, and if they were, what their perceptions of it were; (b) whether they normally kept medicine to treat goats when they were ill; and (c) whether the work that was being done would stimulate them to start keeping medicines or nutrient blocks for their animals. In May 2005, a meeting was held mainly with participating farmers regarding the continuation of the research study through a second year.

During November 2005, questionnaire interviews to assess the potential impact of the project were carried out with the 9 participating farmers by crop and horticulture members of the FSR Section, whose involvement with the goat project had been peripheral. In two cases, the farmer was not available on the day of the interview and the farmer’s spouse, who had been closely involved in the project, was interviewed. The interviewees were asked whether they strongly agreed with, agreed with, were neutral towards, disagreed with or strongly disagreed with a number of statements regarding certain aspects of the project (Table 1). For comparative purposes, 7 neighbors to the participating farmers were similarly interviewed (Table 1). Each response was assigned a value from 1 to 5, with 5 indicating that the farmers strongly agreed with the statement and 1 that the farmer strongly disagreed. For example, if a farmer indicated that they would strongly recommend the FAMACHA© system, the response was assigned a value of 5, whereas if the farmer strongly disagreed, the response was assigned a score of 1. The median score and range for each question were then calculated. The results of the questionnaire were presented to the community at a meeting in December 2005 and further comments recorded. The responses of the participating farmers were discussed, but those of the neighbors had not been analyzed at that time and were not presented.

In March 2006, a workshop was held for technicians and scientists of the South Region of KZN Department of Agriculture and Environmental Affairs. Two of the participating farmers, one man and one woman, who had increased substantially in self-confidence and knowledge, were invited to this workshop. They were given an opportunity to present their experiences of the project.
Findings

The findings of the study are best considered in terms of: (a) how the participation of the farmers in the on-farm research was enhanced, and (b) how an awareness of the potential to improve goat production in the communities was created.

Enhancing the Participation of the Farmers

Participation in the on-farm experimental work was good. In 82% of cases (range for individual farmers: 44%-100%), the 9 farmers were present on the day that they were visited for the work. On all occasions it was possible to collect data at all the households during the scheduled 4-weekly visits.

When interviewed in November 2005 and at the meeting in December 2005, the participating farmers indicated a positive response to the project in general (Table 1). Based on their own observations, the farmers said that their goats had showed an improved rate of kidding, an improved survival rate of goat kids, and increases in the total number of goats.

The information, training, and advice provided during the project had been very useful (Table 1). The farmers or their assistants learnt to drench their animals and give subcutaneous or intramuscular injections where necessary. The male farmer at the workshop for agricultural scientists and technicians in March 2006 mentioned that he had learnt how to use the FAMACHA® card, how to look for worms in goats that are killed or die, how to trim the hooves of goats, how to lance abscesses, how to identify pneumonia in animals that died, and how to take samples from animals that die for submission to a laboratory for examination. At these exit interviews, most of the farmers indicated that diseases and worms were not a problem in their goats. From comments recorded by the interviewers for this question, it appears that the farmers felt that worms were under control or that one needed to examine the goats and/or take samples from them to determine whether worms were a problem.

Of the 9 participating farmers, 1-2 persons were in the researchers’ opinion satisfactorily trained in the FAMACHA® system at 4 of the households. Of the other farmers, 4 could not be trained because of age or poor eyesight and their sons or goat herds were not consistently available to learn the technique. The 9th farmer was not consistently present mainly because he carried out odd jobs in town. The response of the participating farmers to the FAMACHA® system was very positive (Table 1).
Table 1

Responses of Participating Farmers and Their Neighbors to Exit Interview Questions

