Improvements and future prospective of forage production

by Stefan Böttinger (University of Hohenheim)

Germany

1. Land Use Definitions

FAO´s land use definitions distinguish clearly between cropland and land under permanent meadows and pastures, **Figure 1** (FAOSTAT 2017). Cropland also includes land under temporary meadows and pastures and land under temporary crops. FAO does not distinguish between land under temporary crops for animal fodder production and for other purposes. The same type of crop can be used for different purposes. Here further harmonization is necessary for the statistics of the different countries. Due to this lack it is not easily possible to access to statistics about the share of agricultural land with temporary forages.

2. Type of Forages

Forage can be divided in permanent and temporary crops. The permanent crops are mainly grass-like and/or herbaceous crops, cultivated as permanent grassland or growing wild as in a prairie. These two groups are used as pasture. Especially in less developed countries grazing is very common. On a global scale they have a fundamental role in livestockfarming. The cultivated permanent grassland can also be harvested.

The intensively cultivated temporary crops include three major groups:

- grasses, including also green harvested cereals,
- legumes, including also green harvested pulses, and
- root crops.

Grasses include crude fibre, crude protein and some minerals. Legumes are particularly rich in protein and minerals. Root crops include high content of starch and sugar and low content in fibre. These three types of crops and also the harvest from the cultivated grassland are fed to the animals either as green feed, as hay (harvested dry or dried after harvest) or as silage. Silage from maize, rye, barley, wheat and grass is green fodder preserved by fermentation that retards spoiling. This type of fodder has got an important role in intensive livestock farming due to the simplification of the harvest mechanisation chain, the lower cost per unit and the higher productivity. With silage it is easier to maintain a constant level of quality. Due to the higher energy content the feed transformation efficiency has improved, **Figure 2**.

3. Land Use Analysis

An FAO own analysis of grassland as cultivated and naturally grown permanent meadows and pastures points out this type of ecosystems cover 26 % of the world land area and 70 % of the world agricultural area. **Table 1** summarizes the area used to cultivate fodder crops in different regions of the world. In total, this area has decreased significantly between 1990 and 2000. The increase of

the yield due to the intensification of the production could not compensate this loss of area. (Panunzi 2008).

4. Improvements of forage production

For the improvement of the production of forage several parameters have to be taken into account. The tendency for higher forage quality, higher yields and the availability of powerful machinery chains are leading more and more to the production of silage instead of hey. In **Figure 3** the harvest and the storage losses are summarized in dependence of the type of forage production. In this example, the minimal losses are achieved for low moisture silage. Also with silages a more constant quality of the forage can be realized.

To improve the quality of harvested grass it is essential to optimize the cutting time. Especially for the first cut in the season a period of only 2 - 5 days is available. The cutting height should be between 5 to 7 cm. So the growth of the plant is faster due to the photosynthesis activity of the remaining green parts. Also the impurity with particles of the soil is reduced. The handling of the grass for tedding and raking causes harvest losses mainly of broken parts of dry leafes.

Silage production of corn or other creals is optimised also by the harvest time. Big influence has the chopping length and the kind and intensity of the processing. Therefor a variety of processors are available from the different manufacturers.

For the economic optimization of the silage production an exact matching of the equipment (harvester, transport units, storage equipment) is necessary (e.g. Buckmaster 2009). Due to yield and transport distances this matching should be often adapted. With given number and sizes of equipment this match is mostly a compromise. Actual studies show again, that still today the utilization of the harvester is only 61% (Harmon et al. 2018). To increase the utilization by reducing mainly the idle time is principally a management task, which has to be supported by better information and communication of all participating persons.

References

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FIGURES

Figure 1 – FAO´s land use definition *(Source: [3])*.

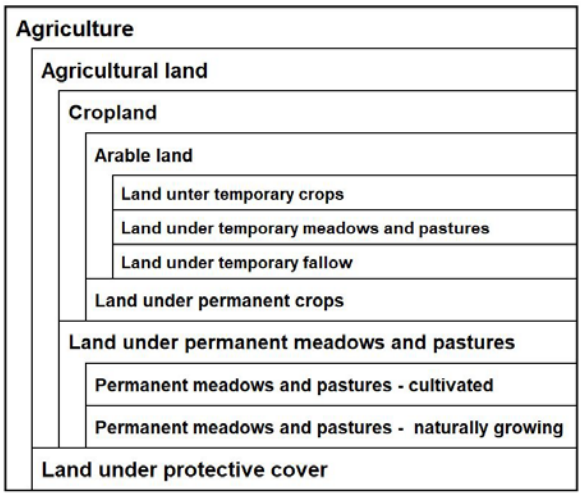


Figure 1: Different feeding systems due to land and husbandry intensification *(Source: [2])*.

