

Protocol for testing beef cattle for net feed intake using Growsafe/Vytelle applicable to LRF associated Breed Societies in Southern Africa

1. Introduction

This protocol applies to any test station collecting Net Feed Intake (NFI) data with the aim to submit data to Livestock Registering Federation (LRF) affiliated Society databases for the purpose of generating BREEDPLAN Estimated Breeding Values (EBVs) for Net Feed Intake Post Wean (NFI-P) and Net Feed Intake Finishing (NFI-F).

Code of practice

Each of the points listed as the Code of Practice for that section are mandatory and must be included in the testing procedures applied at the test station.

2. Facility requirements

This manual outlines the test protocol applicable to a testing facility equipped with Growsafe/Vytelle equipment (Growsafe Feed Intake Hardware & Software) including continuous in-pen partial animal weighing (Growsafe Beef Hardware & Software).

NFI tests are to be conducted at test facilities equipped as described above where animals from several origins are assembled at a designated location for testing under uniform conditions.

3. Background

3.1 In a study of the Growth and Feed intake patterns of ruminants, Meissner and Roux (1984) identified three growth phases plus a final adult phase as detailed below:

Phase	Age (days)	Weight (kg)
1	0 to 140 ± 7	40 to 150
2	140 to 280 ± 21	150 to 325
3	280 to 420 ± 35	325 to 500
Adult	485	500

3.2 BREEDPLAN distinguishes between post wean (animals 210 days and older, similar to Meissner group 3) and finishing (animals weighing more than 500 kg at start of adaptation (like Meissner adult phase). Planned test periods for feed intake testing should take cognizance of the identified phases. Test periods spanning across these phases should be avoided, unless the intention is to establish further data in support of the specific studies.

3.3 The minimum age at entry of a feed intake test should allow for a valid scrotal circumference to be measured and valid scan data to be collected at an age above 300 days and allowing the test center to measure the scrotal circumference during the last 7 days of a test.

3.3 In South Africa, over 80% of cattle are finished in feedlots, with a typical feedlot period between 90 to 140 days after an initial back-grounding stage. The RSA market preferred carcass weight is anything from 225kg to 300 kg, suggesting a typical live weight of 375 to 550.

3.4 BREEDPLAN age at turn-off requires animals accepted for submission to a test to be less than 700 days of age (at start of test period after adaptation).

4. Environmental and legal responsibilities

Testing facilities may require acceptance and approval under the applicable statutory regulations as published from time to time.

Testing facilities may be regarded as legally constituting feedlots. Statutory requirements for feedlots, such as environmental protection and animal welfare should always be adhered to. It remains the accountability of the facility operator to always ensure compliance to all statutory requirements.

Testing facilities should further ensure compliance to all applicable veterinary requirements including but not limited to the requirements to manage and contain foot-and mouth disease.

5. Eligibility of animals for testing

5.1 Age

Animals accepted for submission in the test should be at least 210 days of age (start of adaptation period) or such higher age to ensure an age of 300 days or greater at end of test to ensure a valid scrotal circumference measurement during the last 7 days of test.

NOTE: To meet the above requirement with the shorter test described in paragraph 8 below animals should be at least 230 days of age (start of adaptation)

Animals accepted for submission to a test shall not be older than 700 days of age (start of test period).

5.2 Sex

Bulls, steers or heifers can be tested. Due to management difficulties with testing of mixed sex groups, the different sex groups should be separated.

5.3 Contemporary Groups

Animals must be tested in contemporary groups (as defined by the breeder) and constitutes animals managed under the same conditions from birth to date of entry into NFI test to ensure that comparisons are made between animals which have been run under identical conditions, both for traits measured before and during the NFI test. **The largest practical number of animals in a contemporary group is recommended as it will provide more comparative information per animal.** In the event of an animal being withdrawn from a contemporary group after commencement of the test, data from the remaining animals

should still be submitted. Animals must be born within 60 days from each other to be considered for the same contemporary group.

Code of practice

A comparative group shall consist of a minimum of five (5) animals bred from a minimum of two (2) sires with a minimum of two progeny per sire animal, all from the same contemporary group and the same sex, within a sixty-day age slice.

5.4 Post wean

Post wean animals must be weaned at least 14 days prior to start of adaptation.

5.5 Genetic Links

Comparison between contemporary groups is based on genetic links. To ensure that adequate linkage is available between contemporary groups it is recommended that each contemporary group shall include the progeny of at least one link sire. A link sire is defined as any sire which has had progeny tested for NFI in another contemporary group.

