

# Livestock – Livelihood – Environment

## The Policy Context and Challenges

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### Synopsis

The multiple contributions of livestock in natural resource based livelihood strategies is very well accepted in India. But the current and emerging trends in the livestock sector such as faster growth in industrial livestock production, involution of crop livestock integrated mixed farming etc. raise increasing concerns as these can cause larger livelihood and ecological implications. These consequences manifest in the form of marginalization of the small holders and the landless, degradation of land and water resources and contribution to climate change, Though there are isolated attempts from the government, NGOs and other stakeholders to address these issues, they are not sufficient enough to bring about a significant change. A second revolution in the livestock sub-sector in less hospitable marginalised areas with primary focus on the resource poor livestock keepers (like the pastoralists, small ruminant rearers and farmers under the informal milk sector) would be required to have an inclusive growth. Further, development and sustainable use of waste /common land through sizeable investment, promotion of ecologically sustainable livestock farming through incentive mechanisms, diverting intensive production system to appropriate areas, control of negative environmental impacts of livestock production through proper policies and environmental regulations etc. are some of the ways to drive livestock production through an environmentally conscious growth path.

### 1. Introduction

With a GDP annual growth rate of 8% (driven mainly by industrial growth of 9% and service sector growth of 9.8%) and inflation around 5%, India ranks today as the world's fourth largest economy in terms of purchasing power parity (after US, China and Japan). Agriculture and allied sectors contribute nearly 18% of Gross Domestic Production (GDP), while about 65-70% of the population is dependent on agriculture for their livelihood. Trends show that the contribution of agriculture to national GDP has been steadily declining from 27.83% in 1994-95 to 17.62% in 2004-05 (Govt. of India, 2004). Juxtaposed against this, the contribution of livestock sector to agricultural GDP has been steadily growing. It was about 22.51% in 1999-2000 and has increased to 24.72% in 2004-05.

Birthal and Taneja (2006) reported that increasing population, urbanisation and sustained rise in per capita income are fuelling rapid growth in demand for animal food products in India. Over the last few decades the consumption pattern of food items in the country has changed dramatically (IFPRI, 2005). Kumar and Birthal (2004) report that between 1977 and 1999 the per capita cereal consumption declined by 20%, while there was significant increase in the consumption of fruits (553%), vegetables (167%), milk products (105%) and meat, eggs and fish (85%). The demand for animal food products is more income elastic, as compared to staples. It is reported that the per capita consumption of milk has increased by 71% in 2000 compared to 1983 (43 kg per annum in 1983 to 73.5 kg in 2000), while poultry meat by 133% (0.3 kg to 0.7 kg) during the same period. Delgado et al (1999) made a prediction that the demand for milk will double and that for meat would treble in India by 2020. The current trends in the animal population are also showing strong signals endorsing the above prediction.

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The smallholders and landless, together control over 75% of country's livestock resources. Evidence shows that smallholders obtain nearly half of their income from livestock (Birthal et al, 2003). So, a rapid growth in livestock production in India has the potential to contribute to poverty reduction. But it is noticed that the livestock sector growth has been mainly contributed by dairy and large scale poultry production. Hence one has to doubt whether the sector growth is inclusive and has any significant developmental impact.

Growth in large scale industrial production, though contributes to economic development, can also produce negative environmental impacts unless properly regulated. Further, increasing livestock intensity on limited land resources causes increased degradation of natural pastures and grazing areas.

The Millennium Ecosystem Assessment (UN, 2006) carried out between 2001 and 2005 under the auspices of the United Nations reports that over the past 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food. These problems, unless addressed, will substantially diminish the benefits that future generations obtain from ecosystems.

In this context, this paper analyses livestock-livelihood-environment interactions from livelihood, food security and environmental perspectives.

