USE OF A *PROSOPIS JULIFLORA* PODS/BARLEY SUPPLEMENT TO IMPROVE THE REPRODUCTIVE PERFORMANCE OF DOES

UTILISATION D'UN COMPLÉMENT D'ORGE ET DE COSSES DE *PROSOPIS JULIFLORA* POUR AMELIORER LES PERFORMANCES DE REPRODUCTION DES CHÈVRES

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Summary

In Bhilwara District of Rajasthan, India, there is evidence that feed scarcity in the dry season is a constraint on the reproductive performance, particularly conception rates, of goats belonging to poor people. On-farm trials in 1998 and 1999 fed breeding does a mixture of *Prosopis juliflora* pods and barley for 10 weeks, during the later part of the dry season when fodder scarcity is most acute. The mature does in the treatment groups had higher conception and twinning rates than those in the control groups, and hence higher kidding rates. The mean number of kids per doe in the treatment groups was significantly higher than that in the control groups, providing clear evidence that the treatment results in does producing more kids than they would otherwise have done. The benefits of the treatment exceeded the costs, but not by a large margin. If modifications to the treatment can reduce costs substantially, with only limited reductions in benefits, this could prove to be a valuable technology for many goat-keepers in India.

Résumé

Dans le district de Bhilwara en Rajasthan en Inde, il est démontré que le manque d'aliments pendant la saison sèche a des effets négatifs sur la reproduction caprine, surtout en ce que concerne le taux de conception des chèvres appartenant aux familles pauvres. Au cours des expérimentations faites au niveau paysan en 1998 et 1999, un mélange d'orge et de cosse de *Prosopis juliflora* a été donné aux chèvres reproductrices pendant 10 semaines, dans la deuxième moitié de la saison sèche, quand le manque d'aliments est le plus sévère. Les chèvres appartenant aux lots complémentés avaient un taux plus élévé de conception et de jumélage que celles appartenant aux lots témoigns, et en consequence un taux plus élévé de réproduction. Le nombre moyen de chevreaux par chèvre appartenant aux lots complémentés était significativement plus élévé par rapport aux lots témoins ce qui est une preuve évidente que le traitement mène à des biques produisant plus des chevreaux. Les bénéfices du traitement surpassent les coûts, mais pas par une marge importante. Si des modifications au traitement peuvent réduire les coûts de façon significative, avec seulement une réduction limitée des bénéfices, cela pourrait être une technologie appropriée pour de nombreux propriétaires de chèvres en Inde.

Background

Since October 1997 the Natural Resources Institute (NRI) and BAIF Development Research Foundation (BAIF) have been collaborating on a research project entitled "Easing Seasonal Fodder Scarcity for Small Ruminants in Semi-Arid India, through a Process of Participatory Research". The project is working in two districts of Rajasthan (Bhilwara and Udaipur) and one district of Gujarat. The project conducted a programme of on-farm trials with goat-keepers in these districts, in 1998 and 1999, to test the effect of supplementing particular feeds on feed-related production problems.

BAIF had been undertaking a goat development programme in parts of Bhilwara for several years. It had evidence that the reproductive performance of does belonging to poor goat-keepers was unsatisfactory. Thus, the project proposed to poor goat-keepers that they collaborate in a trial to test the effect of feed supplementation on their does. In Patiyokakheda, the village where the 1998 trial took place, about 20% of poor goat-keepers' breeding does were not conceiving during the breeding season and others were conceiving late. In the 1999 trial village, Iras, goat-keepers identified feed scarcity during the dry season as the most important constraint on goat production.

The main breeding season is May/June, which is preferred by the goat-keepers, as it means that the kids will be borne in October/November when there is plenty of fodder available and there is little disease. However, the breeding season coincides with the late dry season when feed is scarce. It was hypothesized that inadequate feed was responsible for the poor reproductive performance, and that selective supplementation at this time would reduce the problem.

The project team suggested that the treatment, to be given daily, be composed of *Prosopis juliflora* pods and barley, and the goat-keepers agreed to this. *Prosopis juliflora* is a tree species that is abundant on common lands in many parts of Bhilwara, whose production of pods is bimodal, concentrated around April/May and October/November. In parts of Gujarat, *Prosopis juliflora* pods are collected and marketed for use as a high quality livestock feed, but there is no such market in Bhilwara. They contain 17% protein and are rich in sugar (20%) (Singh, 1995); and have been shown to be an effective substitute for wheat bran in diets for crossbred calves and lambs (Rao and Reddy, 1983).

Methods

Treatment

Pods were collected during April/May, and stored for use over a 10-week period from mid-May to the end of July. The pods and the barley were fed in equal proportions (a combined total of 250 grams/day): half was fed to does in the morning and half in the evening. In the 1999 trial the pods were fed in the morning and the barley in the evening. The pods are not normally collected and stored, so this was a new practice for the goat-keepers. Prior to the trials the goat-keepers were concerned that the pods might cause diarrhoea in their animals, but were nevertheless persuaded to apply the treatment.

Selection of participants and goats

The participants were goat-keeping households in the villages who belonged to scheduled castes or tribes (the poorest groups). They were divided between the treatment and control groups in such a way that there would be roughly equal numbers of trial does in each group. Some animals were sold during the course of the trials and were not monitored subsequently. The initial and final (some were sold or died) numbers of does in each group are shown in Table 1.

