

Report on the “Role of education in addressing Livestock, Environment and Development issues” workshop

held on the 25th and 26th November, 2007

Introduction

Dr. Mohanan of CEE, Kannur, inaugurated the session and introduced the audience to the workshop, chair and the panelists.

The objective of the south-South consultation is to exchange experiences, ideas and strategies addressing livestock-associated environmental issues. It aimed to bring out recommendations for improving the livestock sector keeping in mind environment and development concerns in making policies and enforcement of regulations.

Livestock have been blamed for land and environmental degradation more today than before because of the methane emitted by it contributing significantly to global warming. A global initiative was started as organisations withdrew support for developmental activities on livestock. This programme was aimed at promoting and conducting multi-disciplinary R & D on Livestock Environment Interaction issues and increase awareness among key stakeholders. The programme also supports decision makers by providing specific decision making tools (guidelines, options, tool boxes etc.). These objectives are achieved through regional platforms in five languages.

Rationale

The South-South Consultation will address the sustainability of the livestock production sector in the present context of changing trends such as the large-scale industrialisation of production and processing systems. With climate change being the burning global environmental issue today, the contribution of livestock to the phenomenon has given it a bad reputation. This sector has its own issues with rising land degradation, water depletion, pollution and problems caused by antibiotic residues. Little acknowledgement is made of the positive and supportive role in the livelihood options that they provide through products like milk and meat as well as the benefits in land management. The dung and urine they produce are valuable as good sources of manure for farmlands. They also help propagate certain plant species that are specific to a region. What needs to be done is balance the positive and adverse impacts of the livestock system. The redefinition of the role of livestock in the sustainable development of a region is the need of the hour.

This workshop addressed these issues and also the some of the hotspots identified by the platform. The focus will be on understanding the issue in varied geographical contexts and share experiences and learning among the participants.

The consultation was based on 5 sub-themes -

1. Livestock-land issues
2. Livestock-forest issues

3. Livestock water issues

4. Industrial livestock production-issues

5 Livestock-biodiversity issues

The workshop had:

- Panel discussions for each identified sub themes, with subject experts as panelists
- The panel will moderate the discussions at the end of presentations under each sub-topic.
- A concluding plenary session to address all related issues, consolidate learnings and chalk out future steps and opportunities.

The conference aimed for the following *outcomes*

- To gain a better understanding of the livestock production systems with focus on its impact on the natural resources and ecosystems - land, water, forest and green house gases (GHG) emissions.
- Publication of the conference proceedings with the papers presented at the workshop
- To gain a better understanding of the issues, knowledge gaps and opportunities to be explored will be developed.
- Establishment of a South-South Network for future interactions.

A panel discussion and a general discussion were held during the consultation and general recommendations were formulated. These recommendations would be a part of the compilation of recommendations that the conference secretariat would publish.

Presentation 1: Shailendra Tiwari of Seva Mandir, Udaipur presented a paper on “Livestock- Land Perspective Issues, Challenges and Way Foreword”. He first discussed the change in the populations of various livestock species according to the Livestock census of 2003. While there has been a decline in the cattle population between 1992 and 2003, there has been close to 60% increase poultry population.

India has 17% of the total livestock of the world on just 0.5% of the world’s surface area. This area constitutes only 4.2% of the total land use area. He commented on the livestock density based on the studies carried out by FAO in 2006.

He then discussed the availability of grazing land from 1947 to 1997. While the CPR (common property resource) Land has reduced to less than half, forest and protected area land has increased. However the total land available for under these two categories has reduced by nearly 30% whereas the population of livestock has increased by about 60%. This has obviously put pressure on the water and other resources available within an area.

As for the present stocking rate in rain-fed areas, it is 1-5 adult cattle units (ACU) /ha against the permitted rate of 1 ACU /ha. However in arid zones, the stocking rates are 1-4 ACU /ha as against 0.2-0.4 ACU /ha. Forest areas are overgrazed with 100 million cow units grazing in forests against a capacity for 31 million¹.

He said that the reasons for shrinking common resources and grazing avenues are –

- Privatization and encroachment

- Distribution by the government to the landless, poor and others
- Conversion for settlement and real estate
- Conversion for National parks and Sanctuaries
- Allotment for energy plantations

Depleting CPRs and grazing avenues cause consequences like expansion of crop and grazing lands into forest and protected areas. Natural habitats are destroyed, deforestation and land degradation increase while wildlife-livestock conflicts are exacerbated and biodiversity is lost.

The other side of the impact of livestock can be seen in the positive effect acting as a source of livelihood – it provides for 60% of marginal farming households and 11.24% landless households. As a part of the crop livestock system they maintains the agricultural cycle. They fertilise, regenerate grazing land and forest land and maintain ecological balance.

To manage the situation a Massive Watershed Development programme has been launched by the Government to, conserve, up-grade and utilize natural endowment (esp. land and water) in an integral manner. According to Mr. Tiwari, these efforts should be geared to enhance availability of fodder, timber and other biomass to meet growing demand of human and livestock population in rural areas. These watershed projects however, need to consider livestock as well in their objectives. In this regard the LEAD programme has tried to understand the Livestock-Livelihood and Environment triad through research.

What was found about Land through this programme was that the highest livestock holdings are in areas with lowest biophysical potential. Livestock keepers in arid areas tend to rely more on common property resources. Encroachment of common lands is found to be a serious problem and the problem is accentuated by a lack of proper law enforcement mechanisms. Institutional and governance mechanism is also at the village level.

Livestock are not only indispensable for the livelihoods of the poor they are the last resort in times of drought. Mr. Tiwari said with adequate community participation, proper institutional set up, external facilitation and appropriate technical and social planning, a positive livestock-livelihood-environment interaction can be achieved even if in some places. At certain places, the watershed development has led to change in livestock composition, leaving both positive and negative consequences on livestock species and the communities dependent on them.

Mr Tiwari suggested that the way forward would be that the concerned authorities understand the plight of small holder livestock keepers. According to the National Commission of Farmers, 2006, the livelihood of pastoralists and small holders are threatened by progressive loss of grazing lands. Small holders also suffer on account of obstructive mechanisms and harassment by the revenue bureaucracy. They thus cannot access public land resources which they depend on²

The Planning Commission recommends that traditional grazing and camping rights in forest areas be restored. Alternate grazing areas may be provided in the case of forest plantation, alternate grazing area to be provided. It suggests that livestock keepers and pastoralists be involved in all local NRM programmes and Village Forest Protection committees.

As a civil society initiative, the LEAD India Platform under support from CALPI trying to promote pro-poor, pro environment sustainable livestock production can help ameliorate problems in this area.

Presentation 2: In his presentation of a joint paper with Don Pedan and Girma Taddese, Mr. Amare Haileselassie, spoke about the concepts and practices in livestock -water productivity. He discussed the changing context wherein availability of water resources would be uncertain. Water sustains the environment and livelihoods of people. With increasing population, the related production and consumption of livestock products would also increase. At the current rate of population growth, it is expected to reach 9 billion by the year 2050.

Overall the percentage change in consumption of livestock products between 1997 and 2020 is expected to increase both of meat and milk across developed and developing nations. During the same period, the production of milk is expected to increase much more in developing countries.

The implications of this changing context is that feed and water requirements would be under pressure from a growing population, market forces, rising diet expectations, rising diet expectations and also climatic factors. Meeting these demands would require improving water productivity managing water consumed through food, by drinking and my increasing livestock-water productivity. Counter measures also need to be taken up for the rising diet expectations.

He explained livestock water interactions from the scale of fields and farms to large river basins. While most of the water available from rain and surface inflow is lost or depleted by transpiration and non-productive depletion in a hypothetical agro-ecosystem boundary, a small percentage of it seeps into the ground. Transpiration happens through pasture, feed crops, food crops and through trees. Evaporation, discharge and flood, and contamination account for the non-productive depletion.

Livestock-Water Productivity (LWP) is an indicator of healthy livestock water interactions and is defined as the ratio of beneficial livestock outputs to water depleted. LWP can be applied to evaluate the

- impacts of livestock on different flows,
- selection of different strategies for different systems,
- complementary & trade offs

There were 4 cases taken up to research on LWP by the team and all of them were based on the Ethiopian scenario. In the first case the water productivity in different systems was compared.

System & Scale	Commodity	WP (US\$/m³)
Rainfed mixed crop-livestock	Multiple animal products & services	0.68
Water harvesting & drip irrigation	Tomatoes	0.73
Rainfed grain production	Teff	0.28
	Barley	0.18
	Wheat	0.18

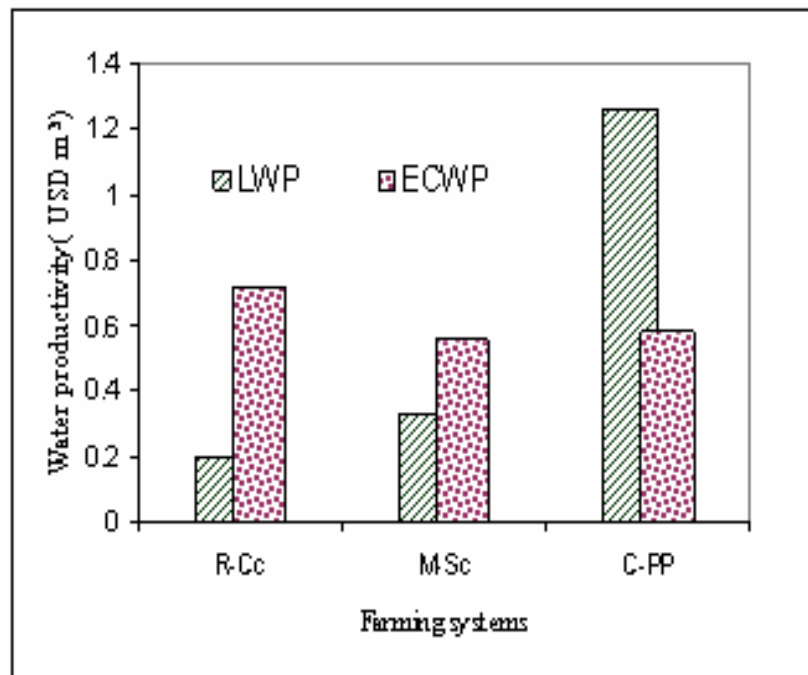
Source: LWP from ILRI; Grain WP from ECSA (2005); Tomato WP from SG2000.