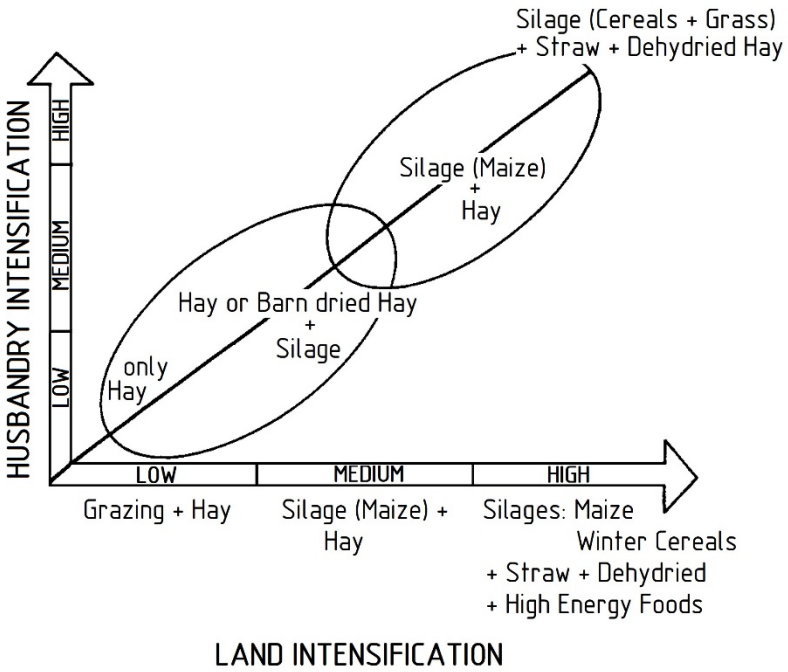
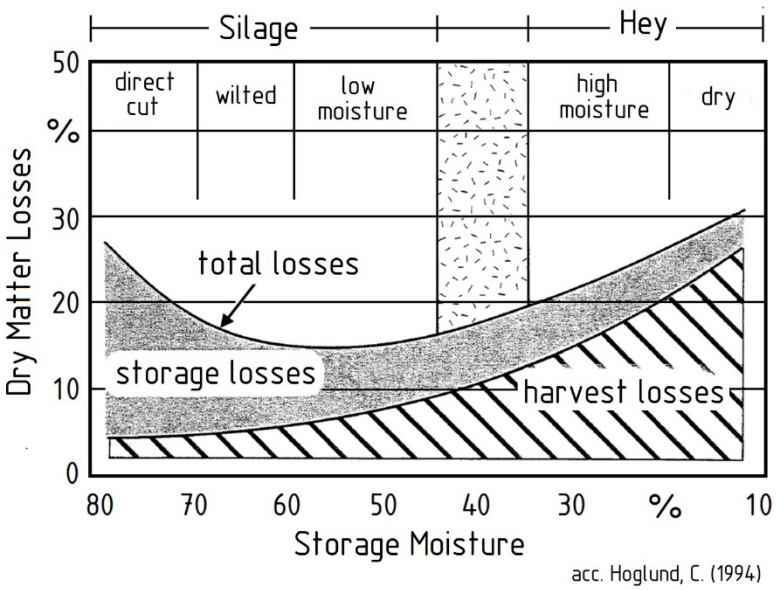


Figure 2: Harvest and storage losses of forage in dependence of storage moisture *(Source: [5])*.



TABLE

Table 1: Area of fodder crops classified by macro areas *(Source: [6])*.

COUNTRIES	AREA HARVESTED (Ha)			YIELD PER HECTARE (Kg/Ha)			PRODUCTION QUANTITY (tonnes)		
	1980	1990	2000	1980	1990	2000	1980	1990	2000
Africa Northern	1,220,947	1,112,863	1,165,600	46,471	51,206	45,163	54,000,000	50,862,000	47,417,000
Africa Southern	250,000	245,000	220,000	39,240	25,102	26,818	9,810,000	6,150,000	5,900,000
Former USSR	16,958,000	16,859,008		15,696	21,413		266,168,000	360,999,936	
Asia Eastern	149,900	171,200	121,100	55,809	64,401	64,766	7,565,700	9,238,900	6,915,000
Asia South-Central			315,361			78,713			4,688,251
Asia South East	442,000	618,033	556,000	10,611	24,626	26,374	4,690,000	15,219,977	14,664,000
Asia Western	197,697	377,102	587,090	427,855	463,601	520,245	3,683,191	11,191,551	16,332,563
America Northern	15,092,410	13,176,100	12,108,280	41,435	64,303	61,538	193,295,334	393,342,592	392,645,836
America Central	383,047	485,259	567,059	51,413	41,838	47,511	19,693,566	20,302,448	26,941,548
America Southern	6,867,670	3,803,282	3,171,030	79,035	123,925	130,934	104,619,410	77,116,606	80,738,107
Russian Federation			3,670,000			13,896			51,000,000
Europe Eastern	640,592	1,115,576	804,626	63,036	402,400	252,917	1,850,882	2,205,566	3,058,317
Europe Northern	406,643	412,610	685,201	80,164	101,704	156,256	1,972,732	14,857,519	21,013,501
Europe Southern	3,716,976	2,970,446	2,277,247	91,292	164,717	292,952	107,744,908	92,969,632	75,049,677
Europe Western	3,293,523	5,435,426	8,536,133	186,019	236,736	263,418	115,394,178	175,063,208	212,317,361
Australia	220,603	200,961	231,820	14,106	56,891	54,690	1,554,703	5,109,000	5,347,000
World	**49,840,008**	**46,982,866**	**35,016,547**	**1,202,180**	**1,842,863**	**2,036,192**	**892,042,604**	**1,234,628,935**	**964,028,161**