<table>
<thead>
<tr>
<th></th>
<th>Participants’ goats</th>
<th>Neighbors’ goats</th>
<th>Participants’ goats</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Productivity of goats</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goats have improved</td>
<td>5 (4-5) 8</td>
<td>4 (3-5) 7</td>
<td>4 (3-5) 7</td>
</tr>
<tr>
<td>Goats producing more kids</td>
<td>5 (4-5) 9</td>
<td>3 (2-5) 7</td>
<td>4 (3-5) 7</td>
</tr>
<tr>
<td>Goats better condition</td>
<td>5 (4-5) 9</td>
<td>3 (2-4) 7</td>
<td>4 (4-5) 7</td>
</tr>
<tr>
<td>Goats healthier</td>
<td>5 (4-5) 9</td>
<td>4 (3-5) 7</td>
<td>4 (3-5) 7</td>
</tr>
<tr>
<td>Livelihoods/income from goats</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goats more valuable</td>
<td>5 (4-5) 9</td>
<td>3 (3-5) 7</td>
<td></td>
</tr>
<tr>
<td>Selling/bartering more goats</td>
<td>4 (1-5) 9</td>
<td>2 (1-4) 7</td>
<td></td>
</tr>
<tr>
<td>Wealthier now</td>
<td>4 (1-5) 9</td>
<td>3 (1-4) 6</td>
<td></td>
</tr>
<tr>
<td>More status now</td>
<td>4 (3-5) 9</td>
<td>3 (1-5) 7</td>
<td></td>
</tr>
<tr>
<td>Goat farming more important</td>
<td>4 (3-5) 9</td>
<td>4 (3-5) 7</td>
<td></td>
</tr>
<tr>
<td><strong>Information provided</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Researchers gave useful advice</td>
<td>5 (4-5) 9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have learnt from training</td>
<td>5 (4-5) 9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have learnt from my neighbor</td>
<td>4 (3-5) 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have heard about FAMACHA©</td>
<td>4 (1-5) 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have been made aware of diseases</td>
<td>5 (4-5) 9</td>
<td>4 (2-5) 7</td>
<td></td>
</tr>
<tr>
<td>Have been made aware of worms</td>
<td>4 (4-5) 9</td>
<td>4 (2-5) 7</td>
<td></td>
</tr>
<tr>
<td>Have applied technologies</td>
<td>4 (3-5) 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Would like to learn more</td>
<td>4 (4-5) 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disease/worms not a problem</td>
<td>4 (2-5) 8</td>
<td>4 (2-5) 7</td>
<td></td>
</tr>
<tr>
<td>Did not need training</td>
<td>2 (1-5) 9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Researchers did not explain info</td>
<td>1 (1-4) 9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technologies not applicable</td>
<td>4 (1-4) 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neighbor did not teach me</td>
<td>3 (1-4) 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FAMACHA©</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAMACHA© is useful</td>
<td>5 (4-5) 9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAMACHA© improved goat health</td>
<td>5 (4-5) 9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I will continue to use FAMACHA©</td>
<td>5 (4-5) 9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I will recommend FAMACHA©</td>
<td>5 (4-5) 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAMACHA© upset my farming</td>
<td>2 (1-5) 9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Too many problems with FAMACHA©</td>
<td>2 (1-3) 9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAMACHA© did not work</td>
<td>1 (1-1) 9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAMACHA© difficult to use</td>
<td>2 (1-4) 9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I will buy worm remedies</td>
<td>4.5 (4-5) 8</td>
<td>4 (3-4) 7</td>
<td></td>
</tr>
<tr>
<td>Easy to buy worm remedies</td>
<td>4 (3-4) 9</td>
<td>4 (2-5) 7</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Interviewees responded to each statement in the table according to the following scale: 1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree. $Mdn =$ median; $R =$ range; $n =$ number of respondents.
Based on comments from farmers at the meeting in December 2005 and at the workshop in March 2006, the training in the FAMACHA® system had encouraged the farmers to examine their animals to see what was wrong with them. This allowed animals that were sick as a result of worm infections to be treated early or for other causes of illness to be identified. Both these leading farmers were continuing to examine their goats for anemia after the end of the project. While the male farmer had kept remedies before the start of the project, the female farmer was now buying anthelmintic to replenish her stock. Both farmers were apparently supplying medication to their neighbors for a fee. Community members now apparently consult them on how to treat their animals.