Water harvesting was studied in the second case.

Most households are poor with an income of less than USD 300/year. Their water needs are met by rain water. They have to make long treks to obtain water for people and animals. Consequently, milk production is less than 3L/day/cow.

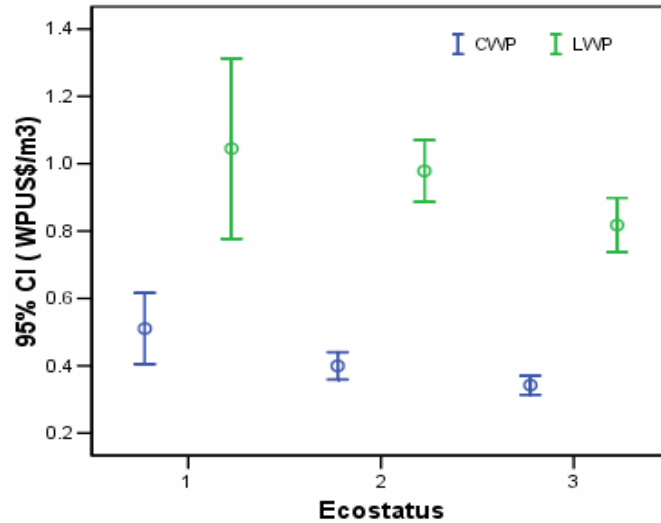
In case three, the Crop-Water Productivity across farming systems was studied in the Nile basin of Ethiopia.

Farming systems	Crop groups	Area (ha)	CWP
			(kg m ⁻³)
<i>Rice-based cash crops</i>	Rice	5378	0.6
	Teff	2201	0.2
	Pulses	5300	0.6
	Onion	67	1.5
	Garlic	21	0.9
	Grass and	6442	0.6
<i>Maize-small cereals</i>	Sorghum	6587	0.3
	Millet	14169	0.5
	Teff	29400	0.4
	Maize	15040	0.5
	Wheat	3184	0.2
	Potato	176	1.8
	Grass and	8312	0.7
<i>Cereal-pulses-potato</i>	Barley	2811	0.4
	Wheat	787	0.2
	Triticale	4667	0.4
	Pulse	2138	0.2
	Potato	2811	1.5
	Grass and	1579	0.6



LWP & CWP across different farming systems (R-cc, M-sc and C-pp stands for rice based cash crops, maize–small cereals and cereals-pulse-potato farming systems respectively)

In their fourth case study, the team studied LWP across socio-economic classes in the Nile basin of the Ethiopia.



1 - rich

2 - medium and

3 - poor

The study gave an understanding of the water productivity, LWP, CWP and the LWP across socio-economic classes. The study found that

- integrating livestock & water development can result in increased livestock water productivity. The overall LWP compares favourably with CWP even without efforts to increase LWP. There is, however, a need for improved methods and filling in of gaps in data.
- LWP was found to vary with the livelihood of farmers and biophysical settings. Therefore intervention for improving LWP must consider these factors as well.
- A positive relationship was found between water productivity, which includes LWP and CWP, and a farm household's access to resources.
- The poor can be empowered by providing for diverse livelihood options as their dependence on just livelihood on resource-demanding livestock would be reduced. 'Empowering' the poor (e.g. the diversification of livelihoods)

The team felt that there is a need for more research on livestock-water productivity and where we stand in this regard.

"The frog does not drink up the pond in which he lives" Indian proverb

Presentation 3: In the second session **Dr C T Chacko** presented his paper on the **Shift to industrial livestock production in India - its environmental, social and health consequences and responses**. He set the background by explaining the livestock scenario in India. Agriculture & allied sectors in the country contribute to nearly 18 % of GDP. India being an agrarian country, a majority of the population (65-70%) depends on agriculture for

their livelihood. Over the years, a sustained economic growth, rising incomes and urbanisation have increased the demand for animal source foods.

The objective of his paper he said we to examine the factors driving livestock production over the last 25 yrs and the production trends. He studied the environmental, social and human health consequences of production changes. His paper has sought to understand the public & private responses, mechanisms to address the consequences and the lessons learnt.

The livestock production in India is present in the widely distributed small holdings and 56% of rural households own some kind of livestock. The emergence of large-scale livestock production seen in recent times could be an environmental threat if not properly managed.

What has driven these changes is the human population growth which is expected to shoot to 1,395 m by 2025, and 1,593 by 2050. Added to that, India is urbanizing at the rate of 2.5% per year which means that cities over million may double to 70 by 2025. While the urban population has grown at 3%/yr the rural population has grown at just 1.7% between 1981 and 2001. Most of the demand for livestock products, he observed, is from the urban population. Among them a large middle class population is emerging and is expected to reach 180 million by 2010. Along with and increase in consumption of food of animal origin, where the consumption of milk has increased by 105%, meat, eggs and fish by 85%.

The changes in the livestock sector have therefore been effected from an increase in human population, changes in the production systems and productivity. The favourable climate for livestock production has been set by the government's trade liberalisation policy propelled by a rapid growth in the livestock sector. The consumption of milk in rural areas has risen faster than it has in urban areas and the overall demand for milk is expected to double in the range of 180-190 million tons. India has a competitive advantage in livestock production

The population of livestock has shown the following trend -

Species	1982	1992	2003	Growth /yr % (82-92)	Growth /yr % (92-03)
Cattle	192.5	204.6	185.2	0.59	-1.15
Buffalo	69.78	84.21	97.9	1.71	1.54
Sheep	48.76	50.78	61.47	0.40	1.91

Goat	95.25	115.3	124.36	1.74	0.80
Pigs	10.07	12.79	13.52	2.13	0.59
Poultry	207.7	307.1	489.01	3.23	4.09

The livestock production in “mio MT” during 20 years from 1985 to 2005 is shown below.

Product	Year					Change
	1985	1990	1995	2000	2005	
Milk	44.0	53.7	65.3	80.8	96.2	118%
Beef & buff meat	1.9	2.4	2.7	2.9	3.0	58%
Sheep & goat meat	0.5	0.6	0.7	0.7	0.71	42%
Poultry meat	0.19	0.4	0.6	1.1	2.0	952%

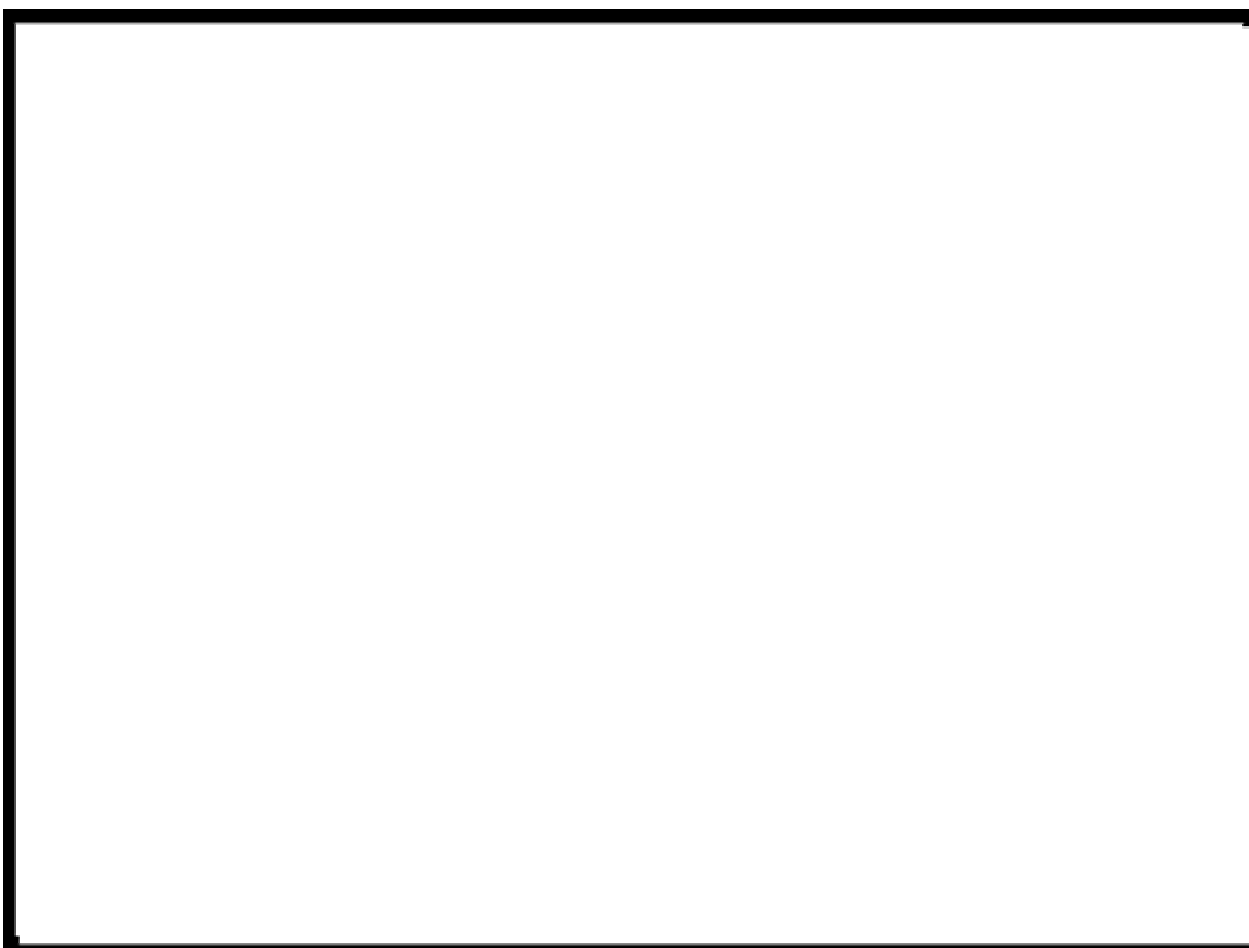
The growth in production has been very impressive according Dr Chacko with poultry meat showing 46% increase, eggs 9% and milk an increase of 5.5%. He said that increased productivity was instrumental to increase production.

