Collecting Feed Intake Information for BREEDPLAN for Post Weaning and Finishing Tests

Feed intake information is used to calculate Net Feed Intake EBVs within BREEDPLAN. This fact sheet outlines the requirements for the collection and submission of feed intake information for BREEDPLAN.

Why Collect Feed Intake Information?

Feed efficiency is recognised as one of the most economically important production traits, both in grazing enterprises and feedlot operations. Research has shown that significant variation exists in feed intake and feed efficiency between animals, and that a proportion of this variation is due to genetic differences.

Obtaining feed intake measurements for the generation of NFI EBVs calculated within BREEDPLAN provides a valuable source of information when attempting to identify animals with superior genetics for feed efficiency to use in a beef breeding program. Feed intake and weight data is analysed in BREEDPLAN to produce two Net Feed Intake EBVs being:

(i) Net Feed Intake - Feedlot Finishing EBV (NFI-F EBV)

This EBV is an estimate of genetic differences between animals in feed intake at a standard weight and rate of weight gain when animals are in a feedlot finishing phase.

(ii) Net Feed Intake - Post Weaning EBV (NFI-P EBV)

This EBV is an estimate of genetic differences between animals in feed intake at a standard weight and rate of weight gain when animals are also in a feedlot but in a younger growing stage, immediately after weaning.

In both cases, NFI EBVs are expressed as kilograms (kg) of feed intake per day. Lower, or more negative, NFI EBVs are more favourable. For example, a bull with a NFI-F EBV of –0.6 kg/day would be expected to produce progeny that consume less feed per day than the progeny from a bull that has a NFI-F EBV of +0.8 kg/day (when the progeny are of similar weight, are growing at a similar rate, and are in a feedlot finishing phase). Whilst there is a positive relationship between the two EBVs, some animals will rank differently for feed efficiency in the two different scenarios.

How Much Effort is Involved?

Breeders who are considering collecting feed intake information for BREEDPLAN need to be aware that it can be challenging, expensive, time consuming and must be collected in a standardised way. However if effective feed intake information can be collected and analysed through BREEDPLAN, the economic benefits from a selection perspective can be considerable.

Where and How Can I Collect Feed Intake on My Animals?

Feed Intake collection can be conducted either 'on-farm', or at a 'central-test' facility (e.g. Tullimba Feedlot, Kingstown, NSW).

Commercial feeding systems that automatically record feed intake of individually electronically identified animals are recommended. Currently most feed intake data is collected using the GrowSafe system (See http://www.growsafe.com/our-systems/feed-intake/) however there are other systems such as the Calan Broadbent Feeding System that can effectively capture feed intake data.

The recommendations and requirements that follow apply to all testing locations and systems.

Feed Intake Collection on Steers using the GrowSafe system at Tullimba Feedot, Kingstown, NSW.

What Animals Should Be Tested for Feed Intake?

❑ Animals must be between 210 and 700 days of age at commencement of the test.

❑ Bulls, steers or heifers can be tested. Sexes should not be mixed in the same pen.

❑ Animals should be tested in contemporary groups (i.e. animals of the same sex which are born within an individual herd in a 60 day period) to ensure that comparisons are made between animals which have been run under identical conditions, both before and during the feed intake test.

- The animals must be recorded with the breed society/BREEDPLAN prior to the start of the test and it is strongly recommended that they have at least a 200 day weight recorded which includes management group information.

- Animals that are in small or single animal contemporary groups prior to the test (e.g. twins, sick animals) should not be included.

- For effective sire comparisons it is recommended to have a minimum of five progeny per sire with at least two sires represented.

- The largest practical number of animals in a contemporary group representing the progeny of more than one sire is recommended as it will provide more comparative information per animal.

- If it is necessary to split a large contemporary group for the feed intake test (e.g. due to pen size) then it is important that each sires progeny are equally represented in each subgroup. For example, if a contemporary group of 120 steers' needs to be split into 3 sub-groups due to the pen size of 40 head then 1/3 of the progeny of each sire should be randomly selected for each sub-group.

What Are the Considerations Before the Feed Intake Test Commences?

