KOONAC Goat Farm

Bodyweight and Growth of Goats

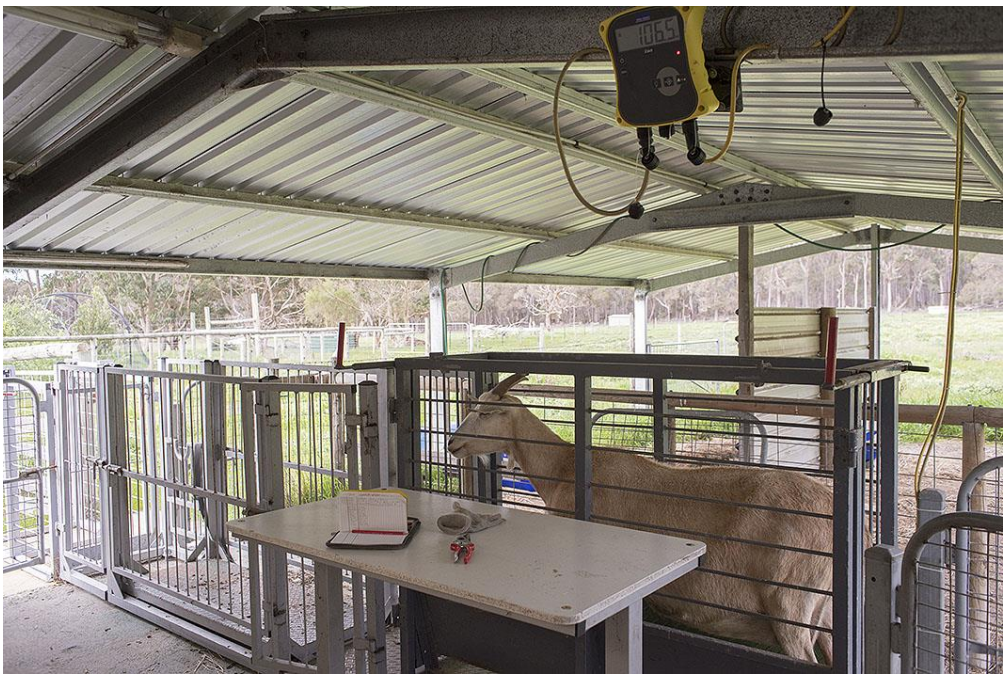
Introduction

Significance of Bodyweight

Bodyweight is one of the most significant and important parameter for the management of livestock.

- The body weight of a goat is a direct indicator for its condition;
- The nutritional situation of a goat quickly translates into its bodyweight;
- Most health issues affect the body weight of a goat;
- Almost all medications require the actual body weight of the goat for correct dosage;
- In a meat goat operation, a high growth rate is of prior economic importance.

We weigh our goats every time they are taken into the yard, for example for vaccination, for de-worming, or for hoof trimming, where they have to walk through the weighing crate (Picture 1), before they are treated. On average, our goats are weighted 6 to 12 times per year. Young animals are weighted somewhat more frequently.



Picture 1: The goat "Louise" (5 years old) in our weighing crate, which is used to weigh all goats except newborn kids. The indicator is connected with the yellow cables to two weighing bars below the crate.

Newborn kids, which are too small and too light for our weighing crate system, are weighed with a hanging fish scale (Picture 2), normally some hours after birth (up to 24 hours after birth). Hence, the recorded birth weight also includes the milk the kid has been drinking since it was born.

The recorded weighing data are entered into our goat management database (an MS Access database) for further usage. The database currently contains approximately 20'000 goat weight data for the period from 2006 to 2018.

Picture 2: To weigh newborn kids, we use a cotton shopping bag and a hanging fish scale.

Taking the high significance of body weight for the management of goats into account, it is surprising how little detailed information is available. With this text we would like to make our data and findings about the bodyweight and growth of farmed goats available for other goat farmers.

Influence of breed and environment on body weight and growth of goats

Size, body weight, and growth of goats vary substantially between different breeds, and are also strongly influenced by the environment and the feeding conditions. For example, a FAO study in Central Mali found that the average birth weight of goat kids was 2.2 kg (Wilson, R. T. 1986: "Livestock production in central Mali: Long term studies on cattle and small ruminants in the agropastoral system" ILCA Research Report No 14), and the body weight of New Zealand feral goats at maturity has been reported to be around 25 kg for females and 40 kg for males, respectively (Batten, G. J. 1987: "A New Meat Goat Breed. Origin of Kiko Goats". Proceedings of the IV international Conference on Goats, Volume II). In contrast, average birth weight on our farm is around 3.9 kg, and our meat goats weigh 60 - 70 kg, our dairy goats 80 - 90 kg at maturity, and the heaviest animals exceed the 100kg mark. These differences between the goats in Central Mali and in New Zealand and those on our farm are a result of different breeds, and also reflect the more favourable conditions on our farm than in the above mentioned studies.

Our farm is located in the Southwest of Western Australia. Our climate is Mediterranean, with hot and dry summers, and cool and wet winters (Figure 1). 83% of the annual rainfall occurs between May and October. This seasonal distribution of the rainfall translates directly into a distinct seasonal pattern of the quality of the pasture. During winter and spring the paddocks are green. The quantity and quality of the grass during winter depends on the beginning of rainy season, which normally is around 20th of April. An early "season-break" allows the grass to grow to a good size before the days get too cold and too short. If the "season-break" is late, however, pasture will remain poor throughout the entire winter, and substantial growth of the plants will only take place in spring.

During summer (i.e. from December to April), when rainfall is scarce, only the dead, dried grass is available as feed on the paddocks.

