

# Action research on improved small livestock keeping with landless poor in two communities of Terai, Nepal<sup>1</sup>

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## Abstract

The raising of goats and pigs appears to offer income-generating opportunities for resource-poor landless households in the Nepal Terai, as in other regions of the country. This paper describes the first stage of an initiative to develop, validate and disseminate improved technologies for raising goats and pigs, through a participatory self-learning approach with landless farming communities.

Participant groups were formed as a first stage in the process. Initially these undertook planning of the initiative; subsequently they served as savings groups and to manage the funds raised by project activities.

Project support took the form of training, and a grant in the form of stock, concentrate feed and a small cash payment for housing materials. Housing was of local materials, and feed rations made up from locally-available ingredients, with the aim of testing and demonstrating systems which were capable of scaling-up.

Growth and reproduction rates of goats have been encouraging: kidding rates exceeded 130 per cent, some does have kidded a second time within the eight months since the start of the project, while male kids reached up to 25 kg and female kids up to 14 kg at eight months from birth. Fattening pigs reached live weights of some 80 kg over an eight month period, yielding a projected gross margin (over feed and other direct costs but excluding labour) of Rs 3,000-plus per animal.

The participatory approach adopted and the growth and reproductive performance of the animals, provide a model for improved small stock husbandry by very poor people. While interest has been shown by non-participant members of the communities in the achievements of the participant groups and their stock it is too early to assess whether the model is 'scaleable' in the sense of likely to be replicated widely.

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## **Introduction**

Nepal is one of the least developed and poorest countries in the world with a per capita annual income of US\$ 233. Nearly 66 per cent of the total population is engaged in agriculture. Of this, 42 per cent are below the poverty line. Poverty and food insecurity prevail across the country. Average land holdings per farm household are 0.79 hectare and the number of rural landless households is 27,000 (CBS 2004). Rural landless resource-poor farmers have to struggle hard for their survival. They lack access to agricultural land, are mostly illiterate, lack technical knowledge and access to micro credit. Their sources of income are typically daily wages and sometimes raising livestock on a sharing basis. Some of them raise a few small animals like goats, pigs and chicken.

Goats are raised under traditional management with an open grazing system from the Trans Himalayan range to the Terai. The system of rearing is extensive, characterised by low investment, natural grassland, forest land and crop residues. Goat-raising appears to provide an income generating opportunity for landless households providing that they can get access to fodder from the sources mentioned above. Pig keeping is limited to certain socially deprived ethnic groups in Nepal who raise them as scavengers. Improved pig keeping could be an important source of income for the resource-poor landless people if management costs are low.

This paper outlines an action research (AR) initiative to develop, validate and disseminate improved technologies for the raising of small livestock, through a participatory self-learning technique, by landless farming communities with the aims of enhancing their livelihoods. It forms a component of DFID/LPP project R8109 (Using livestock to improve the livelihoods of landless and refugee-affected livestock keepers in Bangladesh and Nepal).

The Action Research started in February 2004 and has continued to date (October 2004) with the intention that it should continue for at least a full 12 months. The results presented here are preliminary. Although the husbandry systems have been adopted enthusiastically by participants and the growth and health of stock has been good, it is early to assess the economic and livelihood benefits.

## **Materials and methods**

Two sites, in Bara and Rautahat Districts, were selected after a survey of 20 locations with the Participatory Learning Approach (PLA) which aimed to explore poor rural people's aspirations and constraints with regard to livestock keeping. In an approach to the two locations, a participatory approach was again used to identify the poorest households within the community, and to select participants from among members of these households who expressed their interest in, and commitment to, the action research project.

In both sites, livestock raising groups were formed, which also served as savings groups and as means of managing the funds raised by project activities (described in more detail below).

### **Action research site A: Bakulahar, Bara**

Twelve does, at an advanced stage of pregnancy, were provided to 12 participants. Does were allocated to two treatment groups consisting of six in each group. Treatment 1

(TR1) does were given 300 g of supplementary ration based on mustard oil cake, containing 14 per cent crude protein (CP) and 2700 Kcal ME/kg of feed. Does in treatment 2 (TR2) were provided with the same nutrients from a diet based on lentil husks. Feed was provided to the farmers in advance on a weekly basis by the project local motivator throughout the project period. Before the initiation of the experiments, on-the-spot two days training in improved husbandry practices (including construction of stock housing) were conducted for participants as well as for neighbouring livestock keepers. The trainers were from the Nepal Agricultural Research Council (NARC), Nepal Agroforestry Foundation (NAF) and District Livestock Service Office (DLSO) facilitated by NARC. In addition to 12 participating farmers another eight farmers from the same locality were also included in the training. During the training, farmers were also provided with one packet of oat seeds, one packet of maize seed, a plastic bucket and a mug. Along with the research animals, another 169 goats belonging to 75 villagers were also vaccinated against PPR (Peste des Petits Ruminants) and drenched against liverflukes and worms.

