

GIC Indexes

How should we interpret
the GIC Indexes in practice?



June 2024



**GOAT
IMPROVEMENT
COMPANY**



Imagine what
GIC Saanen could
do for your herd,
your business,
your life...

Breeding is selecting the right goats and bucks, with the aim of creating a new, better generation of goats. You want offspring from a specific goat or buck, not in general from every goat or buck in your herd. Breeding values help you with this selection. A breeding value is an estimate of an animal's genetic potential for a certain trait. It is an indispensable tool when making choices in breeding.

In this manual you will find an explanation of the background of the GIC breeding values and how you, as a goat farmer, can use these breeding values in practice.

In this manual you will find:

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General information about breeding values

What are breeding values ?

The offspring from which goats are most valuable to keep for the next generation? Which bucks suits the breeding goal of your herd and your farm the best? With breeding values you can honestly compare animals and make a ranking. This helps when you make your breeding choices.

A breeding value is an estimate of the hereditary predisposition of an animal for a certain characteristic. The value is determined by analyzing a lot of performance data, where all non-hereditary influences are filtered out

Compare performance of animals

When there were no breeding values yet, goat farmers selected their goats by comparing the performance of individual animals. That's not very accurate. For example, a goat produces less milk in the first lactation than in the second or third lactation. Furthermore, milk yield is strongly influenced by the season, nutrition and all kinds of other environmental factors. For breeding purposes you want to know which part of the differences between animals is hereditary. Breeding values have been developed for this purpose. The hereditary part is what the goat or buck can potentially pass on to the next generation. All GIC Saanen goats and bucks receive a breeding value. Breeding values are traditionally calculated on the basis of the performance of the animal itself and that of its family. The more data on offspring and family members are available, the more reliable the breeding value.

Reliability of breeding values

The reliability of a breeding value is expressed in percentages. If a buck has a reliability of 55%, then the reliability of its breeding value is not that high. It means that there is still a quite a bit uncertainty in the estimate. There is a chance that the prediction of his hereditary performance will change if information from more daughters becomes available. Many breeding bucks have dozens, even hundreds of daughters in milk. With this information the breeding value reaches a reliability of 95%. In overviews of breeding bucks the reliability of the breeding values is stated.

Background information of the GIC Indexes

Who calculates the GIC breeding values and indexes?

The GIC breeding values are calculated with the program "MIXBLUP", developed by Wageningen University in The Netherlands.

MIXBLUP is a modern genetic evaluation system. It estimates genetic merit of individuals using observations and genetic similarity, given the components of variance. Scientists from Wageningen University use the individual performance of the 34,000 goats that today are in the GIC database. The data from the GIC breeding program is collected in collaboration with farmers, industry experts and the Dutch Organization for Sheep and Goat Farmers.

How are the GIC Indexes ranked?

All GIC breeding values are shown on an index scales, where 100 is the average. All breeding values above (or below) 100 indicate that the performance of the individual animal on that specific trait is higher (or lower) than the average of all GIC Saanen goats recorded in the GIC breeding program. In addition to the average of the index scale being 100, the standard deviation of each index scale is 10. That means that 99% of all goats have an index between 70 and 130. That also means, that a buck with an index of for example 138 is exceptionally high; he is in the top 0,1% of all the goats in the GIC breeding program. He is one out of a thousand!

What is the average lactation length on which the GIC Indexes are calculated?

One of the key traits in our breeding program is the selection for a long persistent lactation. The standard GIC Indexes are therefore calculated for an average lactation length of 730 days. Wageningen University also estimates the breeding values for each trait based on a lactation length of 350 days for GIC. These can be supplied by GIC as well, but are not shown standard for the GIC Saanen.

GIC breeding committee

The decisions within the GIC breeding program are made carefully by the GIC breeding committee. This committee consists of 7 people who give their opinion through an individual vote about the structure and strategy of the GIC breeding program. These 7 people are 6 Nucleus farmers and a representative of NSFO. The breeding committee meets twice a year, in April and September.