Species/yr	Milk/egg yield (kg/year)		%milked/ laying	
	1990	2005	1990	2005
Cattle	732	1000	15.0	21.2
Buffalo	1122	1450	32.1	34.9
Chicken	10.1	11.6	39.1	42.7

Productivity

Species/yr	Milk/egg yield (kg/year)		%milked/ laying	
	1990	2005	1990	2005
Cattle	732	1000	15.0	21.2
Buffalo	1122	1450	32.1	34.9
Chicken	10.1	11.6	39.1	42.7

Milk production



Geographic shift

	1992		2003	
	Rural	Urban	Rural	Urban
Cattle	195.9/96%	8.7/4%	175.6/95%	9.5 /5%
Buffalo	79.9/95%	4.3/5%	91.9/94%	6.0/ 6%
Sheep	48.9/96%	1.9/4%	58.0/94%	3.5/6%
Goat	109.4/95%	6.0/5%	117.5/94%	6.9/6%
Poultry	282.7/92%	24.4/8%	449.1/92%	39.9/8 %

There has been a shift from rural to urban areas in the livestock population from 1992 to 2003.

Shift in producer categories

Sp/Farmer	Large	Medium	Small	Landless
Cattle	+100%	+17%	- 6-20%	0%
S Ruminants	+25%	0%	0%	- 50%
Poultry	+ 110%	+ 55%	- 24 %	- 48%

Here the trend shows that there has been a substantial increase in the medium to large producer categories while there has been a decrease in the small producer category. No change is seen in the medium and small producers of small ruminants.

The study showed that there have been changes in production systems where mixed farming systems for large ruminants are undergoing a steady transformation because of an increasing pressure to produce more. Poultry production has largely been transformed from what was a backyard activity to a commercial one.

The environmental impacts of livestock are mostly positive, according to the study. However, land degradation, social issues, impacts on human health through the spread of disease and pollution are associated problems.

The consequences of this change in production systems and productivity are that it has had an effect on the social well-being, the environment and the health of both livestock and humans.

Socially, the growth in production did not help reduce poverty and the landless are becoming increasingly marginalised. As a result, they have increasingly been abandoning livestock production.

Smallholder producers have been displaced by industrial producers because of their greater capacity to invest in food quality, safety and to sell through organised marketing systems.

There is an increasing grazing pressure in arid and semi-arid dry lands. An involution on mixed farming is observed in input-intensive areas. At the same time there is pressure on land to cultivate more grain. The slaughter of poultry at sale point pollutes the area and ruminant livestock produce GHGs that contribute to climate change. These are the environmental damage the increase in livestock production and productivity have caused.

Increased production has taken a toll on the livestock as there is a dearth of adequate slaughtering facilities and techniques. Livestock are routinely injected with medicines to control disease. Cases like the Avian flu outbreak are a serious hazard to human health as well as that of poultry itself.

Response

The Livestock revolution is bound to polarize the inequality between rich and poor. This could lead to social tension. With the rapid growth in production, there are doubts of whether smallholders can play a significant part in the livestock enterprise. They would be put to a disadvantage by the large-scale producers that have found a market because of a rise in demand.

The study predicts the emergence of three scenarios. In one of them, the increased demand is met by large-scale industrialised units. In the second scenario, small scale developers would develop livestock production that can satisfy the demand and the possibility is that there is a harmonized combination of the first two scenarios.

Intensive industrial production may be a necessary evil for faster growth of livestock sector economy but it can lead to several problems. The high concentration of animals pollutes the surrounding area and gives scope for many zoonotic diseases (diseases which can be transmitted between animals and people). Large-scale producers would also marginalise small-scale producers as they have better access to larger markets and resources. Since most of the rural population comprises small-holder, this would snatch their employment from them.

Conclusion

The increase in human population together with a rise in demand for animal-sourced foods has increased the demand and as a result encouraged large-scale livestock production. The matters of concern with industrial production are the environmental and water pollution, social issues, human health problems, lack of adherence to regulations.

Dr Chacko suggested that spreading awareness at all levels about livestock is necessary to...

The law needs to be enforced on ... and changes in the law and its enforcement need to be made with the participation from all the stakeholders. Additionally, production units need to be decentralised so that smaller units and individuals have greater control over resources as they are likely to manage it more sustainably.

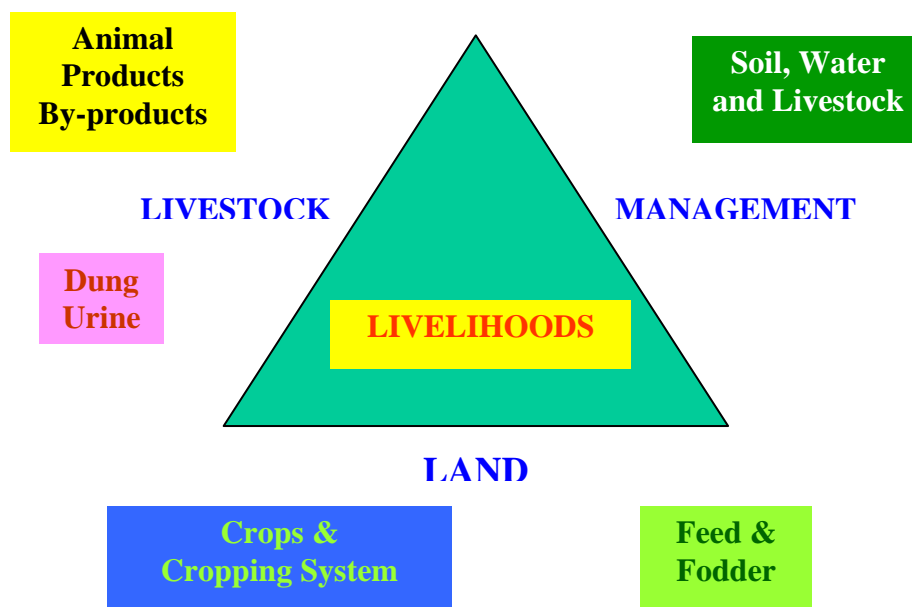
The government can promote smallholder production systems that satisfy consumer's requirements (quantity & quality). It needs to develop policies, infrastructure and vertical integration for private investment and interventions in the livestock sector. The government needs to apply the "polluter pays" principle of Agenda 21 in its policy formulations and impose stricter rules and regulations related to environmental issues.

References:

(1) Chako, 2006 and (2) draft NLPP, 1996).

(2) Prathasarthy committee on Watersheds in India, 2006

Presentation 4: In his open presentation, **DBV Ramana**, presented a joint paper with **Mr. M. Osman** and **Mr Y. S. Ramakrishna** of Central Research Institute for Dryland Agriculture titled "***Livestock-Livelihood Interaction: Sustainable Management of CPRs and PPRs under Watershed Programmes***".



Livestock-Land-Livelihoods Interaction

The central benefit of livestock is the livelihood it generates. Livelihood is generated indirectly depends on the land as livestock depends on it for fodder. Livestock produce animal products, byproducts, dung and urine. Animal feed and fodder, soil, water and the livestock themselves need to be managed to sustain livelihoods. The management of crops and cropping system too are important factors in the interaction between these three factors.

It is estimated that India has about 15% of world ruminant livestock population on just 2.4% of world's geographical area. With this backdrop, there has been a decline in the cropped and forest areas at the rate of 1.5 million ha per year. Studies carried out in 1996 show that, the intensity of grazing is very high – 2.6 ACU per ha against 0.8 in developed countries. The cropped area under fodder production is about 11 million ha, which is 6.25%. This areas needs to be doubled to meet the rising demand.

Livestock's economic contribution- The Livestock sector's contribution to the Agricultural GDP has risen from 6.0% in 1970 to 26.5% in 2006. This sector provides employment to 11 million people in the principal status and 8 million in the subsidiary status. Income from livestock production accounts for 15-40% of the total farm household earning in India and of this milk production forms 27% of the household income. Small ruminants happen to be the major source of income for the poor families and their contribution ranges between 17 to 24%.

They provide a gainful employment of 180 to 330 man-days a year.

Land use pattern and grazing pressure in India (GOI, 2005)

Land use	Area (million ha)	%Change
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	1950-51	1999-00	
Non-agriculture/Barren	47.5	42.41	-10.7
Pastures	26.5	14.7	-44.5
Cultivable land	22.9	13.83	-39.6
Fallow land	28.1	24.9	-11.4
Net area sown	118.8	141.2	18.9
Gross cropped area	131.9	189.7	43.8
Cropping intensity	1.1	1.3	18.2
Grazing pressure*	2.9	3.1	6.9

*estimated

In 40 years between 1950 (shortly after India's independence) and 1999, there has been a sizable decline in pastures and cultivable land. The area under fallow land and also non-agricultural or barren land has shown a decline. However, the gross cropped area has increased substantially by about 44% along with lesser yet note-worthy increase in cropping intensity and the net sown area.

Watershed Programs (period)

Scheme name	Area treated (lakh ha.)	Expenditure (Rs. in crore)
NWDPR	85.59	2671.56
RVP& FPR	62.51	2037.74
WDPSA	3.53	255.58
RAS	6.87	105.94
WDF	0.39	21.02
EAP	28.00	4980.00
DPAP	65.74	05060.5
DDP	35.31	1960.75
IWDP	84.54	2228.41

EAP	3.60	212.67
NAEP	8.77	852.89
Grand Total	384.85	20387.06

Several watershed programmes have been adopted by the government. By providing water, watershed programmes facilitate livestock production apart from other activities. However what needs to be looked into here is the balance between the area treated and the amount expended for the programme. For an area of 384.85 lakh ha and amount of Rs. 20387.06 crore was spent

The watershed programmes, in the initial stages gave highest priority to bio-physical measures. The stakeholders however were mere onlookers as the projects were both planned and implemented by the government without much consultation with them.

