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Discussion Paper No. 9
Targeting and Innovation

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Acronyms and abbreviations

AP	Andhra Pradesh
BC	Backward Caste
BRAC	Bangladesh Rural Advancement Commission
BYP	Backyard Poultry
CGIAR	Consultative Group of International Agricultural Research
CPI	Consumer Price Index
CPR	Common Pool Resource
DFID	Department for International Development
FAO	Food and Agriculture Organization of the United Nations
FC	Forward Caste
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GIS	Geographic Information Systems
GOI	Government of India
IFPRI	International Food Policy Research Institute
ILRI	International Livestock Research Institute
IRDP	Integrated Rural Development Programme
LDCs	Less Developed Countries
LOP	Livelihood Options Project
LS	Livestock
MP	Madhya Pradesh
NGO	Non Governmental Organization
NSSO	National Sample Survey Organization
NRI	Natural Resources Institute
OC	Other Caste
ODI	Overseas Development Institute
RIR	Rhode Island Red (high yielding chicken breed)
SAC	Scottish Agricultural College
SC	Scheduled Caste
SLU	Standard Livestock Unit
ST	Scheduled Tribe
WLH	White Leg Horn (high yielding chicken breed)

Glossary of terms

Backward Castes	Intermediate castes between Scheduled Castes and upper castes. Also known as Other Backward Castes, they are basically service castes in the traditional hierarchy such as carpenter, barber, potter, ironsmith etc.
Caste system	A rigid hierarchical system of Hindu society comprising endogamous social classes (castes) based on ritual purity. Castes with 'unclean' occupations have lower status. Official classification groups them into three categories: Scheduled Castes, Backward Castes and Forward Castes.
General category	Upper castes in the Hindu caste hierarchy, also known as 'open category' or 'forward castes' for administrative purposes.
Kharif	First crop season after monsoons (June to September).
Lambada	Nomadic non-indigenous Scheduled Tribe migrated to the south from north India, now a settled community.
Madiga	A major Scheduled Caste in AP; more backward than malas.
Mala	A major Scheduled Caste in AP with relatively higher status than madiga.
Mandal	Intermediate administrative unit in AP between district and village comprising 20–25 villages.
Rabi	Second crop following kharif, usually October–February
Reddy	An upper caste in AP. Traditionally farmers now diversified into services and business/trade.
Scheduled Castes	Former untouchables with lowest status in Hindu caste hierarchy.
Scheduled Tribes	Tribal communities scheduled or notified by the President of India. STs are traditionally outside the Hindu caste hierarchy.
Summer	Third crop following Rabi, usually March–May

List of selected villages

OP	Well-connected village of Chitoor District, Andhra Pradesh
VP	Poorly-connected village of Chitoor District, Andhra Pradesh
KO	Well-connected village of Krishna District, Andhra Pradesh
KA	Poorly-connected village of Krishna District, Andhra Pradesh
GU	Well-connected village of Medak District, Andhra Pradesh
MD	Poorly-connected village of Medak District, Andhra Pradesh
PR	Well-connected village of Ujjain District, Madhya Pradesh
LJ	Poorly-connected village of Ujjain District, Madhya Pradesh
GG	Well-connected village of Mandla District, Madhya Pradesh
PT	Poorly-connected village of Mandla District, Madhya Pradesh
SM	Well-connected village of Tikamgarh District, Madhya Pradesh
MB	Poorly-connected village of Tikamgarh District, Madhya Pradesh

Executive summary

This paper is mainly based on data collected during early 2005 including 394 livestock farmers drawn from the same sample of 662 households selected under the Livelihood Options Project (LOP), a three-year DFID funded policy study of ODI located in the Indian States of Andhra Pradesh (AP) and Madhya Pradesh (MP).[1] Under LOP, 12 villages from AP and MP were selected purposively to identify factors promoting or impeding diversification out of low productivity livelihoods, and identify the policy changes necessary to support upward trajectories and prevent downward ones. Several rounds of survey were carried out including a census and several sample surveys in 2001–02. The 2005 re-survey in the same sample was carried out, largely with the intention of generating more detailed information on revenues from the sale of livestock products and services. This report is primarily based on the 2005 re-survey data supplemented by data collected from 2001–02 survey as well as qualitative method. The objectives are:

- To examine the dynamics of livestock keeping in recent years when occurrence of droughts was severe
- To examine the role of livestock in reducing the vulnerability to which the poor are exposed
- To examine the relationship between migration and aspects of livestock keeping in the context of drought and vulnerability.

The main conclusions based on descriptive analysis, qualitative evidence and multivariate analysis are that:

- India's intensification program in the livestock sector appears to have contributed successfully to growth among sample households, but has been dualistic in the sense that it is seriously biased towards wealthier households, and gives little attention to risk-prone species, location-specific problems and the social aspects of human deprivation and opportunities.
- Marked changes in livestock keeping patterns occurred over the three years since the earlier survey. These were in part due to shocks and stresses (e.g. domestic shocks and stresses, and drought, especially in the case of AP). This shows the capacity of livestock to cushion households against shocks and stresses: it can be drawn down rapidly as and when needed.
- The poor who use livestock, the most fluid asset they own, to cope with crises have been disadvantaged by this dualistic pattern of growth. Livestock sector policies hardly given any thought regarding re-building the asset to reduce its negative impact on future production and to reduce poverty and vulnerability.
- The results should not be interpreted as part of a trend. The re-survey was done at the end of a three-year drought. The drought appears to have had less serious impacts in MP. Analysis of the transition matrices appear to confirm that the drought caused a digression from otherwise upward trends in livestock keeping; in the long term, keeping of milch animals is likely to expand.

1. www.odi.org.uk/livelihoodoptions, Farrington et al. 2006.

- There is some evidence from both states of the impacts of technological change: the spread of more intensive poultry keeping, especially in AP, is reducing prices for consumers but also reducing the attractiveness of backyard poultry production.
- Livestock were frequently sold over the preceding three years to finance major expenditure. Domestic shocks and stresses were reported particularly strongly by poorer households as a reason for sale. Small ruminants play a strong role in smoothing consumption expenditure for the households who keep them.
- Better infrastructure and improved markets appear important reasons to increase livestock keeping. Richer households are able to reap the benefits of improved markets, which are important reasons for the increase in stock.
- Seasonal migration and livestock keeping do not always significantly compete with each other.
- Contract farming in relation to livestock is growing rapidly at the cost of backyard farming. Large companies supply inputs to contract growers and the poor has little access. Policy agenda of the hour should give explicit focus on how the poor get access to production and marketing systems given emphasis to disaster coping enterprises to be grown under improved management.

The authors thank Nils Teufel for comments and suggestions that helped improve the quality of the paper.

1 Introduction and background

The demand for and production of livestock and livestock products in LDCs is expected to double in the 20 years from the base year 2000 (Delgado et al. 1999). The livestock sector of India plays a crucial role in the welfare of its population by contributing about 6.8% to GDP and employing 8% of the labour force (FAO 2005). India's intensification program began more than three decades ago in the area of poultry and dairy subsectors comprising subsidized inputs, veterinary and extension services. The programs were successful in terms of growth. The real value of livestock products grew by 6% per annum between 1985 and 1992 (World Bank 1999). The reasons for this remarkable success were mainly twofold.

First, due mainly to government policy and investment as well as private sector investment towards dairy and intensive poultry production, technologies improved and these two enterprises grew extremely rapidly. For example eggs and broilers had been growing at a rate of 8–10% per annum (Metha et al. 2003). Between 1980/81 and 1998/99, poultry meat production increased about three fold from 250 thousand tonnes to about 770 thousand tonnes. During the same period, egg production increased from 10 thousand to 29 thousand million (Ramaswamy et al. 2006). Improvements in productivity and shift in priorities towards crossbred cattle and buffalo resulting from the Operation Flood in early seventies made India the largest producer of milk globally (Ravishankar and Birthal 1999). Livestock sector productivity is still low compared to the potential and world average, largely due to the dominance of indigenous breeds. For example, according to Livestock Census 2003, crossbreds comprise only 13% of all cattle, although representing almost double the Livestock Census 1992 crossbred proportion. Similar is the case with other species.

Second, due to sustained economic growth and rising incomes, demand for all types of livestock products grew and is still growing. The country is far behind the realization of potential.

The success achieved so far has heavily disadvantaged the poor (Turner 2004; Deshingkar et al. 2006). The interests of the poor have not been well represented in policy processes, public sector livestock research tends to be of limited relevance to the priorities of smallholders and landless livestock keepers and extension services are not pro-poor (Conroy 2004).

Matthewman and Ashley (1996) highlighted five biases in the extension services that result in them tending to neglect poor rural livestock keepers. First, many organizations follow a top–down 'transfer of technology' approach; they rely heavily on interactions with 'progressive' farmers, and assume that others will learn from the experiences of these farmers and will subsequently adopt the technology in question. Second, most extension organizations tend to focus on large ruminants almost to the complete exclusion of other species (Turner 2004). Third, they also tend to focus primarily on intensive systems and particularly on milk production, to the neglect of other roles of livestock. Fourth, services are usually concentrated in higher potential areas. The State Departments of Animal Husbandry tend to have higher densities of veterinary institutions and activity in areas where production is high. Similarly, dairy cooperatives use business criteria to determine their areas of operation, which result in less well developed areas being explicitly excluded from involvement in their activities. Fifth, livestock extension is generally provided by men for men, despite the key roles that women play, particularly in goat keeping and backyard poultry.

In addition, government policies towards the management of common pool resources (CPRs) have not been pro-poor. The poor smallholder and landless livestock keepers are particularly dependent on CPRs for grazing their animals for which viable stall feeding technology is not yet developed. The literature reported that restrictions on the use of common grazing areas under the watershed projects in Andhra Pradesh had forced landless livestock owners to sell their stock but landowners benefited by producing more crop residues using improved irrigation facilities due to the project (Turton 2000). It is argued that the smallholder could benefit in the longer term; better utilization of CPRs via e.g. watershed development can generate important fodder resources for cut-and-carry systems (Farrington and Lobo 1997). This may again enhance the income of the poor from livestock, but only if they could continue to keep livestock in the meantime.

The most recent livestock census 2003 shows unimpressive growth of the sector in the recent decade (GOI 2006). In particular, all types of livestock are falling other than dairy and intensive poultry. The growth of dairy and poultry also slowed down substantially as market limits are reached in some areas. On the other hand, due to negligence and policy restrictions, other types of livestock are falling. The latter has a greater implication to the welfare of the poor who constitute the majority of livestock producers. Priority on coping strategy in the short term disaster was not given to the policy and research towards livestock production. Unfavourable climatic conditions like drought could cause more immediate damage to milch animals as they depend more on fodder crops. Species like goat may survive more in the face of drought.

The objectives of this paper are to:

- Examine the dynamics of livestock keeping in recent years when occurrence of droughts was severe
- Examine the function of livestock in reducing the vulnerability to shocks and stresses to which the poor are exposed
- Examine the relationship between migration and aspects of livestock keeping in the context of drought and vulnerability.

The paper is organized as follows: Following the executive summary, Section 2 introduces the paper giving its background. Section 3 describes the methodology. Section 4 presents an overview of livestock keeping and poverty. Section 5 describes the dynamics of livestock keeping in two sub-sections. Section 6 analyzes livestock sales due to major expenses in three years. The relationship between migration income and livestock keeping is examined in Section 7. The paper concludes with Section 8, where implications are discussed. Questionnaire for 2005 panel re-survey and qualitative assessment of the impact of commercial poultry farms on backyard poultry production and additional tabulation are included in the appendices.

2 Methodology

Study design and sample description

This study draws on data collected under Livelihood Options Project (LOP) of Overseas Development Institute (ODI), a three-year project beginning 2001 and a panel re-survey of livestock enterprises in the early 2005 in the same site. LOP study was conducted in six districts, chosen purposively with one district each from three regions of Andhra Pradesh (AP), and the same pattern for Madhya Pradesh (MP). The intention in each State was that these regions should represent divergent historical, political and agro-ecological conditions and therefore distinct patterns of livelihood evolution and diversification, because the focus of the study was livelihood diversification. The regions chosen for AP were Rayalaseema, Coastal Andhra and, Telangana, and for MP, Malwa, Mahokoshal and Bundelkhand. After considerable discussion with key informants, a decision was taken to locate the fieldwork within Chittoor, Krishna and Medak districts of the AP regions, and Ujjain, Mandla and Tikamgarh districts of the MP regions. Within each district, two contrasting villages were selected for detailed household level study. The villages were Otiripalli (OP) and Voolapadu (VP) from Chitoor District; Kosuru (KO) and Kamalapuram (KA) from Krishna District; Gummadidala (GU) and Madhwar (MD) from Medak District; Piplia Ragho (PR) and Lotya Junarda (LJ) from Ujjain District; Ghugra (GG) and Portola (PT) from Mandla District; and Sammara (SM) and Mohangarh Bhata (MB) from Tikamgarah District. The selection of villages was guided by a number of different criteria including proximity to urban areas, roads and markets; social and economic indicators of development; absence of factionalism and extremism; coverage by pro-poor programs; whether studied in the past (as this would facilitate longitudinal analysis) as well as the presence of civil society organizations (Farrington et al. 2006).

LOP study conducted several rounds of survey over 14 months in 2001–02, including a village census of all twelve villages comprising 4647 households in AP and 1297 households in MP, and detailed enterprise/activity survey of a sample of 662 households (360 in AP and 302 in MP). Sample sizes for the villages varied from 40–80 households, depending on the size of the village, and were selected through stratified random sampling by landholding and caste to capture the land and caste-based differences in wealth and power (Deshingkar et al. 2006). In addition to this, qualitative data were also collected from district and Mandal-level officials, key informants at the village level, and poor households across all locations. Focus group discussions (FGDs) were used as a tool to understand structures of power and patronage as well as exclusionary processes and how these impacted on beneficiary selection.

