A BREEDING OBJECTIVE THAT MAY REDUCE THE CARBON FOOTPRINT OF EXTENSIVE COW-CALF PRODUCTION SYSTEMS.

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Livestock is believed to be a major contributor to global warming, which originated from the FAO publication "Livestock's Long Shadow" that indicated that livestock is responsible for 18% of the world's greenhouse gas emissions (GHG). This initial figure has been scaled down to 5-10%, indicating that livestock contributes about 65% of the total agricultural GHG (C02 equivalent) which is mostly accounted for by enteric methane (produced in the digestive tract of ruminants, including game). It is imperative that these GHG are reduced, with great emphasis placed on methane, since it is the second most abundant GHG and has a shorter life span and a greater heating potential than other GHG, which will result in quicker and greater impact if its emissions can be reduced. Reducing methane levels will have a significant effect on the GHG reduction targets set by governments. The emission of GHG from livestock is calculated either in terms of kg CO2 (carbon dioxide) equivalent per kg of meat or milk available for consumption, or per area of land used.

Livestock on extensive pastures produce more methane than livestock on intensive production systems, since the lower quality feed (mainly pastures that they are consuming) produce more GHG per kilogram feed intake than the higher quality feed used in intensive systems. Livestock agriculture is the largest user of land resources in southern Africa. Over 70% of the surface area is suitable for extensive livestock farming in South Africa. Thus, major beef cattle farming (cow- calf production cycle) is largely extensive. The cow-calf portion of the production cycle, (the extensive part in Southern Africa) accounts for 72% of the nutrient requirements from conception to harvest.

Until now most measurements for beef improvement in South Africa, and many other parts of the world, is per individual (weaning weight, calving interval, growth rate, etc.). A measurement is therefore needed that expresses performance per constant (standardized) unit. Selection for productivity and efficiency will for instance have a permanent mitigating effect on the production of GHG's, as higher productivity will lead to higher net efficiency as a result of diluting the maintenance cost of animals.

A possible breeding objective/goal that may reduce the carbon footprint of extensive cow-calf production is being investigated. A trait that expresses performance (calf weaning weight) per constant unit, viz. kilogram calf weaned per Large Stock Unit (KgC/LSU) may be useful as such a breeding objective. Since a LSU (Large Stock Unit) unit is linked to specific metabolisable energy requirements it should be possible to eventually "link" this breeding objective with the carbon footprint of weaner calf production.

In a breeding objective/goal, the trait under consideration is the end product—what should be achieved. Decisions about such a trait are based purely on the end result, not on whether it is difficult or easy to measure or whether there may be problems in selecting for it. The next phase will then be to identify selection criteria, which are the traits that should be actually used in the selection of animals.

Traits in the selection criteria should be correlated with the trait in the breeding objective, easily measurable and heritable.

This investigation used the information of 30 beef and dual purpose breeds recorded over a period of 10 years. The 205 days corrected weaning weights and cow weights were used to estimate the kilogram of calf weaned / Large Stock Unit (KgC/LSU). In South Africa a Large Stock Unit (LSU) is defined as the equivalent of an ox with a weight of 450kg and a weight gain of 500 g per day on grass pasture with a mean Digestible Energy (DE) concentration of 55%. To maintain this, 75 MJ Metabolisable Energy (ME) is required. In practice this means a requirement of 9kg of grass per day that meet these requirements.

This investigation indicated that KgC/LSU is independent of cow weight (R2 = 0.08) as indicated in Figure 1. This is contrary to the calf/cow weight ratio that is currently being used in South Africa (and other countries) which favours smaller cows. In Figure 2 the relationship between cow weight and the cow to calf weight ratio is demonstrated. From this Figure it is clear that this ratio favours smaller cows (R2 = 0.45).

> "Livestock on extensive pastures produce more methane than livestock on intensive production systems"

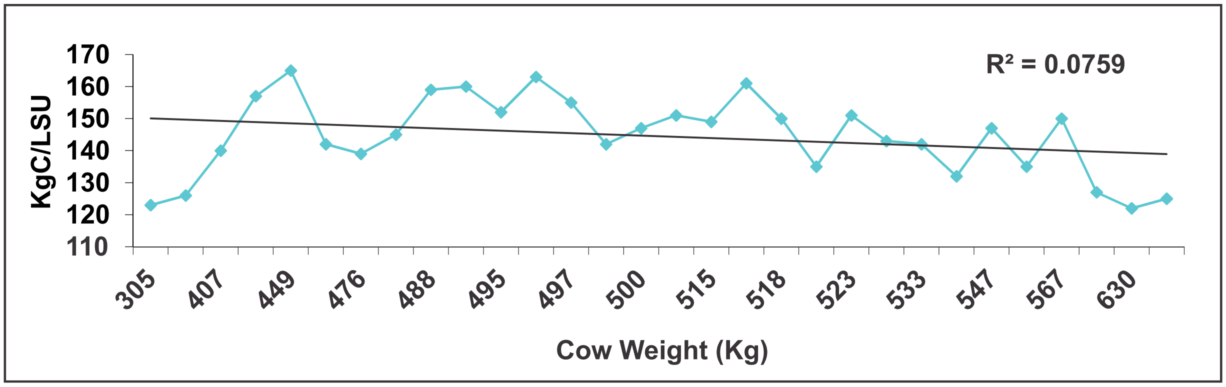

Figure 1. The relationship between kilogram calf weaned/LSU (KgC/LSU) and cow weight.

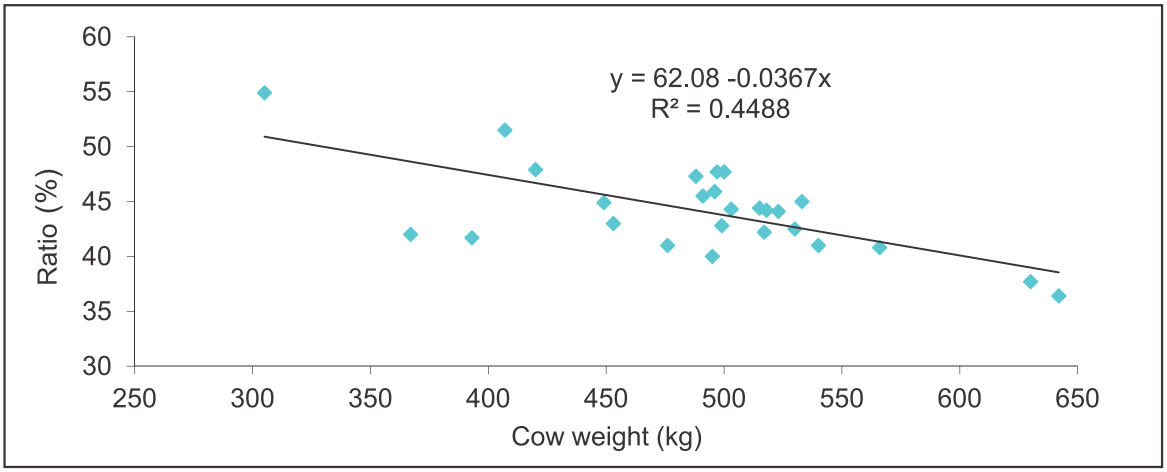

Figure 2. The relationship between the calf to cow weight ratio and cow weight.

This investigation is continuing with the aim to identify the optimal way in which to improve true cow efficiency through breeding. To achieve this well-defined breeding objective(s) and innovative selection criteria are needed.

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