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Potential/Constraints for their Expansion
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Demand and Supply of Feed Crops in Nepal

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Executive summary

Livestock is a key element in the agricultural production system of Nepal. Livestock farming is largely found on small, mixed farms with varying interaction between crop, livestock, fisheries and forestry. At farm level, the role of livestock is often multipurpose. Livestock is a source of nutritive products (milk, meat, eggs) and is an income and employment generating activity. Animals supply draught power without requiring fossil fuels and farmers depend on animals for transport in many rural areas. Draught animals are used for processing crops and for irrigation. Animal manure is used as fertilizer, fuel or as feed in fishponds. The multipurpose function of livestock is contributing about 15 per cent to the overall gross domestic product and 31 per cent to the agricultural gross domestic product (AGDP) of the country. The contribution of livestock is expected to grow to 45 per cent of AGDP by 2015 as envisaged in the long-term agricultural perspective plan (APP) of the country.

Increasing evidence shows that a demand driven livestock revolution is underway in developing countries with a profound implication for agriculture, environment and poverty.

The term, livestock revolution, is used to describe the massive increase in demand for foods of animal origin fueled by population growth, urbanization and income growth in developing countries over the next 20 years (IFPRI, 1999).

The livestock revolution encompasses the following distinct trends:

1. Rapid increase in consumption and production of livestock products.
2. A change in production base from local, mixed farms to market oriented, vertically integrated types.
3. Increased substitution of meat and milk for grains in the human diet.
4. Rapid rise in the use of cereal based feeds.
5. Growth of more intensive production systems closer to cities.
6. Emergence of technological changes in livestock production and processing along the industrial systems.

Lack of policy action to adjust to emerging issues will not stop the livestock revolution but it will ensure that the form it takes is less favourable for growth, poverty alleviation and sustainable agricultural development in the country.

In the period between 1982-2000, FAO estimated an average annual growth rate in demand for meat, milk and eggs in developing countries of 3.7, 3.1 and 4.3 per cent respectively (FAO, 1987). Population growth, urbanization and income growth determine the changes in demand for livestock production. An IFPRI report estimated the income elasticity of demand for meat, milk and eggs at 0.97, 0.52 and 1.07 for Asia indicating a high elasticity of demand for meat and eggs. The FAO / IFPRI predictions to year 2020 are that meat and milk consumption will grow at 2.8 and 3.3 per cent per annum in developing countries. The demand for livestock products, particularly meat and eggs, is elastic with respect to income changes indicating there would be increase in demand if there were changes in income of the customer.

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Feed resources

Inadequate feed resources, both qualitatively and quantitatively are serious constraints to increased animal production. Perspectives for the future must be sought in expanding and improving the feed base.

Feed resources can be divided into:

1. Low quality roughages (natural pasture, crop residues).
2. High quality roughages (fodder crops, legumes, trees).
3. Agro- industrial by products (oil meal, cakes and others).
4. Concentrates (compound feed of grains and agro-industrial products).
5. Supplements (vitamins, minerals and others).

In the conventional feeding regime, most of the feed energy supply for ruminants originates from rangeland, pastures and crop residues. Livestock feeding was based largely on extensive grazing on natural pastures, and to some extent on forests, crop residues and fodder crops.

About 35 per cent of animal productivity is estimated to have been lost due to the poor feeding system. The supply of total digestible nutrients (TDN) from crop by-products, forests and grazing lands, and others is estimated at 45 per cent, 30 per cent and 25 per cent respectively. Total production of digestible nutrients was 6,133 thousand mt against the requirement of 8,643 thousand mt in 2000. This indicates a deficit of TDN by 29 per cent in the country.

Reduced grazing resources due to land occupation and land degradation makes livestock increasingly dependent on crop residues. Fodder and forage production on crop land is competing with food production for human beings.

Grain feed used in developing countries increased by 3 per cent per annum due to increased demand for livestock products of milk, meat and eggs.

Demand for feed crops is a derived demand which depends on the size of the livestock population and the quantity of feed fed to animals.

Livestock population and production patterns

Major livestock populations in Nepal include cattle, goat, buffalo and poultry.