A further short study on livestock was undertaken for a panel of households in the same samples during early 2005, largely with the intention of generating more detailed information on revenues from the sale of livestock products and services by types and to identify the reasons for the decreasing trend of livestock as obtained by National Sample Survey Organization (NSSO).[1] The questionnaire is appended (Appendix 1). This paper is mainly based on this short panel study, nevertheless supplemented by 2001–02 data. Some qualitative data were also collected using key informant interviews to supplement the results of the survey as well as to add necessary information not covered by the survey.

1. GOI (2006), Deshingkar et al. (2006).

Detail discussions about the selected villages are available elsewhere (Deshingkar et al. 2006; Farrington et al. 2006). In this section we describe some essential characteristics relevant to this study. Six villages (OP, KO and GU in AP and PR, GG, and SM in MP) are located nearer to the town and the other six are located relatively farther from the town. In general, within a region/district the nearer village enjoys better infrastructure, access to better education, communication and employment etc. and so the nearer villages are named well-connected, while the other category that is farther from the town is termed poorly-connected in this paper.

Analytical framework

Descriptive methods are used to generate tabular presentation of ratios and percentages. Transition matrices are used to describe the short-term dynamics of livestock keeping. The association of household livestock sales and related variables are examined using a multivariate framework. In semi-subsistence farm household models, food crop sales are considered the surplus after household consumption and sales function is simply a negative of consumption function (Akter 1989). In this simplistic framework, production in a particular cycle is assumed fixed as marketing decision comes after production decision is final, because food crops are produced mainly for home consumption. Producers then allocate output between consumption and marketing. Livestock output is produced mainly for marketing, although many smallholders keep a few livestock in addition to crop agriculture to supplement food with egg, milk and meat. However, most low-income farmers keep livestock to meet demand for cash in need. So, in this paper we assume livestock sales function is the difference between production function and consumption function. Accordingly, our sales function includes variables that affect production as well as consumption decisions.

Migration, particularly seasonal migration, has long been an important income diversification and risk coping strategy in many agriculture-based economies in the developing world, and there has been some suggestion that migration and livestock keeping are incompatible (Deshingkar and Start 2003; Macours and Vakis 2007). Here we use a simple, heuristic form of multivariate analysis to test for associations between these two types of enterprise. However, the root for selecting the variables remains in the human capital theory and Mincer earnings regressions (Becker 1964; Mincer 1974; Heckman et al. 2003). Basically, this framework considers that semi-log earnings depend on human capital and other variables. Human capital may be defined as skills knowledge and experience that enhance a worker's productivity in the labour market.

3 Overview of livestock ownership and poverty

Table 1 depicts the livestock ownership and poverty situation of the study villages. Poorly-connected villages have relatively higher number of livestock holders except for the villages in Chittoor District (OP and VP) which have the opposite pattern. This pattern is partly due to the prolonged drought in this region; the summer of 2001 brought the fifth consecutive year of drought in some part; and VP is located in affected area. Concurrently, OP experienced a combination of favourable institutional and policy environment for livestock production such as milk cooperatives, government loan, extension support as well as promotion by NGOs. Both livestock farming and poverty appear higher in MP. In AP, GU is a village near the city of Hyderabad and closer to industries and workshops with diverse non-farm livelihood opportunities and this might be the reason for the lowest level of livestock keeping, although popular dairy activities exist in this village.

Table 1. *Livestock ownership and poverty among 2005 re-survey panel*

	Census 2001–02		Sample			Census (2001–02)[a]			Sample (2001–02)[b]		
Villages	N	Have livestock (%)	N	Have livestock (%) 2001/02	Have livestock (%) 2003/04	Poverty head count (%)	Poverty gap (%)	Severity (%)	Poverty head count (%)	Poverty gap (%)	Severity (%)
Andhara Pradesh (AP)											
OP[c]	214	63.6	40	70.0	65.0	44.4	39.6	20.4	30.8	47.4	26.4
VP[d]	553	52.8	60	60.0	53.3	40.4	29.6	12.3	42.1	42.7	24.4
KO[c]	1429	42.8	80	45.0	36.3	21.1	28.6	10.9	10.7	34.7	20.3
KA[d]	464	64.7	60	68.3	60.0	29.1	31.2	13.9	12.3	19.8	4.6
GU[c]	1560	19.6	80	32.5	32.5	47.0	46.4	26.7	52.6	49.4	29.4
MD[d]	427	46.8	40	50.0	62.5	70.5	47.6	27.5	69.2	44.5	28.2
Total	4647	39.7	360	51.9	48.3	38.5	40.0	21.1	34.5	44.0	25.7
Madhya Pradesh (MP)											
PR[c]	140	68.6	38	68.4	65.8	na	na	na	52.6	56.9	40.4
LJ[d]	296	72.3	64	70.3	50.0	89.7	56.5	37.2	78.7	59.1	42.2
GG[c]	187	46.5	40	35.0	37.5	na	na	na	77.8	54.8	35.5
PT[d]	176	69.3	40	72.5	65.0	na	na	na	75.0	49.6	30.3
SM[c]	369	72.4	78	62.8	57.7	66.0	42.8	23.4	68.5	54.5	35.8
MB[d]	129	75.2	42	73.8	64.3	85.9	63.1	44.2	92.7	61.8	43.9
Total	1297	68.1	302	64.2	57.6	78.0	52.3	33.0	74.0	56.4	38.3

Data source: Livelihood options study: Census and sample surveys 2001–02 and panel re-survey 2005, ODI.
a. Calculated based on data for 4532 households of AP and 786 households of 3 villages of MP; poverty estimates are based on official state specific rural poverty line of 2004/05 adjusted for CPI inflation rate,
b. Calculated based on the data for 345 households of AP and 289 households of MP, official poverty line is used;
c. Villages AP and MP are well connected and
d. Villages in AP and MP are poorly connected. Income data were either not collected or missing for other households.
na means data not available.

About 54% of the re-survey panel were rearing one or more species of livestock, the density was relatively higher in MP villages (58%), the pattern is similar to 2001–02 census and sample surveys except that in the poorly-connected village LJ in 2003/04 farming is lower than the well-connected

village PR in the same region. In LJ, the decline in farming is much higher in 2003/04 (farming proportion dropped from 70% in 2001/02 to 50% in 2003/04. Focus group discussions (FGDs) identified prolonged drought, poor management of declining CPRs, intensive crop agriculture, fodder and water scarcity as responsible for the rapid decline in livestock farming.

There are considerable variations in the poverty level between villages. Head count poverty, poverty gap and severity are all relatively higher in MP than AP. Poverty in the latter state is much higher in the villages of Medak District, and much lower in the villages of Coastal Andhra. The pattern between proportionate participation in livestock economy and poverty situation at the village level is not universal. In some villages both participation and poverty are higher, but in some other villages the pattern is opposite.

4 Dynamics of livestock keeping

Descriptive analysis

The panel survey in early 2005 found that the size of livestock holding had fallen for most species except for calves, goats and poultry in AP and calves in MP over the three-year period beginning 2001–02. The difference was statistically significant only for bovines in AP and for calves in MP (Table 2). In AP, the average poultry size was 32 birds per household and the flock size increased to 47 birds. This change resulted from the introduction of intensive poultry-keeping technology and a large increase in flock size on 3 commercial farms belonging to relatively better-off households, 2 of them belonging to the richest quintile. When these 3 households are excluded, the poultry holding in the remainder of the sample declined significantly. This is consistent with a shift in poultry technology towards large, intensive units and away from backyard poultry keeping. Backyard poultry keeping has declined significantly in AP, especially in villages that are near urban centres. Key informant interviews made it clear that the products from intensively farmed poultry have become so cheap that they are pushing out backyard producers (Appendix 2). This finding seems consistent with the argument of supply-side technological progress towards intensive production, but this is not a contradiction with the demand driven growth arising from income growth, which is usually considered more apposite in the developing country context (Delgado et al. 1999). India's impressive supply growth in the dairy and poultry sub-sectors are considered more related to the response of growing demand (Staal et al. 2006). The demand driven growth is translated into technical change, which is not pro-poor. An IFPRI study claimed that in the period of 1980/81 to 1998/99 in AP, poultry meat production increased by 4.5 times and egg production by 3.5 times due to technological breakthroughs in breeding, feeding and health, and sizable investments from the private sector (Ramaswamy et al. 2006).

In terms of annual average growth of farming households, the decline is more visible in AP than MP; all types except goat holdings decreased in AP whilst both dairy and goat holdings increased in MP (Table A3.2 in Appendix 3). In terms of annual average growth of holdings, all types declined in both States except chicken holdings in AP. It is obvious that this pattern is due to intensive poultry production in AP and less intensive dairy technology in MP. The longer term (8 years period beginning from 1996/97) growth trajectory in AP was upward except for cows and pigs.

The long drought preceding the 2005 survey was the most important reason for the decline in the overall livestock holding in AP (excluding poultry farms). The impact of drought is especially visible in the case of bovines, particularly the milch animals, due to factors such as water and fodder scarcity. These were sold predominantly by better-off households (where there was some increase in small ruminant holdings), whereas small ruminant sales were concentrated in the lower income quintiles.[1] The impact of drought can also be gauged from the drought-related reasons for decrease, i.e. reasons 1, 4 & 6 of Table 3.

1. Income quintile, caste and village-based increase and decrease are listed in Tables A3.3, A3.4 and A3.5 in Appendix 3.

Table 2. *Change in stock by livestock type in AP and MP in three years period, 2001–04*

States	Livestock species	Na	Number owned 2001–02	Number owned 2003–04	Change in 3 years	T value	Sig.
AP	Buffaloes	107	2.4	1.6	–0.8	3.12	***
	Cows	64	2.5	1.5	–1.0	1.66	*
	Bulls	61	2.0	1.3	–0.6	3.78	***
	Calves	47	1.1	1.5	0.4	1.1	ns
	Sheep	22	11.8	9.4	–2.4	0.48	ns
	Goats	23	3.7	3.8	0.1	0.06	ns
	Poultry	78	31.8	46.9	15.1	0.46	ns
	Poultry[b]	75	5.1	3.5	–1.6	2.85	***
	Pigs	4	10.8	3.0	–	–	–
	Donkeys	1	5.0	0.0	–	–	–
	Total	211	16.4	20.8	4.4	0.35	ns
	Total[b]	208	6.5	4.7	–1.8	2.11	**
	Total[c]	211	2.9	2.2	–0.7	2.00	**
	Buffaloes	46	2.8	2.0	–0.8	1.49	ns
	Cows	125	1.8	1.5	–0.3	1.01	ns
	Bulls	96	1.8	1.6	–0.1	1.27	ns
	Calves	75	0.9	1.5	0.6	3.33	***
MP	Sheep	1	0.0	3.0	–	–	–
	Goats	30	4.6	4.2	–0.3	0.26	ns
	Poultry	18	7.1	4.9	–2.2	1.13	ns
	Ducks	1	3.0	0.0	–	–	–
	Total	183	4.7	4.2	–0.5	0.94	ns
	Total[c]	183	2.7	2.4	–0.3	1.09	ns
Total	Buffaloes	153	2.5	1.7	–0.8	3.32	***
	Cows	189	2.0	1.5	–0.5	1.92	*
	Bulls	157	1.8	1.5	–0.3	3.55	***
	Calves	122	1.0	1.5	0.5	2.95	***
	Sheep	23	11.3	9.1	–2.1	0.45	ns
	Goats	53	4.2	4.0	–0.2	0.16	ns
	Poultry	96	27.1	39.0	11.9	0.44	ns
	Poultry[b]	93	5.5	3.8	–1.7	2.90	***
	Ducks	1	3.0	0.0	–	–	–
	Pigs	4	10.8	3.0	–	–	–
	Donkeys	1	5.0	0.0	–	–	–
	Total	394	11.0	13.1	2.1	0.32	ns
	Totalb	391	5.7	4.5	–1.2	2.29	**
	Total[c]	394	2.8	2.3	–0.5	2.27	**

Data source: Livelihood options study: Panel survey 2005, ODI.
*** significant at 1%, ** significant at 5%, * significant at 10%.
The sample size for individual species is the total number of households having the particular species in either of the two years or both.
Exclude 3 large poultry farms.
Standard livestock units (SLUs).
'–' sample size is less than 5 and so the test was not carried out.

Table 3. *Frequency and percentage distribution of the major reasons for the decrease in livestock number in the last three years, 2001–04*

Major reasons for decrease	AP		MP		Total	
	N	%	N	%	N	%
Loss of access to grazing/fodder	14	7.7	8	9.0	22	8.1
Poor markets for livestock and/or their products	1	0.6	2	2.2	3	1.1
Inadequate labour	17	9.4	12	13.5	29	10.7
Drought	12	6.6	2	2.2	14	5.2
Pest/disease problems	39	21.5	32	36.0	71	26.3
Had to sell to cover agriculture shock or stress	12	6.6	4	4.5	16	5.9
Had to sell to cover domestic shock or stress	67	37.1	20	22.5	87	32.3
Paying off debts	11	6.1	5	5.6	16	5.9
Lease out	1	0.6	0	–	1	0.4
Consumed	2	1.1	2	2.2	4	1.5
No self-cultivation	1	0.6	1	1.1	2	0.7
Sold to buy other livestock	1	0.6	1	1.1	2	0.7
Lack of space	1	0.6	0	–	1	0.4
Killed by predator	2	1.2	0	–	2	0.8
Total	181	100	89	100	270	100

Data source: Livelihood options study: Panel survey 2005, ODI.
Note: This sample comprises the households reporting decrease and mentioning reasons. Species-wise decrease was recorded and so N is greater than the number of households reporting decrease since several households reported decrease for more than one species (Actual no. of households in AP reporting decrease was 129 in AP and 68 in MP). 'Migration' was not included in the questionnaire options, but of the 29 households reporting labour shortage, 4 had at least one migrant member. Whether migration is associated with, or a cause of, lower livestock keeping is discussed below.