One adult breeding buck was also provided to the Participatory Action Research group. One Burdizzo castrator was provided to the group and the local motivator was trained on its proper handling and efficient use. The project provided NRs 300 to each farmer for construction of a shed and feeding stall in addition to farmers' contributions of materials and labour. The sheds were entirely constructed from local material like bamboo, wooden planks and local vines.

Recording of growth performance, feeding, breeding, animal health and management were maintained regularly with the help of two local motivators and technical staff from the Livestock Service Centre of Dohari VDC, Bara. Coordination, consultation and experience sharing meetings were organised with local non-governmental organisations (NGOs) and community based organisations (CBOs) and the District Livestock Service Office (DLSO) as and when needed. The Action Research period was from February to October 2004

### **Action research site B: Santapur, Rautahat**

At Santapur -Rauthat, selected landless farmers wished to have two types of livestock (a) Goats and (b) Pigs. One pregnant doe was provided to each of eight participants and assigned into one of two treatment groups, consisting of four in each group. The treatment given to each group was the same as in the Bakhulahar, Bara (described above). All animals in the experiments and a further 132 goats of 51 neighbouring farmers were vaccinated against PPR and drenched against internal parasites.

The eight selected farmers who had chosen to keep pigs each received a 5-week old piglet. Again, the piglets were allocated to one of two treatment groups. Treatment 1 consisted of a diet based on mustard oil cake and the treatment 2 was based on lentil husks. Both the diets initially contained 17 per cent CP, although this was later reduced to 14 per cent, and 2800 Kcal ME/kg of feed. Each piglet received 300 g per day up to eight weeks of age and thereafter a 25 g increment every week. This concentrate ration was a supplement to other local feeds which the farmers provided like kitchen garbage, colocasia, rice bran, green forage, etc.

Before starting the experiment, on-the-spot two days of training in improved husbandry practices were conducted for both goat and pig keepers, as well as for a similar number of neighbouring farmers. As in Bara, trainers were from the NARC, NAF and DLSO. All

training participants were provided with two packets of forage seed (one kg oat seed and one kg maize seed), a polythene bowl and a mug. Experimental animals as well as animals of neighbouring livestock keepers were vaccinated against PPR and drenched against internal parasites. Financial support of NRs 300 was provided to each participating farmer for shed and feeding stall construction.

Body weight of does, kids and piglets were taken at 15 day intervals. Breeding, feeding and health records were also maintained regularly. For comparison purposes, the same number of does, kids and piglets of neighbouring farmers under their traditional management was used as a control group. Statistical analysis of growth rate of kids and pigs was done using a Minitab package through the General Linear Model.

## Preliminary results

### Technical aspects

#### *Growth trends of goats in two sites*

The body weight of does (Table 1) was increased in both treatments (TR1 and TR2), in the eight month period in Bara and Rautahat (Table 1). This preliminary observation indicated that the body weight gain of does at Rautahat was higher than in the does at Bara. However, the difference was not statistically significant ( $P>0.05$ ). Neither was there any significant difference in the body weight gain between the treatment groups in both sites. Shrestha (1994) reported  $23.32\pm 0.024$  kg average body weights for farmer-owned does in the Terai region, which is slightly lower than the average weight of does in this study and is a result consistent with the enhanced nutrition of animals in the project.

**Table 1** *Adult body weight of doe*

Location	Treatment	Initial body weight (kg)	Final body weight (kg)
Bara	Mustard oil cake based diet	$25.17\pm 1.768$	$26.53\pm 2.713$
	Lentil husk based diet	$25.13\pm 1.581$	$26.02\pm 1.653$
Rautahat	Mustard oil cake based diet	$25.53\pm 4.098$	$28.60\pm 0.567$
	Lentil husk based diet	$24.63\pm 1.421$	$27.33\pm 2.134$