Which GIC Indexes are calculated?

The following GIC Indexes are shown for the GIC Saanen:

- Milk kg
- Fat kg
- Protein kg
- Kg Fat + Protein
- Urea in milk
- Somatic cell count
- Total GIC Index (an total merit Index in which all the other GIC Indexes are combined).

The structure of the overall GIC Index

The weights of the traits are chosen by the GIC breeding committee in a way that maximizes the profitability of the goats. Production traits are weighed in with 80% and both somatic cell count and ureum are weighed in with 10% each. Hereby we generate a strong progress for production traits, while at the same time breeding for better udder health and protein efficiency.

New breeding values three times a year

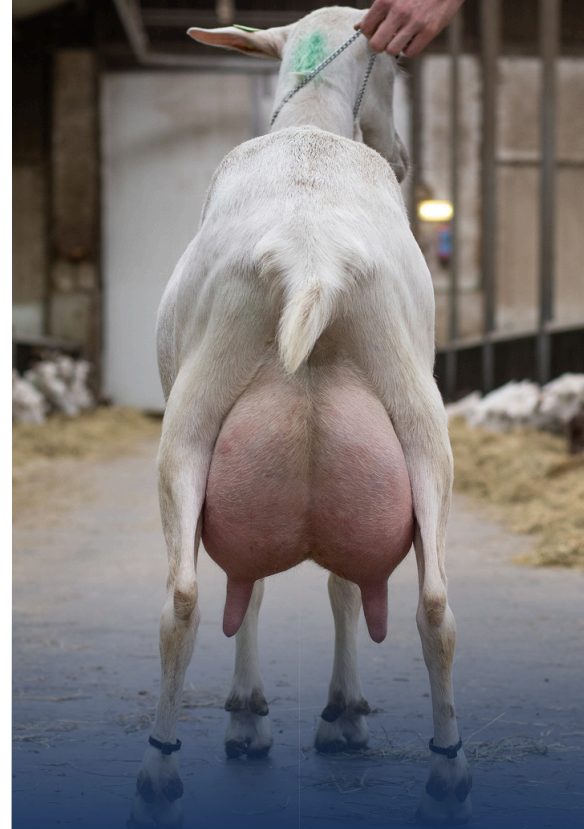
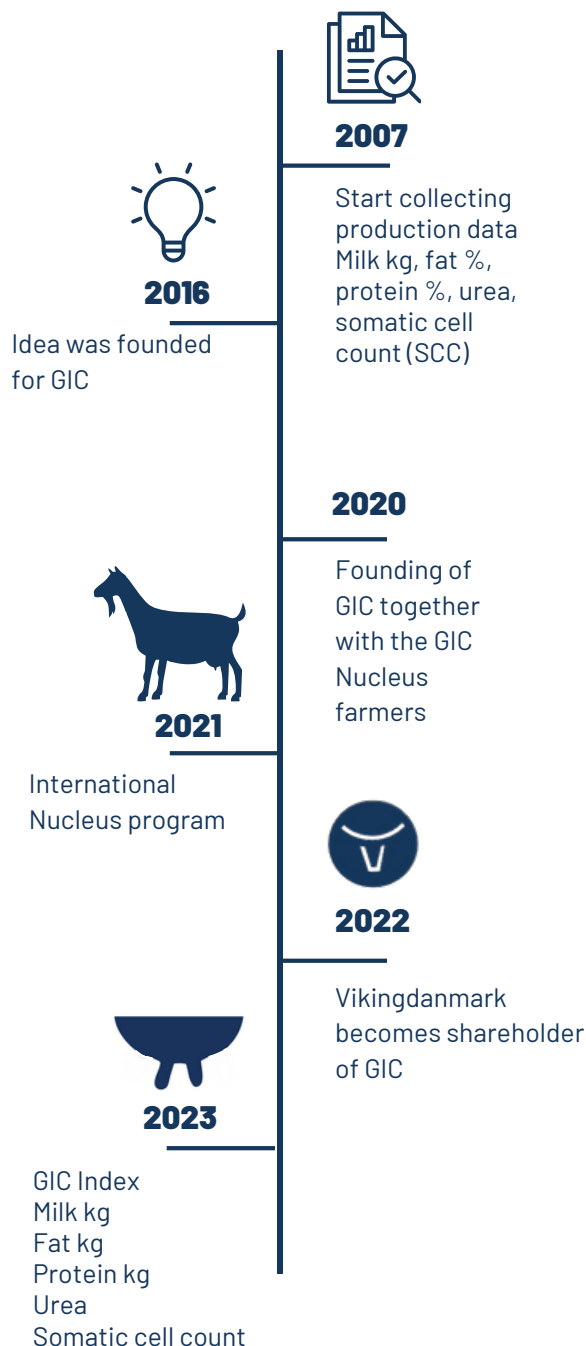
The breeding values are calculated three times a year (in April, August and December). GIC publishes the breeding values of goats and bucks in the nucleus program in the management system of NSFO for each individual nucleus farm. The breeding values of AI bucks are published on the GIC website. Goats born in a certain year determine the average breeding value. There is one breed of goats that serve as a basis for expressing the breeding values, the GIC Saanen. As a basis for these breeding values, goats and bucks with a minimum of 87.5% Saanen blood were used.