1. Cattle are the major livestock raised in all ecological regions of the country. It is estimated that 50 per cent of the cattle population is concentrated in the mid-hills and 38 per cent in the Tarai. The percentage of improved breeds in cattle is 8.25 per cent that are spread along the periphery of major highways and Tarai urban centers. Many dairy cattles are raised under intensive systems in the milk grid areas. Total population of cattle in 2001 was 6.98 million.
2. Goats are also raised in all ecological regions with 55 per cent of goats concentrated in the mid-hills. About 13.7 per cent of goats are estimated to be of improved breeds. There were 6.5 million goats in 2001.
3. Buffaloes are important livestock animals in the farming system. About 50 per cent of the total buffalo population is reported to be raised in the mid-hills. Improved breeds consist of 21.14 per cent in the case of buffalo. The buffalo population was reported to be 3.6 million in 2001.
4. Poultry is a fast growing enterprise. Commercial production of poultry meat and eggs is spreading over the major urban areas and highway areas. In the rural areas, poultry is raised under scavenging conditions, whereas in highway areas with accessibility to urban areas, poultry birds are raised under intensive production systems with the use of

commercial feeds. About 50 per cent of the poultry is estimated to be of improved breeds. The fowl population was 20 million in 2001.

5. One of the fastest growing livestock species is piggery, which is concentrated in certain areas of east Nepal. About 40.7 per cent of pigs are reported to be of improved types. The pig population was 0.912 million in the country in 2001.

The annual growth rates of the major livestock populations are given in Table 1. The annual growth rate is 1.05 per cent for cattle, 1.73 per cent for buffalo, 1.88 per cent for goat, 4.93 per cent for pigs and 4.17 per cent for fowl. The population of milk cow and milk buffalo has grown by 2.15 per cent and 2.25 per cent respectively.

Table 1. Livestock population of Nepal, 1990-2001 (unit in '000 number)

Type	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	Annual % Increment in 2001 over 1990
Cattle	6,255	6,246	6,237	6,546	6,838	7,008	7,025	7,049	7,031	7,023	6,982	1.05
Buffalo	3,044	3,058	3,073	3,176	3,278	3,302	3,362	3,419	3,471	3,526	3,624	1.73
Sheep	906	912	911	914	919	859	869	869	855	851	850	0.56
Goat	5,367	5,406	5,452	5,524	5,649	5,783	5,922	6,080	6,204	6,325	6,478	1.88
Pigs	591	599	605	612	636	670	723	766	825	877	912	4.93
Fowl	13,559	13,496	13,600	13,854	14,063	14,521	15,576	16,664	17,797	18,620	19,790	4.17
Duck	391	389	392	394	404	416	415	417	421	425	411	0.46
Milking cow	689	695	699	739	766	785	816	826	828	840	852	2.15
Milking buffalo	750	752	756	786	811	821	857	882	896	910	936	2.25
Laying hen	4,206	4,187	4,217	4,295	4,405	4,548	4,887	5,182	5,421	5,668	5,998	3.87
Laying duck	202	202	205	207	212	218	218	219	220	222	215	0.58

Source: Ministry of Agriculture and Cooperatives "Statistical Information on Nepalese, Agriculture" (2000-2001), Kathmandu 2001.

Review of production and consumption of livestock products

Meat

During 1990 to 2001 a consistent growth in livestock products of meat, milk and egg was reported. The annual growth of meat {including meat from buffalo (66 per cent), goat (25 per cent), poultry and pigs (9 per cent)} has increased by 2.89 per cent. Poultry meat in particular increased by 4.09 per cent during the period. Total production of meat was about 194,258 mt in 2000-2001. (Table 2)

Milk

Annual growth in milk production has been recorded at 2.83 per cent with 3.06 per cent in cow milk and 2.58 per cent growth in buffalo milk. Total milk production was 1,124,132 mt in the country.

Eggs

Egg production has increased by 3.39 per cent per annum. Total egg production was 507,323,000 units in 2000-2001.

Per capita consumption of milk, meat and eggs is estimated at 58 liters of milk, 10 kg of meat and 25 units of egg for the year 2000-2001.

To meet the increased requirements of livestock products, Nepal imported about 382,454 heads of buffalo, 465,506 heads of goat, 1,703,220 units of poultry birds, 929,276 liters of milk

54 Country Reports

and 2,792,000 units of eggs in 1998-1999. Similarly, some exports from Nepal were 36,348 heads of buffalo, 47,266 heads of goat, 33,169 poultry birds, 149,986 liters of milk and 717,900 units of egg to India.