Creating an Awareness in the Community of the Potential to Improve Goat Production

Excluding the meeting in May 2004, on average 14 farmers attended the information days for the testing of the “Goatkeepers’ Animal Health Care Manual”. Twenty-seven farmers had been identified by the FSR Section for interviews on goat production in the area and these interviewees were invited to attend the information days. As such, there was attendance of about 50% at the information days. Attendance did wane in March 2004 and extra effort was put in to encourage farmers to attend the next meeting which took place in May 2004. Forty-seven goat farmers and non-goat farmers then attended this meeting. The workshop for the greater farming community in June 2004 was attended by 57 members of the community, a record number and an indication of the positive awareness that had been created of the project. The meeting in December 2005 for reporting back on the results of the research was attended by 27 farmers.

Fifty-three of 57 participants from the community were aware of the goat research being conducted in the area and they saw it as an important initiative because problems were diagnosed and advice given to improve the livestock. Seventy percent of the respondents normally kept medicine to treat goats when they were ill. All of the participants indicated that the research project would stimulate them to start keeping medicines or nutrient blocks for their animals, but they required financial support.

When interviewed in November 2005, the neighbors of the participating farmers felt that the goats of the participating farmers were producing more kids and were in better condition (median score = 4), while their scores regarding these productivity measures of their own goats were slightly less favorable (median score = 3) (Table 1). While the farmers who had participated in the on-farm work indicated that their livelihoods had improved since the project started (median score = 4 or 5), their neighbors’ corresponding scores were generally neutral (score = 3). The response to questions regarding the uptake of information by the neighbors gave somewhat conflicting responses. For example, the neighbors said that they had learnt from the participating farmers but also that they did not teach them anything new. The neighbors had been made aware of diseases and worms, wanted to learn more, and wanted more information, but on the other hand they indicated that worms and diseases were not a problem. It seemed that while the neighboring farmers were aware that potential improvements in goat health and management were possible, these farmers did not yet have the detailed knowledge of how to go about doing this. For example, the neighbors may have tried out the FAMACHA® system but not followed the examinations through on a regular basis, leading them to believe that the technology was not applicable to their situation.
At the meeting in December 2005, the attendees were specifically asked what they saw as the way forward. The formation of a farmers’ organization received some support as the suggestion was made that such an organization would be able to buy in bulk and thus save. Appreciation was shown for the training of farmers in the FAMACHA© system which was being extended to other farmers in the area by the FSR Section. Farmers who had not taken part in the on-farm research expressed a desire to learn from those who had participated in the work and these, in turn, indicated their willingness to assist others. Theft was mentioned as a continuing problem in the area.

Based on inputs from the FSR Section who had interacted with the target farmers as well as veterinary personnel working in the area, the first draft of the “Goatkeepers’ Animal Health Care Manual” contained information on abortions, abscesses, coccidiosis, footrot, heartwater, mastitis, orf, pneumonia, pulpy kidney, rectal prolapse, roundworms, and tetanus. There was a section on the basic procedures of injecting and drenching goats. The information was well received, numerous comments were made, and all kinds of questions were asked by the farmers. This showed that there is an insufficient flow of information from and to people in these rural areas. It was apparent that the farmers were familiar with symptoms of diseases and problems, such as abortions, orf lesions, and diarrhea. However, they were generally less familiar in associating these symptoms of disease with specific causes such as bacteria, viruses, and protozoa. Based on the information from the farmers and other specialists, the information on footrot and rectal prolapse was removed, while information on bluetongue, foot abscesses, and liver fluke was added. More information was also provided on the general management of goats, on other simple procedures (such as castration), on how to identify sick animals, and on the correct use of medicines. The demand for the manual was high amongst farmers, governmental and non-governmental organizations, and other individuals. Almost 2000 copies of the final English version were distributed nationally and internationally within a year of printing and several hundred in IsiZulu.