From 1990 to 2000, however they were involved in natural resource management. But there were conflicts because the Ministries of Agriculture and Rural Development had both different norms of implementation of the same watershed programmes. Added to this was the lack of a well-defined mechanism.

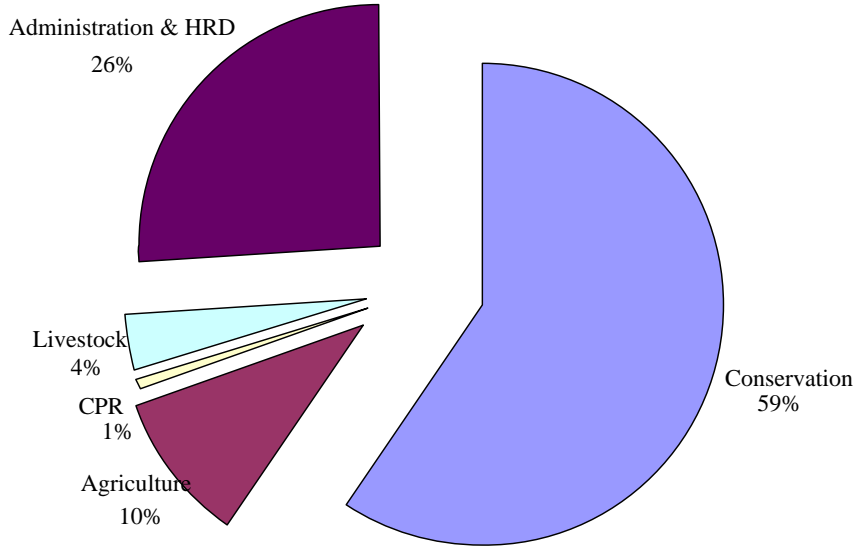
But all this changed in the next years when common guidelines were brought out in both the ministries for the implementation of the programme. There was also focus on capacity building of stakeholders and alternate enterprises and the social, human capital and the landless. A withdrawal policy too was looked into.

From 2005 onwards, an integrated participatory approach for livelihood security was adopted by bringing out equilibrium between the bio-physical and socio-economic aspects of the programme. Panchayat Raj Institutions (PRIs), User Groups (UGs) and Community-Based Organisations were designated as Project Implementing Agencies and Government offices and Non-Government Organisations (NGOs) as the facilitators for infrastructural and technical support. Management strategies of common pool resources too were put in place to achieve better output from the programme.

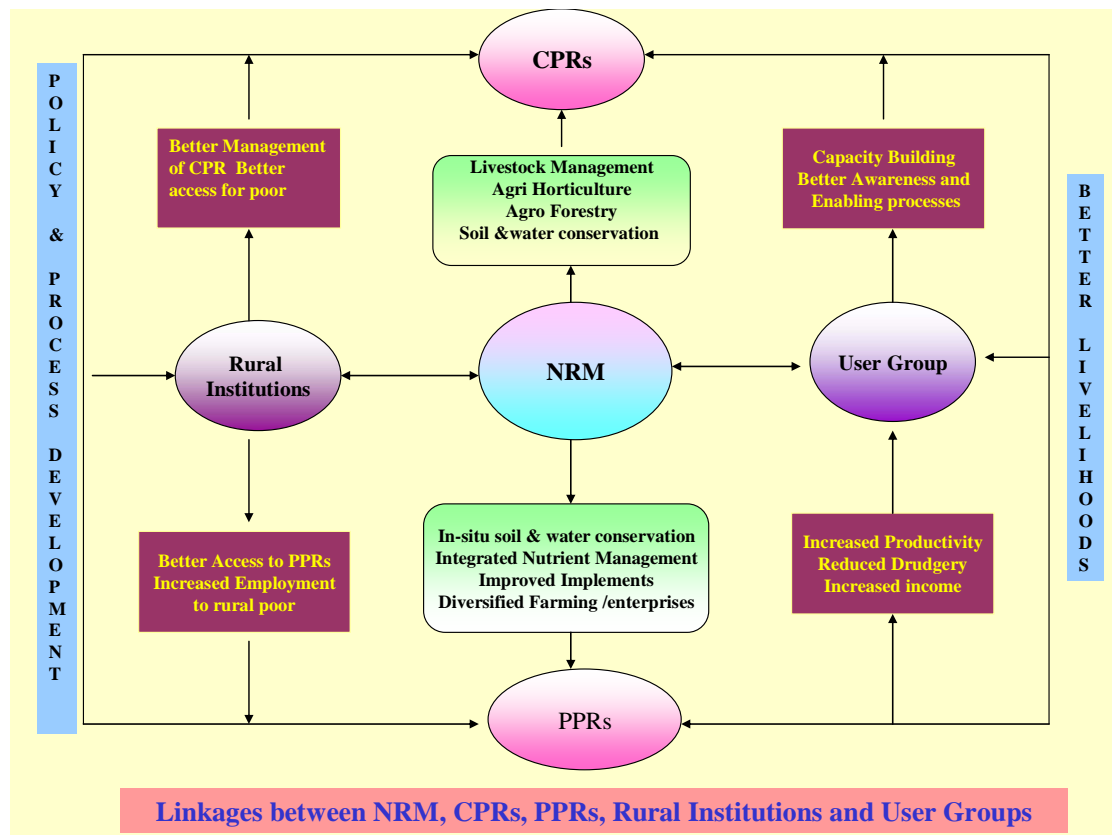
Although CRIDA and ICRISAT evaluations (during different periods) of these watershed programmes demonstrated an improvement in land use, cropping intensity, crop yield, income and employment generation, it did not reflect in the development of livestock except in very few states.

A meta analysis of the programmes showed several improvements like better returns especially to large and medium farmers (LMFs) but not the small and marginal farmers to the desired extent. The LMFs benefited to a greater from improved output from livestock produce. They even increased stall feeding of animals. The percent irrigated area increased from 38.4 in non-watershed areas to 52.4 in watershed areas. Overall, the livestock sector did not receive due share in the watershed programme.

Amount spent towards the different activities in watersheds



This data was obtained for 19 watersheds across 9 states. An amount of Rs. 10, 16, 00, 000 was spent on these watersheds.



Land use options of Private Property Resources (PPRs) – Below are few of them -

- > Alley cropping – useful in the dry season to get green, palatable fodder, and reasonable quantity of fodder in rainy season
- > Ley cropping – includes a period of pasture in which two or more crops are grown
- > and Horticultural & Silvipastoral systems of cultivation.

Common Pool Resources

The rich and poor vie with each other for forest resources and the rich often get more resources than their fair share. There have been some encouraging examples like the tank bed cultivation in Zamistanpoor, Mahubnagar and in Chalamari Tank bed in Roddam mandal, Ananthapur district, both in the state of Andhra Pradesh (India) that provided the poor greater access to forest resources.

Approximately 91% of households depended on CPRs for open grazing for about 35% of their forage needs. Even as much as 82% of large farmers utilised common lands for grazing. But unfortunately about 40% of the potentially productive CPRs are producing below their optimum capacity. The area of CPRs has greatly declined from 67 million ha in 1950-51 to 38 million ha in 1997. Together with this are problems of over grazing and lack of protection measures for CPRs.

Number of herbage species and production as influenced by management of CPRs

Management type	Herbage production (t/ha/year)	No. of species
Open grazing lands (CPRs)	0.9	13.0
2 years protected CPRs	2.4	21
3 years protected CPRs	3.0	25

A study by Pathak in 2002 has shown that the number of herbage species as well as herbage production improves significantly after just 3 years of protecting CPRs.

Constraints and remedial measures for management of CPRs

Problem	Causative factor	Remedial Measures
Poor regeneration of forages species	Severe damage due to over grazing and stampede	Rotational and restricted grazing
Low forage production	Low yielding annual grass species and competition by unpalatable shrubs and trees	Reseeding/ planting of high yielding perennial grass species and bush clearing
Low nutritive value of the forage	Lack of legume among forage species	Seeding of legumes like Stylo with onset of monsoon and application of P as basal dose
Non-availability of green fodder during lean period	Very few tree species suitable as top feed in CPRs	Development of silvopastoral systems

Mr. Ramana spoke about the an innovative model that CRIDA has come up with to manage CPRs. It is an institutional mechanism for providing advice by committees called *Salaha Samitis* at the village level for transparency and to address gender issues. Members are drawn from SHGs and PRIs for the implementation of livelihood programmes.

He put forth some suggestions that he said should be considered while bringing out the recommendations –

- Dependence on common lands for fodder should be gradually reduced through institutional mechanism
- Stall feeding of productive livestock and
- Producing fodder in high yielding agricultural areas
- Institutional arrangements for rotational grazing
- Promotion of silvopastoral and hortipastoral systems
- Promotion of utilization of non-conventional feed resources

- Management of rangelands and pasture through fencing, soil and water conservation measures
- Inclusion of shepherds and landless in watershed, JFM and other natural resource committees for participatory management

Presentation 5: Mr C. Shivashankara Reddy, the Principle Chief Conservator of Forests – Production of Andhra Pradesh Forest Department, presented a paper on Livestock and forest issues. His paper was based on the status of livestock in Andhra Pradesh. He enumerated the status of livestock, its change over the years and the percentage composition of each category of livestock in Livestock Units (L.U.).