Overall, domestic shocks or stresses were identified as the most important cause for a decrease in numbers of livestock, followed by pest and disease problems. This same pattern was evident in AP, but in MP, pest/disease problems were identified as the most important, followed by domestic stress. Other natural/environmental factors such as drought, and loss of CPRs were also identified as important reasons. The loss of access to grazing/fodder has resulted both from natural factors as well as man-made factors like CPR related rules and regulations and overgrazing. Natural/environmental factors altogether were identified as major cause of decrease in the livestock population. We categorized these factors into three major groups to carry out an analysis based on income quintiles to find out the situation of the poorer groups (Table A3.6 in the Appendix 3). In AP, the poorer groups identified shock/stress variables as most important reasons, with priority being given to the poor natural environment by the richest quintile. In MP, poor natural environment (particularly pest/diseases) was given by the poorest as the most important reason for decline, against labour shortages by the highest quintile. The other groups in both AP and MP considered shock/stress variables as most important followed by poor natural conditions. Thus most of the groups accounted for the shock/stress reasons followed by unfavourable natural causes responsible for the decline in the livestock numbers in AP and MP.

The drought was less severe in MP as borne out by Table 3 (also note the reasons for the increase in livestock in Tables A3.7 and A3.8 in Appendix 3) . In fact better access to grazing etc. is the most important reason for the increase of livestock in MP.

These drought-related results are likely to be a temporary phenomenon: long-term demand for livestock products in India is on an upward trajectory, and, for the long term, the keeping of milch animals, in particular, is likely to grow quickly in response.

Table 4. *Percentage distributions of respondents by livestock species increase/decrease/same, 2001/02 to 2003/04*

Livestock type	AP					MP				
	N	Increased	Decreased	Same	Total	N	Increased	Decreased	Same	Total
Buffaloes	107	18.7	53.3	28.0	100	46	19.6	30.4	50.0	100
Cows	64	26.6	51.6	21.9	100	125	17.6	24.8	57.6	100
Bulls	61	9.8	42.6	47.5	100	96	8.3	17.7	74.0	100
Calves	47	61.7	14.9	23.4	100	75	54.7	8.0	37.3	100
Sheep	22	40.9	50.0	9.1	100	1	–	–	–	–
Goats	23	60.9	39.1	0.0	100	30	43.3	33.3	23.3	100
Poultry	78	14.1	43.6	42.3	100	18	33.3	55.6	11.1	100
Total	211	29.9	52.6	17.5	100	183	37.7	31.1	31.1	100

Data source: Livelihood options study: Panel survey 2005, ODI.
Pearson Chi-Square: 86.27*** with df 16 for AP and 93.41*** with df 14 for MP.
***Significant at 1%.

In AP, the decline in livestock population was spread over a larger number of households (52.6% in Table 4) than in MP (31.1%). In MP, the number of households experiencing an increase exceeded the number of households who experienced a decrease.

A large proportion of households in both AP and MP reported an increase in the number of calves and goats, the change being significant for calves in MP but not for goats. The significant increase in calf holdings may indicate the result of stall feeding technology with improved milch bovines developed in some of the AP villages in response to the growing scarcity of open grazing.

The households which managed to increase livestock reported different reasons for their success as between AP and MP (Tables A3.7 in the Appendix 3). Poultry increased in the well-connected villages in AP due to improved markets (Tables A3.5 and A3.8 in Appendix 3). In AP, 56% of the households appeared to get access to better market; on the other hand, in MP 42% of these farmers reported other reasons (mostly births of calves). Also, on average, small ruminants increased slightly in poorly connected villages of MP. About 7% of the farms (7 farms) in AP reported that they increased their livestock numbers by using the money from migration and remittances; the proportion was much lower in MP (2%, 2 farms). These farms were either marginal or small.

Transition matrix of species

Transition matrices are often used to examine dynamic relationships when two or more observations are available over time. In poverty studies, they are used to show the number of households passing into and out of poverty in a particular period, broken down by their poverty status in a previous period (Baulch and McCulloch 1998). In this study, livestock holdings by species were collected for three different periods in AP and for two different periods in MP. These data allow us to investigate both changes in holding and the entry and exit status of a particular species by farm. Instead of dichotomous classification of farms with and without species, we divide the farms into four categories (no stock, 1 stock, 2 stock and >2 stock) for each period and then compare the changes using a transition matrix. This analysis includes buffalo, cattle and goat.[2] Table 5 presents the transition matrix for buffalo. In AP, about 70% of the sample households did not have any buffalo, in 2001–02 or in 2003–04. Overall in AP the number of buffalo farm decreased over the three-year period. Exit from buffalo farming exceeded entry with 7.1% farms exiting but only

2. For goat we consider two categories such as zero and non-zero stocks due to very few goat farms observed in the sample.

2.5% farms entering. Holding size also decreased, 6.5% of the households had holding greater than two in 2001–02, but the proportion reduced to 5.1% in 2003–04. The two-buffalo farms also decreased but the one-buffalo farms increased from 6.5 to 7.9%.

Table 5. *Transition matrix for buffalo farms in AP and MP (2001/02 to 2003/04)*

Holding size (no. of baffaloes)			2003/04				Total[a]
			0	1	2	>2	
AP	2001/02	0	69.7%	1.4%	1.1%	0%	72.2%
		1	2.3%	2.5%	0.8%	0.8%	6.5%
		2	4.8%	3.4%	5.7%	0.8%	14.7%
		>2	0%	0.6%	2.5%	3.4%	6.5%
	Total		76.8%	7.9%	10.2%	5.1%	100.0%
			Chi square = 297.99 ***, Pearson's R=0.77***				
MP	2001/02	0	83.4%	2.2%	0%	0%	85.6%
		1	0%	3.6%	0.4%	0%	4.0%
		2	1.4%	0.4%	3.6%	0.4%	5.8%
		>2	0.4%	0.7%	0.7%	2.9%	4.7%
	Total		85.2%	6.9%	4.7%	3.2%	100.0%
			Chi square = 423.79 ***, Pearson's R=0.86***				

Data source: Livelihood options study: Panel survey 2005, ODI.
a. Total households=630, in AP=353, in MP=277.
*** Significant at 1%.

Farming density was proportionately lower in MP and the entry was higher than the exit, unlike AP. Holding size decreased, similar to AP.

Using recall data from the sample to consider a longer period in AP (i.e. from 1996–97) in Table 6 we observe that entry to buffalo farming was much higher than exit. Thus the most recent 2001–02 to 2003–04 period was unfavourable and resulted in smaller number of buffalo keepers and smaller number of stock per keeper, unlike the previous five-year period. This is undoubtedly attributable partly to the drought in AP for the three years from 2001–02. The impact of drought is evident on both holding size and exit from farming, almost equally in case of buffalo in AP; net exit from buffalo farming was 4.4% in the period 2001–02 to 2003–04, and concurrently net decrease in stock holding size occurred in 4.1% of the farms (Table 5). Both exit and entry were lower in MP.

Table 6. *Transition matrix for buffalo farms in AP (1996–97 to 2003–04)*

Holding size		2003/04				Total[a]
		0	1	2	>2	
1996/97	0	72.7%	4.3%	4.0%	1.4%	82.4%
	1	2.3%	1.4%	0.9%	0.9%	5.4%
	2	1.1%	1.4%	3.4%	0.9%	6.8%
	>2	0.6%	0.9%	2.0%	2.0%	5.4%
Total		76.7%	8.0%	10.2%	5.1%	100.0%

Data source: Livelihood options study: Census survey 2001/02, Panel survey 2005.
a. Total households in AP=353.
Chi square = 157.33 ***, Pearson's R=0.0.61***

Cattle density was higher than buffalo, and much higher in MP, where 60% of the farms had cattle (Table 7). More than 4.2% of the sample farms in AP entered into cattle farming in this three-year period, whilst 6.5% exited. Farms having a holding of more than two cattle declined from 4.8 to

2.5% but two-cattle farms increased slightly. So the net exit from cattle farming was 2.3% in AP and net entry into the cattle farming was 4.3% in MP.

Table 7. *Transition matrix for cattle farms in AP and MP (2001/02 to 2003/04)*

Holding size (no of cattle)			2003/04				Total[a]
			0	1	2	>2	
AP	2001/02	0	66.3%	3.1%	1.1%	0%	70.5%
		1	2.5%	3.7%	3.7%	0.3%	10.2%
		2	3.7%	1.7%	8.2%	0.8%	14.4%
		>2	0.3%	1.1%	2.0%	1.4%	4.8%
	Total		72.8%	9.6%	15.0%	2.5%	100.0%
			Chi square = 254.07 ***, Pearson's R=0.73***				
MP	2001/02	0	40.1%	5.8%	0.7%	0.4%	46.9%
		1	2.2%	15.9%	6.1%	1.1%	25.3%
		2	0.4%	6.1%	14.8%	0.7%	22.0%
		>2	0%	0%	1.8%	4.0%	5.8%
	Total		42.6%	27.8%	23.5%	6.1%	100.0%
			Chi square = 338.69 ***, Pearson's R=0.81***				

Data source: Livelihood options study: Panel survey 2005, ODI.
a. Total households=630, in AP=353, in MP=277.
*** Significant at 1%.

In the period since 1996/97 in AP, cattle farming density was slightly higher (Table 8) and entry was more than exit reflecting the same conditions as applied to buffalo. More than 15% farms entered into cattle farming, whilst 8% exited.

Table 8. *Transition matrix for cattle farms in AP (1996/97 to 2003/04)*

Holding size (no of cattle)		2003/04				Total[a]
		0	1	2	>2	
1996/97	0	65.3%	7.1%	6.0%	1.1%	79.5%
	1	0.9%	0%	0.3%	0%	1.1%
	2	5.1%	0.9%	5.4%	0.6%	11.9%
	>2	1.7%	1.7%	3.1%	0.9%	7.4%
Total		73.0%	9.7%	14.8%	2.6%	100.0%

Data source: Livelihood options study: Census survey 2001–02, Panel survey 2005.
a. Total households in AP=353.
Chi square = 83.51 ***, Pearson's R=0.46***

Unlike cattle and buffalo, goat farming increased in the three-year period. Farming density was higher in MP than in AP (Table 9). Goat farming increased gradually from 1996/97 (Table 10). Goat farming trend has not been reversed due to drought; may be affordable investment allowed rapid adjustments to stock numbers, but the farming density was much lower than cattle and buffalo farming.

From this analysis of transition matrices, it can be concluded that stock holding size and farming density of large ruminants decreased in the period 2001/02 to 2002/03, especially in AP from an earlier increasing trend. This is in part due to prolonged drought in the region. Goat farming has increased and appears less risky in relation to drought but the farming density is still less than either of buffalo and cattle.

Table 9. *Transition matrix for goat farms in AP and MP (2001/02 to 2003/04)*

Holding size (no of goat)			2003/04		Total[a]
			0	>0	
AP	2001/02	0	93.5%	3.4%	96.9%
		>0	2.0%	1.1%	3.1%
	Total		95.5%	4.5%	100.0%
	Chi square = 26.59 ***, Pearson's R=0.27***				
MP	2001/02	0	89.2%	2.9%	92.1%
		>0	0.7%	7.2%	7.9%
	Total		89.9%	10.1%	100.0%
	Chi square = 171.71 ***, Pearson's R=0.79***				

Data source: Livelihood options study: Panel survey 2005, ODI.
a. Total households=630, in AP=353, in MP=277.
*** Significant at 1%.

Table 10. *Transition matrix for goat farms in AP and MP (2001/02 to 2003/04)*

Holding size (no of goat)		2003/04		Total
		0	>0	
1996/97	0	94.1%	4.2%	98.3%
	>0	1.4%	0.3%	1.7%
Total		95.5%	4.5%	100.0%

Data source: Livelihood options study: Census survey 2001–02: Panel survey 2005.
a. Total households in AP=353.
Chi square = 2.08 ns Pearson's R=0.07 ns
ns means not significant.

5 Livestock sales for major expenditure

Descriptive analysis

The richest and the poorest groups in AP were the ones selling most livestock units to meet major expenses (Table 11), whereas in MP it was the richest two groups. The size of sales in MP was almost half the sales in AP. It was observed in the data that livestock holding was lower in 2003/04 relative to 2001/02 for those who sold for major expenditure irrespective of the reasons for sale.

Table 11. *Total standard livestock units (SLUs) sold in last three years to finance major expenditure by income quintiles in AP and MP, 2001–04*

Income quintiles	AP			MP			Total		
	Average*	N	Std. Dev	Average*	N	Std. Dev	Average*	N	Std. Dev
Poorest	2.2	21	4.2	0.6	4	0.4	1.9	25	3.9
2	1.7	16	0.9	0.3	8	0.2	1.2	24	1.0
3	1.5	15	0.7	0.4	12	0.5	1.0	27	0.8
4	1.5	22	0.8	1.8	13	4.0	1.6	35	2.5
Richest	2.8	24	2.2	1.7	16	1.2	2.3	40	1.9
Total	2.0	98	2.3	1.1	53	2.1	1.7	151	2.3

Data source: Livelihood options study: Panel survey 2005, ODI.
* Averages are based on the species-wise records for livestock sold.