#### *Kidding and kid growth rates*

In Bara, all experimental does kidded (six does produced seven kids in TR1 and six does produced nine kids in TR2). The birthweights of kids were  $2.52\pm 0.158$ ,  $2.10\pm 0.214$  and  $2.16\pm 0.155$  kg in TR1, TR2 and the control group respectively. Weight gain of kids up to four months of age was significantly different ( $P<0.05$ ) depending on the type of birth (inversely related to the number of kids in the litter). Daily weight gains of kids up to four months in Bara were  $89.57\pm 7.54$ ,  $82.56\pm 5.33$  and  $45.00\pm 1.40$  g in T1, T2 and control group respectively, whereas at the same period in Rautahat, the daily weight gain of kids were  $82.33\pm 9.53$ ,  $81.00\pm 9.55$  and  $47.00\pm 6.33$  g in T1, T2 and control group respectively. Treatment 1 kids and Treatment 2 kids grew faster than the kids in the control group ( $P<0.05$ ).

The average daily weight gains of kids from 4-6 month in Bara were  $44.44\pm 10.55$  and  $40.00\pm 10.66$  g in T1 and T2 respectively, whereas at the same period in Rautahat the

weight gain of kids were  $28.22 \pm 18.35$  and  $48.66 \pm 2.06$  g in T1 and T2 respectively. The growth rate (4-6 months period) between the treatment groups was not statistically significant. The cumulative body weight of kids in Bara was  $25.00 \pm 4.90$  kg and  $17.85 \pm 2.370$  kg in eight and seven and a half months in TR1 and TR2 respectively (Figure 1). Three does from treatment 1 and one doe from treatment 2 have now kidded for the second time since the project started. In comparisons to the first kidding, the number of kids per kidding and birthweight of kids has increased. In Rauthat, all experimental does have kidded (In TR1 four does produced six kids and in TR2, four does produced five kids). The birthweights of kids were  $1.42 \pm 0.063$ ,  $1.90 \pm 0.084$  and  $1.30 \pm 0.082$  kg in TR1, TR2 and the control group, respectively. The birthweight of kids was significantly different ( $P < 0.05$ ) in the two locations irrespective of treatments. Body weight gain was  $14.75 \pm 0.612$  and  $13.85 \pm 2.735$  kg in TR1 and TR2, respectively, in the eight month period (Figure 2), which was statistically non-significant. Three does on TR1 have kidded for the second time since the project started.