**Discussion**

Cristóvão, Koehnen, and Portela (1997) describe an extension program development continuum which has at its one extreme a “centralized, top-down, and blueprint approach” (p.58) and at the opposite extreme a process that is “decentralized” (p. 58) and “bottom-up” (p.58). The approach adopted for the project described in this article was closer to the first extreme on this continuum. It had a leaning towards the transfer of technology approach as described by Lev and Acker (1994, p. 37). The researchers set the agenda and directed the process to a large extent in terms of designing the on-farm experiment and determining the frequency of visits and contact with farmers. There was dissemination of information generated on-station and from the general scientific literature to an “audience” of farmers (Lev & Acker, 1994, p. 39). However, the project moved away from a traditional transfer of technology exercise in which the farmers were simply passive recipients of technology and information. Rather, the project facilitated the “acquisition of skills by farmers to engage with scientific enquiry” (Worth, 2006, p. 12) while simultaneously allowing the researchers to share their knowledge and information.

The process followed led to adoption and ownership of what was shared, taught or demonstrated. The farmers participating in the on-farm research stated that they had learnt a number of techniques, including how to use the FAMACHA© card for identification of anemic goats; they were continuing to implement improvements in goat management beyond the duration of the project; and they were sharing information...
with their neighbors and the community. This range of learning was found to extend beyond the intended degree of learning when the farmers indicated that they were themselves providing medication and advice to fellow farmers. These farmers were starting to act as important role models or “champions” (for examples of champions see the Web site of the Government of the United Kingdom, Department for Children, Schools and Families, n.d.) and as an accessible source of advice and encouragement for other farmers in the area.

The farmers’ participation was achieved and enhanced through a number of aspects of the approach. The project underwent a thorough preparatory phase (which included community meetings, interviews, and focus group meetings) during which the need for the work was identified. Carrying out the experiment on-farm meant that any improvements in the goat herd were immediately visible to the participating farmers. Regular visits to the farmers’ homesteads and a “hands-on” approach meant that important concepts could be reinforced, techniques such as drenching and injections repeatedly demonstrated, and the confidence of the farmers built up. The incorrect or partial application of extension messages was avoided. Regular meetings, including information days and workshops, with the farmers and members of the greater community played an important role. To avoid the top-down approach described by Cristóvão et al. (1997, p. 58), attention was paid to the particular socio-cultural environment and circumstances in which project implementation occurred. Participation was enhanced by conducting the meetings in the local language, by opening up the meetings to any community member, and by taking questions on any aspect of animal health. In particular, matters of concern to those farmers of the greater community who were not direct participants in the on-farm research could be addressed. In this way, fears and misperceptions of the greater community towards the on-farm work were allayed.

The meetings allowed for an interaction and a flow of information between farmers and researchers, and opportunities for learning on both sides. Both the farmers and the researchers were able to investigate, assimilate, and share information in a manner proposed by Worth (2006). The local farmers acted as partners in the work and the research scientists and the farmers were “co-learners”, a term used by Lev and Acker (1994, p. 39). Farmers learnt from the information provided, while the researchers gained insight into the uptake of new knowledge and gaps in the knowledge of farmers. Perhaps, more importantly, the researchers gained insight into the farmers’ systems and priorities. The researchers were able to immerse themselves, albeit transiently, in the life of the community, to understand better the problems, hardships, and challenges faced by the farmers. The changes in the “Goatkeepers’ Animal Health Care Manual”, especially the need for more information on the general management of goats, illustrated a shift away from the extension approach which looks narrowly at the transfer of the technology of the researcher to an approach that incorporates the whole system. It also supports Worth’s (2006) assertion that “farmers are experimenters, innovators, and active participants in change” (p. 6) and that extension needs to engage farmers in this vein (p. 6).