Our goats are "pasture-fed" (Figure 2). With the exception of those goats which are milked they normally don't get fed grain or concentrate. They feed on the grass on the paddocks, and on bushes (e.g. Wattles and Tagasaste) they have access to. During summer, we supplement them with hay.

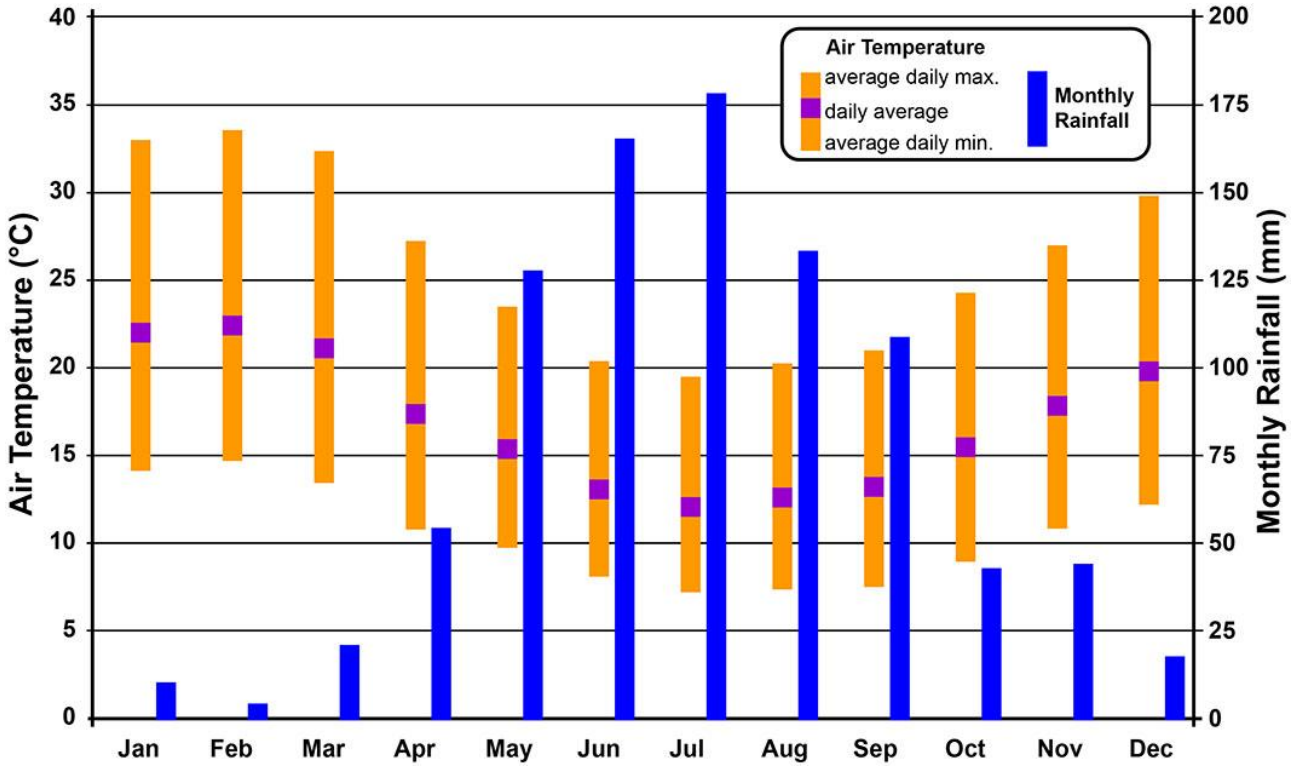


Figure 1: Average monthly temperatures and rainfall in Rosa Brook 2004 - 2011.

Figure 2: The goats on the Koonac goat farm are "pasture fed". With the exception of those goats that are milked they normally don't get grain or concentrate.

We started farming meat goats in 2006. Our initial herd consisted of animals we purchased from several farms in our vicinity. Most of these animals were high-percentage Boer goats, however, in most cases their exact genetics was not documented. In January 2010, after we had decided to change our business from goat meat to goat cheese, we purchased our first 6 Saanen does, followed by our first dairy buck (an Anglo-Nubian buck) in January 2010. Since then the genetic

composition of our goat herd has gradually changed from meat to dairy goats. Figure 3 shows the number of goat kids that were born alive and healthy on our farm between 2006 and 2018, and the genetic composition of every year's generation.