A basic adjustment every five years

Through breeding, goats and bucks improve with each generation. This progress is reflected in the breeding values, which increase every year. After a number of years it is necessary to adjust these values and set the average back to 100. We call this the basic adjustment. Without such an adjustment, breeding values would continue to increase. You would get goats or bucks that score an average of 120 or more for conformation, for example. That is confusing and makes comparison more difficult. That is why a basic adjustment remains necessary every five years.

Breeding for health and production

Within our breeding program, we use the data that our farmers collect daily on their farms. Our database goes back to 2007. All this data allows us to offer you the most accurate and reliable breeding values. We continuously develop new breeding values together with universities and research organizations with which you can accelerate and improve the genetic progress of your goats every generation.



Farmers and other industry experts are committed to recording the performance of each GIC Saanen for our breeding program.

Dutch Saanen genetics are the basis of the GIC Saanen. We continuously combine this Dutch base with the best Saanen lines from different countries to create maximum heterosis.

Recordings of more than 34,000 goats are in our breeding program. All this data comes together in the GIC Indexes.

The GIC Index gives you a combination of economic traits such as udder health, efficiency, milk production and longevity that increase the profitability of your farm.

The GIC index is a total net merit index in which the weights of the traits are set in a way that maximizes the goat's profitability.

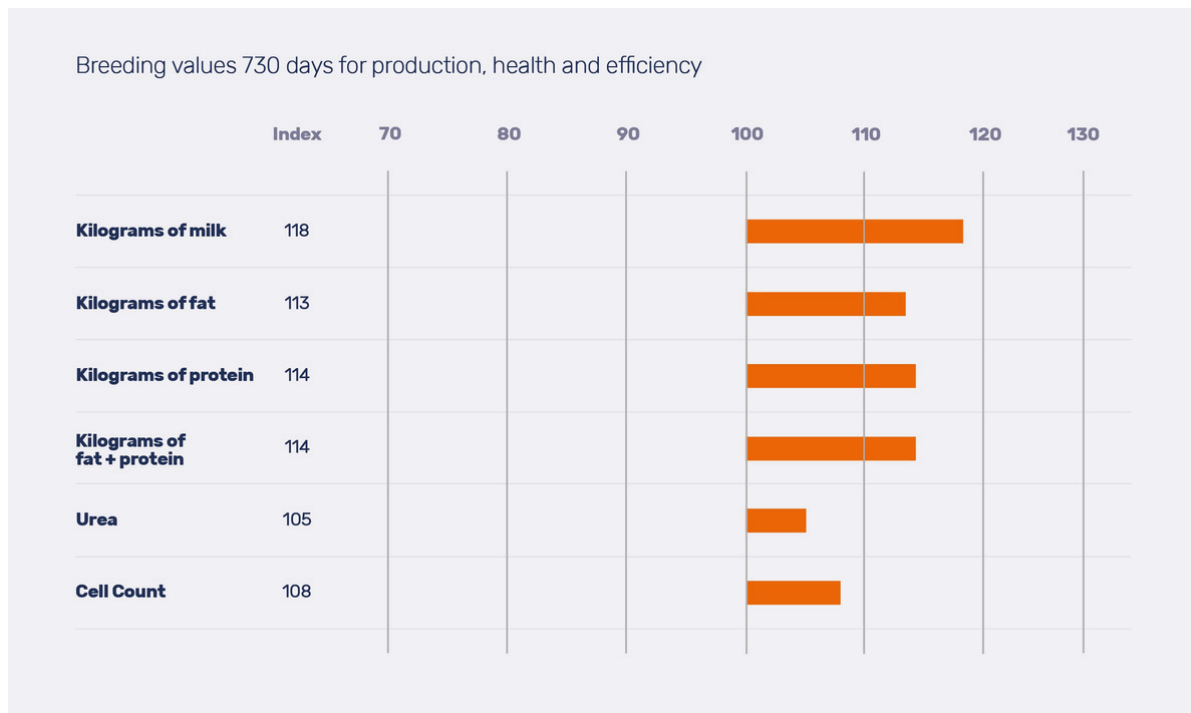
Because a long persistent lactation is one of the key traits in the GIC breeding program, the standard GIC Indexes are calculated over an average lactation length of 730 days.

A woman with brown hair, wearing a blue jacket over a purple hoodie, is shown in profile, looking at a laptop. She is sitting on a blue perforated metal floor in a server room. In the background, two other people are working among rows of server racks filled with blue and black cables. One person is wearing a blue jumpsuit, and the other is wearing a black jumpsuit with reflective stripes and a grey beanie. The text "The overall GIC Index is a tool to maximizes the profitability of your goats" is overlaid in white on the image.

The overall GIC Index is a tool
to maximizes the profitability
of your goats

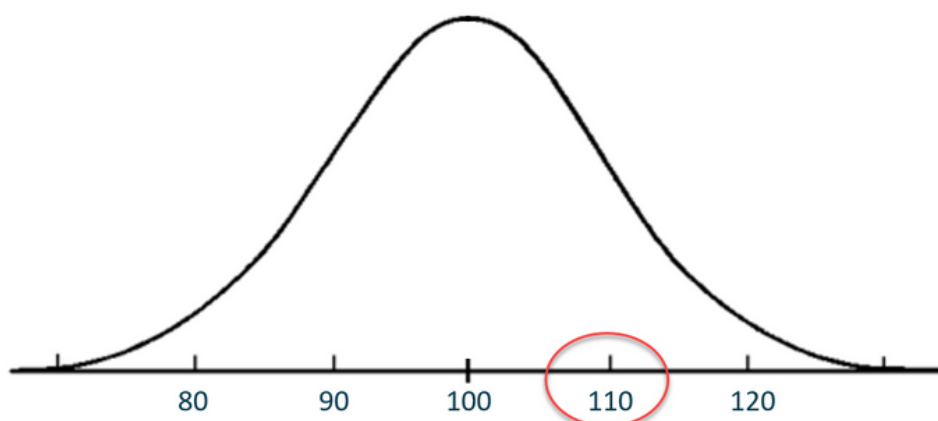
Now let's give an example of how to interpret the GIC Indexes

The diagram below shows the breeding values of the young GIC AI buck GB Jimte GIC from the run from August 2023.



You can clearly see that GB Jimte GIC scores well above the average of 100 for all its traits.

To interpret GB Jimte GIC' index of 118 for Kilogram of milk, let's start by looking at an index of 110. An index value of 110 means that the animal is 10 Index points better than the average goat in the GIC breeding program, as illustrated in the figure below. This goat is 1 standard deviation better than the mean of 100. But what about the performance of an animal with 10 Index points more than the average goat with 100 Index points?



