

Breeding for Production System Efficiency

A large number of traits contribute to the profitability of cattle production systems. This article will discuss how BREEDPLAN EBVs fit in cattle production systems and how cattle producers can utilise them to select for more efficient cattle. To increase commercial cattle profitability, cattle producers need to consider both the sources of income and the costs of production. If we break the profit equation for commercial beef production down into its simplest form, we get the following:

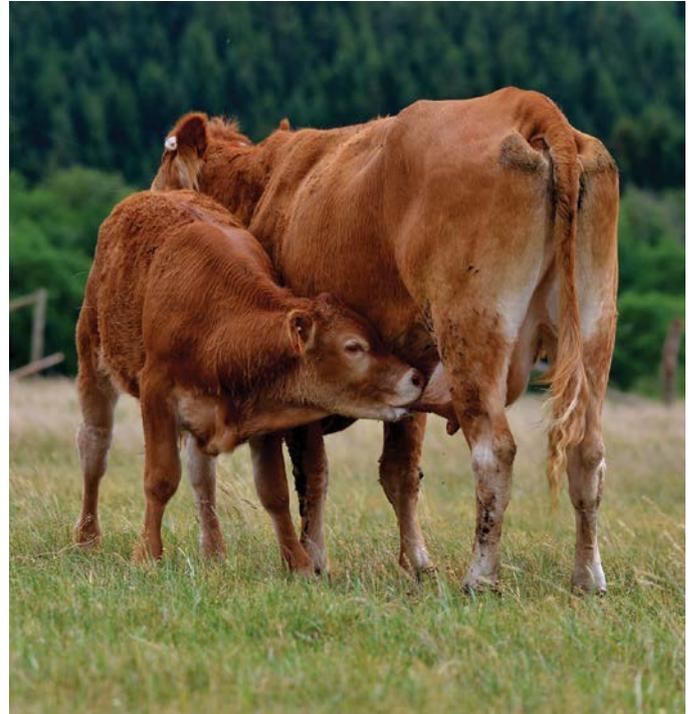
$$\text{Profit (\$)} = \text{Number of Calves} \times \text{Weight (kg)} \times \text{Quality (\$/kg)} \text{ minus the Cost of Production (\$)}$$

If we look at each of these components in turn, the relevant BREEDPLAN traits can be observed. It is important to note that no one society reports all of the EBVs that BREEDPLAN can calculate. This is due to variation in breeding objectives and levels of data recording between societies.

Number of Calves is determined by the number of calves born (fertility) and calf survival (calving ease). Each year a calf is not conceived or does not survive means a year where the cow is carried without performing her primary role. A number of BREEDPLAN EBVs contribute towards calf survival including Calving Ease Direct (%), Calving Ease Daughters (%), Birth Weight (kg) and Gestation Length (days). Fertility EBVs include Days to Calving (days), Scrotal Size (cm) and Percent Normal Sperm (%).

The *Weight* of the individual progeny has multiple influences on the profit equation. In the context of income, an animal's size is the largest contributor to its value. Depending on the desired target market, the relevant BREEDPLAN Growth EBVs could be 200 Day Growth (weaners), 400 Day Weight (yearlings) or 600 Day Weight (later ages). Additionally, the Milk EBV quantifies the maternal contribution (e.g. milk and maternal behaviour) to each animal's weaning weight. All Growth EBVs are reported in kilograms (kg).

Carcase *Quality* also contributes to the value of sale animals. The relevant BREEDPLAN Carcass EBVs are Carcass Weight (kg), Eye Muscle Area (sq. cm), Rib Fat (mm), Rump Fat (mm), Retail Beef Yield (%) and



Intramuscular Fat (%). There are two further traits, Marble Score and Marble Fineness (%) that are specific to Wagyu BREEDPLAN. In addition, Shear Force (kg), is included in the Belmont Red and Brahman BREEDPLAN analyses.

Livestock producers tend to be good at selecting traits that earn money but have a tendency to overlook traits that influence the *Cost of Production*. Part of the reason for this is that evidence of beef production is easily observed from an animal's size and condition, and the feedback sheets received from processors. Unfortunately, the costs of production are a lot harder to see and quantify, and thus are easier to overlook. Ideally, a seedstock recording program would allocate as many resources to recording and selection emphasis to reducing the cost of production, as it does towards maximising income.

The *Cost of Production* is determined by multiple factors, some of which appear in or are closely related to the income components of the profit equation. Unfortunately, some of these are negatively correlated with their income equivalents. For example, an animal's size (Growth EBVs) is the largest contributor to its value (income) but also determines how much an animal needs to eat each day to maintain its size (cost). As a

consequence, a popular selection objective to balance this relationship is to select for fast growth to sale weight in the progeny from moderate sized mature cows (Mature Cow Weight EBV) that require less feed. This can be achieved by selecting curve-bender animals and/or by using a larger terminal sire over smaller cows. Cow nutrition is the largest cost of any beef production system and applies to all cows regardless of whether they produce a live calf or not.

The carcass traits contribute to both the income and cost sides of the profit equation in a manner similar to the growth traits. Both carcass and growth traits determine the value of sale progeny (income) and influence the age at which each animal reaches market specification (cost of production). Additionally, the cost of production for a high MSA grade carcass is broadly similar to the cost of producing a poorer one, so targeting better carcass quality can be more economically efficient.

Milk is another trait that occurs on both the income and cost sides of the profit equation. Milk is a nutritionally expensive trait and breeders are encouraged to consider the optimum Milk EBV for their production system. Selection for increased milk production may be warranted when cows are run under good nutritional conditions (e.g. improved pasture), while poorer environments (e.g. scrubby rangeland) may not support cows with higher Milk EBVs. In addition, high milking cows may not



get back in calf as easily as lower milking cows in the following year.

The Net Feed Intake EBVs (NFI; kg feed per day) are an estimate of the genetic differences between animals in feed intake at a standard weight and rate of weight gain. As such, NFI EBVs have an obvious role in determining the cost of production and overall beef production efficiency. Unfortunately, it is uncommon to see the NFI trait recorded outside of breed society progeny tests due to cost and the availability of the test equipment. This has limited the availability and utility of the resulting EBVs.

Given the complexity of combining all of these EBVs into a breeding objective in an appropriate manner, it is perhaps not surprising, although suboptimal, to see that recording levels for the income traits are much higher than for those that determine the cost of production. Fortunately, BREEDPLAN utilises a sophisticated piece of computer software called BreedObject that accounts for all of the above when creating the selection indexes that breeders can use to select cattle that are efficient producers of beef.

SUMMARY

Breeding for production system efficiency involves consideration of a number of traits. Fertility is paramount; after all, a cow in the breeding herd should raise a live calf each year and failure to do so makes her a drain on resources. Faster age to turnoff, achieved through selection on a combination of growth and carcass traits, reduces the amount of feed required for the same amount of product. With feed being the biggest cost in any beef production system, maintaining production levels while minimising required feed input will also improve economic efficiency. While NFI EBVs can assist with this, they are not widely available and so many breeders will only be able to utilise mature cow weight to apply selection pressure on mature size and associated feed intake. Balancing all of the traits that influence efficiency is made easier for beef producers with the availability of BreedObject selection indexes, as these balance both the income and expense sides of the profit equation. For further information on breeding for efficiency, please contact staff at SBTS or TBTS.