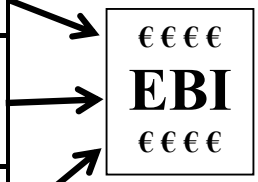
Understanding the Economic Breeding Index (EBI).

What is EBI?

EBI is a single figure profit index aimed at helping farmers identify the most profitable bulls and cows for breeding dairy herd replacements. It comprises of information on five sub-indexes related to profitable milk production. These are; (i) milk production, (ii) fertility, (iii) calving performance, (iv) beef merit and (v) health. Foot angle, Udder Depth, Angularity and Body Condition Score are also indirectly included in the EBI through their contribution to calving interval and survival breeding values. A summary of the sub-indexes, including traits and relative weightings for traits in the EBI are given in **Table 1**. The economic values in the index are based on data collected from Irish Dairy Farms and the Dairy Industry.

Table 1. *Economic values & % emphasis of the various traits in the EBI formula.*

EBI Sub - Index	Trait	Economic Value (€)	Trait Empasis	Overall Emphasis
Production	Milk Yield (kg)	-€0.09	12%	**42%**
	Fat Yield (kg)	€1.26	5%	
	Protein Yield (kg)	€6.91	25%	
Fertility	Calving Interval (days)	-€11.97	23%	**34%**
	Survival (%)	€11.17	11%	
Calving	Direct Calving Difficulty	-€3.65	4%	**11%**
	Maternal Calving Difficulty	-€1.73	2%	
	Gestation (days)	-€7.54	4%	
	Calf Mortality (%)	-€2.58	1%	
Beef	Cull Cow Weight (kg)	-€0.51	2%	**9%**
	Carcass Weight (kg)	€1.38	4%	
	Carcass Conformation	€10.32	2%	
	Carcass Fat	-€11.71	1%	
Health	Locomotion (score)	€1.13	1%	**4%**
	Udder - (SCC)	-€57.21	3%	



Does the EBI work?

Recent work by Teagasc has demonstrated that herds with high average EBI values have higher common profit/litre. The work indicated that each €5 increase in herd average EBI, increased common profit by 0.3 cents/litre. This equates to a cumulative increase in profit of €1200/year for 400,000 litre milk quota. The simple advice to farmers is to use AI to breed dairy replacements (either bulls from the ICBF Active Bull List or bulls from the G€N€ IR€LAND young bull program) as this will achieve a herd average increase in EBI of €5/year.

Genetic Evaluations

Knowing the genetic merit of your herd is a key component to successfully improving traits of importance on your farm. The observed performance (e.g. 305 day milk yield) of an individual cow depends on two things:

a) the genetic merit of the cows
b) the environment in which she is performing

Genetic evaluations attempt to disentangle the effects of genes and the environment in order to select animals that have high genetic merit, and not those that perform well simply because they are well managed and fed. For example, if Cow X has a much higher genetic merit for milk yield than Cow Y,

Cow Y will need much more feed to milk the same as cow X. Alternatively, if Cow X and Y are fed the same, Cow X will outperform Cow Y for milk yield. Genetic evaluations allow us to directly compare animals that are performing in many environments, by removing the part of the observed performance that is due to the environment and management of the cows.

We cannot directly alter the genetic merit of an individual cow, however improvements can be made for specific traits in the offspring of the cow provided she is bred to a sire that is better than she is for those traits. Therefore it is important to know both the genetic merit of the cow and the sire in order to make genetic improvements in traits of economic importance.

How do I interpret the Predicted figures for Milk kg, Fat kg, Protein kg, etc.?

We call these Predicted Transmitting Ability figures (PTAs). An animal's PTA indicates the amount of a particular trait an animal is expected to pass on to its progeny relative to the base population (See **Table 1**). The PTA is equal to half of its own Breeding Value since a cow only passes on half her genes to her offspring. All values on the EBI report are expressed as PTA. Information on bulls (in catalogues, bull search, etc.) is also presented in terms of PTA.

	Milk kg	Fat kg	Prot kg	Fat%	Prot%	CI days	Surv%
Observed Performance	5190	196	171	3.79	3.30	387	83

Table 1. ***Base Population Performance – Cows born in 1995 and milk recorded in 2000***

Example:

Cow 721 (**Fig 1.** below) has a Milk kg PTA of **+153kg** and she is mated to a bull with a Milk kg of **+247kg**. The resultant offspring will have a potential for milk (i.e. Breeding Value) of **+400kg**.

FB Cow ID	Sire ID	Sire EBI	C. Date	M Kg		Surv%	Milk Solids	Fertility	EBI €
Name	Dam FB	Dam EBI	Age	F Kg	F %	CI	Calving	Beef	Herd Rank
Breed	MG Sire ID	MGS EBI	Lact.	P Kg	P %	(Days)		Health	
721 IE123456720721	ESZ	76	17/04/2007	153		0.7	€ 39	€ 22	€ 65
Highfield Mary	0543	41	3y 10m	4.0	-0.03	-1.4	€ 5	€ 2	38
HO 96.9% FR 3.1%	AHD	64	2	9.0	0.07			€ -3	

Fig 1. ***Example of an animal's PTA in the EBI Report***

Does this mean the offspring, assuming a heifer, will actually milk 400Kg more than the "base cow" (i.e. 5190kg + 400kg = 5590kg)? The answer always depends on the level of management – the heifer will be genetically capable of milking 400kg more than the base cow but how much she physically outperforms the base cow will be dependent on the management of the animal. In a higher input environment she could perform much more than this or in a lower input environment it may be less than this.

Key Point: Although the potential of the offspring heifer is **+400kg**, she will only pass on half of this to her own offspring, therefore her PTA for milk kg is **+200kg** (½ her Breeding Value) and this is what is displayed on the EBI report.

In simple terms, in order to improve the potential of a cow's offspring to milk more, you need to use bulls that have a higher PTA for milk kg than the cow itself. The same applies to all other traits, be it milk solids yield, fat and protein % or calving interval and survival.

When selecting a team of bulls for your cows you should pick bulls that are higher than the herd PTA for the traits you want to improve. To improve individual cow weaknesses use the cow PTA to help you determine the best bull to use on her.