Status of Livestock in Andhra Pradesh

Category	1966	1972	1977	1983	1987	1993	1999	2003	% inc. since 1966
Cattle	123.42	125.87	120.41	132.20	123.75	109.46	105.57	93.00	-24
Buffaloes	67.91	70.57	71.63	87.04	87.57	91.53	96.39	106.30	56.53
Sheep	80.04	83.43	70.64	75.19	68.72	77.87	96.41	213.76	167.06
Goat	37.58	43.80	43.64	55.59	48.75	43.28	51.65	62.77	67.02
Others	6.99	7.77	8.40	8.54	7.87	6.95	7.69	6.12	-12

Livestock Units

Category	Number	Livestock Units	% of State Total	Conversion factor
Cattle	93,00,000	10570000	42.11%	1 Cow = 1 L.U.
Buffalo	1,06,30,000	1,27,20,000	46.08%	1 Buffalo = 1.2 L.U.
Sheep	2,13,76,000	42,75,200	7.68%	1 Sheep = 0.2 L.U.
Goats	62,77,000	12,55,400	4.11%	1 Goat = 0.2 L.U.

Total		2,88,20,600		

He then explained the scenario of livestock in terms of their percentage composition in finer detail. The categories he considered were cattle, buffaloes and goat & sheep.

About half of the **cattle** population, that included bulls kept for work and cows kept for milk, were sedentary and did not graze on forest or community lands unlike the remaining 50% of the cattle consisting of males, dry females and young ones.

Contrary to cattle, **buffaloes** have very little impact on forest by grazing. Almost 60% of the females and calves are stall-fed, 30% areas adjoining the villages and just 10% graze on waste lands or forest areas.

Almost the entire population of **goats and sheep** (125.95 L.U.) graze on forest land as they do not have access to crop lands and crop residue. The 50% of cattle population – 61, 00, 000, 10% of buffalo population – 8, 00, 000 and almost all of goat & sheep population - 48, 00, 000 & 68, 00, 000 respectively, add tremendous pressure on the forests and other grazing lands.

He elaborated on the environmental impacts that livestock overgrazing can cause. Seedlings of other species of plants are destroyed when they are eaten along with the grass. Similarly, the passage of animals through an area causes mechanical damage to saplings while heavy hoofed animals cause damage to even their roots. The treading of animals also compacts the soil, reduces water absorption and consequent increase in soil erosion. This compaction makes the soil surface hard and dry and prevents the germination of tree seeds. On the other hand soil is dislodged on steep slopes because of animal movement, again making condition unsuitable for the growth of young plants.

Also, the palatable and native grasses are replaced by less palatable and inferior grasses. In such conditions weeds and bushes like Lantana, Carissa, Dodonea, Parthenium, Eupatorium etc. take over extensive areas. Large areas have consequently gone out of fodder production and as a result the grazing pressure on the remaining forest area has increased further.

The nutritive value of forest fodder has degraded and livestock are left under-nourished and with low productivity. To make up for low productivity, farmers have had to increase the number of livestock but such an increase leads to overgrazing and degradation making a vicious cycle of degradation. As for the ecosystem, the dynamic equilibrium existing between the soil and vegetation is greatly disturbed and the bio-complex thus regresses.

Another issue with forests is fires. These cause expensive damages and is worsened by the removal of green mat of grass that protects micro flora and fauna of the soil that help enrich it. Lack of grass cover also accelerates run off leading to floods and siltation in reservoirs. Humus that provides similar protection and nutrition is also destroyed thus making the soil vulnerable to desiccation. Thus, a deleterious chain reaction sets in after forest fires. It impoverishes the site quality and creates tree-less tracts invaded by hardy unpalatable bushed and coarse grasses. Such soils are left unsuitable for plants until the soil building processes set in again and this takes a very long time.

He also mentioned that cattle movement in forests increases the number of cases of carnivore attacks on cattle which in turn creates human – animal conflicts in forests.

Category	60-61	76-77	91-92	04-05	Area dec.	% reduced
	(L Ha)					
Forests	58.47	63.81	62.81	61.99		
Barren uncultivable waste	23.58	22.87	20.72	20.83	2.75	12
Cultivable waste	16.36	9.55	7.66	6.94	9.42	58
pastures	12.03	9.72	8.31	6.76	5.27	43.85
	51.99				17.45 (27% forest)	33.60

History of grazing in forests in Andhra Pradesh

Grazing was regulated by the issue of permits and a grazing fee and goat browsing is specifically prohibited. Certain Pentas (villages) were identified for grazing, the forest department improved water facilities in the pentas with tanks, wells etc., grazing paddocks were identified and demarcated by walls. Later grazing was allowed free of charge from 1968 by the Government Order Ms. No 387 Food & Agriculture department dated 14th March, 1968. The GO. Ms. No. ICL of 16th December 1968 allowed leader goats with flocks of sheep on payment of a fee.

He made reference to section 4.8.3 of the **National Forest Policy on Grazing, 1988**, which says that grazing in forests should be regulated especially conservation areas, young plantations and regeneration areas be fully protected. It stipulated the levy of adequate grazing fee to discourage people in forests area from keeping large herds of non-essential livestock.

He also spoke about the following sections of the policy –

(15) grazing would have to be regulated and fires prevented. Each area must have prescribed management practices with emphasis on harvesting grass rather than grazing, which would help in the augmentation and regeneration of grass and its nutritional value enhanced.

(16) A policy should be formulated to regulate inter state movement of livestock to enable the states to control grazing pressure on eco – sensitive areas

(28) there should be appropriate rural development and animal husbandry policies and projects to address issues of grazing and fodder for cattle

The policy also says that the grazing requirements of livestock of villages located in and around forests (with in 5 km) should be specified with in carrying capacity of forests. The practice of unregulated grazing should be replaced gradually with stall feeding.

He elaborated on the National Commission on Agriculture report

Para 42.11.1 section 11 of Vol. IX of the report says that *grazing in forests would have to be allowed in view of the role of livestock in the country's economy. But instead of unlimited and continuous grazing, it should be controlled and restricted so that it does not interfere with the productive and protective functions of the forest.*

Grazing of goats in forests should be prohibited sheep grazing may be allowed only in earmarked grasslands in the forest areas under strict rotational control

And para 42.1.22 section 11 of Vol IX of the report stipulates that *grazing rules should be promulgated by each state govt. the rules should specify the grazing units constituted , carrying capacity fixed , grazing and closure cycle indicated and administration of rules carried out.*

Issues that need attention: He stressed on the need for a state grazing policy in the interest of livestock for which he made some recommendations. He said that there were some gaps in research on the issues of range lands, pastures, fodder crop and related livestock management that includes AHD & dairy development federations. He said that there is no data on the impacts of grazing on forests and CPRs. There is a wide gap between the demand and supply of fodder. He said that in the state of Andhra Pradesh, the estimated fodder requirement is around 3, 69, 00, 000 MT and there is a deficit of 10, 00, 000 MT of fodder. The forest department has given little attention to the evaluation of the potential and propagation of grass, legume and fodder tree species. The government, he added needs to take more responsibility to meet the grazing and fodder needs of livestock.

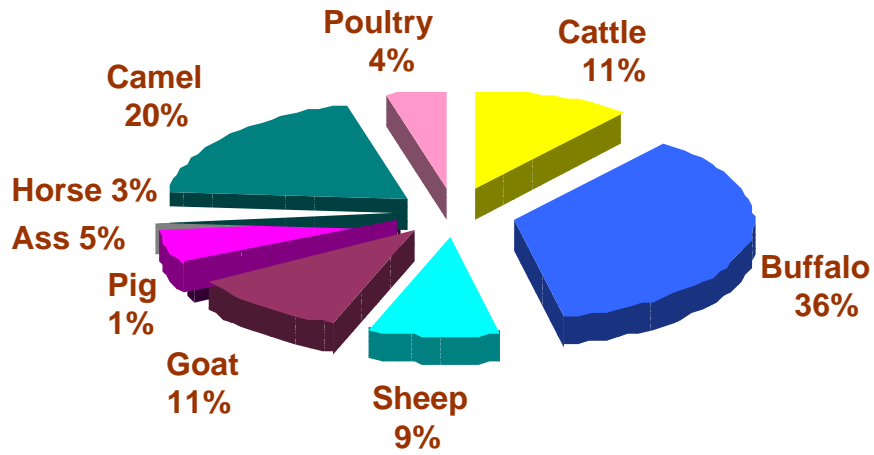
He made **recommendations** that suggest action in these areas. He emphasised however, the provision of a state policy on fodder and grazing. He suggested the broadcasting of palletized fodder seeds in forests and the planting of top feed species and ground cover fodder species. He also recommended the establishment of fodder demonstration plots and the production of fodder seeds by farmers. Other recommendations include –

- disposal of surplus fodder in Vana Samrakshana Samiti (VSS) [village level forest protection committees] areas and the constitution of forest based sheep cooperative societies.
- Discouragement of cattle grazing in good forest areas

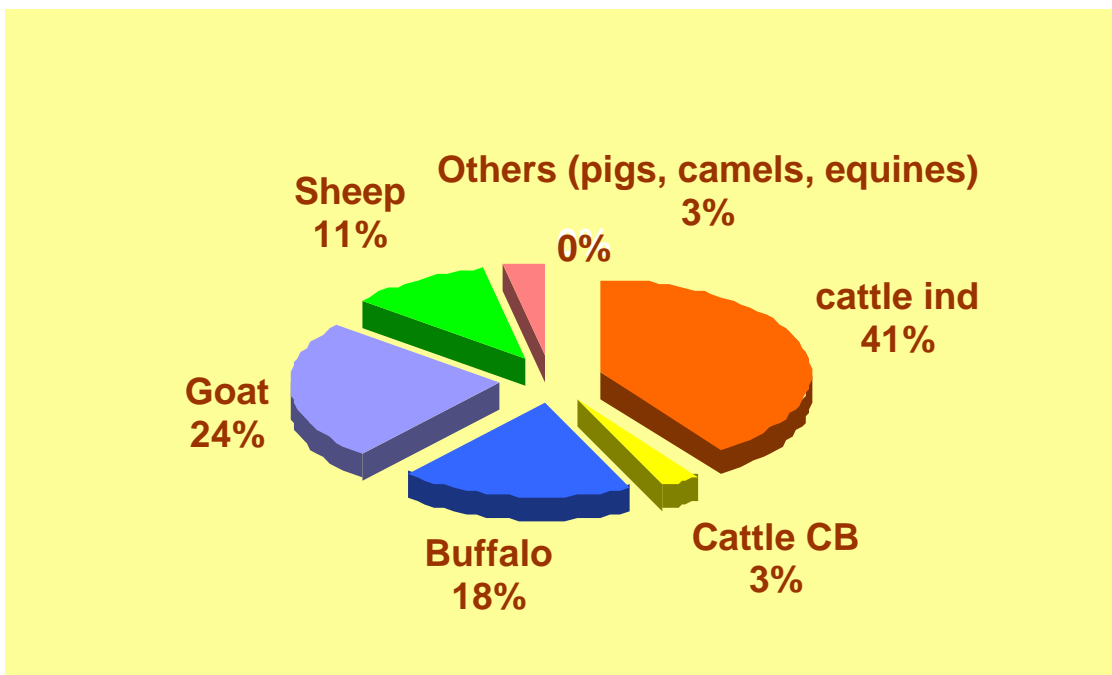
Finally, he suggested the exploration of forest weeds as animal feed especially with the intervention of physical, chemical and microbial treatments for Fibrous Agricultural Residues (FARs) of crop residues and agro-industrial wastes.