## **2. Livestock, livelihood and food security**

The central role of livestock in natural resource based livelihood strategies, particularly that of poor women and men in rainfed regions of India is well acknowledged. It contribute to the livelihood of the poor in many ways – income from products, insurance against drought, emergency cash requirements, tenancy for share cropping, household nutrition, fuel for cooking, manure for crops, draught power for farming etc. (Ashley et al, 1999). The small holders keep livestock mainly on common property resources and free crop residues and use the available family labour for livestock production activities. The dairy cooperative movement started in 1970 could drive a large number of these small holders from livestock as subsistence to an economic activity through marketisation. Today, roughly about Rs 300 million is ploughed back to Indian villages on every single day in the form of milk value payment. But still there are millions of small holder farmers who are unorganized (pastoralists, small ruminant rearers, milk producers under informal segment etc.) and living in marginalised lands who could not participate and enjoy the economic benefits of this massive movement, which has made India the number one milk producer in the world.

2.1. Resource poor dropping out. The data below (Table 1) shows that while the landless livestock keepers are dropping out of the livestock sector, the livestock ownership of large landowners is growing at the fastest rate, giving way to emergence of commercial production systems based on high producing animals and external inputs. The number of cattle and poultry, which are the main contributors of livestock sector growth, has increased significantly among large land holders (with more than 4 Ha) in 2002-03 compared to 1991-92. Poultry production has largely been transformed from a backyard activity to a commercial activity. This commercialization trend is also emerging in the case of dairy.

**Table 1: Average no. of animals per 100 households in India**

	Landless <0.002ha)	Sub-marginal (0.002-0.5ha)	Marginal (0.5-1.0ha)	Small (1.0-2.0ha)	Medium (2.0-4.0ha)	Large (>4.0ha)	
<b>Cattle</b>							
1991-92	196	281	335	340	306	274	
2002-03	200	226	293	318	357	433	
<b>Buffalo</b>							
1991-92	151	190	211	259	287	352	
2002-03	153	197	225	256	286	366	
<b>Small ruminants</b>							
1991-92	335	339	378	427	513	800	
2002-03	153	371	428	443	523	998	
<b>Pigs</b>							
1991-92	337	266	262	267	298	486	
2002-03	177	319	283	233	261	311	
<b>Poultry</b>							
1991-92	641	701	783	816	1138	1029	
2002-03	366	794	876	1025	867	3311	

Source: (i) Govt. of India. 1992. NSS 48<sup>th</sup> round unit level data on land and livestock holdings (ii) Govt. of India. 2002-03. NSS 59<sup>th</sup> round report on livestock ownership across operational land holding classes in India as quoted by Birthal, Jha and Joseph, 2006.

For the landless, size of cattle holding remained unchanged. Average buffalo holding remained stable everywhere. Average number of small ruminants reduced to half in the landless households, remained almost stable on small and medium farms, and increased by 25% on large, 13% on marginal and 9% on sub marginal farms. Scale of pig production improved on sub marginal and marginal farms. Elsewhere, it declined in the range of 13-48%, the maximum being in the landless households. For poultry there was a decline of 48% in the landless and 24% in medium land class, while for others there was an increase, the maximum being for the large landholders.

**2.2. Social impact.** Since the livestock wealth is largely concentrated among the marginal and small landholders in India, it is expected that any growth in the livestock sector would bring prosperity to the small holders. From the perspective of the poor, small animals like sheep, goats, pigs and (backyard) poultry are considered important because of their low initial investment, zero /low input requirement and quick returns to investment on a continuous basis (Birthal et al, 2006). But the trends in the livestock sector provide a picture of how sector growth does not necessarily go hand in hand with poverty reduction. The landless poor are becoming increasingly marginalized (in terms of ownership as well as share in livestock population) with respect to small ruminants, pigs and poultry. There is an increasing exodus of the landless households out of livestock production, mainly because of reduced access to grazing resources, lack of access to non exploitative market and credit & other services. What happened to the poor landless and smallholder farmers who dropped out of the sector is an area to be studied to know the present status in respect of their well-being.