This article also aimed to describe how and to what extent an awareness was created of the potential to improve goat production in the greater goat farming community. Some awareness was created through the meetings and workshops with the community, but the findings of the study suggest that the process followed was less effective in disseminating the technology and information to the farmers not directly participating in the on-farm research. This is borne out by the contradictory responses of
the participating farmers’ neighbors to the questions in the exit interviews; their conclusions that the technologies were not applicable to them; and the difference in perceived impact on livelihoods between the participating farmers and their neighbors. If uptake had been better than it was, the neighbors may have been expected to have had some improvement in livelihoods rather than these remaining the same. These responses, together with the mention of theft (which has nothing do with goat illness) and the stated need for financial support to be able to “adopt” the concept of greater goat care, all emphasize: (a) the need to engage further the farmers of the greater community in a spirit of learning; and (b) the need to understand that no matter how focused the researcher wants to be (on improving goat health, in the present study), farmers will always default to a wider system (in the present example, to the whole farming system, which includes the real threat of theft of goats).

### Educational Implications and Recommendations

Changing the perception of agriculture in the rural communities is central to the realization of the enormous potential that agriculture holds for food security, gainful employment, income-generation, and improved standards of living (De Villiers, 2006). The participatory approach, described in this paper, is suggested, as such on-farm adaptive research and extension approaches help increase community confidence, awareness, and activity (Subair, 2002). Such was the result of the present study and by the end of the project, indications were that farmers were becoming more independent.

The approach described in this article, if upscaled and improved, could be extended to include other communities in the province. Upscaling would involve such factors as: (a) facilitation of the formation of livestock associations to promote greater sharing of knowledge and expertise; (b) further training of farmers in “new” communities in general goat care and management and the identification of local farmer champions; (c) further specific training of farmer champions so that they could provide local community animal health care and advice, and supply small amounts of animal medication; and (d) the introduction of “Farmer Field Schools” (Minjauw, Muriuki, & Romney, 2003) to assist farmers to learn from their own shared experiences and to “think for themselves” (Kumba, 2003, p. 53).

In South Africa, agricultural teaching and training is mainly conducted by institutions of higher learning, research by the Agricultural Research Council (ARC) of South Africa and extension by the provincial departments of agriculture, but there is minimal cross-linking (Ngomane et al., 2002). The present study exemplifies how the successful integration of teaching, research, extension, and farming may be formulated. The stakeholders included university scientists that provided a teaching and research function through the supervision and guidance of a graduate student, an ARC specialist discipline researcher, on-farm adaptive researchers and extension agents from the KZN Department of Agriculture and Environmental Affairs, and small-scale farmers. This integration of teaching, research, extension, and farming constitutes a successful and powerful tool which, if further supported and adopted, could be of great benefit to the small-scale farming communities of South Africa and beyond. Ideally, students that are being trained as researchers and extension practitioners should be exposed to, and participate in, on-farm research projects as part of the main stream teaching curricula of institutions of higher education.

While the findings of this study cannot be generalized, they contribute to a growing understanding of the need for a serious review of South Africa’s extension programs. Few of South Africa’s extension practitioners are adequately trained to be
able to facilitate the range of learning that the approach suggested by this study demands. Most public sector extension practitioners have little or no formal training in learning theory. They are trained primarily as technologists (Worth, 2006). What extension training they do have is largely grounded in the technology transfer mode (Worth, 2006) which has long outstripped its usefulness (Röling, 1995).

It is argued that the changes taking place in agriculture in the Republic of South Africa call on the extension practitioner to become more of a “developer and facilitator of the specific learning process, content and outcomes which will drive his [/her] engagement with farmers as ‘learners’ ” (Worth, 2007, p. 142). To make this possible will require extensive revision of agricultural extension curricula (Worth, 2007).

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**References**