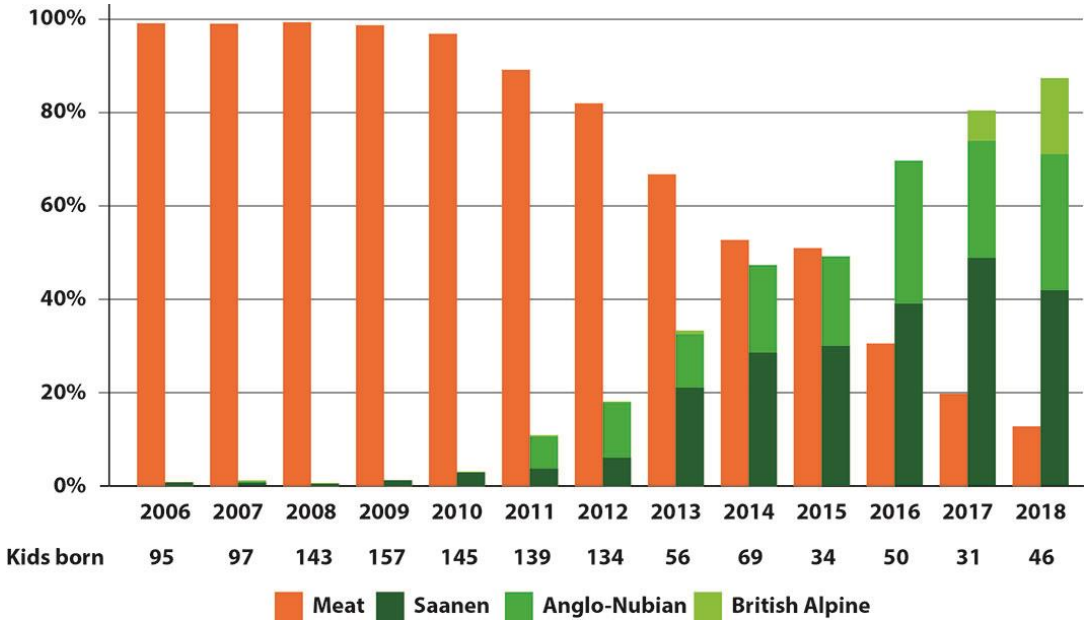


Figure 3: Number of kids born on our farm alive and healthy between 2006 and 2018, and genetic composition of every year's generation.

Body weight of fully grown female goats

Goats reach their full body weight in their 5th year (see page 12 for more details). Our database contains data on 101 does for this age. The average body weight of these 101 does was 71 kg, with a range from 51 to 112kg. However, our dairy goats, which are those goats with 50% or more dairy genetics, are substantially larger and heavier than our meat goats ($p>>0.001$, Student's t-Test), and it is therefore more informative to differentiate between the two groups.

The average body weight of the meat goats was 66.5 kg, with a range from 51 to 86 kg, whereas the dairy goat's average body weight was 90.6 kg, ranging from 69 to 112 kg. The weight distribution of the two groups in our herd is shown in Figure 4.

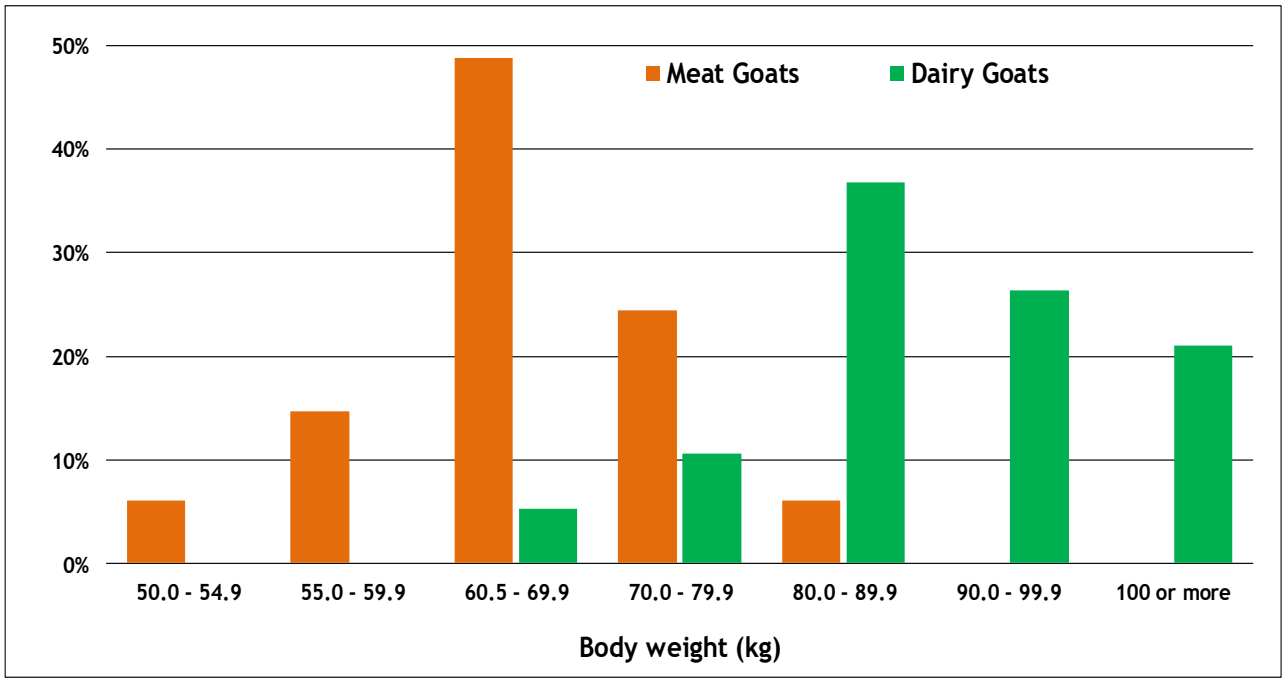


Figure 4: Body weight of our fully grown female meat and dairy goats (dairy goats are those animals with 50% or more dairy genetics)

The body weight of a goat can vary substantially over time. To illustrate these "normal" changes in the body weight of mature goat, the weighing data from "Nubia" are used here as a typical example.

"Nubia" came to us to on 31. May 2006 as part of a goat herd from another farm. She was 5½ years old at that time. No information about her genetics was available. We assessed her to be a cross between Boer and Anglo-Nubian. She was an excellent and hardy breeder. She kidded 7 times between November 2006 and July 2012. She had 18 kids in total, 4x twins, 2x triplets, and 1x quadruplets. She died in August 2018 of old age, at the age of 18 years.

Picture 3: "Nubia", one of our meat goat breeders.