Sales attributable to shock/stress variables were notably higher among the lower income quintiles in AP. In MP, the sample size was too small to permit reliable conclusions (Table 12). Only one of the households in the poorest group of AP (in the village OP) reported to sell a cow to finance migration expenditure that resulted in a decline in stock from 3 cows to 2.

Table 12. *Frequency and percentage distribution of the major reasons for the sale of livestock in last three years to finance major expenditure by income quintile in AP and MP, 2001–04*

States	Income quintiles	Most important reasons							
		Shock/stress variables[a]		Investment[a]		Paying debts /others		Total	
		N	%	N	%	N	%	N	%
AP	Poorest	10	47.6	2	9.5	9	42.9	21	100
	2	5	31.3	5	31.3	6	37.5	16	100
	3	6	40.0	1	6.7	8	53.3	15	100
	4	6	27.3	5	22.7	11	50.0	22	100
	Richest	3	12.5	10	41.7	11	45.8	24	100
	Total	30	30.6	23	23.5	45	45.9	98	100
MP	Poorest[b]	1	–	2	–	1	–	4	100
	2	3	37.5	3	37.5	2	25.0	8	100
	3	4	33.3	4	33.3	4	33.3	12	100
	4	2	15.4	6	46.2	5	38.5	13	100
	Richest	4	25.0	12	75.0	0	0.0	16	100
	Total	14	26.4	27	50.9	12	22.6	53	100

Data source: Livelihood options study: Panel survey 2005, ODI.
a. Shock/stress variables include: marriage expenses, paying for medical treatment, death expenses, and other domestic shocks and stresses.
Investment includes: Purchase of assets/inputs.
b. Only 4 observation in this case and so percentages are not shown. Nine livestock farmers were not included in this analysis due to lack of income data to define quintile group.
N is greater than number of households for the same reason as above, some households sold more than one species and so reported a reason for each species sold. Number of households is 75 in AP and 48 in MP (originally 53 in MP, but 5 had no quintile due to lack of income data).

Domestic shocks and stresses were reported particularly strongly by poorer households as a reason for sale (Table 12). This indicates the important role played by livestock in 'buffering' or 'smoothing' expenditures. About 37% of the households which experienced a decline in stock in AP and about 23% of the households with a decline in stock in MP reported this reason as a major cause. In AP, this involved 39% of the total large ruminant farms and 55% of the total small ruminant farms. In MP, this included 13% of the total large ruminant farms and 40% of the total small ruminant farms. Thus, although fewer farms were keeping small ruminants, the proportion indicating that they had an important buffering function was high.

However, the number of farmers who restocked following sales of this kind varied widely between states. It was very low in AP — only around 10% did so—with a slightly higher ratio among the poorer quintiles. More households in MP — almost half—restocked (Table 13), and the levels of restocking appear to be higher in poorly-connected villages in AP and well-connected villages in MP. The difference between the two states is no doubt in some measure attributable to the drought conditions which hit AP much harder than MP in the period of study. It may also be in part attributable to the wider range of opportunities (in the non-farm economy, seasonal migration etc.) available to poor people in AP than in MP. The fact that small livestock are among the very few assets owned by the poor, and appear to be used extensively as 'buffers' against shocks and stresses, suggests that approaches to poverty reduction which combine livelihood protection and promotion would do well to focus on how the (re) building of assets such as livestock can be assisted, since livestock performs both productive and socially protecting functions.[1] The provision of 'matching grants' for livestock purchase may be one means of supporting the rebuilding of assets.[2]

Table 13. *Frequency distribution of households selling livestock for major expenditure and the replenishment of their stock*

A. by income quintile

States and quintiles	Total number of HH	Number of livestock HH	HH selling to meet major expenses	Number who did not restock	Number who restocked
AP					
Poorest	61	29	14	11	3
2	70	36	11	8	3
3	71	41	11	10	1
4	72	50	19	19	0
Richest	71	54	20	20	0
Total	353	211	75	68	7
MP					
Poorest	49	31	4	2	2
2	54	38	8	3	5
3	54	33	10	3	7
4	55	37	12	7	5
Richest	54	35	14	11	3
Total	266	174	48	26	22

1. A number of literature on India and Africa also provided evidence that livestock sales and purchases were used as part of farm households' consumption-smoothing strategies (Watts 1983; Swinton 1988; Rosenzweig and Wolpin 1993). It was argued that sales of livestock played a central role in the response to drought. The literature however lacks the analysis on re-building the stock of livestock asset if reduced considerably due to shock.
2. 'Matching grants' provided by government which in some way match the contribution of households to expenditure on approved assets or investments.

B. by village type.

AP					
Poorly-connected	154	106	36	30	6
Well-connected	199	105	39	38	1
Total	353	211	75	68	7
MP					
Poorly-connected	126	89	22	13	9
Well-connected	151	94	31	17	14
Total	277	183	53	30	23

Data source: Livelihood options study: Panel survey 2005, ODI.
Poorly-connected villages in AP are VP, KO, MD, and in MP are LJ, PT and MB; well-connected villages in AP are OP, KA, GU, and in MP are PR, GG and SM.
These are actual number of households reporting livestock sales for major expenditure (75 in AP and 53 in MP (48 for quintile based analysis))

The percentage shares of sales revenue by 'poorest 3 and richer 2 quintiles' are shown in Table 14. The table indicates that revenues from the sale of livestock species are substantial, and that there is a clear pattern of what the revenue from livestock species is spent on. There are differences in the pattern between states, between species and between the rich and the poor. In AP, households spent relatively more for shock/stress reasons and on paying debts, but in MP, investment was relatively higher. On average, the poorer spent more on shock/stress and debts repayment but the richer spent more on investment and debt repayment.

The same broad results held when the categorization changed from poorest three and richest two to poorest two and richest three — i.e. the middle quintile was shifted from poor to rich category — except that the very small number of data points for goats and poultry in AP gave disproportionate weight to this shift (Appendix 3, Table A3.9).

In AP, the three poorest quintiles' expenses on the shock/stress variables were higher than those of the top two, and differences in spending on the three broad purposes were statistically significant. The two richest groups spent more on investment and debt but the difference was not significant. The difference was significant for bovines, for other species the number of cases was not sufficient to draw a strong conclusion.

In MP, the two richest groups spent significantly more on investment in the case of bovines, differences for other species were not significant but the result indicates that the poor depend more on poultry to cope with shocks and stresses.

Overall, richer households were more dependent on bovines to meet investment and debt needs, but the poorer households were dependent on poultry to cope with shocks and stresses. Poorer quintiles spent more on shocks/stresses and debt repayment, while richer quintiles spent more on investment.

Table 14. *Percentage share of sales revenue due to finance major expenditure by reasons for sale, by species and by quintile groups in AP and MP, 2001–04*

States	Livestock species	Income quintile group	N	Shock/stress variables[a]	Investment[a]	Paying debts /others	F ratio
AP	Bovines	Poorest 3	27	38.9	14.2	46.9	4.01**
		Richest 2	38	23.7	30.1	46.2	0.27
		Total	65	30.0	23.5	46.5	0.53
	Goat/sheep	Poorest 3	11	27.3	9.1	63.6	0.91
		Richest 2	2	0.0	50.0	50.0	–
		Total	13	23.1	15.4	61.5	0.16
	Poultry/duck	Poorest 3	5	100.0	0.0	0.0	–
		Richest 2	1	0.0	0.0	100.0	–
		Total	6	83.3	0.0	16.7	–
	Total	Poorest 3	43	43.0	11.2	45.7	10.86***
		Richest 2	41	22.0	30.3	47.7	0.50
		Total	84	32.7	20.6	46.7	2.46*
MP	Bovines	Poorest 3	4	25.0	50.0	25.0	–
		Richest 2	17	17.6	64.7	17.6	5.89***
		Total	21	19.0	61.9	19.0	13.03***
	Goat/sheep	Poorest 3	11	27.3	45.5	27.3	0.48
		Richest 2	4	25.0	75.0	0.0	–
		Total	15	26.7	53.3	20.0	1.44
	Poultry/duck	Poorest 3	8	50.0	12.5	37.5	2.10
		Richest 2	5	40.0	40.0	20.0	–
		Total	13	46.2	23.1	30.8	1.06
	Total	Poorest 3	23	34.8	34.8	30.4	0.00
		Richest 2	26	23.1	61.5	15.4	5.68***
		Total	49	28.6	49.0	22.4	5.93***
Total	Bovines	Poorest 3	31	37.1	18.8	44.1	0.12
		Richest 2	55	21.8	40.8	37.4	3.10**
		Total	86	27.3	32.9	39.8	1.69
	Goat/sheep	Poorest 3	22	27.3	27.3	45.5	0.00
		Richest 2	6	16.7	66.7	16.7	2.15
		Total	28	25.0	35.7	39.3	0.48
	Poultry/duck	Poorest 3	13	69.2	7.7	23.1	12.80***
		Richest 2	6	33.3	33.3	33.3	0.00
		Total	19	57.9	15.8	26.3	6.26***
	Total	Poorest 3	66	40.2	19.4	40.4	5.38***
		Richest 2	67	22.4	42.4	35.2	4.15***
		Total	133	31.2	31.0	37.8	0.56

Data source: Livelihood options study: Panel survey 2005, ODI.
a. Shock/stress variables include: marriage expenses, paying for medical treatment, death expenses, and other domestic shocks and stresses; Investments include: purchase of assets/inputs.

Livestock sales: Multivariate analysis

To get a more precise measure of the effect of shocks/stresses on livestock transactions, we have developed a sales function with the variables as defined in Table 15. This function should contain variables that are usually considered in production and demand functions as discussed in the methodology section of the paper, but could be interpreted as a market supply function and may also contain current and past prices as response variables. However past prices were not collected for this panel and the current price may not contribute much if quality and spatial factors are

accounted for by location dummies. We would expect spatial factors to be accounted for by village dummies. Data on livestock age, weight, health etc. are not available and the effects of these quality factors are expected to be translated into price. Better quality would offer higher price. We would expect a backward bending sales curve in this case, that means negative price elasticity; the previous descriptive analysis shows farmers sell livestock to meet urgent needs, so a higher price would mean selling less to meet the target need. We would also expect quality differences higher among the well-off farmers who keep more large ruminants or crossbred animals and improved birds. Models were estimated for the entire sample as well as separately for two income groups. Sales, income and asset variables were expressed in natural logs. To examine the relationship between livestock sales and seasonal migration, two variables — a log of income from seasonal migration per adult equivalent and seasonal migration dummy—were introduced in the model. We would expect a negative relationship for the seasonal migration income variable: the higher the seasonal migration income the lower should be livestock sales and a positive relationship for the dummy variable, since those migrating may find it difficult to keep livestock.

Table 15. *Definition of variables in the sales function*

Variables[1]	Definition
Sales	Log of household annual sales of standardized livestock unit per adult equivalent. Conversion factors used to calculate SLU are: bull=buffalo=1, cow=0.7, goat=sheep=0.1, pig=0.4, poultry=duck=0.02. Conversion factors used to calculate adult equivalent are: males older than 14 years = 1, females older than 14 years = 0.8 and children 14 years or younger = 0.5.
Stocks	Log of the average of 2001–02 and 2003–04 standardized livestock unit inventory per adult equivalent.
Income	Log of total household income in Rs. per adult equivalent.
Assets	Log of total value of assets (other than land and livestock) in Rs. per adult equivalent.
Adults equivalent	Males older than 14 years = 1, females older than 14 years = 0.8 and children 14 years or younger = 0.5.
Diversity	Diversification index (Herfindahl-Hirchman index) per adult equivalent[2].
Sincome	Log of income from seasonal migration per adult equivalent
Lsprice	Log of average selling price per unit of livestock in Indian Rupees
DS1	Dummy variable for household seasonal migration (1=yes, 0=no).
DS2	Dummy variable for selling due to shock/stress (1=yes, 0=no).
D5	Dummy variable for scheduled tribes (1=yes, 0=no).
D6	Dummy variable for scheduled caste (1=yes, 0=no).
D7	Dummy variable for backward caste (1=yes, 0=no).
VP, KO, LJ, PT, SM, MB	Village dummies: VP=1 for VP, KO=1 for KO, LJ=1 for LJ, PT=1 for PT, SM=1 for SM, MB=1 for MB.

1. Income, assets, adult equivalent and diversity variables were taken from the 2001–02 census, they were not collected in the panel survey, income and asset data were adjusted for average annual CPI inflation rate of 3.5%.
2. The value of this index ranges from 1 to the highest number of activities taken into account (6 in this case). The higher the value of the index the greater is diversification.

The statistical performance of the models appears satisfactory (Table 16) with significant goodness of fit and moderately good explanatory power. The signs of the coefficients seem consistent for all variables except for some caste and village dummies. Stocks were the most significant variables with higher coefficients for the poorer groups as expected; the poorer sold proportionately more than richer groups in response to the increase in stocks. The significant negative coefficient for adult equivalent variable may be due to higher consumption than sales; it may also be due to less

dependency on livestock income as the number of adult members increases as well as more family labour becomes available to keep livestock.

The negative sign of the seasonal migration income variable and positive sign of the migration dummy variable appear as expected but are not statistically significant. The sign and size of the dummy variable for selling due to shock/stress appear highly interesting. The result confirms that the poorer sold a higher proportion of their sales due to shock/stress reasons.