- Health Treatments - All animals should have comprehensive health treatments (e.g. 5 in 1 vaccine, internal and external parasite drench, Bovilis MH + IBR vaccine) prior to entering the test so that sickness is minimised and they have the ability to achieve their genetic potential for growth and feed intake performance, and are assessed on an equal basis.

- Animal Identification - The animal identification system adopted must be appropriate for the feeding system used. An adequate identification system is essential to allow individual animal feed intake to be recorded and data submitted to BREEDPLAN. Commercially available automatic feeding systems (e.g. GrowSafe) require the use of a compatible electronic animal identification system such as NLIS tags. The electronic identification numbers must be cross referenced with the breed society identification number which is used to record the animal with the breed society.

- Ration - For a Post weaning (growing) test the ration must consist of a minimum of 10.0 MJ metabolisable energy (ME) per kg dry matter (DM), and a minimum of 14% crude protein (CP) per kg dry matter (DM). Minimum levels for ME and CP ensure that potential growth rates are not restricted.

  For animals in a finishing phase, a ME level of 12 to13 MJ/kg DM with a minimum of 13% crude protein is recommended.

❑ Pre-test Adjustment Period - A minimum adjustment period of 21 days is recommended. This can be a combination of a ration in open bunks and then a ration in the feed intake facility. An adjustment period is necessary to allow all animals to adjust to the ration and the environment prior to commencement of the test. Assessments should be made during this period to monitor individual feed intakes and acceptance of the diet. If shy feeders are detected during this phase, it is recommended that they be separated from the rest of the group during the pre-test adjustment period. Shy feeders or poor performers may have to be excluded before the test commences.

What Are the Considerations During the Feed Intake Test Period (i.e. Test Protocols)?

❑ The duration of the test must be for a minimum of 70 days on a constant ration fed Ad libitum, with the aim to achieve a minimum of 60 valid feed intake days per animal.

❑ Feed intake is recorded as kilograms consumed (on an Ad libitum basis) per animal per day. This is averaged across the feeding period for each animal for valid feed intake days.

❑ Pen differences will generally have an effect on feed intake performance and should be taken into account by way of a different management group for each pen. This is particularly the case for animals that start their feed intake test on the same day in the same location.

❑ During the test period, it is strongly recommended that animal performance be monitored by way of regular checks (e.g. daily intake measurements and visual assessment). Sick animals may have to be removed from the test.

❑ Faulty equipment, such as feeding units, scales or animal identification systems which can cause loss of reliable data must be detected in time to allow repairs before the test is invalidated.

❑ Invalid feed intake records (see next section) must be removed from the average Feed Intake calculation.

What Constitutes a "Valid" Feed Intake Measurement During the Test Period?

A day's Feed Intake data can be identified as invalid for either a single animal, a single pen or the trial for one or more of the following reasons:

❑ An animal becomes sick. The animal's data should be excluded from the test if the sickness extends for more than 5 consecutive days.

❑ An animal loses the Electronic Ear Tag and/or cannot be identified for a period.

❑ A pen is out of feed for an extended period (i.e. not Ad libitum).

- There is loss of power or faulty equipment in a pen or in the whole system.

- There is more feed lost than can be accounted for against animals.

- A rain event alters feed figures substantially (uncommon).

- Animals are off feed for too long for weighing or other measuring (e.g. ultrasound scanning) scanning. Quick weighing events, a pen at a time, are important to minimise the impact on feeding behaviour.

Excluding the invalid intake days, the remainder of the data would then be considered valid and used to calculate the average daily feed intake over the test period.

If there are too many invalid records for an animal, a pen or a trial, the animal may need to be excluded or the trial may need to be extended to meet in minimum 60 valid day criteria.

**What Are the Weighing Considerations During the Test Period?**

- Weighing animals regularly is required as net feed intake is calculated by adjusting feed intake for liveweight and gain for the duration of the test. For this reason, each animal must be weighed at the start and end of the test period and at 14 day intervals in-between (Table 1).

Table 1. Time Scale for Feed Intake Test

Pre-Test Adjustment Period (days)			Test Period											
			Ad libitum feeding											
			W		W		W		W		W		W	
-21	-14	-7	0	7	14	21	28	35	42	49	56	63	70

*W represents days on which animals are weighed

- Animals should be weighed as a pen group and weighed as promptly as possible after removal from the pen. There should not be any delays in weighing due to other procedures such as ultrasound scanning. If scanning is to be carried out, run all the animals from a pen through a weighing then start the scan process.