**2.3. Competitiveness.** In the context of changing consumption pattern and rapid increase in the demand for quality meat and milk products, it is assumed that smallholder livestock producers may be displaced by large industrial producers who have the capacity to invest in food quality and safety and sell the products through well organised marketing channels such as supermarket chains. The target of super market chains is the growing urban middle class that are increasingly demanding choice, quality and finished products. This has already happened in the case of poultry and is slowly moving to milk and small ruminant meat sector, majority of which is currently handled by the informal segment. Projections to 2020 indicate that the demand for milk is expected to double in the range of 132-140 million tons compared to 2000 and that of meat would

treble to 8-9 million tons (Parthasarathy Rao et al., 2004). The concern becomes significant in the context of the present system of poor standards of hygiene and sanitation maintained by the informal sector. Super markets depend on regular, large scale deliveries of goods of consistent quality. Small scale producers face a challenge in meeting these criteria. Large quantity of milk and meat marketed in the country is processed through systems of sub standard quality.

### **3. Livestock sector growth and environmental consequences**

The concerns over environmental effects of livestock production in India are of relatively recent origin. It is generally considered that the environmental impacts of livestock production in India have more positive implications than negative ones as the production system is still largely predominated by rural based crop livestock integrated smallholder mixed farming system (Chacko et al, 2006). Emergence of large scale industrial production units, declining grazing resource base, increasing relevance of livestock towards climate change etc. are important concerns around livestock production in the context of sustainability.

3.1. Dryland, livestock intensity and land degradation. About 57% of the land (188 million Ha) in India is degraded in one way or the other. Land degradation is caused by many factors such as intensity and distribution of rainfall, slope of land, type of soil, type of vegetation, grazing interval, frequency of grazing etc. The National Environment Policy of Government of India (GoI, 2006) reports that the proximate causes of land degradation are loss of forest and tree cover, unsustainable grazing, excessive use of irrigation, improper use of agricultural chemicals, diversion of animal wastes for domestic fuel and disposal of industrial and domestic wastes on productive land. It continues to say that insufficient empowerment of local institutions to manage their resources leads to overexploitation of the biomass base. The absence of conducive policies reduces people's incentives for afforestation.

Farmers in India, still continue to keep high number of non descript breeds depending on climate, terrain, soil and ecology. Draught power and manure are pivotal for the poor to cultivate their land as its substitutes are unaffordable for them. Some suggest substitution of bullocks with tractors. While tractors are reported to be viable for cultivation only in units with more than 5 Ha, the size of land holding of 70% of farmers is less than 3 Ha. In some situations, ownership of draught power is essential for sharecroppers to secure a tenancy. These may be the reasons why there is no significant reduction in the work animal population (62 million bovines in 1997 and that in 2003 is 60 million). From an ecological point of view, the replacement of bullocks by fossil fuel based tractor has both pros and cons. There are no adequate studies in the Indian context.

The grazing intensity of livestock is a matter of serious concern in arid, semi arid India as the livestock intensity is higher and bio-physical conditions are weak in these dry lands. Growth of livestock population in India is almost static during the period from 1997 to 2003 (485.39 million in 1997 and 485 million in 2003). Though there is no change in the population, there is a steady decline in common grazing lands both in terms of area and quality. More than 80% of resource poor households depend on common property resources for the fodder requirement of their livestock. Several studies (Jodha, 1992, FAI, 2002) show that there is a decline in the area under permanent pastures and grazing land from 1950 onwards because of privatisation, encroachment, distribution of land by government to the poor, requirements of real estate conversion into national parks and sanctuaries etc.

The qualitative decline is due to improper management, unregulated land use, over grazing and lack of reseeding of pastures. In rainfed areas, the present stocking rate is 1-5 adult cattle units (ACU) /ha against the permitted rate of 1 ACU /ha, while in arid zones, the stocking rates are 1-4 ACU /ha as against 0.2-0.4 ACU /ha (Shankar and Gupta, 1992). It is estimated that about 100 million cow units graze in forests against a capacity of 31 million. Pastoral system is putting more pressure on the limited land available. It is argued that one of the reasons for deforestation is uncontrolled grazing of livestock in forest land. This is always a contentious issue.