Table 16. *Determinants of livestock sales in AP and MP, 2003–04*

Variables	All sample		Quintiles 1–2		Quintiles 4–5	
	Coefficient	P value	Coefficient	P value	Coefficient	P value
Constant	–2.089	0.08	–0.789	0.72	–1.122	0.45
Stock	0.521	0.00	0.731	0.00	0.608	0.00
Income	0.185	0.05	0.051	0.78	0.192	0.15
Assets	0.052	0.05	0.081	0.02	0.081	0.08
Adults equivalent	–0.214	0.00	–0.377	0.00	–0.267	0.00
Diversity	–0.425	0.00	–0.755	0.02	–0.321	0.10
Seasonal Income	–0.268	0.13	–0.292	0.17	–0.396	0.21
SLU price	–0.152	0.12	–0.178	0.29	–0.245	0.03
DS1	1.862	0.17	1.631	0.31	2.993	0.23
DS2	0.393	0.02	0.661	0.00	0.486	0.05
Female-head	0.542	0.17	0.690	0.12	1.104	0.26
Landless	0.229	0.25	–0.218	0.44	0.645	0.04
Scheduled Tribes	–0.459	0.21	0.464	0.36	–1.306	0.02
Scheduled Caste	0.555	0.03	1.492	0.00	0.060	0.89
Backward Caste	0.488	0.02	0.733	0.03	0.109	0.70
VP	0.288	0.27	0.557	0.08	2.907	0.01
KO	–0.794	0.00			–0.913	0.00
LJ	–0.574	0.18	1.380	0.09	–0.427	0.42
PT	–1.050	0.03	–1.734	0.04	–0.749	0.23
SM	–0.107	0.82	1.551	0.04	–1.198	0.05
MB	–1.162	0.07	–1.050	0.19		
No. of obs	161		50		76	
F value (Prob> F)	9.29 (.00)		10.28 (.00)		5.93 (.00)	
R^2	0.57		0.87		0.67	
Adj R^2	0.51		0.78		0.56	

Data source: Livelihood options study: Panel survey 2005, ODI.
Dependent variable= Log of total sales of standardized livestock unit per adult equivalent.

6 Migration and livestock keeping in the panel

For MP, simple tabulations (Tables 17 and 18) indicate that the overall ownership of livestock is not disproportionately low among those categories with higher levels of migration, and that this pattern is consistent over the three years separating initial from most recent survey. However, a breakdown by livestock type (Table 18) indicates that bovines are disproportionately concentrated among those households with little migration, and small ruminants and poultry among those with higher levels of migration.

On an average, households having migrants kept lower numbers of buffalo, bulls and goats but more cows, calves and poultry in AP. The difference is significant only for buffalo. The result is consistent both for the stocks of 2003/04 and those of three years ago.

Table 17. *Madhya Pradesh: Percentage of livestock owned (all livestock types) by prevalence of migration in the household*

Category % of migrants in HH	% of HH in each category	% LS now	% LS 3 years before
Cat 1	56	54	50
Cat 2	30	28	36
Cat 3	7	17	10
Cat 4	5	1	2

Notes: Category 1 = fewer than 25% of family members migrate, cat 2= in between 25 and 49% of family members migrate, Cat 3= 50 to 74% of family members migrate and cat 4 = 75% or more of family members migrate

Table 18. *Madhya Pradesh: percentage of livestock owned by prevalence of migration in the household, and by livestock type.*

Category	Buffaloes %		Cows %		Bull %		Calves %		Goats %		Poultry %	
	Now	3 yrs. before	Now	3 yrs. before	Now	3 yrs. before	Now	3 yrs. before	Now	3 yrs. before	Now	3 yrs. before
Cat 1	57	58	51	35	80	86	54	52	52	59	23	13
Cat 2	43	42	41	60	12	7	31	10	10	7	38	80
Cat 3	–	–	5	4	5	5	15	21	38	33	39	6
Cat 4	–	–	2	–	2	2	–	5	–	–	–	–

Notes: Category 1 = fewer than 25% of family members migrate, cat 2= in between 25 and 49% of family members migrate, Cat 3= 50 to 74% of family members migrate and cat 4 = 75% or more of family members migrate

Migration income and the associated variables

The multivariate analysis in Table 19 shows that annual migration income depends on the factors such as experience, land ownership, education levels, gender, status of the worker, location, type of job and caste variables. The statistical performance of the model was satisfactory. Most of the variables had signs as expected. Human capital variables such as education, experience and skill were associated positively with income earning. An extra year of migration experience resulted in 1.8% increase in annual average gross income from migration. An extra acre of land ownership caused a decrease in migration income by 2.8%. Females earned lower cash income than males. This might be due to some degree of occupational segregation and pay discrimination. Commuters earned lower income than temporary migrants. Permanent migrants' income was in fact remittance, which is only a small share of their total income that was not available in the data. So, the result

does not mean that permanent migrants earn much less than the temporary or circular migrants.[1] Skilled workers earned significantly higher income, migration to large town was associated with higher income and salaried job in government and private sectors produced more income. Migrants belonging to Schedule Tribes, Schedule Castes and Backward Castes earned less than others.

Table 19. *Determinants of annual migration income in Andhra Pradesh, 2003/04*

Variables	All sample		Poorer quintiles (1–3)		Less poor quintiles (4–5)	
	Coefficient	p-values	Coefficient	p-values	Coefficient	p-values
(Constant)	8.493	0.00	8.949	0.00	9.165	0.00
Age (years)	0.069	0.02	0.051	0.14	–0.023	0.73
Age squared	–0.001	0.01	–0.001	0.11	0.000	0.76
Migration experience	0.018	0.09	0.023	0.11	0.006	0.82
Total land owned (acres)	–0.028	0.11	–0.027	0.34	–0.056	0.39
Years of schooling in household	0.009	0.02	0.009	0.08	0.014	0.09
Log of current livestock unit per adult equivalent	0.071	0.12	0.136	0.02	0.022	0.87
Log of livestock unit per adult equivalent 3 years ago	–0.073	0.05	–0.152	0.00	0.111	0.21
Gender (female = 1)	–0.515	0.00	–0.541	0.00	–0.207	0.46
Skilled worker = 1	0.377	0.01	0.401	0.02	0.647	0.02
Migration to large town =1	0.289	0.06	0.233	0.23	0.098	0.75
Salaried work = 1	1.002	0.00	0.688	0.01	1.700	0.00
Commuting daily = 1	–0.397	0.02	–0.627	0.01	–0.961	0.02
Worker status (permanent = 1)[a]	–2.242	0.00	–2.223	0.00	–2.627	0.00
Schedule tribe=1	–1.118	0.00	–1.396	0.00	0.845	0.38
Schedule caste = 1	–1.105	0.00	–1.192	0.00	–1.211	0.01
Backward caste = 1	–0.673	0.00	–0.721	0.00	–0.488	0.12
VP = 1	0.106	0.66	–0.012	0.97	0.961	0.09
KO = 1	–0.794	0.00	–0.438	0.19	–0.233	0.60
KA = 1	–0.388	0.00	–0.567	0.23	0.093	0.84
GU = 1	–0.236	0.02	–0.142	0.55	0.677	0.32
MD = 1	–0.233	0.01	–0.295	0.28	–	
N	204		146		58	
F value	19.08	0.00	15.05	0.00	6.42	0.00
R-square	0.69		0.72		0.79	
Adj R-square	0.65		0.67		0.66	

Data source: Livelihood options study: Census survey 2001–02: Panel survey 2005.
Dependent Variable: Natural log of annual gross migration income (cash).
a. Permanent migrants' gross migration income was not collected but the remittances they sent to the origin were recorded, which was used as their gross income data and so their income was underestimated in this analysis and that is picked up by this dummy variable.

Migrants from and Krishna and Medak districts earned less than the migrants from Chittoor District. This is consistent with the actuality that Chittoor District is better connected than the other two districts. However, Medak has a large industrial belt to provide urban employment to many rural migrants and wages were higher due to higher demand for labour (Deshingkar et al. 2006). This may be the reason for lower size of negative coefficients for villages of Medak.

The relationship obtained for livestock variables seems surprising: the sign for past stock is negative but for the current stock is positive. We would expect a negative relationship between migration

1. The lower income might also arise from the lower demand for permanent workers due to the seasonality of work available. The permanent workers might accept overall lower wages but assured work for the whole year to avoid risk of not getting regular work, but this cannot be generalized from this analysis due to a lack of data.

and livestock keeping from our previous analysis and qualitative evidence. However, once a migration begins, income from this source may not be affected much by the livestock keeping unless it places a partial mobility barrier on temporary workers making them work less than the expected number of days in a given year. If so, temporary workers would move for fewer days and so would earn lower annual income. The present analysis does not support this hypothesis.

Quintile based analysis shows that in general migrants from the poorer quintiles were more disadvantaged than the less poor. Women belonging to the poorer quintiles earned the lowest. Similarly, skilled migrants and those engaged in salaried jobs belonging to bottom three quintiles earned less than the top two quintiles.

Table 20. *Determinants of annual migration income in MP, 2003/04*

	All sample		Poorer quintiles (1–3)		Less poor quintiles (4–5)	
	Coefficient	p-values	Coefficient	p-values	Coefficient	p-values
(Constant)	8.976	0.000	9.206	0.000	7.385	0.000
Age (years)	0.024	0.382	0.033	0.304	0.053	0.432
Age squared	0.000	0.378	0.000	0.257	–0.001	0.513
Migration experience	–0.014	0.214	–0.010	0.445	–0.028	0.350
Total land owned (acres)	0.021	0.341	–0.003	0.939	0.058	0.112
Years of schooling in household	0.003	0.587	0.002	0.805	–0.008	0.594
Log of current livestock unit per adult equivalent	–0.089	0.176	–0.135	0.131	–0.244	0.156
Log of livestock unit per adult equivalent 3years ago	0.233	0.002	0.270	0.019	0.320	0.009
Gender (female = 1)	–0.158	0.160	–0.192	0.163	0.030	0.890
Skilled worker = 1	0.460	0.006	0.641	0.009	0.065	0.843
Migration to large town =1	0.257	0.102	0.201	0.308	0.537	0.151
Salaried work = 1	0.066	0.778	–0.222	0.603	–0.168	0.638
Commuting daily = 1	–0.684	0.000	–0.653	0.012	–0.825	0.016
Schedule tribe = 1	–0.978	0.145	–1.082	0.170	–0.928	0.020
Schedule caste = 1	–0.635	0.363	–0.953	0.255	–0.240	0.503
Backward caste = 1	–0.783	0.233	–1.193	0.118		
GG = 1	0.524	0.021	0.410	0.170	1.240	0.030
PT = 1	–0.303	0.196	–0.603	0.060	0.592	0.288
SM = 1	0.609	0.003	0.531	0.072	1.177	0.009
MB = 1	–0.685	0.002	–0.512	0.055	–0.877	0.088
N	167		112		49	
F value	10.15	0.00	4.85	0.00	6.44	0.00
R-square	0.57		0.50		0.79	
Adj R-square	0.51		0.40		0.67	

Data source: Livelihood options study: Census survey 2001–02: Panel survey 2005.
Dependent Variable: Natural log of annual gross migration income.

In MP, human capital and caste factors are mostly insignificant. It appears that the results for this multivariate analysis were more consistent in AP in terms of the sign of the coefficients and significance level of the experience, education, land and livestock variables (Table 20). The performance of the migration characteristics variables was consistent but here most of them were not as significant as in AP. In MP as in AP, migrants belonging to Schedule Tribes, Schedule Castes and Backward Castes earned less than others but this was significant only for the ST in the largest 2 quintile group of the caste dummies.

In MP, livestock factors have shown opposite relationship to that obtained in AP: the sign for past stock is positive but for the current stock is negative. Thus the association of migration income and livestock was not so consistent to draw a clear conclusion.

Quite plausible is the association of higher migration income with well-connected villages in MP, which is not shown in AP results. Migrants who were less poor accessed more to such higher income than the poor.

7 Conclusion and policy implications

Conclusion

India's intensification program in the livestock sector is considered successful in terms of growth but dualistic in the sense that it is seriously biased towards wealthier households by ignoring wider groups of species, location-specific problems and social aspects of human deprivation and opportunities. The poor who use livestock, the most fluid asset they own, to cope with crises have been disadvantaged by this pattern of public expenditure. Nor do public policies provide support for restocking, essential though it is to enhance robustness against future shocks and stresses.

The recent drought, especially in AP, has contributed to a reduction in livestock keeping. At the same time, technological change in the form of intensive poultry keeping has displaced traditional backyard poultry, which plays a dominant role in the livelihoods of the poor. However, over the longer term, patterns of livestock keeping among the AP and MP samples are remarkably consistent. Analysis provided by the transition matrices indicate that the drought was in fact a deviation from an otherwise upward trend. Bad drought can cause significant damage to livestock. Small ruminants and poultry appear more tolerant to drought.

What is noticeable, especially from the 2005 re-survey, is that livestock sales often take place to meet major items of expenditure and that meeting domestic shocks and stresses are among the most important of these among poorer households. However, restocking rates are low, at least in part because of the drought conditions prevailing at the time in AP, and some support might be merited here, in the form of 'matching grants' for the purchase of small stock for instance.

Domestic shocks and stresses were reported particularly strongly by poorer households as a reason for sale indicating greater dependency on livestock to tide over shocks. This in fact indicates the important role played by livestock in 'buffering' or 'smoothing' expenditures. Although fewer farms were keeping small ruminants, their buffering function was large. Without any support, the poor would be more vulnerable being unable to rebuild fluid asset like livestock, which play such buffering function, especially in the crisis period.

Better infrastructure and improved markets appear important reasons to increase livestock keeping. Richer households are more able to reap the benefits of improved markets, and the poorer sell more in response to shocks and stresses. Multivariate analysis show that the poorer also sell more with the increase in their stock, but sell less than the richer if able to diversify livelihoods.

