KOONAC Goat Farm

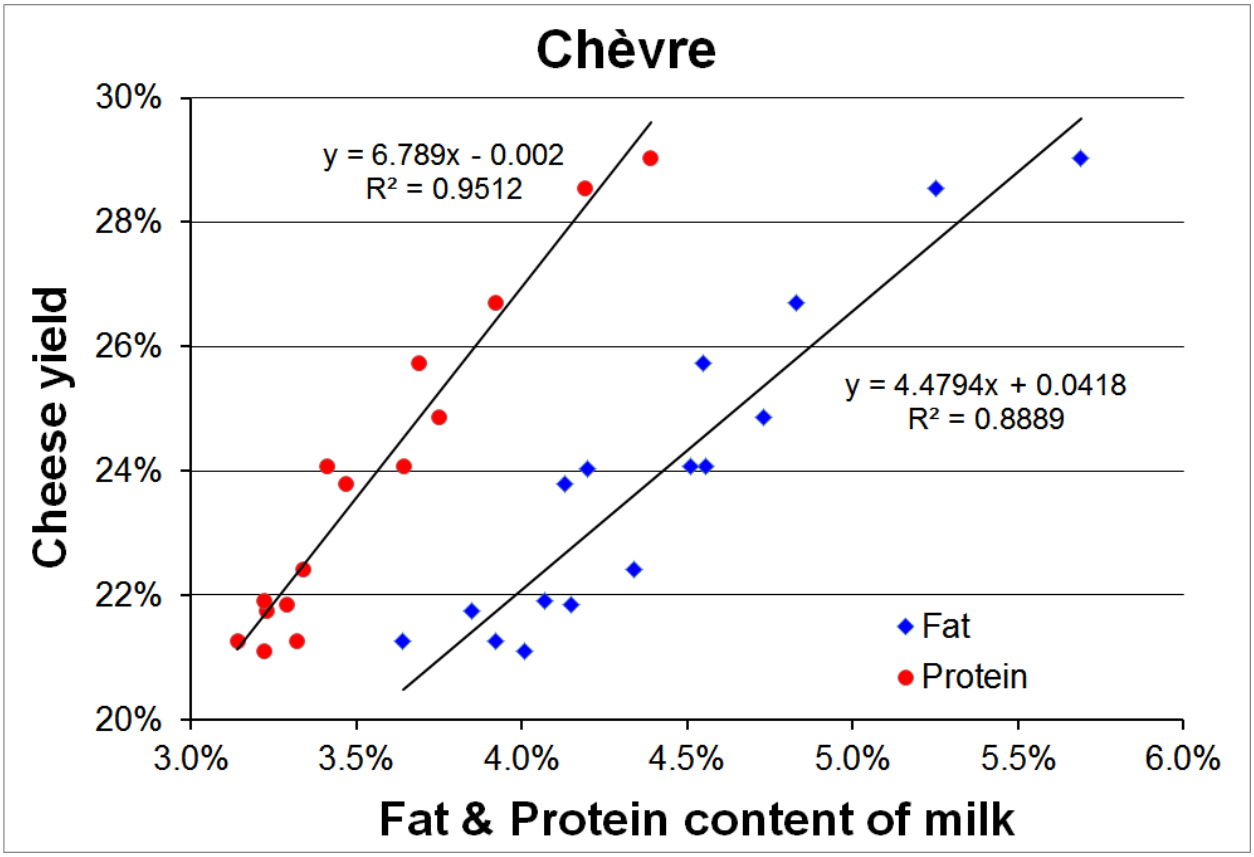
Protein

Milk protein

Our milk analysis data (“Herd recording”) demonstrate that protein, more than any other milk solid, determines, how much cheese can be made from a given amount of milk. The Table below shows the results from the "bulk" milk from November 2014 to February 2016. “Bulk” milk is a sample from the milk vat, where the milk from all goats is mixed.

Date	Fat	Protein	Yield
18/11/2014	3.64%	3.14%	21.3%
16/12/2014	3.85%	3.23%	21.7%
20/01/2015	3.92%	3.32%	21.3%
17/02/2015	4.56%	3.64%	24.1%
17/03/2015	4.73%	3.75%	24.9%
21/04/2015	5.69%	4.39%	29.0%
19/05/2015	5.25%	4.19%	28.5%
15/06/2015	4.83%	3.92%	26.7%
20/07/2015	4.55%	3.69%	25.7%
17/08/2015	4.13%	3.47%	23.8%
14/09/2015	4.51%	3.41%	24.1%
19/10/2015	4.15%	3.29%	21.8%
17/11/2015	4.07%	3.22%	21.9%
14/12/2015	4.01%	3.22%	21.1%
18/01/2016	4.34%	3.34%	22.4%
15/02/2016	4.20%	3.36%	24.0%

Herd recording during this period was always on a Tuesday. Tuesday is also the day of the week where, according to our weekly cheese making program, the milk is used for making Chèvre. Chèvre is very suitable to be used as indicator for the cheese yield, because the cheese making process is short and "simple", hence the yield is not much affected by process parameters (e.g. drying during maturing). We know exactly how much milk is used for making the cheese, and how much Chèvre results. From this we can calculate the yield. Combining the yield with the “bulk” results from the herd recording allows us to statistically analyse the importance of milk fat and protein for cheese making (see Chart).