The LEAD study (CALPI-IWMI, 2005) conducted in five semi-arid watersheds in India revealed that common grazing land in most of the villages studied are under various stages of degradation. Here, the grazing lands are used as open access resources without any control on the intensity of use. Insecurity of user rights refrain villagers from investment in biomass development. It has also indicated that wherever management systems are in place, land quality is improved even in places with high aridity.

The grazing areas if overused would modify the physical and hydraulic properties of soils and ecosystems. When vegetation cover declines, soil organic matter content and soil's infiltration capacity reduces. When soil layers are compacted by trampling, porosity and level of infiltration reduces. Compaction occurs particularly in areas where animals concentrate, such as water points. Under heavy grazing pressure, plants may not be able to compensate sufficiently for the phytomass removed by grazing animals. When soil is exposed due to over grazing, carbon in the soil will escape as CO<sub>2</sub>. The degree of land degradation also has an effect on the amount of water pollution. As plant cover is reduced, run off increases and hence transport of nutrients to water courses increases.

So far no realistic estimation exists of the extent of land degradation due to over grazing' as this is difficult to quantify because of its complexity and lack of easily measurable land quality indicators. Therefore the magnitude of livestock associated land degradation is not yet established.

3.2. Industrial production and environmental impacts. In India, mixed rainfed systems are practiced on 46% of land and mixed irrigated system on 37%, where cattle or buffalo forms the second or third largest economic activity (Parthasarathy Rao et al, 2004). However, currently the mixed farming systems are undergoing a gradual transformation to industrial system due to increasing pressure on livestock to produce more to meet the growing food demand (Birthal and Taneja, 2006).

The grain based intensive system, though efficient in terms of output per unit of input, is less efficient in terms of energy. Large amounts of fossil fuels are burnt to produce meat /eggs under the intensive system. There is also a decline in recycling of farm yard manure due to lack of integration. This necessitates increased use of inorganic fertilizers in a soil which is already overdosed with chemical fertilizers. This affects the soil quality, soil health, water holding capacity and infiltration.

Poultry is one of the fastest growing segments of the agricultural sector in India. The broiler industry in India is growing at about 15% per annum. Fast growth in the commercial poultry sector has serious environmental, social and health implications. The main feed ingredients for poultry production are grains. Maize constitutes 50-55% of broiler feed. Increasing demand for grains will create pressure on land to cultivate (or /and import) feed grains, which will ultimately compete with grain production for human consumption (currently India produces only 11 million tons of maize, of which 5 million tons are used for poultry sector).

Another important consequence of intensive system (or shifting away from crop livestock integrated mixed farming system) is its impact on **water use efficiency**. Animals need much more water than grain to produce the same amount of food. Globally, a kilogram of lamb from a sheep fed on grass needs 10 cubic meters of water. Whereas a kilogram of cereals needs only 0.4 to 3.0 cubic meters (Inforesources-Focus, 2006). This is endorsed by a much discussed study conducted to estimate irrigation water productivity of dairy animals in Gujarat (Singh et al, 2004), which found that 1,900 to 4,600 liters of virtual water (total volume of water directly and indirectly used to produce a commodity) was used to produce one litre of milk. A large share of this water is used to produce livestock feed. But this is one extreme that requires a thorough analysis as one has to consider multiple contributions of livestock.

The IFPRI-FAO study conducted by Mehta et al (2002) shows that there are bio-security issues associated with industrial poultry production in India such as polluted water, soil toxicity, wastage disposal and health hazards, especially when the production units are located too close to densely populated areas. Soil toxicity occurs when there is a build up of nitrogen and phosphorous in the soil deposited through manure over a period of time. Farms close to population centers and watercourses produce ecological harm due to over concentration of nutrients and human health issues. The same thing will happen in rural industrial units as well if the wastes are not properly handled /managed. It is reported that 250 chickens produce about 135 kg of Nitrogen and 95 kg of Phosphorous per year. Water pollution may occur if nutrients from manure enter the water course, especially when there is rain.