- There should be a strong, positive relationship between the weights on individual animals over this period. For example, on a statistical basis, the R squared value of the weights for each animal should be 0.9 or above (see example in Table 2). Weights that are clearly incorrect (too high or low with no variation in feeding pattern) can be excluded from the linear regression calculation mentioned below.

- **IMPORTANT:** The start and end weight for the test are to be taken from a linear regression "fitted" line calculated using the valid weights over the trial
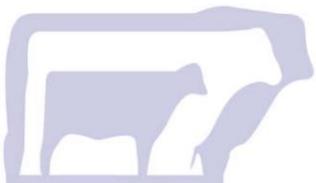
period. Note that they are not the raw measured weights at the start and end of the test. See example in Table 2 and Figure 1.

For further information on calculating the "fitted" start and end weights and the R squared value contact staff at BREEDPLAN.

Table 2. Individual Animal Example of "Fitted" Start and End Weights and R Squared Value

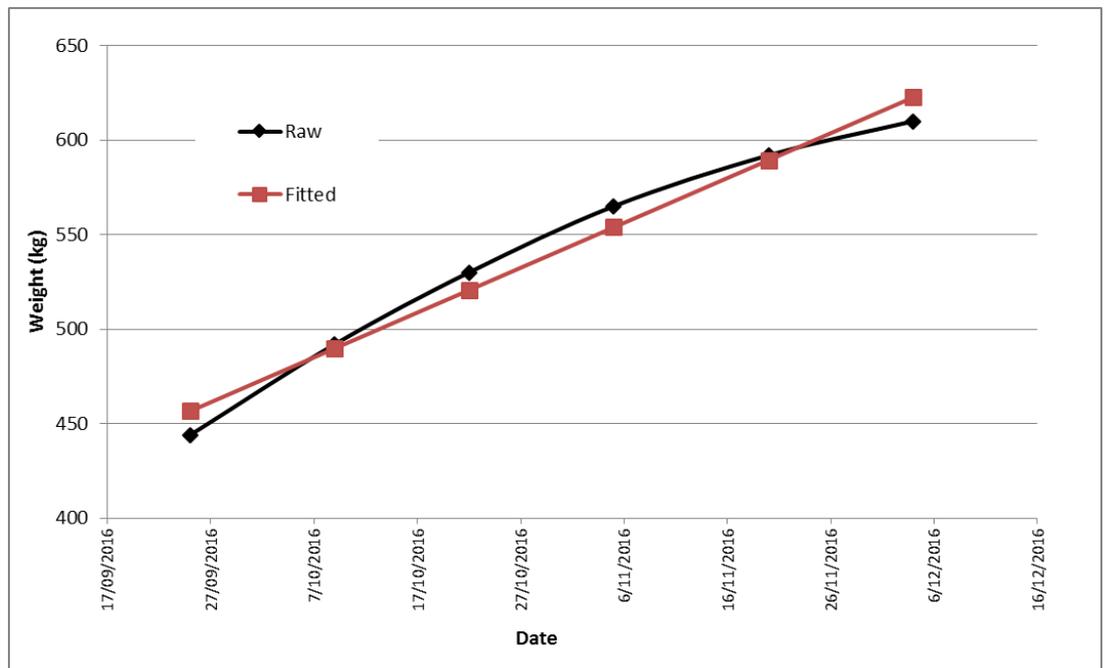|	Weigh Date	Raw Weight (kg)	"Fitted" Weight (kg)
Start Weight	25/09/2016	444	**457**
	9/10/2016	492	490
	22/10/2016	530	521
	5/11/2016	565	554
	20/11/2016	592	589
End Weight	4/12/2016	610	**623**
	R Squared	**0.97**	

Figure 1. Individual Animal Example of "Fitted" Weights.

Are You Recording NFI-F or NFI-P?

BREEDPLAN is able to analyse two types of feed intake data being for animals in a post-weaning or finishing test. Following is an explanation and guide for the two EBVs:

(i) Post-Weaning

- ❑ Young growing animals post weaning.

- ❑ Generally heifers or bulls.

- ❑ Average start weight of less than 500 kg.