Table 1 Numbers of Goats in the Trials

	Treatment		**Control**	
	Initial	Final	Initial	Final
1998	25	24	25	23
1999	56	50	63	55

Monitoring and evaluation system

For each trial a local person was trained to undertake the monitoring of the trial animals. The monitors visited the participating households every 15 days during the supplementation period and the kidding season. Records were made of: breeding activity (including heat, number of services and conception); the health and condition of the does; and the number of kids born and, in a few cases, their birth weight.

In addition, every month or so the BAIF researcher met with participants to discuss with them how the trial was progressing. At the end of the first trial, in December 1998, the researcher convened an evaluation meeting with participants from both the treatment and control groups. A similar meeting is planned for the 1999 trial.

Results

Conception

The treatment had the desired effect, with does in the treatment groups having higher conception rates than those in the control groups. Another benefit in the first trial was that there were no late conceptions in the treatment group: earlier conception is beneficial in that it results in earlier sales (hence a quicker return on investment) and/or higher prices. The conception data are summarised in Table 2.

Table 2 Conception Data for Mature Does

	1998		**1999**	
	Pregnant	Not pregnant	Pregnant	Not Pregnant
T	24	0	39	11
C	18	5	34	22

T = Treatment Group C = Control Group
The 1998 data were tested using an exact chi-squared test. This gave a p-value of 0.022,

giving significant evidence that the conception rates are different for the two trial groups. It is clear from the cross-tabulation that this is caused by the 100% conception rate for the treatment group. The results were not conclusive, however, as there were only three goat-keepers in the treatment group, one of whom owned 13 of the 24 mature does. The difference could, therefore, have been related to inter-owner differences and non-experimental variables.

In order to eliminate this factor, the trial was repeated in 1999 in another village, with larger numbers of goat-keepers (13 and 14 in the treatment and control groups respectively) and goats. The conception rates (see Table 2) were again different between the treatment and control groups. Use of an asymptotic chi-squared test gives a p-value of 0.055, indicating that at the 5% level there is no evidence to reject the null hypothesis of equal pregnancy proportions for the treatment and control groups. However, the p-value is very close to the 5% level, and a pragmatic interpretation is that there is some evidence that those animals taking the supplement have a higher conception rate, but further experimentation is necessary to quantify the strength of this inference.

Twinning

The incidence of twinning was also higher in the treatment groups (see Table 3), but the difference was not significant at the 5% level. An exact chi-squared test gives values of 0.37 and 0.35 for the 1998 and 1999 data respectively.

Table 3 Twinning Rates for Does that Kidded*

	1998		1999	
	Twins	Single	Twins	Single
T	4	19	11	28
C	1	16	6	26

* Does that aborted are excluded
T = Treatment Group C = Control Group

Kidding rates

The combination of higher conception rates and higher twinning rates results in higher kidding rates in the treatment groups, as can be seen from Table 4. Another way of expressing the data is in terms of the mean number of kids per doe, which for the 1999 trial is 1 for the treatment group and 0.69 for the control group. To see if this difference is significant an asymptotic Mann-Whitney test, adjusted for ties, was used. This gives a p-value of 0.02, showing that at the 5% significance level there is clear evidence that the mean number of kids per doe is higher in the treatment group. Further evidence of the efficacy of the treatment is provided when the same test is applied to the 1998 data: it gives a p-value of 0.01.

Table 4 Kidding Rates (percent)

Group	1998	1999
Treatment	116.6	100
Control	78.3	69.1

The goat-keepers' apprehension that feeding *Prosopis juliflora* pods would induce diarrhoea proved to be unjustified. There was no problem in this regard.

The benefits of the treatment exceeded the costs, but not by a large margin. Based on the 1999 kidding rate data we can say that a goat-keeper with 10 breeding does would get three extra kids, on average, as a result of applying the treatment. The market rate for a newly born kid is about 300 Rupees, giving a total benefit of 900 Rupees. Barley costs 4.5 Rs/Kg, and *Prosopis juliflora* pods cost about 3 Rs/kg. Assuming that all of the supplement was purchased, applying the treatment to 10 does would cost 656 Rs, giving a net benefit of about 250 Rs.

Conclusions

The 1999 trial provides clear evidence that the treatment results in does producing significantly more kids than they would otherwise have done. Furthermore, these benefits exceed the costs, but not by a large margin.

If modifications to the treatment can reduce costs substantially, with limited reductions in benefits, this could prove to be a valuable technology for many goat-keepers in India. The recommendation domain will be determined by: (a) the geographical distribution of *Prosopis julflora*, which is quite widespread, particularly in semi-arid, saline areas; and (b) the extent to which goat-keepers in those areas are experiencing this kind of problem.
One modification to the treatment that would reduce its costs would be to increase the

proportion of *Prosopis juliflora* pods, correspondingly reducing that of barley. *Prosopis juliflora* pods cost less to purchase; and the fact that they can be collected rather than purchased may be a significant advantage for cash-constrained goat-keepers. This and other modifications will be explored with goat-keepers during the year 2000.

In 1999 goat-keepers in the 1998 trial village, Patiyokakheda, implemented another trial in which *Prosopis juliflora* pods alone (250 grams/day) as a dry-season supplement, to see how effective they are without barley. However, the results of this trial are not yet available.

References

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