Table 2. Production trend of livestock products

Products	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	Annual % Increase in 2001 over 1990
Milk production	864,831	871,234	876,594	918,609	971,373	961,560	1,012,163	1,048,040	1,072,945	1,097,023	1,124,132	2.83
Cow milk	256,398	259,230	260,786	278,065	288,822	296,620	310,183	318,680	328,920	337,455	342,738	3.06
Buffalo milk	608,433	612,004	615,808	640,544	682,551	664,940	701,980	729,360	744,025	759,568	781,394	2.58
Meat production	147,347	148,695	149,893	154,343	158,748	161,520	174,268	180,675	185,034	189,160	194,258	2.89
Buffalo	95,312	96,013	96,574	100,383	104,070	104,830	113,482	117,350	119,562	121,769	124,848	2.82
Mutton	3,029	3,044	3,032	3,055	3,067	2,860	2,900	2,903	2,873	2,860	2,856	0.49
Goat	29,372	29,844	30,377	30,702	30,908	32,040	34,550	35,640	36,235	36,930	37,769	2.60
Pig	10,242	10,407	10,447	10,642	11,027	11,800	12,374	13,090	13,924	14,646	15,239	4.43
Chicken	9,138	9,119	9,195	9,291	9,396	9,700	10,671	11,400	12,146	12,659	13,259	4.09
Duck	254	268	268	270	280	290	291	292	294	296	287	1.04
Egg production*	369,519	368,164	370,928	378,079	383,122	396,400	421,460	440,910	460,625	480,800	507,323	3.39
Hen egg	354,296	352,983	355,539	362,589	367,378	380,400	405,462	424,910	444,500	464,530	491,566	3.52
Duck egg	15,223	15,181	15,389	15,490	15,744	16,000	15,998	16,000	16,125	16,270	15,757	0.31
Wool production	767	620	620	621	625	618	623	623	615	615	613	1.82
Fish production**	8,713	9,125	8,609	8,828	9,542	10,031	11,727	12,373	14,000	14,000	15,320	6.89

Source: Ministry of Agriculture and Cooperation "Statistical Information on Nepalese Agriculture" 2000-2001, MOA, Kathmandu, Nepal, 2001.

Note: * = 000; ** = mt

Demand and supply of feed and feed crops in Nepal

The demand for commercially manufactured concentrated animal feed is being affected by the fast growth of the livestock population, particularly in dairy animals and poultry birds. A significant growth in dairy cattle farms and commercial poultry farms can be seen in the country, particularly in urban areas of Tarai and accessible areas of hills. Increasing numbers of dairy cattle, buffalo and poultry birds of improved breeds are replacing local livestock animals and birds. This has necessitated the use of blended and manufactured feeds under the intensive livestock raising systems. Many farmers in Kabhre, Chitwan, Pokhara and Bhairahawa said that they would sacrifice the personal expenses on unnecessary items and would prefer to spend limited income on the good feeds and health care of their animals.

The feed conversion ratio to produce a kilo of meat, milk and egg output has been derived at 3, 2.5 and 2.5 kg of feed respectively. The ratio does not include the feed required for body maintenance of livestock animals (Department of Livestock and APROSC, 1995). (Table 3).

Table 3. Demand for livestock feed for production of livestock products ('000 mt feed)

	1995	1996	1997	1998	1999	2000	Annual Growth rate in % (in 2000)
Milk	313	320	337	349	357	365	2.77
Meat	63	64	69	72	74	75	3.17
Egg	153	158	168	176	184	192	4.25
Total	529	542	574	597	615	632	3.24

Assumption:

Assuming all milch cattle are fed with commercial feeds

Feed requirement for body maintenance not included

Feed consumption efficiency of livestock and poultry for milk, meat and egg production estimated at 3:1, 2.5:1 and 2.5:1 respectively.

Source: Department of Livestock and APROSC "A Study on Live Animals and Animal Products Marketing in Nepal", Kathmandu, 1995.

The number of improved cattle is also increasing and farmers treat them as important assets and feed them quality feeds. The population of improved poultry is also rising which is estimated at 50 per cent of the total. Poultry birds are raised under intensive conditions by providing commercial feeds. The annual growth in demand for feeds was 3.24 per cent during 1990-2000.

Due to growth in demand for commercial feeds, the prices of feed crops have registered a significant rise. The prices of maize and soybean, the major ingredients in poultry and cattle feed increased by an annual increment of 20 and 10 per cent respectively during 1990-2000.

Prices of livestock products have increased per annum by 13 per cent in the case of milk and 10 to 17 per cent in the case of chicken and mutton. Similarly the annual increment was 9.43 per cent in the case of poultry eggs.