- ❑ Fed a lower energy ration of ~ 10 MJ.

(ii) Finishing

- ❑ Animals in the finishing phase (i.e. laying down fat).

- ❑ Generally steers.

- ❑ Average start weight greater that 500 kg.

- ❑ Fed a higher ration ~ 12-13 MJ.

How Do I Submit Feed Intake Measurements and Associated Weight Data?

Feed Intake measurements and associated weight data are submitted directly to BREEDPLAN via a compatible Microsoft Excel template. See Appendix 1 for the format of the data submission template.

If you are unable to submit the Net Feed Intake information using the Microsoft Excel template, please contact staff at BREEDPLAN to discuss alternatives methods.

For further information on collecting feed intake information for BREEDPLAN, please contact staff at BREEDPLAN.

Appendix 1

Record Structure for Feed Intake import format 4014 for BREEDPLAN

Number	Field name	Type	Description	Purpose
1 A	Record Identifier	A1	Always "F" apart from the header row which is "#"	ABRI record identifier
2 B	Breed Society Code	A5	Describes the database that the animal belongs to	Must match the standard codes. See BREEDPLAN website (http://breedplan.une.edu.au)
3 C	Test Station	A3	Accredited Test Station code	Must match the standard test station codes. See BREEDPLAN website (http://breedplan.une.edu.au)
4 D	Test-ID	A6	Unique code for each test conducted, consisting of year at beginning of test (yyyy) and a test number assigned by station manager (xx) e.g. 199902	Test-ID and Management group added to BREEDPLAN 200-d weight contemporary group, to give NFI contemporary group
5 E	Animal ID	A19	Breed society animal identifier of tested animal	Must match ID on ILR2
6 F	Animal Tag	A10	Tag of animal on test	Optional
7 G	Sire ID	A19	Breed society identifier of sire	Optional
8 H	Birthdate	A8	(yyyymmdd)	Optional
9 I	Management group	A3	Identifier for management sub-groups within a test	Allows: space, alpha, numeric
10 J	Test Sex	A1	Bull, Steer, Heifer	Used for verification of animal match
11 K	Test Feeding Procedure	A1	Auto (A), Manual (M)	Relates to method used for measuring amount of feed eaten
12 L	Test Weighing method	A1	Auto (A), Manual (M)	Relates to method used for weighing individual animals
13 M	Ration Energy Density	I3	MJ ME/kg DM of ration fed during test	Input as 125 for 12.5 value
14 N	Start test date	A8	Date at start of feed intake test (yyyymmdd)	Defines actual test period and excludes pre-test backgrounding
15 O	End test date	A8	Date at end of feed intake test (yyyymmdd)	
16 P	Number of records in weight calculations	I2	Number of records used in method of weight calculation	Used for predicting start and end weights
17 Q	Number of animal weights in daily mean	I3	Average number of weights on same day from which mean weight (start and end) or daily weights for regression have been calculated	Input as *10 (i.e. if average number of weights per day is 3.0, then input as 30)
18 R	Start test weight (kg)	I4	**Predicted** weight on start test date	Used to calculate Net Feed Intake
19 S	End test weight (kg)	I4	**Predicted** weight on end test date	Used to calculate Net Feed Intake
20 T	Daily Feed Intake (kg)	I4	Average daily feed intake over the period defined by the start/end dates	Input as *100 (i.e. if average daily feed intake is 12.34, then input as 1234)
21 U	Test Type	A1	P = post-weaning feed test F = finishing feed test	Determines whether test data corresponds to NFI-P or NFI-F

Note:
- Shaded fields are optional.
- Data is submitted as a comma-delimited file (CSV).
- Start and End weights (fields 18 and 19) are linear regressed weights for that Start to End dates; they are not the actual recorded start and end weights from the feed test.