Presentation 6: Dr Kornel Das presented his paper on Livestock and Biodiversity. Indian biodiversity is very rich and accounts for 6% of all the livestock biodiversity in the world.

Percent biodiversity in livestock breeds (India vs World)



Per cent livestock population in India, 1997 census



India owes its rich biodiversity to tropical, sub-tropical and temperate climatic regions in the country that are favourable for livestock rearing. People too value biodiversity and animals are an integral part of the livelihood of communities including nomads and tribals and across different castes. They are highly regarding in the native culture especially Asian Elephants that enjoy a special religious status along with the cow. Draft cattle, dual purpose cattle horses and even animals with low productivity such as pigs and native poultry are reared.

There has in recent times, been a change in the biological diversity mainly due to several factors. The main factors causing this change are change in human needs, changes in the environment, mutation of genes, natural selection, hybridization and migration.

-
- The trends have changes according to the changing needs and conditions of the market. There is an increase in the number of dairy animals (Buffalo, Crossbreds, Goats, camels) and meat producing spp. (poultry, sheep, goat, pigs etc.
 - There has been an increase in the production of egg
 - Numbers of animals like cattle, buffalo and camel used for draft power has declined
 - An increase has been observed in fur and fiber-producing animal species that supply raw material to the garment industry
 - Small animal farms are vanishing and large industrial production centres are taking their place
 - Livestock farming is now concentrated on rearing commercially dominant animals
 - There is an increase in the demand for animal products in general and a trend of value addition to animal products has emerged.
-

According to Mr Das, the **impacts** of this increase in demand can be seen as strain on the feed resources such as forests, grazing lands and water. The livestock also demand more energy input; therefore more fossil fuel is consumed in rearing (food etc), transportation and storage and preservation of products. There is an effect on the human food consumption too as many people are switching from vegetarian food habits to eating meat because of a changes in lifestyle and income. Ruminants are known to produce Methane gas which is a Green House Gas with a global warming potential 62 times greater than CO₂ over 20 years. Therefore, they contribute significantly to climate change which is the most serious global environmental concern today. Changes in the climate of a region can cause long hot summers, long cold winters, floods, super cyclones and erratic seasonal rains.

Dr Das spoke about the role of biodiversity in climate change and made reference to the Hoffman and Scherf (2006) who say that traditional and modern approaches and techniques can be integrated to enhance the capacity to use and improve productivity of genetic resources across the entire range of production systems.

He discussed the some uses of livestock.

Draft power: Cattle, buffalo, yak, elephant, horse and camel are animals commonly used for draft power. In the tropics, about 250 million animals provide draft power for 60% of arable land. The requirements of draft power in different regions are -

Asia	25%
Near East	15%

Latin America 14%

Africa 8%

Livestock will be an important source of draft power in small and medium farms in developing nations, most of which happen to be in Asia.

Fuel and Fertilizer: Cattle dung is widely used as fuel and bio-gas from animals is a renewable source of fuel. The dung and other waste products are a valuable in fertilizing and conditioning soil so much so that manure constitutes 70% of soil fertility inputs in developing nations.

Use of manure on croplands serves the dual purpose of fertilising soil for crop production and managing livestock waste.

Biodiversity and its anticipated applications:

Biodiversity of livestock is useful for commercial and mixed farming or grazing needs. Different species have different fertility rates and diversity can be used to produce better varieties. Greater biodiversity finds use in producing disease resistant varieties as well as those that can withstand draught conditions. A special genetic pool is required for regions chronically prone to natural disasters.

Dr Das identified some animal genetic resource issues that of concern India and the world. He said that India needs to identify unique genetic resources to maintain in the global gene pools. He suggested that livestock diversity be built and utilised by educating farmers and encouraging them to increase production and productivity under the local system. Monitoring of valuable genetic resources and people-centered approach to biodiversity improvement and management are essential for their preservation.

He put forth some ideas from the works of other researchers for the audience to ponder over-

- 1 Development and conservation must go together. There is a contention that under-development leads to loss of natural resources (Schneider et al. 2003)
- 2 Mankind has the necessary genetic resources in terms of breeds and individuals to meet the challenge of feeding itself now and in future. (Cunningham,1991)
- 3 It is clearly not logical to preserve those resources for future use when we do not properly use them now (Madalena 1989)

According to him there are two main considerations that will guide activities of the future. One is the economic competitiveness and the demand it will make on the rate and efficiency of livestock production. The other is the need to conserve livestock genetic resources and maintain genetic diversity.

He then discussed the most relevant topic of his presentation i.e., the role of education in biodiversity conservation. He said that education on biodiversity conservation can be effective when the objective is clear to the key players and there is agreement among stakeholders on real issues and the agenda for action. Education should aim to sensitise the public and the farming community and encourage open debate. Planners and implementers can be better informed of the issues. It would lead to the formulation of a better action plan for biodiversity conservation while monitoring and action on feedback would be more informed.

He provided several lists of data on livestock.

Breeds at Risk Species	Breeds	Population	Present status
Buffalo	Wild Asiatic	<2000	Decreasing
	Bhadawari	<20000	Decreasing
	Toda	<5000	Decreasing
Cattle	Sahiwal	<10000	Decreasing.
	Red Sindhi	<5000	Decreasing
	Punganur	<1000	Almost extinct
	Vechure	<500	Near extinction
	Ponwar	<15,000	Decreasing
	Krishna Valley	<15,000	Decreasing
Sheep	Breeds of J & K	Few hundreds of each breed	
	Nearly extinct		
	Nilgiri	<2000	Endangered
	Hissardale	<500	Rare
	Pugal	<10,000	Endangered
Camel	Bacterian	< 100	Critical
Poultry	All indigenous poultry except Aseel and Kadaknath	Few thousands	Nearly Extinct

Cattle breeds in India

A P	Ongole (4)	Punjab	Sahiwal (21)
	Punganur		
Bihar	Bachaur	Rajasthan	Nagori (1)
Gujarat	Gir (21)		Rathi (6)
Haryana	Haryana (19)		Tharparkar (11)
	Mewati		
Karnataka	Amritmahal (1)	Sikkim	Siri
	Bargur		
	Dangi	Tamil Nadu	Kangayam (1)
	Gaolao (1)		
	Hallikar (1)		
	Kankrei (9)		
	Krishna Valley	U P	Kenkatha
Kerala	Vechur		
M P	Malvi (2)		
	Nimari (2)		
Maharashtra	Deoni (5)	Ponwar	
	Khillari (3)		
	Red Kandhari		

() – Number of farms

Similarly, he provided statistics on the different breeds of buffalo, goat, sheep and poultry and the numbers of farms in several states of the country.

Pig germplasm in India

Species/breed	Distribution
Wild pigs:	Himalayas, MP
The Indian wild boar	South Hills

Andaman Island wild pigs	Andaman Islands
Eastern region wild pigs	NEH Region
Desi pigs	All over country
Ghori	Eastern region
Ankamali pigs	Kerala

Other important germplasms

Species	Breeds	Importance
Yaks	Different types in Himalayan states	Milk/meat/draft/fibres/transport
Mithun	Arunachali and Nagami in NEH states	Meat/ceremonial
Elephants	Indian elephant	Transport/ religious
Rabbits	Russian, German, French, British Angora	Angora Wool
	White giant, grey giant, New Zealand White and Societ Chinchilla	Meat/Fur
Ducks	Indian runner, Nageshwari Sythetemete	Eggs/meat/feathers
Quail	Japanese quail	Meat/eggs
Turkey		Meat and eggs

He made some suggestions for the **recommendations** of the consultation -

> Give emphasis to traditional knowledge along with the use of modern methods available for the maintenance and improvement of feed resources and productivity of animal genetic resources (AnGR)

> Survey and document diversity with unique traits in AnGR

> Strengthen keeping of breeds under extinction under Government Livestock Farms

> Ensure participation of farmers and stakeholders in breed conservation through breed societies/associations

> Give farmers rights over AnGR

> Lay stress on economic competitiveness of breeds including reproductive efficiency and survivability

Mr Padmakumar, Senior Subject Matter Specialist at CALPI (Capitalisation of Livestock Programme Experiences India) spoke about the theme of the workshop drawing from LEAD India Platform experiences.

As a backgrounder to the initiation of the LEAD programme, he mentioned that the 1990s saw a rise in environmental consciousness. Many environmental movements were started during that period. Livestock in this context was blamed for problems like environmental degradation, manure pollution and land degradation. As a consequence, many developmental organisations ceased to support livestock development activities. But many knew that livestock had many benefits and therefore a global initiative was formed in order to bring them back into the development agenda. The LEAD programme thus initiated with the objective to promote and conduct multi-disciplinary Research & Development on livestock-environment interaction (LEI) issues and increase awareness about them among key stakeholders. Its aim is also to support decision makers by providing specific decision making tools (guidelines, option, tool boxes etc.). This is achieved through regional platforms in five languages.