During her time at our farm she was weighted 93 times. Her average body weight was 56 kg. It varied from 45 kg to 72kg. The variation over time are shown in Figure 5. Pregnancy and lactation always had a big effect on her weight, which normally increased up to 65-70kg during pregnancy, and dropped to 50kg or below after kidding and during lactation. Seasonal changes of the feed available on the paddocks also affected her body weight. During winter and spring, when good feed (green grass) was available, her weight went up, and during summer, with dry conditions and poor feed on the paddock, she lost weight again. These changes due to the seasons can be seen in Figure 5 during the period from 2013 to 2018, after her last pregnancy.

From March to July 2012, during her last pregnancy, her body weight constantly decreased, where it should have been increasing. It became obvious that "Nubia", due to her advanced age, had difficulties to handle the additional stress of her pregnancy. For this reason, we did not mate her again, but used her as leader goat for our weaners.

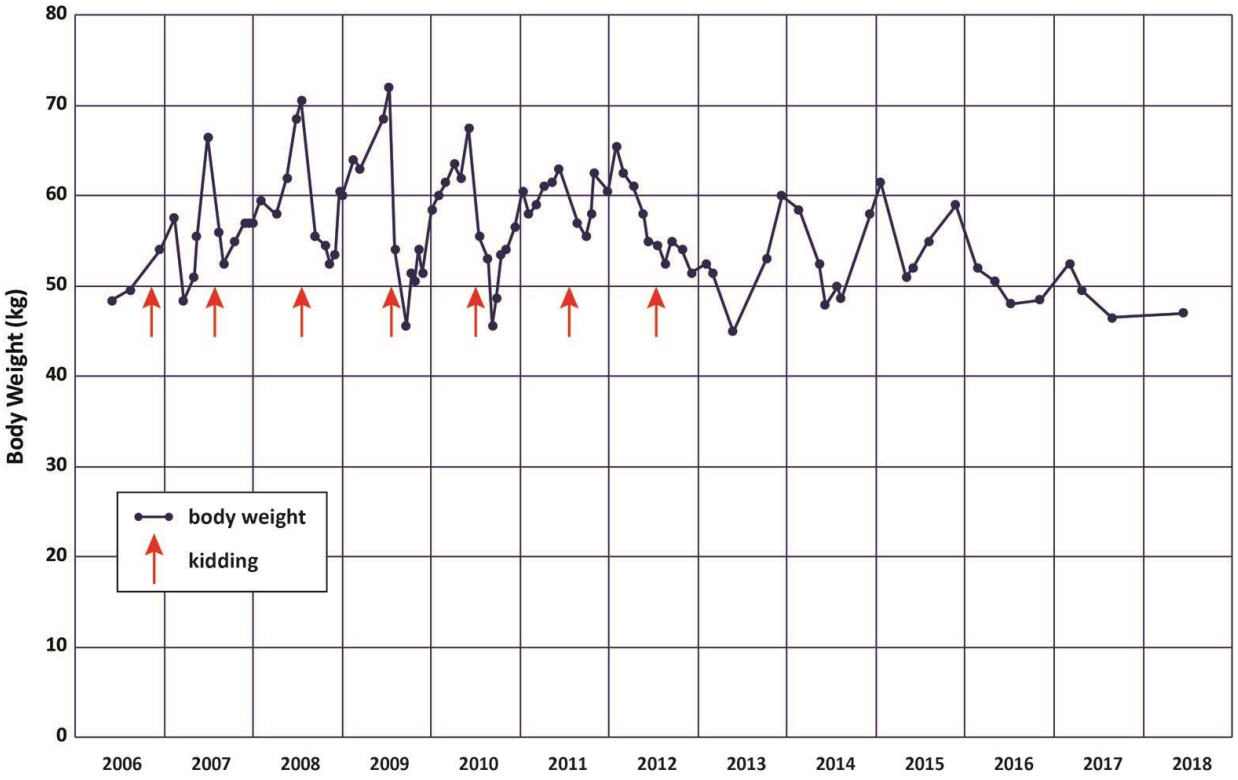


Figure 5: Bodyweight of "Nubia" from 6 to 18 years of age.

Weight at birth

A total of 1196 kids were born alive and healthy on our farm between 2006 and 2018. Their average birth weight was 3.87 kg. 50% of the kids were between 3.40 kg and 4.35 kg, 90% were between 2.56 kg and 5.07. The largest kid was 6.74 kg. The smallest kid that survived weighted 1.55 kg.

Mortality of kids with a birth weight below 2.0 kg, that were born alive, but died within the first 24 hours, was 24%, compared to only 0.4% in kids with a birth weight of 2.0 kg or more.

Male newborn kids are approximately 10 % heavier than female newborns ($p << 0.001$, Student's t-Test). Their average birth weight was 4.05 kg, compared to 3.69 for female newborns (Figure 6).

