

Small animal species in the livelihoods of small-scale farmers in tropical Bolivia

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Introduction In the forest margins of the tropical Bolivian provinces of Sara and Ichilo, some 100 km north-west of the city of Santa Cruz, average land holdings are about 40 ha. The farmers there are generally poor, however, since they lack the capital to work more than a few hectares of their land at any one time. They practice a slash-and-burn farming system, rotating the cropping area around their holdings. The activities are largely concerned with subsistence farming, although excess production, destined for the city, is sold locally. The farm families in the region come from two quite distinct ethnic groups of almost equal size. The local lowland people are descended from Spanish immigrants, usually with some degree of blood from the original lowland indian population, while the other group is composed of almost pure-blood indians who have migrated into the area in recent decades, from the highlands of the country. The ethnic origins are important in terms of attitudes, aspirations and lifestyles. Lowlanders grow a wider range of crops and are less market-orientated than their highland neighbours, favouring a more varied diet and a less hectic life over maximisation of income.

All members of both ethnic groups keep small animal species on their farms, generally to contribute to food security, although, in times of need, production not needed for home consumption, is sold. The lowlanders maintain a wider range of animal species than the immigrant highlanders. Amongst their poultry, they often keep chickens, ducks, geese and guinea-fowl, while in contrast, the highlanders usually keep only chickens. The latter group do, however, have guinea pigs and tropical hair sheep, species which are seldom found on the farms of lowlanders. Previous livestock research and development work in the region concentrated on cattle, since the farmers all expressed a desire to become involved in either dairy or beef production. It was noted, however, that the poorest members of society were usually unable to afford the investment needed to establish a herd of more than one or two cows and these animals made little contribution to family income and consumption. The present programme was undertaken to define the role of small animal species in the households in the region, to identify the major production limitations and to promote their use in small-scale farming operations by poor people.

Materials and methods The work described here took place in a participatory manner, where farm families (both adults and children of school age) and local extension staff worked in full collaboration with a multi-disciplinary team of researchers in both biological and social sciences. Initial informal surveys in the target area identified chickens, ducks, pigs, hair sheep and guinea pigs as the most common livestock in the area and subsequent work concentrated on these species. Monitoring of representative farms took place over a complete year (18 months for sheep), where all events (births, deaths, sickness, accidents, utilisation, sales, feed offered, etc) were recorded. Children were often involved in recording the data, particularly when their parents were illiterate, or lacked confidence in their writing abilities. As far as possible, technical interventions were avoided during this period, to establish the production patterns of the chosen species under traditional management. The major production problems were also determined, using, where appropriate, the assistance of a local diagnostic veterinary laboratory. At the conclusion of this period, possible interventions were discussed with the farm families and their communities, who then chose which ones would be tested in a subsequent programme of on-farm validation. The communities nominated the individuals who would participate in this phase of the work, and neighbours were free to oversee the activities and to suggest modifications as they saw fit.

In parallel with the technical work on animal production, sociological and economic studies were also conducted in the same communities, using a range of participatory techniques, including semi-structured surveys, participatory rural appraisals, farm walks, maps and transects, resource flows, SWAT analysis and wealth ranking. This allowed an assessment of attitudes and aspirations in the communities, while measuring the contribution of small animal species to family livelihoods.

Workshops were used to publicise the findings and to confirm that the results, which had been obtained in a sample of communities, were applicable to the region as a whole.

Results Under traditional management, poultry scavenge around the home compound for the bulk of their feed, receiving only occasional supplements of household scraps and cracked grain. Pigs also scavenge, while receiving occasional offerings of chopped cassava, while sheep graze and browse along roadsides and in fallow-lands. They receive no vaccinations or veterinary treatment and find their own shelter where they can. Although they receive no veterinary care, guinea pigs are the exception, since they are usually kept in sheds, or in the family kitchen, where they are fed freshly-cut forage, often of kudzu (*Pueraria phaseoloides*). As a result of the use of almost zero inputs, apart from the labour of women and children, which has a very low opportunity cost, any production in terms of eggs and meat can be considered as profit.