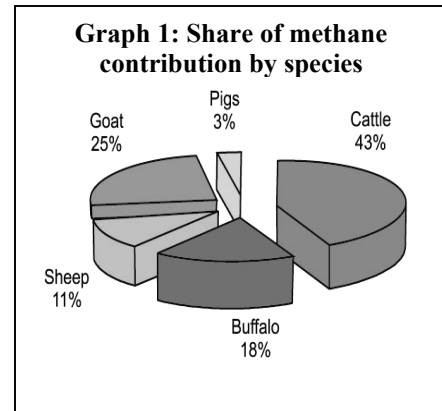
Issues from industrial dairy /piggery production units will also cause similar threats to the environment. Here the issues will be all the more serious as manure is produced in liquid form. Unlike in the case of poultry, the manure can easily enter water bodies, unless strict precautionary measures are taken.

3.3. Methane emission and climate change impacts. The important green house gases (GHGs) associated with livestock are methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O) and carbon dioxide (CO<sub>2</sub>). Methane gas is 21 times and N<sub>2</sub>O is 310 times aggressive than CO<sub>2</sub> in contributing to climate change. The green house gases trap reflected solar radiation in the atmosphere and make the planet warm. Presently the GHG concentration in the atmosphere is 460 ppm CO<sub>2</sub>-eq. This is estimated to increase to 550 ppm by 2020 under 'business as usual' situation. The global increase in carbon di oxide concentration are primarily due to fossil fuel use and land use change, while those of methane and nitrous oxide are mainly due to agriculture (IPCC, 2007). A rise in CO<sub>2</sub>-eq level of 100 ppm would result in an increase of temperature of 1<sup>o</sup>C. There will be 5% reduction in rice yield for every 1<sup>o</sup>C rise in temperature above 32<sup>o</sup>C as it causes spikelet sterility. The potential effects of climate change on agriculture are yet uncertain and could be positive in some respects and negative in others. At the regional level, changes in precipitation and temperature patterns could jeopardize current agricultural practices.

Warming will have many severe impacts. Rising sea levels will result in displacement of millions of people. The impacts of climate change are not evenly distributed. The poorest countries and people will suffer earliest and most. The frequency of extreme weather phenomena like floods, droughts, severe storms may perhaps increase, sea levels could raise threatening vulnerable coastlines around the world, and tropical diseases and pests that affect plants and animals could increase their range (Stern, 2006).

NATCOM (India's National Communication to UNFCC on Climate Change) has estimated that India's contribution to GHGs in 1994 is around 1228 million tons CO<sub>2</sub>-eq, which is 4% of global GHG production. Out of this, 65% are contributed by CO<sub>2</sub>, 31% by CH<sub>4</sub> and 4% by N<sub>2</sub>O. Out of the total quantity of methane produced in India, emission by livestock due to enteric fermentation is the highest (49% - 188 million tons CO<sub>2</sub>-eq) followed by rice fields (23% - 86 million tons CO<sub>2</sub>-eq). Methane produced from manure (5% - 20 million tons CO<sub>2</sub>-eq) is relatively less (Natcom, 2004).

India has the highest density of cattle and buffaloes as well as small ruminants, reared under extensive system – small herds in large numbers dispersed over a vast area. Also livestock is fed poorly under this type of rearing – inadequate rations based on feeding less digestible crop byproducts and grazing on poor quality rangelands. These conditions are most conducive for release of high levels of methane via enteric (in rumen) fermentation into the atmosphere. The share of methane emission by different species of livestock is given in Graph 1.



**Burning of biomass.** In the western part of the Indo Gangetic region large amount of straw are left in the fields due to mechanized harvesting which are to be removed for agronomic or management reasons. Farmers normally burn the straw (over 70% of rice straw and 50% of wheat straw produced in the region are burnt) in the field itself as an easy solution (Parthasarathy Rao, 2003). Burning results in loss of valuable organic carbon necessary to maintain soil health and it also increases green house gases in the atmosphere and contribute to environmental pollution.

Accumulation of the green house gases in the atmosphere also leads to damage of the protective ozone layer that filters sun's UV rays, thus preventing them from reaching earth. This in turn has deleterious effects on climate and thus on agriculture and human life.