Due to scarcity of livestock products, Nepal tends to import a large amount of eggs, meat and milk to meet the rising demand.

The demand of animal feed in the coming decade will accelerate as the demand for livestock products increases from the rising population, growing income levels and a marked shift to consume quality animal foods against the grains. It is projected that a huge gap between the requirement and supply of feeds will appear in the country. The total requirement of feed in 2010 is estimated at 874,000 mt of feed against the current availability of 410,000 mt in 2000. The annual growth rate of demand for feed is at 3.38 per cent per annum (Table 4) for 2001 to 2010.

Table 4. Projection of animal feeds, 2000 - 2010

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Annual Growth Rate
1 Milk Production ('000 mt)	1,128	1,161	1,197	1,233	1,269	1,308	1,347	1,386	1,428	1,470	3.03
Requirement of feed for milk production ('000 ton)	376	387	399	411	423	436	449	462	476	490	3.03
2 Meat production ('000 mt)	193	197	202	207	212	220	227	235	242	250	2.95
Requirement of feed for meat production ('000 ton)	77	79	81	83	85	88	91	94	97	100	2.99
3 Egg production ('000 mt)	500	520	540	562	585	607	632	657	682	710	4.20
Requirement of feed for egg production ('000 ton)	200	208	216	225	234	243	253	263	273	284	4.20
Total '000 mt feed	653	674	696	719	742	767	793	819	846	874	3.38

Source: Authors' calculation.

Supply of feeds

The number of feed processing industries in 2000 were 154, producing about 410,000 mt of feed. Most of the feed industries in Nepal are small and are not operating at full capacity utilization. The reason for the lower utilization of processing capacity was the non-availability of raw materials and lack of proper maintenance. There is one government feed manufacturing

plant in Hetauda with a production capacity of 2 mt per hour, which is operating at a 50 per cent capacity utilization.

Larger processing mills operated in the private sector receive their feed grain supplies either from the local traders or from India. Major ingredients for feed production are maize and soybean accounting for 42 and 11 per cent of the total ingredients respectively.

Many processing industries reported that it is not cost effective to procure maize and soybean from small producers who do not supply large quantities and raw materials are also of poor quality containing heavy moisture in the grains.

It is imperative that there should be a supply contract for maize and soybean for farmers with processing industries to guarantee the supply of quality raw materials. Appropriate institutional and policy arrangements should be worked and implemented for the betterment of both farmers and processors.

The feed crops of maize and soybean are often grown by small farmers on the poorer lands. Efforts should be made to provide the benefits to these small farmers.

Nepal's feed industry will have to face tough competition from other countries after its accession to WTO. Nepal has to improve quality and cost competitiveness in its production. As the feed ingredients are of a bulky nature, Nepal will have to face the problem of increased storage and marketing costs.

Major ingredients such as maize and soybean are mainly produced in the hill-farms and are grown as subsistence crops by small farmers in non-irrigated conditions. Maize required for feed production was about 210,000 mt in 1999. This is estimated to increase to 342,000 in 2010. This increased volume of production has to be made available either through local production or imported from abroad (Table 5).

It was reported that in 1999 the feed processing industries were importing about 40 per cent of total maize ingredient or 84,000 mt to fulfill the raw material requirement for feed production.

Table 5. Projection of maize production and uses, 2001-2010 (unit mt)

Year	Total Production of Maize (mt)	Total Area (ha)	Feed (mt)	Food (mt)	Other Use (Seed, Liquor, Wastage etc.)
2001	1,488,350	822,567	220,500	1,080,725	187,125
2002	1,533,000	827,947	231,525	1,091,532	209,943
2003	1,578,990	833,298	243,101	1,102,447	233,442
2004	1,626,360	838,621	255,256	1,113,471	257,633
2005	1,675,151	843,916	268,018	1,124,605	282,528
2006	1,725,405	849,181	281,419	1,135,851	308,135
2007	1,777,167	854,417	295,490	1,147,209	334,468
2008	1,830,482	859,624	310,264	1,158,681	361,537
2009	1,885,396	864,802	325,777	1,170,268	389,351
2010	1,941,958	869,949	342,065	1,181,970	417,923

Source: Authors' calculation.

An analytical exercise

1. The estimation of coefficients from the data under the area of feed crop maize in 1980-1999 shows that the cropped area under maize is not dependent on the relative prices of the (maize to rice) crop as the value of coefficients is quite low and negative. This result seems to be consistent under a subsistence economy where maize is being cultivated independent of prices.