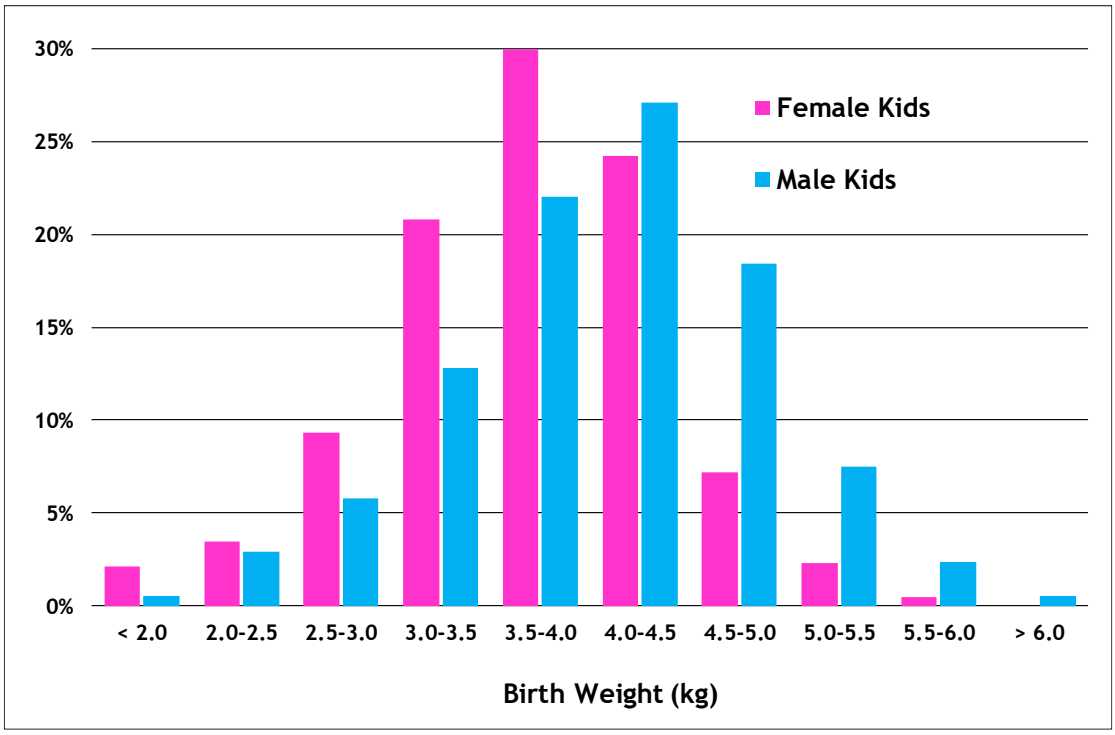


Figure 6: Birth weight distribution of male and female kids.

Furthermore, kids from dairy mothers were about 14% heavier than kids from non-dairy mothers ($p<<0.001$, Student's t-Test). Average birth weight of the former was 4.27 kg, compared to 3.76 kg of the latter (Figure 7).

Table 1 shows more statistical details on birth weights of goat kids that were born on our farm between 2006 and 2018.

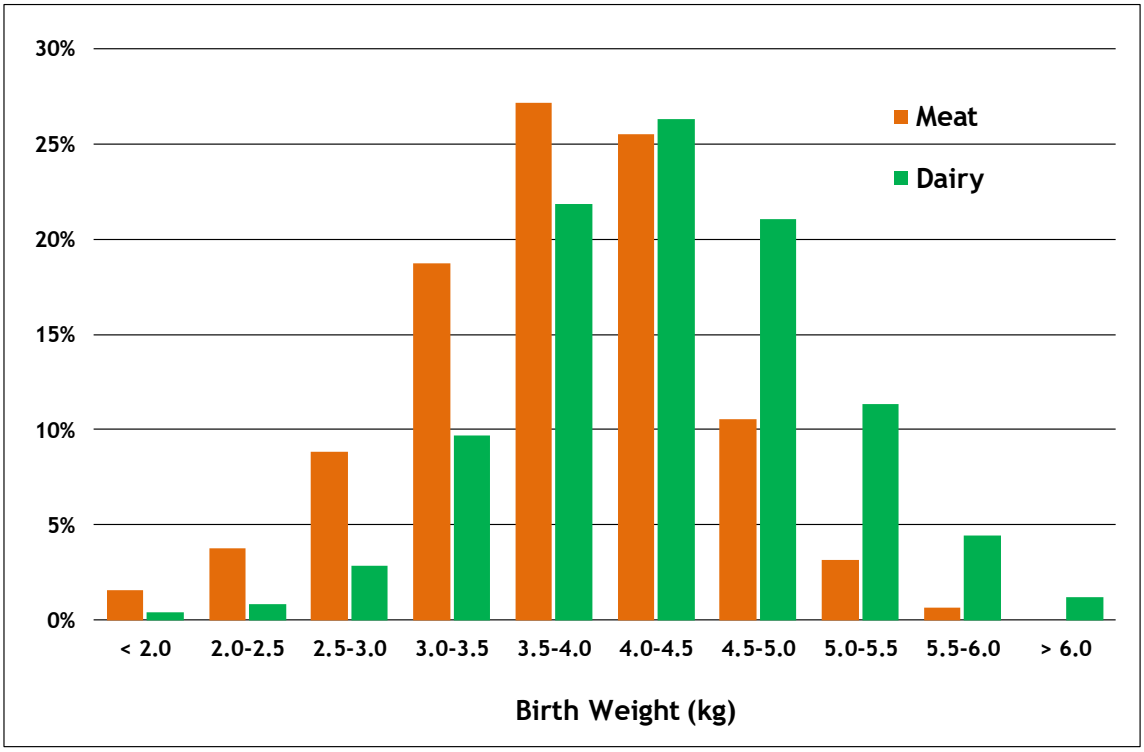


Figure 7: Birth weight distribution of kids from meat goat mothers and dairy goat mothers.