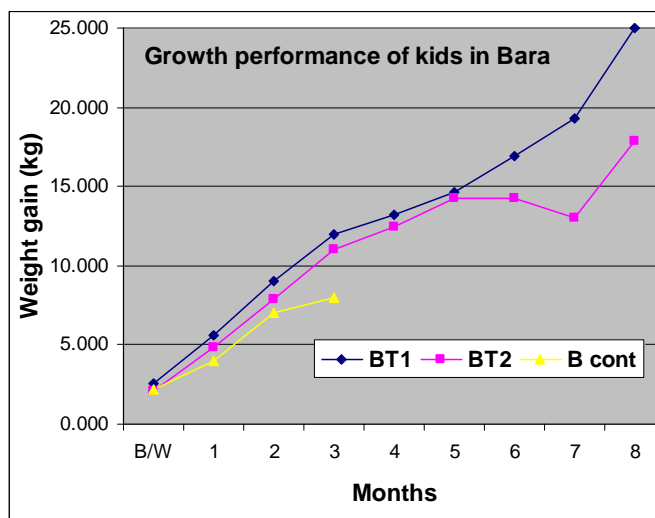


Figure 1 Growth performance of kids in Bara

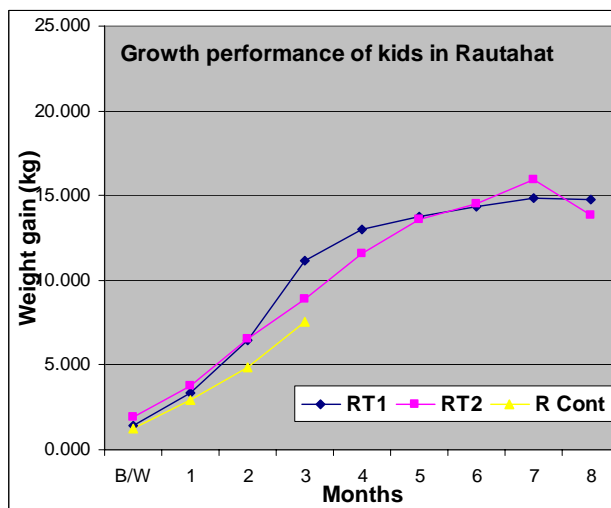
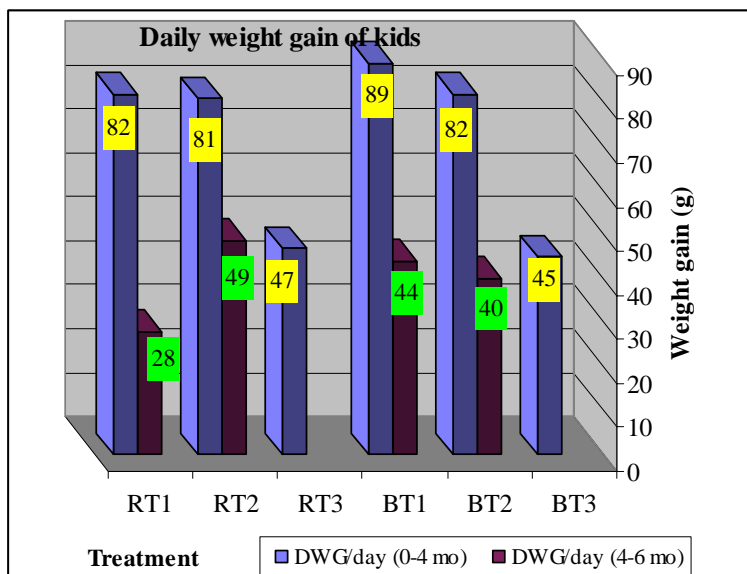


Figure 2 Growth performance of kids in Rautahat

The daily average weight gains of kids in the first four month period were higher than the growth during the four to six month period (Figure 3)



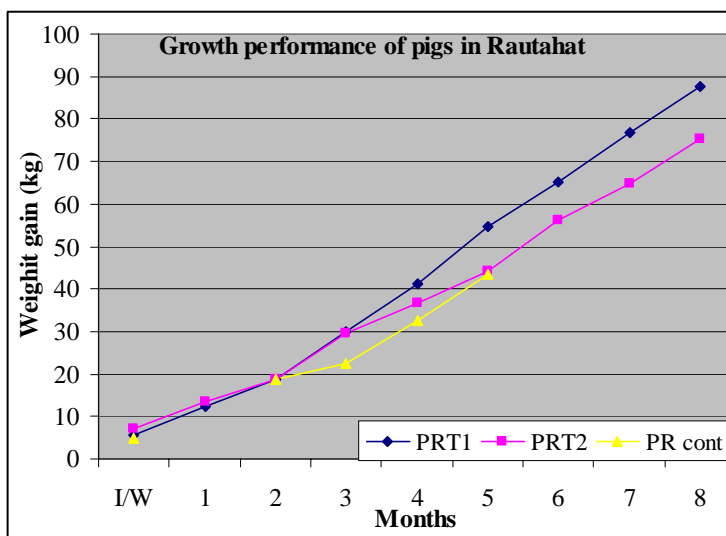
**Figure 3** Daily weight gain of kids

*Breeding service*

In addition to the trial does, over 200 does have been served at the two locations by a breeding buck provided to each participant group as part of the project. A service fee charged to non-group members generates an income for the groups and has formed the basis of the group fund, which is being added to member savings.

*Growth performance of pigs*

In the eight month period, the body weight gain of the piglets was  $87.50 \pm 6.614$  and  $75.25 \pm 10.757$  kg in TR1 and TR2, respectively (Figure 4). On average, the daily body weight gains were  $351 \pm 0.026$  and  $309 \pm 0.034$  g in TR1 and TR2, respectively. There was no significant difference in body weight gain between treatments. Joshi *et al.* (2002) reported from a study at the Outreach Research Site that Landrace and Yorkshire pigs gained 109 kg and 84 kg in a ten month period – a broadly similar result to this.



**Figure 4** Growth performance of pigs in Rautahat

## Economic, social and livelihood aspects

### *Group formation*

An executive committee of participants was formed at each selected site (of 14 members at Bakuklahar and 17 members at Santupur). Rules were formed to raise a group fund, namely: monthly saving of NRs 15 per member; a deposit of NRs 100 for each time a doe kidded; NRs 10 as a buck mating charge; and NRs 5 as a castration charge for outsiders. The total fund raised up to last of October was NRs 4,600 (US\$ 62) at Bakulahar and NRs 3,100 (US\$ 41) at Santupur. This fund was mobilised and used by the group members with a low interest rate to finance investment or other activities to enhance their livelihood.