The relationship between seasonal migration income and livestock is not always consistent and in most cases the relationship is insignificant. The number of livestock kept was lower among the migrant households but not significantly lower except for buffalo. It appears that there are members in the family who are unable to migrates for various reasons but able to take care of household assets including livestock when a member migrates for earning additional income, otherwise migration by livestock owners would not be possible.

Policy implications

Livestock are one of the few means of saving undertaken by the poor, even in the more remote rural areas. The 'divisibility' of especially small stock means that they play an important role in social protection. Government support to asset building and to the regulation of the livestock sector should recognize and build on this property.

Drought is convincingly connected with the decline in livestock farming and population. This implies that drought preparedness programs taking care of reducing sales forced by drought along with 'matching grants' are necessary to mitigate vulnerability. Better livestock and animal health services could reduce the death of livestock as recommended by Varma and Winslow (2004) for the African drought affected countries. Training farmers as community health workers to deliver basic veterinary health care to livestock could be an option; the practice appeared viable in remote areas (Conroy et al. 2002; Akter and Farrington 2007). Some areas are more affected by drought than others. Geographic Information Systems (GIS) technology could be used to identify the severely affected areas to exercise specific package to mitigate vulnerability (Ndikumana et al. 2002).

Better extension and research services are required to adapt new agricultural activities to regional conditions, and help farmers connect to domestic and foreign market.

The poorer depends more on poultry due to shocks and stresses but intensive poultry production as supported by policy, research and extension is not a pro-poor technology. Intensive poultry production is replacing the less competitive backyard poultry which is based almost entirely on native birds of low productivity. The meat and eggs of native poultry are highly valued by local consumers; the price of native meat is almost double that of a high yielding broiler chicken, which indicates the potential of native poultry. A recent experience of LIFE, a network of NGOs working in Tamil Nadu, is that a slight technological/management improvement combined with health-related and capacity development intervention results in almost doubling of the bird population (Conroy 2004). Research in south Rajasthan by BAIF, Scottish Agricultural College (SAC) and the Natural Resources Institute (NRI) suggests that traditional semi-scavenging systems can be improved to halve the number of eggs not hatching, reduce the mortality rate of growing birds by 25% and increase the number of eggs available for consumption by 25% (ibid.). Some NGO activities with semi-intensive systems like PRADHAN in India and BRAC in Bangladesh suggest that the poor can earn enough money from these systems to escape poverty. Extension services should focus on transferring these innovations to the poor.

The poor are able to keep small ruminants due to low investment required and these are the types of animals appear less sensitive to prolonged drought as stocks are still rising. This subsector also remains extremely low-productive due to lack of policy impetus. There is substantial potential for improving productivity of traditional systems of keeping animals like goats and sheep. If the problems like low kidding rates, high mortality etc. are given research, policy and extension priority production of this subsector can be improved substantially (Conroy and Thakur 2002; Conroy et al. 2002). Some technologies of the day are already invented but not widely disseminated. To do so, reorientations of extension priorities as well as reorientation of research to invent more pro-poor sustainable technology are needed. Some organizations are developing technologies to help

the poor but the very poor appear to have little access due to lack of capital and other difficulties. For example, BAIF has been promoting dairy husbandry with crossbred cattle for the larger section of the rural poor since 1967 (BAIF 2006). The very poor may be excluded as we observe that the intensification program is biased towards the better off. Here again the 'matching grant' may help the very poor depending on livestock to get access to such technology.

In recent years contract farming is growing rapidly. Here also the neglected areas are the interests of the poor and their risks. Large companies supply inputs to contract growers having capital inputs and the poor has little access. Usually, backyard growers and small ruminant keepers are underprivileged members of the community with few political and business affiliations and less access to capital inputs and so less access to large companies.[1] Policy agenda of the hour should give explicit focus on how the poor get access to production and marketing systems to compete with the large producers and contract growers.

1. Rola et al. (2003) describes the case of the Philippines..

References

Akter S. 1989. A quantitative analysis of marketable surplus of paddy and food policy in Bangladesh. Unpublished PhD thesis. University of London, UK.

Akter S and Farrington J. 2007. Sustainability of an innovation for poverty alleviation: The case of Bangladesh Poultry Model. Paper read at the Development Studies Association annual conference on 'Connecting Science, Society and Development', 18–20 September. University of Sussex, UK.

BAIF. 2006. Dairy husbandry for sustainable livelihood. BAIF Communication 3. BAIF Development Research Foundation, India.

Baulch B and McCulloch N. 1998. *Being poor and becoming poor: Poverty status and poverty transitions in rural Pakistan*. Working Paper 79. Institute of Development Studies, Sussex, UK.

Becker GS. 1964. *Human capital: A theoretical and empirical analysis with special reference to education*. New York, USA.

Conroy C. 2004. *Livestock sector growth and poverty with particular reference to India*. NRI (Natural Resources Institute), Chatham, UK.

Conroy C and Thakur Y. 2002. Incresasing the productivity of indegenous goat production systems through participatory research in ethno-veterinary medicine: A case study from India. In: *Proceedings of international conference on responding to the increasing global demand for animal products*, 12–15 November 2002, Merida, Mexico. pp. 67–68.

Conroy C, Thakur Y and Vadher M. 2002. The efficacy of participatory development of technologies: Experiences with resource-poor goat-keepers in India. *Livestock Research for Rural Development* 14(3). http://www.cipav.org.co/lrrd/lrrd14/3/conr143.htm

Delgado C, Rosegrant M, Steinfeld H, Ehui S and Courbois C. 1999. *Livestock to 2020—The next food revolution*. IFPRI Food, Agriculture and the Environment Discussion Paper 28. IFPRI/FAO/ILRI. IFPRI, Washington, DC, USA. 72 pp.

Deshingkar P and Start D. 2003. *Seasonal migration for livelihoods in India: Coping, accumulation and exclusion*. Working Paper 220. ODI (Overseas Development Institute), London, UK.

Deshingkar P, Farrington J, Rao L, Akter S, Sharma P, Freeman A and Reddy J. 2006. Livestock and poverty reduction in India. ILRI (International Livestock Research Institute), Nairobi, Kenya, and ODI (Overseas Development Institute), London, UK. Draft working paper.

FAO (Food and Agriculture Organization of the United Nations). 2005. Evaluation of livestock production, policy and information. Programme 2.1.3. Report of the External Peer Review Panel, FAO, Rome, Italy.

Farrington J and Lobo C. 1997. Scaling up participatory watershed development in India: Lessons from the Indo-German Watershed Development Programme. Natural Resource Perspectives 17. pp 6.

Farrington J, Deshingkar P, Johnson C and Start D. 2006. Policy windows and livelihood futures: Prospects for poverty reduction in rural India. Oxford University Press, New Delhi, India.

GOI (Government of India). 2006. Livestock ownership across operational land holding classes in India, 2002–03. National Sample Survey Organization, Ministry of Statistics & Programme Implementation, Government of India.

Heckman JJ, Lochner LJ and Todd PE. 2003. Fifty years of mincer earnings regressions. IZA Discussion Papers 775. IZA (Institute for the Study of Labor), Bonn, Germany.

Macours K and Vakis R. 2007. Seasonal migration and early childhood development. Social Protection Discussion Paper No. 0702. World Bank, Washington, DC, USA.

Matthewman R and Ashley S. 1996. *The generation, assembly and delivery of information on livestock production: A case study of India*. NRI (Natural Resources Institute), Chatham, UK.

Metha R, Nambiar RG, Delgado C and Subramanyam S. 2003. *Annex II: Livestock Industrialization Project: Phase II–Policy, technical, and environmental determinants and implications of the scaling-up of broiler and egg production in India*. IFPRI–FAO project on livestock industrialization, trade and social–health–environment impacts in developing countries.

Mincer J. 1974. *Schooling, experience and earnings*. Gregg Revivals, Aldershot, UK.

Ndikumana J, Kamidi R, Desta KS, Marambii R, Abdi AI and Shori R. 2002. Assessment of possible USAID/OFDA-led activities for increasing resilience of pastoral communities in the Greater Horn of Africa. Addis Ababa, Ethiopia: ILRI (International Livestock Research Institute), Nairobi, Kenya, and ASARECA Animal Agriculture Research Network, Entebbe, Uganda.

Ramaswamy B, Birthal PS and Joshi PK. 2006. Efficiency and distribution of contract farming: The case of Indian poultry growers. MTID Discussion Paper No. 91. IFPRI (International Food Policy Research Institute), Washington, DC, USA.

Ravishankar A and Birthal PS. 1999. The livestock sector in India: Agenda for the future. Policy Brief 7, National Centre for Agricultural Economics and Policy Research, New Delhi, India.

Ravishankar A and Birthal PS. 2003. The livestock sector in India: A country report with special emphasis on trade with southeast Asian economies. National Centre for Agricultural Economics and Policy Research, New Delhi, India.

Rola A, Rola W, Tiongco M and Delgado C. 2003. *Livestock intensification and smallholders: A rapid reconnaissance of the Philippines hog and poultry sectors*. MTID Discussion Paper No. 59. Markets and Structural Studies Division (MSSD). IFPRI (International Food Policy Research Institute), Washington DC, USA. http://www.cgiar.org/ifpri/divs/mtid/dp.htm

Rosenzweig M and Wolpin K. 1993. Credit market constraints, consumption smoothing and the accumulation of durable production assets in low-income countries: Investments in cullocks in India. *Journal of Political Economy* 101.

Staal SJ, Pratt AN and Jabbar M. 2006. A comparison of dairy policies and development in South Asia and East Africa: Part 1. A conceptual framework for dairy development, and regional analysis among 15 South Asian and East African countries. A report prepared for the FAO Pro-Poor Livestock Policy Initiative. ILRI (International Livestock research Institute), Nairobi, Kenya.

Swinton S. 1988. Drought survival tactics of subsistence farmers in Niger. *Human Ecology* 16(2):123–144.

Turner RL. 2004. Livestock production and the rural poor in Andhra Pradesh and Orissa States, India. *Pro-Poor Livestock Policy Initiative Working Paper No. 9*. FAO (Food and Agriculture Organization of the United Nations), Rome, Italy.

Turton C. 2000. Enhancing livelihoods through participatory watershed development in India. Working Paper 131. ODI (Overseas Development Institute), London, UK. 28 pp.

Varma S and Winslow M. 2004. Healing wounds: How the international centers of the CGIAR help rebuild agriculture in countries affected by conflicts and natural disasters. CGIAR (Consultative Group on International Agricultural Research), Washington, DC, USA. 94 pp.

Watts M. 1983. *Silent violence: Food, famine and peasantry in northern Nigeria*. University of California Press, Berkeley, USA.

World Bank. 1999. *India livestock sector review: Enhancing growth and development*. The World Bank, Washington, DC, USA.

Appendix 1. Questions on livestock for all households

	Number owned (adults only)		Has number increased or decreased? 1=increased 2=decreased 3=same	List major reasons for incr/ decr (Code 1)	Number sold in last 3 years to finance major expenditure			Additional value of livestock, or livestock products or services sold regularly over year		
	Now	3 years ago			Nos (incl young)	Rs total	Reason for sale (Code 2)	Number of each livestock type	Type of product/ service (specify any additional ones)	Gross income Total Rs
Buffalo									Milk; curd; dung	
Cows									Milk; curd; dung	
Bullocks									Draught power, dung	
Calves									Dung	
Sheep									Dung	
Goats									Dung	
Poultry									Eggs	
Ducks									Eggs	
Others (specify below)										

Code 1: Decrease owing to: 1=loss of access to grazing/fodder; 2=poor markets for livestock and/or their products; 3=inadequate labour; 4=drought; 5=pest/disease problems; 6=had to sell to cover agriculture shock or stress; 7=had to sell to cover domestic shock or stress; 8=other (specify). Increase owing to: 1=better access to grazing/fodder; 2=improved markets for livestock and/or their products; 3=more labour available; 4=better rains; 5=reduced pest/ disease problems; 6=funds from agriculture permitted purchase; 7=funds from migration/remittances permitted purchase; 8=other (specify).
Code 2: 1=buying land; 2=leasing in land; 3= hiring in labour; 4=purchase of other inputs; 5=buying livestock; 6=buying lift irrig pump/drilling tubewell; 7=paying off debt; 8=marriage expenses; 9=paying for medical treatment; 10=death expenses; 11=to finance migration; 12=to finance obtaining a post by HH member; 13= Other (specify). IF MORE THAN ONE MAJOR EXPENSE, ENTER MORE THAN ONE CODE, RANKED IN IMPORTANCE)

Appendix 2: Impact of commercial poultry farms on backyard poultry production: Qualitative assessments

Andhra Pradesh

India ranks seventh in the world in poultry population. Andhra Pradesh emerges as the 'poultry capital of India'; it is one of the leading producers of poultry products and the largest producer of eggs in the country. In this context it is pertinent to examine the impact of the rapid growth of poultry industry on the backyard poultry (BYP) which plays an important part in the livelihoods of poorer households.

Qualitative information collected from the study villages reveals that the BYP has seen an overall decline over the years. The decline is sharper in villages that are closer to urban centres or well-connected. Penetration of poultry industry is among the major factors accounting for the downward trend in BYP. The impact of commercial poultry farms is more direct in relatively large and well-connected villages such as GU and KO. These villages have both chicken shops within the village and poultry farms in proximity.

While poorer households said that predators, inadequate household labour and diseases are the major factors contributing to the decline, better-off households attribute the decline to, apart from the lack of household labour, their concern for hygiene because of droppings and possible infestation from poultry lice/flea. Migration is another major constraint in keeping chickens at home particularly among households with relatively higher migrant members. In semi-arid locations such as GU and VP a majority of better-off households, upper castes in particular, have given up BYP and rely mostly on poultry products supplied by commercial farms. Poultry keeping is therefore confined mostly to Scheduled Tribes and Castes and Backward Castes. Some hygiene conscious upper castes raise indigenous chickens on their agricultural farms.