## 4. Policy context and challenges

**4.1. Promoting sustainable land use.** Degradation of natural resources is both a cause and a result of poverty. We need to conserve the natural resources for meeting the requirement of future generations. Pastoralists derive food security from dry lands that do not have alternate uses and their animals contribute organic matter to the soils. But long term sustainability of such systems is under question. If farmers in dry land are engaged in an activity that provides immediate food needs BUT results in degradation of the environment, one has to give them alternate 'sustainable' livelihood options (that are environment friendly). Livestock development at any cost should be discouraged and we should not act as livestock lobbyists. The trade offs between poverty and environmental degradation can be minimised if food security is ensured.

Investment support for an integrated development in waste lands /CPRs with backward forward linkages is an option (CPR for fodder production or for other innovative activities that would produce higher benefits to the same communities is an idea to be deliberated upon). Government of India's latest announcement of formation of a **National Rainfed Area Authority** to replicate the Green Revolution in less hospitable, marginalised areas and bring about food security to the poorest of the poor is a positive step in this direction. Presently, livestock are not included as an important component under the envisaged programme. The successfully demonstrated dairy cooperative model may be suitably modified without losing its spirit and the essence (ownership in the hands of farmers + backward forward linkages) and replicated in a massive way in the less /unattended areas to primarily benefit the landless and poor smallholders namely, the pastoralists, small ruminant rearers, farmers under informal market channel etc.

It is to be realized that the demand for livestock products will continue to increase and one cannot limit its use. At the same time, we need to reduce the pressure on the environment. That means we need to produce more from less number of animals. This is possible by improving their efficiency. If smallholders can successfully do this, they can be benefited from the expanding market for animal products. Chacko and Schneider (2005) reports that one can improve productivity of livestock (whether judged based on efficiency or yield) through many ways such as feeding, management, health care and genetic improvement. The genetic progress, once made is permanent in nature. But making this happen in animals that are living in harsh dry land environment is the big challenge before us.

SDC-IC's successful experience of converting low productive milk sheds of Kerala (Malabar region) into a surplus state demonstrates the possibilities of income and food security from dairy farming in marginalised areas. This was also replicated in North coastal Andhra, Ganjam and Gajapati districts of Orissa and more recently in Sikkim where a farmer controlled processing plant (although small scale) has successfully become a part of India's most valued dairy brand (Amul Gouda). Such actions could become path breaking ventures and lead to a **second revolution** in the livestock sub-sector (first is Operation flood), leading to **inclusive growth**. This needs the involvement of all stakeholders and public private partnership models could drive this process..

Innovative mechanisms like (IES) "**Incentives for Environmental Services**" can be tried to reverse land degradation on a financially sustainable basis. India through various watershed development programmes (Dry Land Development Programme, DPAP, IWDP, Combating Desertification Programme, NWDPRP etc.) spent nearly about Rs 94200 million (covering 32 million Ha) for the same purpose. But

sustainability of the efforts after the project period is still an unresolved issue. Market based mechanisms like IES is reported to be financially sustainable as it could mobilize resources from national, international governments, commercial users and private industries towards ecosystem services (water, carbon and biodiversity), which are used to pay **incentives to farmers /communities** who produced those services in public and private land (Inforesources-Focus, 2004). This can be pilot tested in India.

Empowerment of local institutions and communities to manage their natural resources is an area to be given high priority. Similarly, it is essential that the relevant sectoral policies take explicit account of their unintentional impacts on land degradation, if the fundamental basis of livelihoods for the vast majority of our people is not to be irreparably damaged (Gol, 2006). Steinfeld et al (2006) through their global assessment of livestock environment interactions identified that land degradation can be limited and reversed through soil conservation methods, silvopastoralism, better management of grazing systems, limits to uncontrolled burning by pastoralists and controlled exclusion from sensitive areas.