Table 1: Distribution of birth weights (in kg) of kids born alive and healthy on our farm between 2006 and 2018

	All Kids	Female kids	Male kids	Kids from meat dams	Kids from dairy dams
Number	1196	610	586	949	247
Average	**3.87**	**3.69**	**4.05**	**3.76**	**4.27**
Maximum	6.74	5.84	6.74	5.82	6.74
99% Percentile	5.65	5.32	5.80	5.41	5.99
95% Percentile	5.07	4.79	5.29	4.86	5.53
90% Percentile	4.81	4.47	5.00	4.65	5.26
75% Percentile	4.35	4.15	4.57	4.25	4.78
50% Percentile (Median)	3.90	3.75	4.10	3.80	4.23
25% Percentile	3.40	3.29	3.58	3.32	3.80
10% Percentile	2.90	2.80	3.01	2.80	3.34
5% Percentile	2.56	2.43	2.70	2.45	3.06
1% Percentile	1.90	1.80	2.08	1.82	2.42
Minimum	1.55	1.55	1.75	1.55	1.74

Growth

Growth of kids from birth to weaning

We normally wean our kids at the age of approximately 3 months, but due to special circumstances weaning occasionally occurred substantially earlier or later. Data from kids that have been weaned at the age between 80 to 120 days, with an average of 96 days, are used here.

Average weaning weight was 23.6 kg, and average daily weight gain (ADG) was 206 g/day. Male kids grew faster and were heavier at weaning than female kids ($p<<0.001$, Student's t-Test). Average weaning weight and ADG of bucklings was 25.03 kg and 221 g/day, respectively, compared to 22.42 kg and 193 g/day, respectively, in doelings (see Figure 8). Also, kids from dairy mothers grew faster than those from non-dairy mothers ($p<<0.001$, Student's t-Test). Average daily gain of the former was 231 g/day, compared to 203 g/day of the latter (see Figure 9).

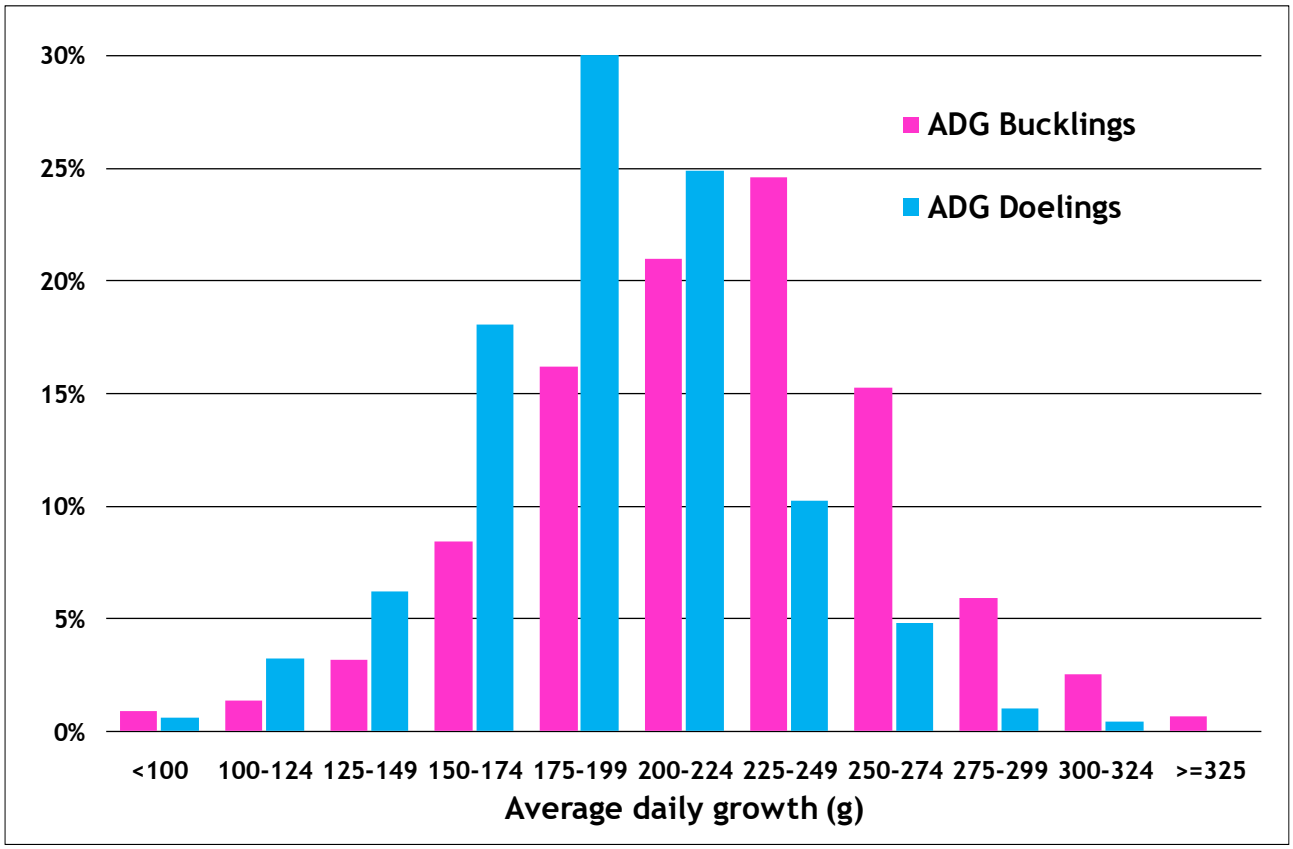


Figure 8: Average daily weight gain (ADG; g/day) of male and female kids between birth and weaning.