2. The yield of maize is stagnant over the comparison period which is shown by the small and negative coefficient of trend variable. However, yield is found to be responsive to price of urea indicating a greater use of urea fertilizer over a decrease in relative prices of the urea to maize.
3. The price response to demand of maize for food purposes is, as expected, negative (-0.07). However, an increase in income of one per cent would lead to an increase in maize demand for food by 0.26 per cent.
4. In maize demand for feed, a one per cent increase in milk production would create a corresponding 1.25 per cent increase in maize demand for feed. However, in the case of eggs, a one per cent increase in egg production would lead to 0.02 per cent decrease in maize demand for feed at the household level. This is due to the fact that processing industries may require more maize for feeds and farmers would have to sell their maize with a corresponding decline in maize availability of feed at the household level. The results indicate that maize demand for feed does not decline with an increase in prices. This is because the processors do not maintain the stocks and have to buy, even at increased prices.
5. Coefficients relating to demand of maize for other uses indicate that a one per cent increase in maize demand for food and feed purposes would lead to a 0.89 per cent increase in demand of maize for other uses.
6. Production of soybean is also found to be not dependent on price. This is, as expected in a subsistence economy under which soybean is produced.
7. Coefficients show that a one per cent increase in the income of the people would result in a 0.46 per cent increase in soybean demand. The price response to demand for soybean is, as expected, negative indicating a decline in demand with an increase in prices.

These parameters have been used to project feed crop demand of the maize and soybean up to the year 2020. (Appendix 1)

Conclusions

To close the widening gap between demand and supply of feed crops, it is recommended that the government should facilitate the production of maize by promoting contract procurement of maize and soybean by feed processing industries which will help to augment appropriate research and infrastructures such as storage, marketing and other logistics.

The second alternative is whether Nepal can import the required feed for the livestock population which involves hard currencies and other priority investment problems.

The third alternative is to grow winter maize and soybean in Tarai, often at the cost of other food crops such as lentil and other legumes which already have an export market abroad.

The fourth alternative is to grow feed crops such as oilseed, millet and other crops on marginal terraced and small farms. This requires the increased collaborative efforts from the Government and the CGPRT Centre to increase feed crop production, employment and the living status of marginal and poor farmers. This will help diversify farm production in the poorer lands and alleviate poverty.

SWOT framework

Strengths	Weaknesses
<ol style="list-style-type: none"> 1. Increasing demand for livestock products. 2. No interference on (ingredients) input and output prices (livestock products). 3. Huge open border market for Nepalese feed crops and feeds. 4. Increased demand for feed likely to continue. 5. Dairy and poultry sector developing and expanding under the private sector. 6. Promotion of oilseed crops in hills – a potential which can be used as a feed crop. 	<ol style="list-style-type: none"> 1. Policy planning not oriented to feed crop and feed development. 2. Technology for feed processing weak. 3. Raw material availability to processing industries not adequate. 4. Indian market prices are dominating. 5. Cost competitiveness is weak for local feed products. 6. Market is fragmented and small. 7. Cost of transport and collection is prohibitive. 8. Government facilitation on research and market development is not available. 9. About 40 per cent of the total maize used for feed, reported as imported. 10. Quality of feed crops is poor. 11. Industries not operating at full capacity. 12. Nepal Feed Association not able to play coordinating role in price, quality or other areas. 13. Import duties on ingredients very high. 14. Storage facilities for feed and feed crops very poor. 15. Tax policy is not conducive for feed development.
Opportunities	Threats
<ol style="list-style-type: none"> 1. Domestic markets can be expanded with improvements in road access for livestock products and feed crops. 2. Export of livestock products such as 'yak' cheese can be promoted. 3. Private sector participation in livestock and feed development forthcoming. 4. Contract procurement of feed crops - a potential. 5. Potential for winter maize expansion in Tarai. 6. Cost reduction for livestock products, an opportunity. 	<ol style="list-style-type: none"> 1. Due to the open border, Indian prices dominate the local market prices. 2. Local prices are higher for livestock feeds and products than in India. 3. Productivity improvements are constrained by the non-availability of blended feeds for animals.

References

- IFPRI, 1999. *World Food Prospects: Critical Issues for the Early Twenty-first Century*, A Food Policy Report, Washington, D.C.
- FAO, 1987. *Agriculture Towards 2000*, Rome.
- Department of Livestock and APROSC, 1995. *A study on Live Animals and Animal products Marketing in Nepal*, Kathmandu.