Not surprisingly, the cheese yield is strongly correlated to both parameters. R^2 for fat is 89%, and for protein it is 95% (R^2 is a measure for the quality of the correlation). The higher correlation of the yield with the protein content than with fat content of the milk indicates that protein is more important for the cheese yield. This can be seen, for example, by comparing the results from 17. August 2015 with those from 19. October 2015. On both dates the fat content of the milk was almost identical (4.13% and 4.15%, respectively), whereas the protein content was about 5% higher in August (3.47% and 3.29%, respectively). This higher protein content resulted in a 9% higher cheese yield.

Protein Requirements of a Dairy Goat

Protein feed is normally fairly expensive, and it is, therefore, crucial to understand the mechanisms that govern protein nutrition of dairy goats, in order to achieve an optimal, and most economic feeding regime.

The protein content of feedstuff is usually expressed in percentage of crude protein (CP). For dairy goats, a CP of approximately 18% seems optimal. If a feed contains substantially more CP than 18%, it does not offer enough energy to fuel the protein metabolism. As a result, some of the protein is wasted, because it needs to be “burnt” to serve as energy source.

A goat cannot digest all the CP it eats. Digestibility varies from feed to feed, but is around 70% on average. Hence, about 0.7 g of every gram of CP is digestible protein (DP).

Proteins are required for growth and repair of the body, for the synthesis of enzymes, hormones, milk, and fibres, and for the production of kids. The protein demand of a fully grown dairy goat during lactation, some time after kidding, consists of the base demand, which is required to maintain all body functions, and the additional protein demand for milk production.

The base CP requirement of a goat varies from about 100 to 150 g CP daily, depending on the size of the goat (estimates from MLA, "Going into Goats"). For the production of one gram of milk protein, additional 1.45 g of DP, or 2.07 g CP, respectively, are required (US National Research Council 2007, quoted in Smith & Sherman," Goat Medicine", 2nd Edition, 2009).

	Small Dairy Goat	**Medium-sized Dairy Goat**	**Large Dairy Goat**
Body weight	60 kg	75 kg	90 kg
Base CP and feed requirement	105 g CP/day 0.583 kg feed/day	124 g CP/day 0.689 kg feed/day	141 g CP/day 0.783 kg feed/day
CP and feed requirement to produce 4 kg milk per day	362 g CP/day 2.01 kg feed/day	381 g CP 2.12 kg feed/day	398 g CP 2.21 kg feed/day
CP and feed requirement to produce 8 kg milk per day	618 g CP 3.44 kg feed/day	637 CP 3.54 kg feed/day	654 CP 3.64 kg feed/day
maximum possible DM intake	3.00 kg/day	3.75 kg/day	4.50 kg/day
maximum possible milk protein production per day, per year	261 g/day 95.2 kg/year	326 g/day 119.0 kg/year	391 g/day 142.8 kg/year

There is a physical limitation to the amount of milk protein per day a dairy goat can produce at most, which is given by the maximum possible dry matter (DM) intake of the goat. The maximum possible DM intake depends on the size of the goat, and on how easy and/or fast the feed is processed and can be replaced by new feed. For meat goats, which live mainly on fairly rough forage, it is estimated that the maximum possible DM intake is around 3.5% of the body weight (MLA, "Going into Goats"), whereas for dairy goats, which are fed a higher quality feed, 5% of the body weight is generally accepted as maximum possible daily DM intake.

The table shows the protein demand for a small, medium-sized, and a large dairy goat, which are based on the above explained estimates and calculations. "Feed" and "DM" refers to feed stuff containing 18% CP. The calculations for the protein requirements for milk production are

based on a milk protein content of 3.1%. This is the commonly used milk protein contend for a "reference milk" (e.g. Smith & Sherman, "Goat Medicine", 2nd Edition, 2009), and it is also the median milk protein content of all DGSA 2015 milk awards where protein values are published.

Goat nutrition and metabolism are extremely complex issues. Although the presented results are estimates, which are based on many simplifications, they are a useful help, for example for a coarse assessment of the protein efficiency of the own goats. However, to improve a given situation, more detailed and more precise analysis will be required.