### *Economic analysis of pig rearing*

The cost benefit analysis of pig rearing by the resource-poor farmers is presented in Tables 2 and 3. The major cost incurred in pig rearing was feed. In the eight month rearing period, the pigs attained an average weight of 80 kg (mean of two treatments) live-weight and fetched NRs 8,000 in the local market. The use of household labour and agricultural by-products made a substantial contribution in the livelihood of farmers through pig rearing. On average US\$ 50 and US\$ 40 were realised as benefit per pig from TR1 and TR2 respectively in the eight month period.

**Table 2** *Composition and cost of additional ration (NRs) per day/pig*

Description	Quantity	Rate (NRs)	Total Amount (NRs)
Colocasia	4 kg	0.5	2.00
Rice bran/ Beverage grain spent	0.5/2	7.5	3.75
Green forage	2 kg	0.25	0.50
Labour cost		LS	3.50
Total			9.75

**Table 3** *Economic analysis of pig rearing (per pig)*

***Treatment group	Ration description				Total Live wt (Meat)	Rate (NRs)	Total Amount	Net profit (Rs)
	Quantity (kg)	Amount (NRs)	Additional. Ration amount	Total				
RT1	175	2016.00	2291.00	4307.00	85.5	70.00	5485.00	1678.00*
	@11.52							3969.00**
RT2	165	1777.00	2291.00	4065.00	68.5	70.00	4795.00	730.00*
	@10.75							3021.00**
RCo	137		2291.00	3319.00	43.5	70.00	3031.00	-288.00*
	@7.50							2004.00**

1 US\$=NRs 75 at time of writing

\*\*\*See text for details

\*\* If labour cost and additional feeds from household by-products were not accounted

\* Labour cost and additional feeds from household by products cost included

### **Livelihood impact of goat rearing**

In the case of goats the economic benefits cannot be so simply quantified. However, the productivity of goats in the trials is clear. Body condition of does improved, male kids reached up to 25 kg and female kids up to 14 kg live weight in an eight month period. Some does produced triplets and the rest are ready to kid for the second time. It indicates that frequent kidding, with eight month intervals, or three kidding in two years, is possible. Farmers noted improved fertility of does, with an increase in the number of kids born at each kidding, compared to does kept under traditional management. Castrated males now could be sold, for additional income.

Non-participant resource-poor landless farmers perceived the goat enterprise is an appropriate source of income generation requiring limited cash investment. The community formed a goat-raising group, and non-participant, resource-poor landless farmers showed interest in building improved sheds and using agricultural by-products for making cheap balanced rations to feed their animals. Participants and others became aware of hygienic conditions, improved housing, balanced rations and proper disposal of urine and excreta produced from pigs and goats.

### **Conclusions**

A participatory approach is an effective way of promoting technology adoption in resource-poor communities. The group approach plays a key role in problem solving and fund generation. Non-participant farmers started to adopt the technologies being tested by the trial participants. The landless poor also realised the benefits. With hindsight it would have been better if only one improved feeding management with feed ingredients easily available in local market (instead of two treatments) had been compared with the farmers' traditional management practices.

The indications are positive in improving the livelihoods of resource-poor landless livestock keepers through improved husbandry techniques, which help to improve productivity of goats (reproductive and growth performance). The growth of goats and pigs under both improved feeding managements were better than in the goats and pigs reared under traditional management. The action research provided the means of livelihood to some of the resource-poor landless farmers while other neighbouring farmers also became familiar with the importance of improved management techniques for small livestock, which ultimately helps to improve their living conditions with increased household income. This study needs further extension and replication of the research work into new areas.

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### Discussions questions/ comments on the presentation

**Question:** *What diseases were you vaccinating the goats against.*

**Answer:** *Pests des petits ruminants (PPR) and rinderpest.*

**Question:** *Kids in Bahaural were almost half the weight of their contemporaries in Bara at eight weeks. Is there an explanation for this?*

**Answers:** i) Differences in immature size of the two populations of goats  
ii) Goats in Bahaural kidded one month earlier than those in Bara.

**Question:** *Is there funding for participatory rural appraisals (PRA), rapid rural appraisals (RRA) and participatory learning and action (PLA)?*

**Answer:** Yes, there is funding for the initial fact finding, prioritising and implementation.

**Question:** *The data presented were comparing the growth rates of goats and pigs under different feeding regimes and yet the conclusions drawn related to the social processes of the project. The conclusions seem to be anecdotal compared to the PLA data.*

**Answer:** Feeding experiments are still on-going, making conclusions impossible at this time. Both technical and social aspects will be covered in the final project document.