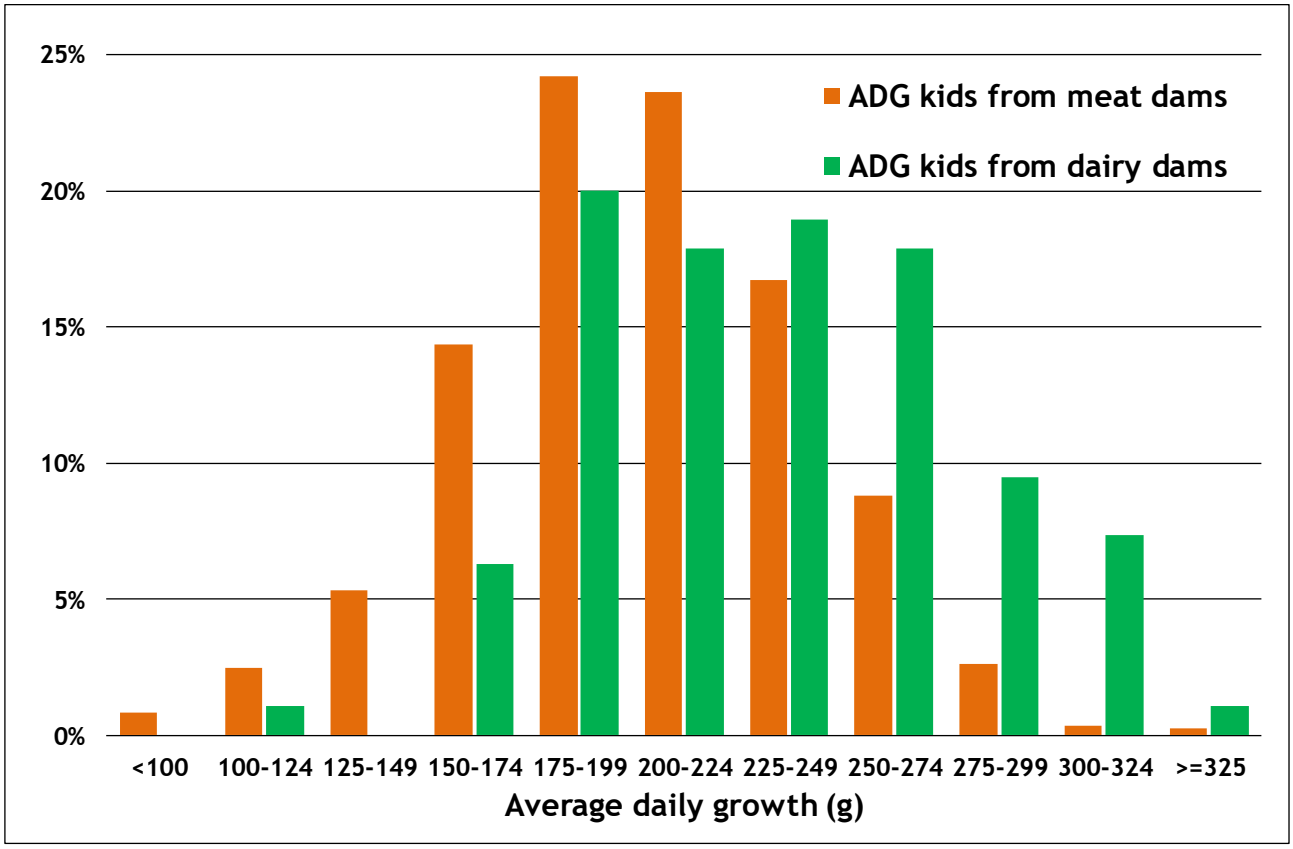


Figure 9: Average daily weight gain (ADG; g/day) of kids from meat goat mothers and dairy goat mothers between birth and weaning.

Growth of goats after weaning

Figure 10 shows growth curves from two typical goats on our farm. One curve is from "Victoria", which was a fairly big, high% Boer goat breeder (Picture 4). The other curve is from "Mary-Anne", which is a dairy-cross-bred (Picture 5).