Regional Platforms

Platform	Theme	Geographical coverage	Hosting Organisation
English	Pollution from industrial animal production	Anglophone Africa,	FAO, Rome
		Asia, Europe, USA	
Chinese	Pollution from industrial animal production	China	MoA
Spanish	Livestock induced deforestation	Latin America	Tropical Agrl. Research & Devpt. Centre, Costa Rica

French	Dry land management	Francophone Africa	CIRAD, France
Russian	Pollution from industrial animal production	Russia, Mongolia, Eastern Europe	FAO, Rome

Research

A primary research that was carried out under the programme in semi-arid watersheds looked into the influence of livestock on livelihoods and the environment and the impact of Water Development Programmes on all three elements.

The LEAD research showed that livestock generally make positive contributions to the environment. However there are some “hotspots” that need special attention. The research proposed various options and made policy suggestions. The research of the LEAD India programme is carried out by a network of NGOs called the LEAD Advocacy Network (LAN) under the guidance of CALPI, Food and Agriculture Organisation (and International Water Management Institute (IWMI). The LAN consists of WASSAN, Sampark, Seva Mandir, Samuha and WOTR.

Organisational structure of the LEAD programme

The LEAD programme has two divisions, the LAN and the LEAD Communication Platform (LCP). The functions of the LAN are to conduct state-level policy round table discussions, national level policy workshops, small pilots or experiments, train stakeholders as well as document and disseminate information on best practices. The outcome of the research carried out by the LAN is fed into the LCP to create products such as the interactive website, newsletter, CD and for inputs into promotional events.

Mr Padmakumar enlisted the functions of the website. It serves as a digital library, provides access to a database of LEAD experts and institutions and decision support tools. The website also hosts electronic conferences and the platform newsletter. Apart from these it provides information such as case studies, hotspots and relevant policies and data on livestock.

Outcomes and impacts of the LEAD programme in India

The LEAD programme made several achievements as a result of the research and advocacy

Integration of livestock received high focus in watershed development programmes. It found reflection in the Guidelines for Hariyali (<http://dolr.nic.in/HariyaliGuidelines.htm>)

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- It created awareness on “livestock associated environmental issues” among makers, practitioner and academicians.
 - The project helped to validate perceptions associated with livestock and environment on the basis of scientific evidence
 - The programme created a bunch of professionals and institutions in the country with the domain knowledge on ‘livestock and environment’
-

- The Planning Commission, for the first time formed an additional working group to look at 'livestock and environment' and prepare proposals for the 11th five year. Livestock found adequate focus in the Planning commission (NRM) working group
- As a result of the work done by LEAD programme, different non-livestock, non-environment organisations started including 'livestock and environment' in their agenda (TERI, IWMI, ICRISAT, CEE)

The critical LEI issues in India were addressed with respect to livestock production systems in India. Mr Padmakumar discussed issue related to mixed farming, overgrazing and intensive farming.

Overall, mixed farming is a beneficial practice as cultivation of crops and rearing of animals are integrated. Although there is no integration of crops and animals in the activity, it helps nutrient cycling, seed dispersal and re-vegetation. These benefits are of high value for biodiversity enhancement. It is a sustainable practice but the intensity of grazing that the resources can bear must be constantly evaluated. The worst kind of production system according to the speaker is intensive farming as creation soil nutrition imbalance and uses only few species which narrows the scope for biodiversity. It does not even integrate crop cultivation and animal rearing. For all these reasons, it is a destabilising and damaging system of production.

He suggested some key issues in judging the appropriateness of intensive /mixed /grazing livestock production in the arid and semi-arid areas:

- the source and sustainability of the water used for feed production
- the length of time that animals spend in the arid and semi arid intensive systems
- the ratio of crop residues and by-products used as feed to the amount of dedicated forage and feed grains used as feed

He said that there is a need to ensure that livestock keeping (intensive or extensive) as well as crop production operates within the limits imposed by hydrology and water balances in the arid and semi-arid areas. Also, it will be necessary to assess the ways that manure and urine are used and affect the environment.

Methane emission is of special significance in the wake of climate change. Fifteen percent of India's GHG contribution of 1228 million MT (4% of global), comes from livestock. But one has to bear with this as livestock in Arid & Semi Arid regions (A & SA) in India contribute significantly to livelihoods of people there, where there are no other alternate livelihood options. Fortunately, 80% of livestock production in India is under mixed farming which means lesser environmental issues (except for methane emission because of large ruminant population and fibre based diet).

Shrinking resource base, lack of development efforts and grazing system with no control on the resource use leads to overgrazing and **degradation** of common land. Common Property Resources (CPRs) have shrunk by 31-55% compared to 1952. Fifty seven percent of land (188 million Ha) is degraded. Most of this land is in the A&SA regions where livestock intensity is high. Livestock contribute to degradation under the 'open access' situation.

Soil & water pollution: Intensive and urban /peri urban poultry or dairy production cause great environmental problems. They cause nitrogen toxicity in soil, nitrogen and heavy metals pollution of water, low (virtual) water use efficiency etc. However, the magnitude of intensive system is comparatively less in India except for poultry.

- Mr Padmakumar mentioned the book “Livestock’s Long Shadow” that presents livestock as an environmental threat. The Green Revolution in agriculture helped India reduce hunger. But the trade offs has been long-lasting damage to soil (dead soil), polluted waters and the proliferation of a number of diseases. Therefore, while acknowledging the positive impacts of green revolution highlighting the negative implications would be responsible approach to managing resources. Green revolution has served to alert the technocrats and policy makers on the potential threats of economic efficiency models that would produce long term negative ecological impacts
 - *Livestock’s long shadow* makes an attempt to do this by informing stakeholders before implementation of policies. The negative environmental impacts highlighted in the study are highly relevant in countries where high external input, intensive system is predominant, for example in USA and China. The situation is not as grim in India at the moment but their example is a warning for India, especially in the current ‘economic growth’ paradigm.
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Discussions: There were intermittent discussions on issues related to the theme of the workshop as well as during the discussion sessions.

A question was raised on what can be done about the damage caused by livestock due to overgrazing. Mr Tiwari, of the Seva Mandir referred to a study carried out in the Indira Gandhi canal area that said that grazing had its own benefits. It was suggested that the sustainable use of resources like water and stall feeding would help minimise the pressure on the forest areas. Mr Haileslassie said that very often water in different areas is either under utilised, optimally or overstocked. So the usage of resources has to be brought to the optimum level for sustainability of livestock.

Comment: Mr. Rathibhai disagreed with the statement made by Mr. DBV Ramana that the use of livestock as a livelihood option addresses poverty.

Comment on Reddy's presentation: Population of livestock is declining.

Dr. Reddy: Grazing is beneficial they disperse seeds and fertilize the soil. Cattle have been living in harmony with the environment from time immemorial. But it is the unmanaged grazing that is a problem. Therefore managing grazing would help reduce the damage caused due to overgrazing.

Comment Mr Tiwari: The Tribal bill is a welcome legislation as it would benefit tribals who traditionally manage their resources sustainably. It would encourage better management of resources especially that of forests.

Dr Mohanan however said that there the issue of transmission of diseases from domesticated livestock to wild animals in this way of rearing animals where they are let to graze in forest areas.

Ms Bhatt spoke about the Keola Deo Bagh spread over an area of 22 sq km that was declared a National Park. This was done to protect it from the damage caused by livestock grazing in the park apart from other influences on the natural habitat of the wild animals in the area, many of which were migratory bird species. She said it was a black mark in the history of biodiversity conservation as there was a lot of bloodshed. She referred to a study by Bombay Natural History Society that was conducted for a period of 10 years. It revealed that livestock that were in fact beneficial in that setting which she said brings out a paradox.

She also mentioned that feral (domesticated but returned to the wild) cattle are found in the Bharatpur National Park as a result of constant grazing in the area.

She also stressed the need to consider agricultural and livestock biodiversity and not just the biodiversity of wild animals that we commonly associate biodiversity with. She also reiterated the fact that we are losing keepers of biodiversity (example tribals). Their cultural diversity, rights need special attention. It has to be realised that livestock rearing is something they have been doing for centuries and we need to appreciate that they have been doing it without harming the resource base. So there is a lot to learn from traditional knowledge.

Education, she said, would go a long way in protecting these resources and that incentives need to be provided to people to conserve diversity. She suggested the organisation of biodiversity melas and similar activities to revive biodiversity enrichment. She spoke of a rally that Deccan Development Society, an organisation in Andhra Pradesh took out with 12 bullock carts and covered 50 villages in 2002.

Comment- Conservation can be done either by rearing animals or keeping them in zoos. How else can it be done when a species does provide enough economic benefits. It is a question of using public money for this purpose- can this be done when there aren't many returns.

Comment- Mr Hailelassie: Our local breeds have low productivity. However, they have

> a long lactation period of 9 months,

> farmers have few cattle

> 5 cross-breeds/ hybrids are allowed to graze openly

As a result, the expenditure on these animals is reduced.

Comment- Dr Chacko: Better marketing of livestock products, wider availability of the products and creation of niche markets are essential to promoting special properties of a particular livestock product.

Comment- Ms Bhatt: Eco-labelling might work to promote the conservation of indigenous species.

Comment- Dr Rangnekar: The *Rati* breed of cow found in Rajasthan produces milk with a unique sweetish taste that is preferred by people. Its taste has earned it economic value. Therefore such qualities can be identified for other species as well. For example, farmers prefer to raise local fowl in the state of Madhya Pradesh. Such preferences can be encashed to preserve indigenous variety.

Comment - Dr Reddy: Off late a lot of land has been diverted for urbanisation and infrastructural facilities. This needs to be controlled as it disturbs and fragments grazing areas.

In Halvad, Gujarat state, some farmers produce only fodder and make a lot of money especially during drought. Such activities in disturbed areas can be taken up to utilise the available resources.

Comment- Shailendra Tiwari: Land usage has changed since independence. Earlier land was managed by locals; now the government manages it. There is no way in which communities are involved in decision-making or management by the government. Slowly, in recent times, even the government is giving away its control to corporates.

