

# Impact of change in land use and land cover on feed resources in the Ethiopian highlands<sup>1</sup>

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## Abstract

The major feed resources in the Ethiopian highlands are natural pasture and crop residues, but both availability and quality of these feed resources are low. Over the years, contribution of these resources to livestock feed changed because of land use and land cover (LULC) change. A study conducted in the Yerer Mountain area in the Ethiopian highlands assessed the impact of LULC changes between 1971 and 2000 (Figure 1) on feed availability. Seventeen black and white aerial photos from 1971/72, Landsat ETM+ satellite image of February 2000), topographic maps and maps of four districts with Farmers' association (FA) boundaries (1:50,000 scale) were used. Detailed digital image processing and visual interpretation of satellite images and the aerial photos were made. Amount of feed from crop residues was estimated using structured questionnaire with 132 households and harvest index (grain: total biomass ratio) obtained from different sources for 2000. Estimates of feed resources from various LULC types were compared with livestock feed requirements in both periods. Livestock number increased from 10 478 to 28 435 Tropical Livestock Units, while overall feed resources declined from 44,489 to 40,610 tons over the study period (Table 1). Contribution of feed from natural pasture decreased from 70 to 25% while, it increased from 30 to over 75% for crop residues. Feed resources were in excess of the livestock requirement in 1971 while only 64% was met in 2000 (Tables 1 and 2). Population growth was the major driving force behind the LULC changes (Figure 1), which also influenced livestock feed availability and type. While this trend is alarming, recent research and development activities in the study area show that feed from crop residues could easily increase using newly released high yielding varieties. Such new developments should however be integrated and follow multifaceted approaches for creating a resilient ecosystem, including working on improving the quality of crop residues and developing intensive livestock management systems among others.

**Table 1.** Estimated yearly feed dry matter from various LULC types for 1971 and 2000

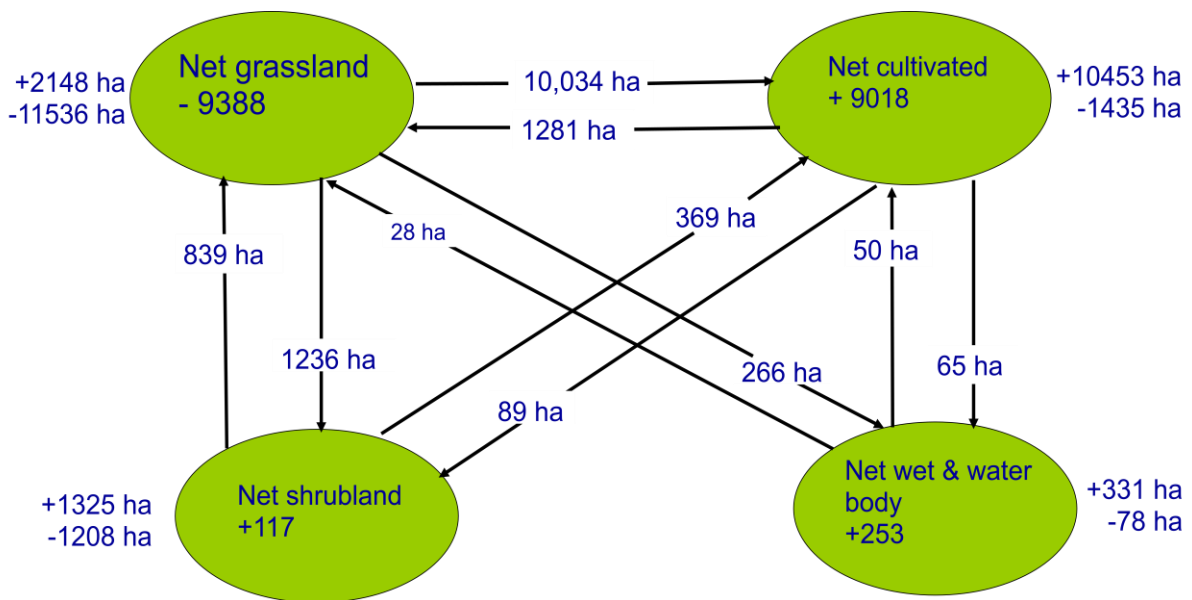
LULC type	Multiplying factor DM yield (t/ha/yr)	Area (ha)		DM production (t)	
		1971	2000	1971	2000
Cultivated land	1.52 + 0.36	7,186	16,204	13,510 (30.4%)	30,464 (75%)

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All other land cover categories	1.45 (1971); 0.83 (2000)	21,365	12,224	30,979 (69.6%)	10,146 (25%)
Total		28,551	28,428	44,489 (100%)	40,610 (100%)

**Table 2.** Daily and annual DM for MEM requirements for animals in the study area in 1971 and 2000

Livestock type	Daily DM requirement (kg/head/d)	Total number of livestock		Total annual DM feed requirement (t)	
		1971	2000	1971	2000
Cattle (local)	4.33	11737	31462	18549.7	49724.1
Sheep	0.625	3349	8153	764.0	1859.9
Goats	0.625	4958	9091	1131.0	2073.9
Donkeys	3.00	2375	8164	2600.6	8939.6
Horses	4.20	138	633	211.6	970.4
Mules	4.20	192	231	294.3	354.1
Total				23551.2	63,922.0



**Figure 1.** Land use and land cover dynamics 1971/72 and 2000

### References

Kahsay Berhe (2004). *Land use and land cover changes in the central highlands of Ethiopia: the case of Yerer Mountain and its surroundings*. M.Sc. Thesis. School of Graduate Studies, Addis Ababa University. 136 pp

Berhanu Gebremedhin, Fernandez-Rivera, S., Peden, D. and Solomon Gebresselassie (2004). *Crop residue as feed in the Ethiopian highlands: Result from maize-based crop-livestock mixed system*. Unpublished. 26 pp. (Mimeo-ILRI, Addis Ababa)

Woody Biomass Inventory and Strategic Planning Project (2001). *The Oromiya Regional State. A strategic plan for the sustainable development, conservation, and management of the woody biomass resources. Final report*. 158 pp.