**4.2. Promoting ecologically sustainable farming.** We need both roughage based small holder production system and grain based industrial system to cater to the needs of the State. Farmers should be paid adequate incentives to promote rural based crop livestock integrated mixed farming system. This would prevent the growing shift from mixed farming and motivate farmers to turn to organic. At the same time, the intensive system needs to be diverted to appropriate areas and the negative environmental impacts need to be controlled through proper policies (removal of subsidies, for instance) and strict enforcement of regulations (distance from cities, manure management, effluent treatment etc.) to have an environmentally conscious growth path. As a long term strategy, proper valuation of environmental costs and **internalisation of negative environmental externalities in the commodity prices** can be planned to promote sustainable use of natural resources. Practical ways of doing this are to be developed.

**4.3. Reducing methane emission.** There is a strong case for taking steps for reducing enteric methane emission from livestock through technical interventions such as supplementation, fibre fortification, fibre pelletisation and improving genetic ability of animals for higher feed conversion /fibre digestion efficiency. Innovative mechanisms need to be developed for wider adoption of these technologies as most of the earlier works related to this were either not so successful or remained as a lab technology. Since CH<sub>4</sub> loss by livestock means 8-10% loss of energy to the animal, any step taken to reduce enteric methane emission are bound to improve animal condition and production. Incidentally, such steps are also the ones for improving productivity of livestock. This would eventually help in reducing the livestock number to some extent.

**4.4. Green accounting.** There is a need for an empirical basis on which calculations can be made to capture environmental damage due to development efforts. Currently the figures on GDP growth rates do not capture many vital aspects of national wealth such as changes in the quality of environment. There is no system of adjusting GDP for the depletion /degradation of natural resources at the cost of development. It is argued that if environmental externalities are taken into account, the contribution of agriculture to GDP will be 2-3% less than the present GDP (Haripriya, 2000). Indonesia is probably the first country to integrate forest depletion into the GDP (called "green GDP" or "Environmentally adjusted GDP"). Let us hope that India also develop similar

mechanisms for internalising the negative externalities and allocate more budget for environmental development in view of having a healthy environment both for the present and future generations to come.

**4.5. Need for new policy paradigm.** Presently, world over there is a shift away from sectoral development. We now look at livestock not as production instruments. We see livestock in the context of vulnerability, in the context of water, in the context of nutrition. The issues of livestock farmers cannot be confined to a particular sector. They cut across many sectors. Hence there is a need to have a holistic view and a collaborative effort to have a pro-poor, pro-environment development, which will produce an inclusive and sustainable growth.

The work done by the **Swiss Agency for Development and Cooperation and Intercooperation** through the LEAD Initiative in India is a good example of influencing frame conditions in favour of ecologically sustainable livestock production process. The basic LEAD studies in India were carried out through an intense collaborative, multi-stakeholder consultative process involving government, research institutions, NGOs, farmer communities etc. Apart from the study findings, the 'inclusive' consultative approach helped in creating awareness on livestock associated environmental issues among all stakeholders and developed a desire for collaborative action. It created informal networking and a conducive environment for change. Many non livestock, non environment organisations (IWMI, TERI, CEE etc.) started including livestock environment interactions in their agenda. The LEAD initiative could influence the newly proposed 'Neeranchal' watershed guidelines, which suggested to strongly integrate livestock as an active component in the watershed development programmes and high emphasis is given for sustainable use of CPRs for livestock.

IC currently provides thematic backstopping support to a new programme of SDC on 'Vulnerability Assessment and Enhancing Adaptive Capacity to Climate Change in Semi Arid areas'. The project seeks to test several hypotheses to improve adaptive capacities of households in pilot villages in Rajasthan and Andhra Pradesh. One of the significant hypothesis being tested is the role and potential of better management practices of both livestock and private and common pasture lands to enhance livestock based coping strategies in the face of erratic and uncertain rainfall. The project is being implemented by local NGOs, the outcomes and experiences will be shared at a policy workshop towards the end of 2008.

These are only a small examples where collaborative effort beyond sectoral boundaries created a good impact on policies. Efforts of such nature should continue in a big way in the years to come.

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