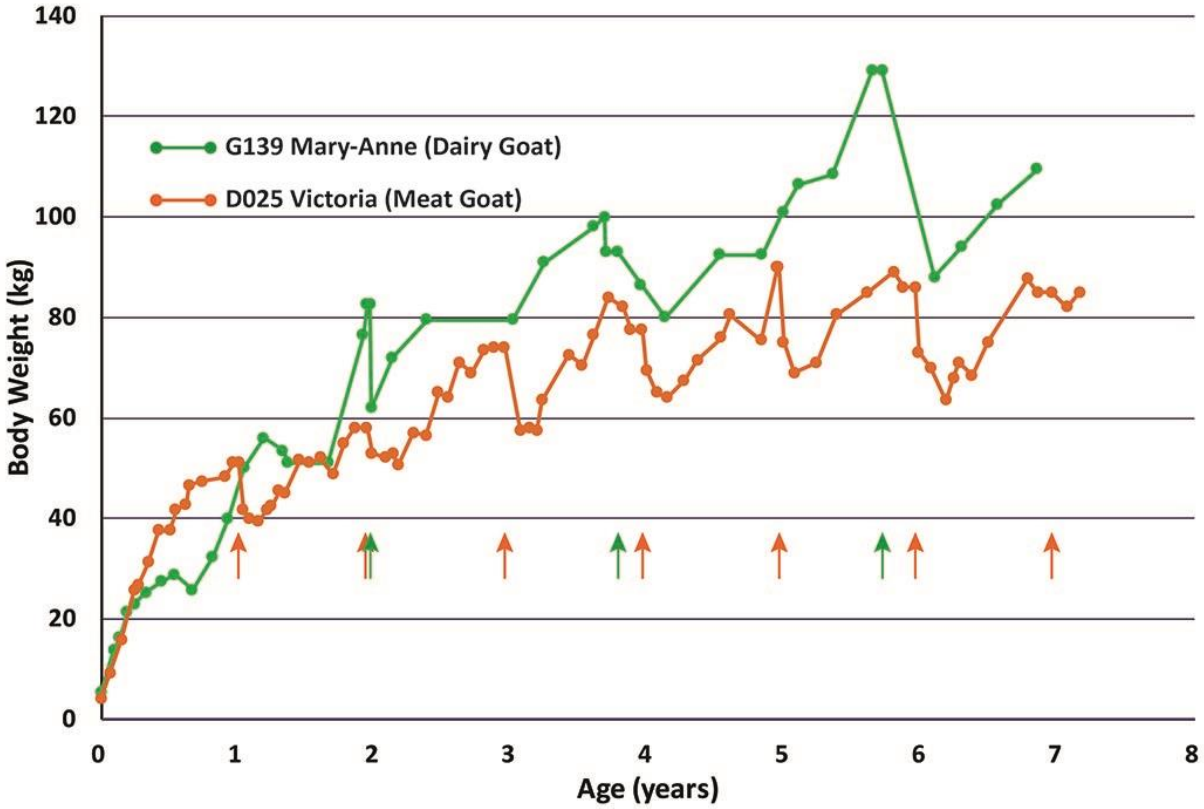


Figure 10: Growth of "Victoria" and "Mary-Anne". The arrows indicate the time of kidding.

Picture 4: "Victoria", a high-% Boer goat, at 22 months of age and 14 weeks pregnant.

Picture 5: "Mary-Anne", a Saanen x Anglo-Nubian dairy goat at 24 months of age at the day she had kidded for the first time. The kid to the left is "Louise", which is show as fully grown animal in Picture 1.

Similar to "Nubia" (Figure 5), the body weights of "Victoria" and "Mary-Anne" varied substantially, mainly due to pregnancy, kidding, and lactation.

Figure 11 shows the average growth and 90% range for all bucks and does on our farm.

Both, Figure 10 and Figure 11 show that it takes goats at least 4 to 5 years to reach their final size. This finding agrees with the result of the above cited study from Central Mali, where at the age of 48 months, which was the end of the study, the goats were still slightly growing.

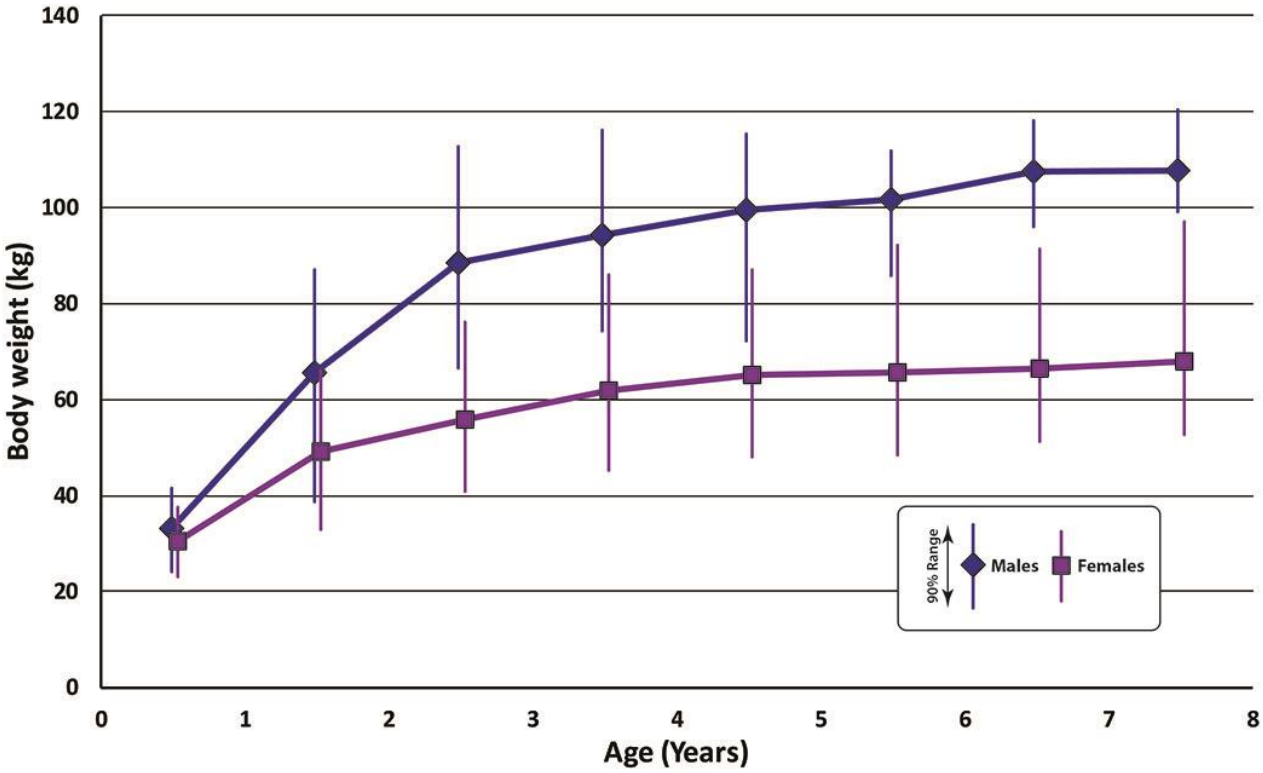


Figure 11: Average weight and 90% range of bucks and does on our farm. The first point of both curves is the average weight of bucks and does between 5.5 and 6.5 months of age, whereas all following points represent the average of all measurements within one year of age, for example from 12 to 24 months of age, from 24 to 36 months of age, etc.

It is generally recommended to mate does for the first time in their second year of life, when they have reached 60-70% of their final weight (e.g. USDA/NIFA Cooperative Extension "Goat Reproduction Puberty and Sexual Maturity"). Does that are mated earlier may have problems during kidding, and their future growth and performance might be affected.