As far as eggs are concerned, people across the state rely mostly on eggs supplied by poultry farms. Poultry farm eggs are widely available even in the remote and tribal villages where the local grocery shop sells them or people buy them from the nearest shop. Two major factors *inter alia* seem to have led to this: the reach of the poultry industry and the growing demand for eggs which the BYP cannot meet.

Rapid growth of contract poultry farming

The case of GU, a peri-urban village, illustrates the trends in poultry industry of Andhra Pradesh and its impact on BYP. This large village had two chicken shops, established around 11 years ago. There are 7 small poultry farms within the village and 4 large farms around it. The small-scale farms, with the number of birds ranging from 5 to 10 thousands, were set up a couple of years ago mostly by small and marginal farmers of the village under the buyback agreements with major poultry companies such as *Suguna, Bromark*, *Venkateshwara* and *Sneha*. Under this arrangement, the company supplies chicks, feed, medication and technical support. The contract growers raise broilers with other inputs (shed, labour and utilities) to a marketable age (around 45 days) and sell them to the company at Rs 2.50 a kg. The expansion of contract poultry farming is also facilitated

by maize crop, a major component of poultry feed, widely produced in the state. Some contract farmers raise both broilers and layers.

Contract poultry farming in the state is a relatively recent phenomenon having taken off over the last couple of years. It has rapidly spread to several districts of the state. Although the contract farms were set up in and around urban centres initially, they are now spreading to even relatively remote villages. As the case of GU shows, marginal and small farmers who can mobilize the necessary resources are also participating in the poultry revolution.

The demand for the indigenous or country birds, at the same time, has not declined. In fact country chickens have their own niche market especially in urban areas. Many chicken shops in urban locations sell both country birds and broilers. The indigenous birds are also exported to neighbouring states such as Maharashtra through a network of agents. The price of a country bird (Rs 90–110) is almost double that of a broiler chicken (Rs 50–60). The former is still considered a delicacy and is preferred for its superior taste though its flesh content is relatively low. Moreover, it is traditionally a ceremonial species, preferred particularly for the ceremonial sacrifice. But the supply no longer meets the demand notably during the peak festive or ceremonial seasons. So some people settle for broilers even for ceremonial purposes. And it is not unusual to find some poorer households that sell their BYP and buy broiler chicken from the local or nearest shop because of the price differential.

In relatively remote and underdeveloped villages, such as MD, people go to the nearest urban centre or major road junction to buy chicken. These places are normally the locations where the weekly markets (*shandies*) are held. People say that broiler chickens are cheaper and convenient. For example, the dressed chicken can be bought in required quantities and easier to cook. The improvements in infrastructure have facilitated the penetration of commercial poultry products even into the remotest villages. More to the point, even the poorer households find the broiler affordable as it is much cheaper than other types of meat such as lamb and fish. The widespread availability of poultry products have also led to changes in food habits of rural populations. It may be recalled here that at the national level the per capita chicken consumption, which was around 400 gm in 1990, has gone up to 1,600 gm.

The process of urbanization is only a part of the explanation for the rapid expansion of commercial poultry. The incentives offered by the government and the heavy competition among the major players in poultry industry have also contributed to the growth. The consumption of broilers by the poorer households is increasing steadily. Another view is that the BYP cannot meet the demand from a growing and mobile population.

Some better-off households of prosperous Green Revolution villages of KO and KA, with better access to both private and public extension services, raise large crossbred birds; a full-grown chicken weighs up to 5 kg but we do not find such a pattern in semi-arid villages.

This quick qualitative exercise has identified only some broad trends in commercial poultry-BYP interface. A closer and more detailed examination could reveal other critical factors influencing the overall decline in backyard poultry and its impact on the poorer households.

Madhya Pradesh

Sawer is a block place between Indore and Ujjain districts. In the villages, poor farmers buy poultry stocks at government subsidized prices of Rs 150 for 55 birds, either male or female. The females are used for laying eggs and males for meat purpose. These birds are cross of two strains, either White Leg Horn (WLH) and local, or Rhode Island Red (RIR) and local. These birds are more resistant to diseases, surviving on available feed in backyard.

In this area many commercial broiler and layer farms are running very well. The commercial farms purchase chicks from different hatcheries and sell eggs and broilers in Sawer and surrounding villages. The supply of Desi eggs is scanty; some come from Hyderabad but demand is high and so a Desi egg costs around double the cost of Minar egg.

In Madhya Pradesh, the following major types of poultry farming are popular:

- Backyard poultry (BYP)
- Commercial poultry farming for eggs (Layer)
- Commercial poultry farming for meat (Broiler)
- Develop new breads for broiler and layer (Hatcheries)

All these systems are very different from each other. Hatcheries develop strains specifically for layer and broiler and they sell small chicks after sex determination to the poultry farmers as per their need (i.e. layer or broiler). The hatcheries keep strain's name secret. In MP there are two main hatcheries — one in Indore and the other in Jabalpur. Farmers also purchase chicks from Pune, Punjab and Uttar Pradesh.

The birds for layers are better in laying eggs and they generally lay around 300 eggs/year after the age of 20 weeks. These birds lay eggs for next 60–65 weeks. These eggs are known as 'Minar'. Initially the egg size is small around 30 to 35 gm but after some time the size increases to 60 gm. Commercial farmers sell eggs to commission agents at the rate of Rs 150/100 eggs and these commission agents sell them to wholesaler and wholesaler pass them on to retailer. The retail rate is Rs 2.50/egg. After the age of 80 weeks the birds are not good enough for eggs so the farm owners sell these birds for meat purpose in the market at little less than the market rate, the range of which could be Rs 30–40 per bird in the pick season and around Rs 20–25/bird in off-season.

The rate of poultry products varies according to weather and festivals. The demand for these products is highest in winter (November to February) or after Depavali. This qualitative information was collected during the festival time in western MP (August–October);10 days of Ganesh festival (August–September), 1 month of Shraadh paksha and then 10 days of Navratri (beginning of October). During the festival time consumption of eggs and meat reduced among Hindus. After the festival time, demand for poultry products increase. Any rumour on infectious diseases like the bird flu rumour causes a sharp decline in price, sometimes price drops by two-thirds of usual price due to such rumour.

The commercial poultry birds are more susceptible to disease. These birds cannot be raised in open yards. They need proper housing, feed and protection. In contrast, as the strains used for the BYP are more disease resistant, they do not need such specific housing and special feed. These birds survive on eating insects and waste material in backyard with little feed supplement. They lay around 240 eggs per year and the egg size is around 40 gm that is smaller than the commercial eggs. These small Desi eggs are sold at higher price in market, sometimes double the price of Minar.

As per the Veterinary Doctors there is a myth among the consumers that they consider some additional value to Desi eggs compare to Minar eggs, although Desi eggs are smaller in size by around 35 to 40 gm. The quality of Desi eggs is also inferior but the higher price is due to excess demand than supply resulting from consumer preference.

Broilers

The commercial poultry farming is done for meat production through broiler. Broiler gains weight quickly compare to layer. Broilers gain 1.5 kg weight in 40 days. The farmers start disposing lots of birds when these broilers gain 1.25 kg weight. In the pick season (winter) these broilers can be sold in Rs 60 to 65/kg to the agent. A bird of 40 days requires around 2.5 kg of feed per day. These strains should not be kept for longer durations than 40 days as the industry would experience loss, because the birds require additional food without extra gain in weight.

A commercial farmer reported that during the period of bird flu rumour in Indore, he had to sell birds extremely cheaply, by around Rs 10–15/kg and incurred a big loss. At the time of interview, he had 20 thousand birds of 7–10 days old. He was expecting a maximum profit from this batch as they would be ready to sell after the festival season.

	BYP	Layer commercial poultry for eggs
Strain	Cross of local with WLH or RIR	From hatcheries for egg production
After care	Need less care	More care required
Feed requirement	Survive on insects, waste material and some poultry feed	Need more poultry feed in the range of 65 gm to 175 gm/bird during egg laying period.
Production	240 eggs/year max	300 eggs/year average
Egg size	35–40 gm	55–60 gm
Rate	Rs 6/egg	Rs 2.5/egg
Govt support	Subsidized Rs 150 for 55 birds/ household	Bank loan
Sexing	There is no choice for beneficiaries to select bird sex wise.	Hatcheries take guaranty for the sex of bird
Rate of birds after 8 months	Rs 160–250/bird	Rs30–40/birds
Egg quality (According to Vet)	Inferior,	Quality is good because egg formation needs balance diet and that diet is not available in back yard poultry.
Egg quality (According to consumer)	Superior The egg is also used for medicinal purpose. The market price is higher doubled the Minar eggs. These eggs are frequently imported from Hyderabad.	Inferior

Appendix 3: Tables

Table A3.1. *Proportionate caste category in the sample households and livestock ownership, 2003/04*

Caste category	AP			MP			Total		
	Sample size	% of sample	% have livestock	Sample size	% of sample	% have livestock	Sample size	% of sample	% have livestock
ST	12	3.3	58.3	34	11.3	64.7	46	6.9	63.0
SC	71	19.7	31.0	51	16.9	37.3	122	18.4	33.6
BC	175	48.6	48.0	203	67.2	59.6	378	57.1	54.2
OC	102	28.3	60.8	14	4.6	28.6	116	17.5	56.9
Total	360	100.0	48.6	302	100.0	55.0	662	100.0	54.1

Data source: Livelihood options study: Panel survey 2005, ODI.

Table A3.2. *Average number of livestock owned by species and year, panel households, Andhra Pradesh and Madhya Pradesh*

Species	2003/04			Three years ago (2001/02)			Annual growth (2001–04[a])		Eight years ago (1996/97)			Annual growth 1996/97–2001/02[a]	
AP[b]													
	N	Max	Av.	N	Max	Av.	Farm	Av	N	Max	Av.	Farm	Av.
Buffalo	82	8	2.1	98	14	2.6	–5.8	–6.9	62	20	2.6	9.6	0.0
Cow	50	15	1.9	52	30	3.0	–1.3	–14.1	35	10	3.5	8.2	–2.9
Bullock	41	3	2.0	56	4	2.2	–9.9	–3.1	51	6	2.1	1.9	0.2
Calves	44	6	1.6	19	10	2.7	32.3	–16.0					
Sheep	17	50	12.2	17	70	15.2	0.0	–7.1	14	40	15.0	4.0	0.3
Goat	16	12	5.4	11	20	7.7	13.3	–11.2	6	10	3.8	12.9	15.1
Chicken	64	2000	57.2	71	1000	34.9	–3.4	17.9	54	1000	24.3	5.6	7.5
Pig	2	8	6	4	25	10.8	–20.6	–17.8	3	30	12	5.9	–2.2
Total	174	2001	25.2	194	1002	17.8	–3.6	12.3	141	1000	14.2	6.6	4.6
MP[b]													
Buffalo	41	12	2.3	40	15	3.3	0.8	–30.3					
Cow	115	15	1.7	107	16	2.1	2.4	–19.0					
Bullock	88	4	1.8	90	6	1.9	–0.7	–5.3					
Calves	72	4	1.6	35	7	1.9	27.2	–15.8					
Sheep	1	3	3.0										
Goat	28	15	4.5	22	25	6.2	8.4	–27.4					
Chicken	15	18	5.9	17	20	7.5	–4.1	–21.3					
Total	174	23	4.4	162	38	5.3	2.4	–17.0					

Data source: Livelihood options study: Census survey 2001–02: Panel survey 2005.
a. Assuming r=average annual growth, Y0 is initial value, Yt is final value, t is the time period (5 years in this case) then r = (Yt/Y0)(1/t) – 1.
b. Drawn from 360 households in AP and 302 households in MP.

Table A3.3. *Change in stock (number) by income quintile and by livestock type in AP and MP in three years period, 2001–04*

Income quintiles	Type	Average number in AP					Average number in MP				
		N	2001/02	2003/04	Change	T value	N	2001/02	2003/04	Change	T value
Poorest	Bovines	21	2.0	1.5	–0.6	1.28	29	2.8	2.5	–0.2	0.26
	Small Ruminant	8	5.9	1.4	–4.5	1.34	4	2.5	3.3	0.8	–
	Poultry	19	59.2	3.1	–56.1	1.07	1	2.0	15.0	13.0	–
	Total	29	41.9	3.5	–38.4	1.12	31	3.0	3.3	0.3	0.30
2	Bovines	29	3.4	2.5	–0.9	0.66	35	2.4	2.9	0.5	1.15
	Small Ruminant	14	15.1	12.9	–2.2	0.34	10	2.3	1.9	–0.4	0.46
	Poultry	15	4.7	136.6	131.9	0.99	6	7.5	3.0	–4.5	1.57
	Total	36	10.6	64.0	53.4	0.96	38	4.0	3.6	–0.4	0.58
3	Bovines	36	2.4	2.2	–0.2	0.58	29	2.5	2.9	0.4	0.87
	Small Ruminant	11	9.7	6.5	–3.3	0.60	6	7.7	4.7	–3.0	0.77
	Poultry	15	4.5	3.1	–1.5	1.13	4	5.0	5.3	0.3	–
	Total	41	6.4	4.8	–1.6	0.93	33	4.2	4.1	–0.1	0.12
4	Bovines	47	2.3	1.8	–0.5	1.78*	35	3.5	2.8	–0.7	1.18
	Small Ruminant	8	1.4	3.1	1.8	2.00*	5	5.8	6.6	0.8	0.23
	Poultry	12	3.6	2.7	–0.9	1.14	5	11.6	6.2	–5.4	1.15
	Total	50	3.2	2.9	–0.4	0.92	37	5.7	4.4	–1.3	1.07
Richest	Bovines	51	5.0	2.9	–2.1	1.79*	33	5.2	4.6	–0.6	0.54
	Small Ruminant	5	3.0	3.6	0.6	0.33	6	4.8	6.2	1.3	0.40
	Poultry	16	73.3	92.1	18.8	0.23	3	2.0	1.3	–0.7	–
	Total	54	26.7	30.4	3.7	0.15	35	5.9	5.5	–0.4	0.43
Total	Bovines	185	3.2	2.3	–0.9	2.20**	161	3.3	3.2	–0.1	1.49
	Small Ruminant	46	8.5	6.7	–1.9	0.72	31	4.4	4.2	–0.2	0.18
	Poultry	74	18.6	3.5	–15.1	0.46	19	6.9	4.7	–2.2	1.20
	Total	211	16.4	20.8	4.4	0.35	174	4.6	4.2	–0.4	1.00

Data source: Livelihood options study: Panel survey 2005, ODI.
*** Significant at 1%, ** significant at 5%, * significant at 10%.