Comment - Kishore Patel: Proper planning is required for good management of land, water and animal resources.

Comment - Mr Hailesslassie: Sub-Saharan Africa gets 500-700mm rainfall per annum. As a management practice water can be stored and utilised later on.

Comment - Dr Rangnekar: Nomadic pastoralist system of grazing is the most resource efficient as animals feed, urinate and defecate in different areas thereby dispersing seeds and forage by turns in different areas which allows time for the herbage to grow.

He responded to Ms Bhatt's comment saying that another reason we should enhance biodiversity is to avoid the underdevelopment associated with lower livestock diversity. Comment- Mr Shukla: Fodder trees should also be given importance and grown more widely. However, new issues that arise out of interaction between wildlife and domesticated animals such as the transmission of diseases need to be addressed. For example, wild ass breeding with female donkeys has produced sterile offspring. He also spoke about the need for grass development and a network deed that can compensate for a shortage of fodder.

Rotational grazing should be adopted where once fully grazed, an area is left unused for 2-3 years. An example of good management of water is seen in the Banni area which has very nutritious grass that is useful for meat production. High production has been achieved even though the rainfall there is very low.

Comment - Dr Reddy: Lopping of trees is a prevalent practice mostly in North India but not in South India. In many cases, the entire tree is felled for fodder instead of just the edible parts. Education for prudent usage of trees for fodder needs to be imparted.

Padmakumar: Common property resources have reduced from 52% before independence to below 50% today. Therefore some kind of control is required. Also, in the context of climate change, many farmers are switching to pastoralism.

Comment - Padmakumar - Livestock & Water - India is blessed with good rainfall in the range of 60-1200 mm. Sugar & Paddy consume a lot of water but cannot be avoided as they are preferred foods. Watershed programmes have been successful all over the country and have improved irrigation.

Blue water is the one useful in increasing biodiversity. It is the water that evaporates or passes through plants.

Climate change is a blessing to us as it is bringing extra rainfall in many regions. We must utilise and manage it well.

A shift in policies has encouraged those who used to eat Bajra earlier to consume rice. The area under coarse cereal cultivation is reducing while that of fine cereals is increasing which consume more water thus denying livestock water. Coarse cereals have their advantages too. For example, maize makes for good quality fodder as well as grain apart from being a good carbon sink.

There is also the concern of decreasing common grazing lands. Mr Reddy provided some data on the land use patterns in the state of Andhra Pradesh which shows this trend.

Intense discussions took place and suggestions from some of the presenters were considered while finalizing the recommendations.

RECOMMENDATIONS:

1. Livestock Forest Issues

- 1.1 It is recommended to formulate/enact and implement a comprehensive state grazing policy in the country. Such a policy is of utmost importance in states where forest is the major source of fodder. All stakeholders including pastoralists should be involved in formulating the policy and a studied and holistic approach should be adopted as suggested in the foregoing paragraphs.
- 1.2 There is need to carry out applied research on various aspects related to rangelands/pastures/CPRs, (including fodder trees, bushes, weeds etc) i.e. grass/tree fodder, impact of different systems of grazing/ number of livestock grazed and time spent on grazing. All stakeholders including concerned organizations/ departments like Forest, Animal Husbandry and Dairy Development departments / Dairy Federation, Agriculture/Veterinary University, Representatives of livestock keepers etc should be involved. The information gathered should be discussed and widely circulated for creating awareness amongst stakeholders.
- 1.3 Extensive studies have been carried out in some of African and South American countries on rangeland/pastures/CPR's production pattern and impact of different grazing systems. Information from studies carried out in comparable systems should be reviewed and widely disseminated. Such information will help in proper understanding the issue, removing misconceptions and proper planning of studies in India as also utilized for creating awareness and for sensitization of stakeholders, policy makers and planners.
- 1.4 Initiatives suggested for promoting understanding of forest-livestock relationship:
 - 1.4.1 Include subject relevant to forest-livestock interaction in formal education from primary level to graduate level (Veterinary, Forestry, Agriculture Civil service)
 - 1.4.2 Education should be supported by appropriate information dissemination mechanism in the form of workshop, training programmes, and experience sharing programmes using mass media for creating awareness and sensitizing farmers, pastoralists on related aspects (including environmental issues).

2. Livestock-water Issues

Population growth and changes in production systems and consumption of crop - livestock products is one of the major drivers of future uncertainty of water resources. The problem is both local and global and basically fuelled by inappropriate unhealthy crop-livestock- water interactions. Using framework analysis approach it is revealed that the livestock productivity is fairly high and the problem of water varies both spatially and temporally. It is also closely related to farmers' livelihood strategies and access to resources.

Recommendations and strategies suggested:

- 2.1 Search and select crops with high water productivity
- 2.2 Develop strategies for enhancing livestock water productivity
- 2.3 Integrating livestock development with watershed/ water resource development programmes for better livestock – water productivity
- 2.4 Provision of sufficient quantity and quality of water for livestock also.
- 2.5 Empower farmers materially, financially as well as by imparting knowledge and awareness.
- 2.6 Explore utilization of 'Halophytes' (like species of *Salicornia*) found in the coastal areas of states like Gujarat for animal feeding. These plants do not compete for use of sweet water.
- 2.7 Promote small-holder systems as these are likely to be more water efficient

2.8 2.2 Conduct studies to find out water use efficiency of livestock breeds of dry arid zones of the country like North-Western parts of Gujarat and Rajasthan

3. Industrial Livestock Production

It is recommended that:

- 3.1. Awareness should be created at all levels regarding 'Pros and Cons of Industrial livestock production', particularly the risk of pollution in peri-urban / urban areas.
- 3.2. Decentralised and smallholder production supported by centralised collection-processing and marketing system (like that of dairy cooperatives) may be considered for wider adoption as it is found to be competitive.
- 3.3. Smallholder production systems that satisfy consumer's requirements (quantity & quality) be promoted and increased urban demand utilized for developing rural production and poverty alleviation.
- 3.4. Policies be developed, infrastructure and vertical integration carried out, for private investment and interventions in the livestock sector, keeping smallholder producer in focus.
- 3.5. Rules and regulations be formulated related to environmental issues- according to the "polluter pays" principle
- 3.6. Pollution from rapidly growing urban - peri-urban commercial livestock production needs to be studied and rules and regulations required for protection of public health be imposed
- 3.7. Producer organisations be developed and empowered to influence agricultural policies and strategies adopted

4. Livestock – Land Interaction

Shrinking land resource has become a limiting factor for livestock keeping by marginal farmers and the landless, particularly the pastoralists, for whom livestock is a major source of livelihood. These livestock keepers depend largely on CPRs (village commons, grazing lands etc.) and forests for feeding their livestock and CPRs are shrinking rapidly due to a variety of reasons. It is recommended that:

- 4.1 The status of village commons (grazing lands etc.) and grass lands (like Banni in Kutch or Kawal lands in Karnataka) be restored and support provided to develop this resource wherever there is scope.
- 4.2 All types of livestock keepers (farmers, pastoralists, tribals) be involved in developing these resources and oriented and encouraged to manage them.
- 4.3 Discussions on land use policies should also involve landless livestock keepers like pastoralists.
- 4.4 Rational grazing policies be developed (for CPRs, Forests) taking into consideration the traditional grazing rights of the pastoralists also.
- 4.5 Degraded CPRs and Forests should preferably be developed into Silvipastures and participatory approach adopted for development and management. Care should be taken to involve Pastoralists in these initiatives.
- 4.6 All Natural Resource Development programmes should have livestock components and consider their needs and scope for development (small as well as large livestock)..
- 4.7 Plantation of bio-fuel plants like *Jatropha*, that has neither any fodder value nor any beneficial effect on soils, should be discouraged on CPRs and other useful species be chosen e.g. multipurpose tree species that meet the needs of the community.

5. Livestock and Biodiversity Issues

- 5.1 Education and awareness programmes on critical role of livestock biodiversity in sustainable development, particularly in eco-fragile areas, must be undertaken for the benefit of planners, policy makers and development professional as well as livestock keepers. For this purpose there is a need to study livestock biodiversity and generate information – since there is dearth of information on many species and types of livestock that exist in India.
- 5.2 Positive incentives should be provided for conservation and development. For example, niche markets can be developed for products of livestock species/breeds with unique qualities that are traditionally recognised.

Combining relevant and proven traditional knowledge with appropriate modern scientific methods for maintenance and improvement of indigenous breeds of livestock is recommended. For this purpose 'Experts amongst traditional livestock breeders' should be identified and involved. The traditional breeders should be made aware of the value of their livestock as gene resource for sustainable livestock development and supported to develop this resource

Presenters' details

	Name of Speaker	Designation & Organisation	Title of presentation
	Dr Mohanan	Senior Project Officer, CEE, KSD Kannur	Introduction, Role of Education in Addressing Livestock, Environment and Development-Issues
1.	Shailendra Tiwari	Seva Mandir, Udaipur	Livestock- Land Perspective Issues, Challenges and Way Forward
2.	Amare Haillassie	Internationa Livestock Research Institute, Ethiopia	Livestock Water Productivity : Concept and Practices
3	Dr C T Chacko	Livestock consultant, Kerala	Shift to industrial livestock production in India - its environmental, social and health consequences and responses
4	M. Osman	Central Research Institute for Dryland Agriculture, Hyderabad	Land- Livestock –Livelihood Interaction: Sustainable Management of CPRs and PPRs under Watershed Programmes
5	Dr. Kornel Das		Livestock Biodiversity
6	Dr Kishore V. Patel	Dist. Animal Husbandry Officer, Dist Panchayat, Ahmedabad	Gujarat Animal Husbandry Department
7	Mr. C.Sivasankara Reddy	IFS, PCCF – Production Andhra Pradesh Forest Department	Livestock & Forest Issues
8	Padmakumar	Senior Subject Matter Specialist	Role of Education in addressing - LEAD Issues LEAD India Platform Experiences