The first column of the table below shows how the breeding value of a goat is expressed in the stable (the genetic potential of the animal expressed in performance). It is not certain that this will be realized with exactly this number of kg's, because of natural variation but also the management at the farm that plays an important role.

The second column shows the increase in production (decrease in urea and somatic cell count) that you can expect from the daughter of a father with 110 Index points compared to a father with 100 Index points. The values in this column are exactly half of the values from the first column, because the father only passes on half of his potential to the daughter. The same, of course, applies to the mother.

Characteristic	Production of an animal with a index of 110 compared to 100	Higher production of a daughter if the father has a index of 110
Kilograms of milk ¹	+277 kg	+138 kg
Kilograms of fat ¹	+12,3 kg	+6,5 kg
Kilograms of protein ¹	+10,0 kg	+5,0 kg
Kilogram of fat+protein ¹	+22,0 kg	+11,0 kg
Urea ²	-2,1 mg per mililiter	-1 mg per mililiter
Somatic cell count ³	-140.000	-70.000

¹ In 730 days (GIC can also calculate the 350 days breeding values of animals)

² Per milking control day

³ Per milking control day, calculated with a company average of 500,000

But what means this in the situation of GB Jimte GIC?

GB Jimte GIC has a GIC Index for milk production of 118, so he is 1.8 times 10 ($10 \times 1.8 = 18$) better than a goat with a GIC Index of 100. This means that we can multiply the values from the second column by 1.8: the higher milk production of his daughters is $138 \text{ kg of milk} \times 1.8 = 248 \text{ kg of milk}$ higher. Calculated in the same way, the cell count is $-70,000 \text{ somatic cells} \times 1.8 = 126,000 \text{ somatic cells}$ lower.

Important to take into account when reading the GIC Indexes...

With an Index above 100 you breed upwards for the production traits (kg of milk, kg of fat and kg of protein). For the health traits (somatic cell count and urea) you breed for lower values with an Index above 100. In other words, if you use a buck like GB Jimte GIC in your herd with a GIC Index for Milk kg of 118 and a GIC Index for Somatic cell count of 108, then he will produce daughters on your farm that will have a higher milk production, but at the same time also a lower somatic cell count compared to their mothers.

GB Jimte GIC has an overall GIC index of 117. This value of 117 is basically a weighted average of the sub-indexes for milk yield, kilograms milk solids, somatic cell count and urea. The weights are chosen in order to maximize profitability. In other words, when selecting for a high GIC index, you are breeding for maximum profitability. The production traits are weighed in with 80% and somatic cell count and urea are both weighed in with 10%. In the future more traits will be added to the GIC index, and the weights will be adjusted to continuously certify that your profitability is maximized.



Innovative breeding

Our passion at Goat Improvement Company is to help you as a farmer achieve your **economic goals, farm in a sustainable way** and **enjoy life**. We do this by breeding healthy, efficient and problem-free goats.

Together with an international group of farmers and a database of **thousands of dairy goats**, we work every day to improve dairy goats all over the world. We do this by providing top genetics and personal advice. The perfect balance between **healthy** and **efficient** goats is the basis for our **"Balanced Breeding"** strategy. In addition to production, the focus here is on improving health, efficiency and sustainability. Our goats offer you as a farmer a **profitable farm with low vet costs, high quality dairy** and **goats that require little attention**.

GIC is co-owned by Vikingdanmark, the cooperative of Danish dairy farmers. Together with similar cooperatives in Sweden (Växa) and Finland (Faba), they own Vikinggenetics.

Vikinggenetics is the cattle breeding organization responsible for the breeding program of Viking Holstein, Viking Red and Viking Jersey in the three Scandinavian countries.

We are a responsible and dedicated team that works every day to find solutions, through genetics, to challenges that you will experience on your farm. We help farmers create a sustainable food production for our planet.

www.goatimprovement.com