Table A3.4. *Percentage distributions of respondents by livestock species increase/decrease/same, by caste category, 2001–04*

Livestock type	AP					MP				
	N	Increased	Decreased	Same	Total	N	Increased	Decreased	Same	Total
ST										
Buffaloes						3		66.7	33.3	100
Cows	2	50.0		50.0	100	15	20.0	26.7	53.3	100
Bulls	2		100.0		100	9	11.1	22.2	66.7	100
Calves	1	100.0			100	10	70.0		30.0	100
Sheep	2	50.0	50.0		100	1	100.0			–
Goats	1	100.0			100	4	25.0	50.0	25.0	100
Poultry	4		50.0	50.0	100	13	38.5	53.8	7.7	100
SC										
Buffaloes	17	11.8	64.7	23.5	100	6	66.7		33.3	100
Cows	11		72.7	27.3	100	13	23.1	15.4	61.5	100
Bulls	8		37.5	62.5	100	7		42.9	57.1	100
Calves	7	42.9	28.6	28.6	100	7	71.4	14.3	14.3	100
Sheep	2		100.0		100					–
Goats	8	75.0	25.0		100	10	30.0	40.0	30.0	100
Poultry	11	18.2	45.5	36.4	100	1		100.0		100
BC										
Buffaloes	46	26.1	45.7	28.3	100	35	14.3	34.3	51.4	100
Cows	28	42.9	46.4	10.7	100	94	17.0	25.5	57.4	100
Bulls	33	15.2	48.5	36.4	100	80	8.8	15.0	76.3	100
Calves	24	66.7	8.3	25.0	100	58	50.0	8.6	41.4	100
Sheep	10	40.0	50.0	10.0	100					–
Goats	12	58.3	41.7		100	16	56.3	25.0	18.8	100
Poultry	33	12.1	36.4	51.5	100	5	25.0	50.0	25.0	100
OC										
Buffaloes	44	13.6	56.8	29.5	100	46	2		100.0	100
Cows	23	17.4	52.2	30.4	100	125	3	33.3	66.7	100
Bulls	18	5.6	27.8	66.7	100	96				100
Calves	15	60.0	20.0	20.0	100	75				100
Sheep	8	50.0	37.5	12.5	100	1				–
Goats	2		100.0		100	30				100
Poultry	30	16.7	50.0	33.3	100	18				100
Total	211	29.9	52.6	17.5	100	183	37.7	31.1	31.1	100

Data source: Livelihood options study: Panel survey 2005, ODI.
Pearson Chi-Square: 86.27*** with df 16 for AP and 93.41*** with df 14 for MP.
***Significant at 1%.

Table A3.5. *Change in stock by livestock and village types in AP and MP in three years period, 2001–04*

States	Village types[a]	Livestock species	N	Number owned 2001/02	Number owned 2003/04	Change in 3 years
AP	Poorly-connected	Bovines	58	3.7	2.7	–1.0
		Small ruminants	23	10.1	10.1	0.0
		Poultry	26	5.2	3.9	–1.2
	Well-connected	Bovines	127	3.0	2.1	–0.9
		Small ruminants	23	7.0	3.2	–3.8
		Poultry	51	46.0	69.7	23.8
MP	Poorly-connected	Bovines	84	3.3	3.1	–0.2
		Small ruminants	16	2.6	3.4	0.8
		Poultry	15	6.8	5.1	–1.7
	Well-connected	Bovines	86	3.6	3.4	–0.2
		Small ruminants	15	6.4	5.1	–1.3
		Poultry	4	7.3	3.3	–4.0
Total	Poorly-connected	Bovines	142	3.5	2.9	–0.5
		Small ruminants	39	7.0	7.4	0.4
		Poultry	41	5.8	4.3	–1.4
	Well-connected	Bovines	213	3.2	2.6	–0.6
		Small ruminants	38	6.7	3.9	–2.8
		Poultry	55	43.1	64.9	21.8

Data source: Livelihood options study: Panel survey 2005, ODI.
a. Poorly-connected villages are VP, KO, MD, LJ, PT and MB. Well-connected villages are OP, KA, GU, PR, GG and SM.

Table A3.6. *Frequency and percentage distribution of the households by reasons for decrease in livestock and income quintile in AP and MP in three years period, 2001–04*

Income quintiles & States[a]	Poor natural environment[b]		Shock/stress variables[b]		Labour, debt and other factors[b]		Total	
AP								
	N	%	N	%	N	%	N	%
Poorest	8	23.5	16	47.1	10	29.4	34	100
2	10	30.3	19	57.6	4	12.1	33	100
3	9	27.3	16	48.5	8	24.2	33	100
4	15	40.5	17	45.9	5	13.5	37	100
Richest	22	51.2	11	25.6	10	23.3	43	100
Total	64	35.6	79	43.9	37	20.6	180	100
MP								
Poorest	8	72.7	3	27.3	0		11	100
2	7	46.7	7	46.7	1	6.7	15	100
3	5	45.5	6	54.5	0	–	11	100
4	14	60.9	4	17.4	5	21.7	23	100
Richest	5	25.0	4	20.0	11	55.0	20	100
Total	39	48.8	24	30.0	17	21.3	80	100

Data source: Livelihood options study: Panel survey 2005, ODI.
a. quintiles are defined based on the 2002 sample survey data on household total income of 2001/02, data on total income are not re-collected.
b. Poor natural environment includes: loss of access to grazing/fodder, death due to drought, pest/disease problems, Shock/stress variables include: had to sell to cover agriculture shock or stress, had to sell to cover domestic shock or stress, Labour, debt and other factors include: inadequate labour, paying off debts and other.
Note: This sample comprises the households reporting decrease and mentioning reasons. Species-wise decrease was recorded and so N is greater than the number of households reporting decrease since several households reported decrease for more than one species (Actual no of households in AP reporting decrease was 129 in AP and 68 in MP).

Table A3.7. *Frequency and percentage distribution of the major reasons for the increase in livestock number in the last three years, 2001–04*

Major reasons for increase	AP		MP		Total	
	N	%	N	%	N	%
Better access to grazing/fodder/better rains	11	10.2	31	31.0	42	20.3
Improved markets for livestock and/other products	60	56.1	8	8.0	68	32.9
More labour available	13	12.1	9	9.0	22	10.6
Reduced pest/disease problems	1	0.9	2	2.0	3	1.4
Funds from agriculture permitted purchase	10	9.3	6	6.0	16	7.7
Funds from migration/remittances	7	6.5	2	2.0	9	4.3
Other*	5	4.7	42	42.0	47	22.7
Total	107	100	100	100	207	100

Data source: Livelihood options study: Panel survey 2005, ODI.
* Other includes bought with borrowed money, leased in, gifts and births of calves

Table A3.8. *Frequency and percentage distribution of the major reasons for the increase in livestock number by village types[a] in the last three years, 2001–04*

Major reasons for increase	N, AP, PC	%	N, AP, WC	%	N, MP, PC	%	N, MP, WC	%
Better access to grazing/fodder/better rains	6	9.2	5	11.9	14	24.1	17	40.5
Improved markets for livestock and/other products	32	49.2	28	66.7	5	8.6	3	7.1
More labour available	10	15.4	3	7.1	1	1.7	8	19.0
Reduced pest/disease problems	1	1.5	0	0.0	2	3.4	0	0.0
Funds from agriculture permitted purchase	6	9.2	4	9.5	5	8.6	1	2.4
Funds from migration/remittances	6	9.2	1	2.4	2	3.4	0	0.0
Other*	4	6.2	1	2.4	29	50.0	13	31.0
Total	65	100.0	42	100.0	58	100.0	42	100.0

Data source: Livelihood options study: Panel survey 2005, ODI.
a. AP and MP stand for Andhra Pradesh and Madhya Pradesh, respectively, PC stands for poorly-connected villages, which are VP, KO, MD, LJ, PT and MB; and WC stands for well-connected villages, which are OP, KA, GU, PR, GG and SM.
* Other includes bought with borrowed money, leased in, gifts and births of calves

Table A3.9. *Percentage share of sales revenue due to finance major expenditure by reasons for sale, by species and by quintile groups in AP and MP, 2001–04*

States	Livestock species	Income quintile group	Shock variables[a]	Investment[a]	Paying debts /others	Total
AP	Bovines	Poorest 2	38.3	19.3	42.5	100.0
		Richest 3	27.1	25.0	47.9	100.0
		Total	30.0	23.5	46.5	100.0
	Goat/sheep	Poorest 2	22.2	11.1	66.7	100.0
		Richest 3	25.0	25.0	50.0	100.0
		Total	23.1	15.4	61.5	100.0
	Poultry/duck	Poorest 2	100.0	0.0	0.0	100.0
		Richest 3	50.0	0.0	50.0	100.0
		Total	83.3	0.0	16.7	100.0
	Total	Poorest 2	41.7	14.2	44.1	100.0
		Richest 3	27.8	24.1	48.2	100.0
		Total	32.7	20.6	46.7	100.0
MP	Bovines	Poorest 2	14.3	71.4	14.3	100.0
		Richest 3	15.8	68.4	15.8	100.0
		Total	15.4	69.2	15.4	100.0
	Goat/sheep	Poorest 2	16.7	66.7	16.7	100.0
		Richest 3	33.3	44.4	22.2	100.0
		Total	26.7	53.3	20.0	100.0
	Poultry/duck	Poorest 2	50.0	25.0	25.0	100.0
		Richest 3	44.4	22.2	33.3	100.0
		Total	46.2	23.1	30.8	100.0
	Total	Poorest 2	23.5	58.8	17.6	100.0
		Richest 3	27.0	51.4	21.6	100.0
		Total	25.9	53.7	20.4	100.0
Total	Bovines	Poorest 2	31.3	34.5	34.2	100.0
		Richest 3	23.9	37.3	38.8	100.0
		Total	25.8	36.6	37.6	100.0
	Goat/sheep	Poorest 2	20.0	33.3	46.7	100.0
		Richest 3	30.8	38.5	30.8	100.0
		Total	25.0	35.7	39.3	100.0
	Poultry/duck	Poorest 2	75.0	12.5	12.5	100.0
		Richest 3	45.5	18.2	36.4	100.0
		Total	57.9	15.8	26.3	100.0
	Total	Poorest 2	35.1	30.4	34.5	100.0
		Richest 3	27.5	35.2	37.4	100.0
		Total	30.1	33.5	36.4	100.0

Data source: Livelihood options study: Panel survey 2005, ODI.
a. Investment includes: Purchase of assets/inputs.
(Goat and poultry groups in AP should be interpreted with caution because of very few data points. Quintile 3 in this case is very critical, adding weight where we put it.)

Table A3.10. *Shares of each livestock type in gross livestock Income by income quintile in Andhra Pradesh, 2003/04*

Livestock type	Income quintiles[a]				
	Richest	4	3	2	Poorest
Buffaloes	63.6	57.5	20.6	3.6	17.3
Cows	27.3	35.5	47.8	49.6	57.5
Bullocks	6.9	4.9	5.0	7.4	11.5
Calves	0.3	1.4	10.7	1.6	0.9
Sheep	0.4	0.0	10.8	21.6	5.0
Goats	0.3	0.4	5.0	8.4	0.2
Poultry	1.2	0.1	0.1	7.1	6.2
Pigs	0.0	0.2	0.0	0.7	1.2
Donkeys	0.0	0.0	0.0	0.0	0.3
Total	100.0	100.0	100.0	100.0	100.0

Data source: Livelihood options study: Panel survey, 2005.
a. Quintiles are defined based on the 2002 sample survey data on household total income of 2001/02, data on total income are not re-collected.

Table A3.11. *Shares of each livestock type in gross livestock income by income quintile in Madhya Pradesh, 2003/04*

Livestock type	Income quintiles[a]				
	Richest	4	3	2	Poorest
Buffaloes*	68.4	77.7	9.5	52.4	0.0
Cows*	24.8	5.4	6.7	0.0	69.8
Bullocks*	4.8	4.1	0.0	0.0	4.3
Calves*	0.0	0.6	0.3	0.0	0.0
Sheep	0.0	0.0	0.0	0.0	0.0
Goats	1.7	11.3	80.7	34.7	26.0
Poultry	0.0	0.8	2.7	12.9	0.0
Ducks	0.3	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0

Data source: Livelihood options study: Panel survey, 2005.
*Income data was absent to define the quintile group for 6 bovine farms with a relatively larger sales income from milk and so this table is not reliable as because they are not included.
a. Quintiles are defined based on the 2001–02 sample survey data on household total income of 2001/02, data on total income are not re-collected.