

Small populations: The Nooitgedachter solution

By Dr Helena Theron and Donné Kruger

High levels of inbreeding are unavoidable when all potential parents in a breed are related. When inbreeding becomes too high, it compromises immune function and increases genetic defects, leading to reduced fertility, and lower offspring survival. Matings should therefore be carefully planned beforehand. For example, parent-offspring, brother-sister, or even a single male used on many females must be avoided, as it substantially increases inbreeding in subsequent generations and reduces the number of possible parents for the next generation.

The Nooitgedachter breed

The Nooitgedachter horse breed originated from a breeding programme for indigenously adapted horses at the Nooitgedacht Research Station near Ermelo in the 1950s. Mainly Basuto mares and stallions were used as a base.

A recent population study conducted by SA Stud Book has shown that today's Nooitgedachters are still closely related to the horses bred at the Nooitgedacht Research Station between 1952 and 1976. Some of the original Basuto mares, together with one of the original stallions, Vonk 2, continue to play a significant genetic role in the breed. Today, more than 600 living Nooitgedachter horses are registered with SA Stud Book.

Although numerous theoretical solutions exist for reducing and controlling levels of inbreeding, most are not practical. One possible solution is the development of relatively unrelated breeding lines. This aligns with the shared goal of breeders to preserve the Nooitgedachter by reducing inbreeding and maintaining genetic diversity.

It remains important that unique Nooitgedachter genes and traits are preserved and continuously selected for. However, genes related to fitness and fertility – traits that are usually the first lost through inbreeding – can be reintroduced from outside by selectively using unrelated animals.

Nooitgedachter lines

Breeders divided the Nooitgedachter population into existing lines and types and identified important ancestors in each line as anchor animals. The relationship of living animals to these anchors was determined using the optiSel genetic analysis program. For example, the N (Nooitgedachter) line consists of horses born at the Nooitgedacht Research Station. The optiSel program was used to calculate the percentage relationship of the current horses to the original Nooitgedachter animals by means of pedigree contributions. The same principle was used for the other identified lines.

The identified working horse types are tough, functional farm horses with good endurance, and includes the N (Nooitgedachter), V (Vonk 2), L (Louise-Logan), BKat, G (Gillroy), and the S (Schreuder) lines. The show horse types have good movement and include the H (Heidie-Hilka-Hilona) line, which is also a strong dam line, the DF (Daydream line 1), which is a children's show pony, and the DM (Daydream line 2), which is an ideal dressage pony.

The two outcross lines aim to increase genetic diversity in the Nooitgedachter. Horses of the B (Base) line are, when approved, used as unrelated foundation animals for upgrading. The Iberian line (I) is a combination of Nooitgedachter crossed with the Portuguese Andalusian

and Lusitano breeds, which are good riding horses.

Guidelines for selection

Most horses in the breed are related to others in more than one of the lines, because the population is highly related to each other. Therefore, the lines are also genetically related. The four most important lines for each horse are presented on SA Stud Book's Logix system as the percentage relationship of each Nooitgedachter to each line, which allows breeders to quickly assess an animal's relationship to specific lines.

For example, an animal is L – 64,6%; V – 13,2%; N – 9,6%; and G – 6,3%. This animal is highly related to the working horse lines, as further reflected in its high inbreeding of 25%. The breeder can then make a more informed decision to suit the breeding objective. For example, the animal can be mated to one of the outcross lines to reduce inbreeding in the foal and increase fitness genes (fertility and survival), with further generations then backcrossed to suitable working horse lines. The foals are selected for the fertility and survival genes of the outcross, in combination with the unique Nooitgedachter genes.

Conclusion

This is a living and changing system – some lines may merge or disappear, and new lines may form over time. The original Nooitgedachter genetics are currently still strongly represented in the breed and have been successfully preserved over the generations. With this system, breeders are, however, able to make more informed decisions and select for more divergent types, rather than keeping all genetics in a single group. **SF**