Example Feed Intake Submission File

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
#	Breed Society Code	Test Station	Test-ID	Animal ID	Animal Tag	Sire ID	Birth Date	Management group	Test Sex	Test Feeding Procedure	Test Weighing method	Ration Energy Density	Start test date	End test date	Number of records in weight calculations	Number of animal weights in daily mean	Start test weight (kg)	End test weight (kg)	Daily Feed Intake (kg)	Test Type
F	AUAA	TUL	201604	ABCK67				D	S	A	M	125	20160308	20160516	6	10	504	628	1282	F
F	AUAA	TUL	201604	ABCK79				D	S	A	M	125	20160308	20160516	6	10	515	622	1445	F
F	AUAA	TUL	201604	ABCK89				D	S	A	M	125	20160308	20160516	6	10	591	702	1549	F
F	AUAA	TUL	201604	ABCK90				D	S	A	M	125	20160308	20160516	6	10	475	614	1573	F
F	AUAA	TUL	201604	ABCK98				D	S	A	M	125	20160308	20160516	6	10	494	586	1199	F
F	AUAA	TUL	201604	ABCK99				D	S	A	M	125	20160308	20160516	6	10	475	568	1194	F
F	AUAA	TUL	201604	ABCK100				D	S	A	M	125	20160308	20160516	6	10	541	632	1417	F
F	AUAA	TUL	201604	ABCK105				D	S	A	M	125	20160308	20160516	6	10	494	615	1369	F
F	AUAA	TUL	201604	ABCK107				D	S	A	M	125	20160308	20160516	6	10	517	640	1365	F
F	AUAA	TUL	201604	ABCK108				D	S	A	M	125	20160308	20160516	6	10	511	625	1429	F
F	AUAA	TUL	201604	ABCK118				D	S	A	M	125	20160308	20160516	6	10	558	693	1726	F
F	AUAA	TUL	201604	ABCK122				D	S	A	M	125	20160308	20160516	6	10	472	594	1368	F
F	AUAA	TUL	201604	ABCK124				D	S	A	M	125	20160308	20160516	6	10	490	620	1425	F
F	AUAA	TUL	201604	ABCK125				D	S	A	M	125	20160308	20160516	6	10	490	629	1409	F
F	AUAA	TUL	201604	ABCK126				D	S	A	M	125	20160308	20160516	6	10	511	633	1522	F
F	AUAA	TUL	201604	ABCK147				D	S	A	M	125	20160308	20160516	6	10	522	653	1545	F
F	AUAA	TUL	201604	ABCK158				D	S	A	M	125	20160308	20160516	6	10	549	690	1278	F
F	AUAA	TUL	201604	ABCK166				D	S	A	M	125	20160308	20160516	6	10	513	634	1347	F
F	AUAA	TUL	201604	ABCK167				D	S	A	M	125	20160308	20160516	6	10	527	630	1325	F
F	AUAA	TUL	201604	ABCK171				D	S	A	M	125	20160308	20160516	6	10	546	647	1241	F
F	AUAA	TUL	201604	ABCK182				D	S	A	M	125	20160308	20160516	6	10	519	667	1501	F
F	AUAA	TUL	201604	ABCK184				D	S	A	M	125	20160308	20160516	6	10	523	653	1547	F
F	AUAA	TUL	201604	ABCK192				D	S	A	M	125	20160308	20160516	6	10	545	683	1628	F
F	AUAA	TUL	201604	ABCK197				D	S	A	M	125	20160308	20160516	6	10	501	601	1183	F
F	AUAA	TUL	201604	ABCK199				D	S	A	M	125	20160308	20160516	6	10	594	684	1410	F
F	AUAA	TUL	201604	ABCK208				D	S	A	M	125	20160308	20160516	6	10	539	653	1494	F
F	AUAA	TUL	201604	ABCK218				D	S	A	M	125	20160308	20160516	6	10	513	615	1472	F
F	AUAA	TUL	201604	ABCK62				E	S	A	M	125	20160308	20160516	6	10	504	625	1268	F
F	AUAA	TUL	201604	ABCK65				E	S	A	M	125	20160308	20160516	6	10	477	570	1370	F
F	AUAA	TUL	201604	ABCK78				E	S	A	M	125	20160308	20160516	6	10	565	708	1450	F
F	AUAA	TUL	201604	ABCK84				E	S	A	M	125	20160308	20160516	6	10	526	631	1493	F
F	AUAA	TUL	201604	ABCK85				E	S	A	M	125	20160308	20160516	6	10	569	656	1545	F
F	AUAA	TUL	201604	ABCK88				E	S	A	M	125	20160308	20160516	6	10	467	582	1263	F