Under these conditions, when the value of family consumption is considered, the return from small animal species can represent up to 30% of annual family income, when home consumption is costed at the prevailing, local market prices.

Monitoring showed that the productivity of chickens and ducks was reduced by the attacks of a range of controllable diseases and natural predators, while losses from pigs and sheep were mainly due to accidents and internal parasites. Guinea pigs had few identifiable problems, with low levels of losses, restricted almost entirely to theft and accidents, often involving dogs belonging to neighbouring families.

Although it was recognised that inadequate nutrition was probably limiting the growth rates of all species, farmers were reluctant to adopt improved feeding regimes as part of their strategy for better management, since this would substantially increase their production costs. Instead, they opted for the provision of rustic, night-time shelters, which would protect poultry and guinea pigs from attack by dogs and wild predators. Chickens were to be vaccinated, particularly against Newcastle disease, and hygiene measures and treatments would be employed to lessen the impact of problems such as diarrhoea in both chickens and ducks. Pens would be constructed to confine pigs during times when they could damage crops and farrowing bays would be included in the design, to reduce the danger of piglets being crushed by their mothers. Pigs and sheep would be regularly dosed to control internal parasites. Participatory evaluation showed the positive impact of these measures through reduced losses of eggs (leaving more to be harvested by the family) and young animals, together with decreased intervals between births for all species except guinea pigs.

Levels of productivity and estimated financial returns for both the traditional and improved systems are shown in Table 1. Average holdings of animals varied widely during the year, in response to family preferences and needs for cash and meat, but typically consisted of about 15 chickens, 6 ducks, 1 or 2 sows, up to 10 ewes and 15 guinea pigs. Simple improvements in the management of existing animal resources resulted in increased annual incomes of about US\$213 and 207 for lowland and highland families respectively. These returns are put into perspective by data which show that, in the region, casual labour is paid at about US\$ 5/day and total family annual incomes are often in the region of US\$ 1,000-1,200.

Table 1 Annual productivity of small animal species

Species	Traditional management			Improved management		
	Live young per breeding event (No.)	Mortality before maturity (%)	Gross return per breeding female (US\$/year*)	Mortality before maturity (%)	Gross return per breeding female (US\$/year*)	Increase in productivity (%)
Chickens	7.1	30.5	13.29	18.2	17.21	29.5
Ducks	6.7	54.1	12.05	27.4	23.82	97.7
Pigs	8.1	38.2	260.34	28.3	302.05	16.0
Hair-sheep	1.2	30.8	13.82	19.5	22.51	62.9
Guinea pigs	2.3	10.5	8.91	11.0	9.30	4.4

* Returns calculated at constant 1999 prices, US\$1.00 = Bs5.50

Conclusions The implementation of simple, cheap, available recommendations for vaccination and parasite control and the provision of simple, rustic shelters, largely built from materials available on the farms, was shown to reduce losses of young animals and to increase the productivity and profitability of the holdings. This, in turn, increased the stability of the farming enterprises and reduced the need to hunt in the forest to provide meat for the table. In general, lowland families consumed more of the animal products, thus enjoying a better and more varied diet, while immigrant families tended to sell more produce to provide for an increased cash income. This was often treated as capital to be invested in other productive activities on the farm. Small animals are cared for almost exclusively by women and children and increases in the availability of foodstuffs of animal origin made their contributions to livelihoods more visible, serving to improve the social status of these individuals, both in the family and in their wider communities.

The programme of research has attracted the attention of local and national government, leading to requests for promotional work with small animal species in a number of other provinces, both in Santa Cruz and in the neighbouring departments of Cochabamba and Chuquisaca. The potential impact is therefore large, both in the direct target area and elsewhere in the region.

Acknowledgements This paper is an output from a research project funded by the United Kingdom Department for International Development (DFID) for the benefit of developing countries. The views expressed are not necessarily those of DFID. [Project number R6774, Livestock Production Programme].