5.6 Horns

All animals submitted for testing shall be dehorned at least one month prior to start of adaptation.

5.7 Animal Health

Health requirements are the responsibility of individual test stations and shall be specified for entry to each test location.

All veterinary or health treatments applied prior to delivery to the test station to any individual /all animal(s) shall be recorded (dosage and date) and such record shall be provided to the test station.

The purpose of specifying mandatory health treatments is to ensure that all animals can achieve their potential growth performance, and all animals are assessed on an equal basis.

All veterinary or health treatments to any individual /all animal(s) shall be recorded (dosage and date) and such record shall be maintained by the test station together with the treatment record prior to test for a minimum period of 5 (five) years.

Code of practice

Within a test all animals shall be subjected to identical health treatments.

All animals entering a test will have received standard health treatments that allow each animal to achieve potential growth performance in that environment.

Records of any remedial health treatments administered to individual animals must be maintained and submitted to the Society together with the NFI test data.

5.8 Twins

Twins or triplets form a separate contemporary group from single born animals, as specified for BREEDPLAN contemporary groups.

Code of practice

Animals born and raised as twins or triplets shall not be eligible for acceptance into a NFI test.

5.9 Mandatory Background Information

Specific background information must be recorded for all animals entering a test for data to be accepted by BREEDPLAN.

Prior to the removal of test animals from existing contemporary groups, the weights of all animals in that group shall be recorded.

Code of practice

The following information shall be recorded for all animals entering a test:

- Individual animal identification
- Sire and Dam identification
- Date of Birth
- Whether single or twin birth
- Breed
- Sex
- Property of birth identification
- Breed composition (% of parental breeds) for composites
- Weights of all animals from contemporary group test animal originated from.

All animals must be recorded on BREEDPLAN, with at least a 200-day weight record taken within the complete contemporary group as defined by the breeder on the property the animal was raised directly prior to extraction for the NFI test. Performance data on all animals from the same herd as the tested animals must be available to account for effects of prior selection of animals entering the test.

5.10 Weight

- the minimum and maximum weights at start of test are 120 kg and 600 kg, respectively
- the minimum and maximum weights at end of test are 200 kg and 800 kg, respectively

6. Recommended practice prior to test.

Breeders/owners shall maintain all animals designated for NFI testing within the management groups applicable at weaning.

Breeders/owners are strongly advised to background all animals designated for testing from weaning until delivery for test adaptation inclusive of a Phase C ration available from the animal feed industry in South Africa and according to the prescriptions provided by the feed producer in consideration of the age of the animal.

7. Conduct of test

7.1 Allocation of Animals to pen groups.

A 'pen group' may consist of any number of animals in individual pens, providing those pens are adjacent to each other and are of a similar structure, size and physical environment. The allocation of individuals to group pens should be random and must be recorded. The number of animals within a pen should not exceed the Growsafe/Vytelle limitations based on the animal size (weight) and number of feed bunkers (nodes) available within the pen.

Code of practice

All animals in the same pen group must be fed and maintained under similar physical conditions and must be fed a ration containing ingredients from the same batch.

Where animals need to be fed in more than one pen group, they must be allocated to pen groups at random within age and/or weight classes, to minimise bullying when randomising animals. **Contemporary groups existing prior to the test (as defined in 5.3 above) must be maintained.**

7.2 Feeding System

This test protocol applies to a test station fitted with Growsafe/Vytelle equipment (Growsafe Feed Intake Hardware & Software) including continuous partial in-pen animal weighing (Growsafe Beef Hardware & Software).

Cattle should have constant access to feed. In the event of a mechanical breakdown or disruption to the feeding system, strategies must be in place to enable all cattle to have access to their normal ration within 24 hours. If this feed cannot be accurately weighed or recorded to each individual animal, those days data must be excluded from the weekly feed intake summary, and this event recorded.

Code of Practice

The feeding system used must incorporate accurate measurement and recording of daily **individual** animal feed intake. Provision must be made to have available sufficient back-up facilities, resources, equipment and personnel to ensure that interruptions to feeding systems are minimised.

Feeding must be ad libitum throughout the test, with animals having constant 24-hour access to feed.

If changes to the feeding system prevent accurate measurement of individual feed intake for any period, for the duration of that period any data generated must be excluded from weekly feed intake summaries, and this event recorded.

7.3 Animal identification

The animal identification system shall comply to the requirements of Growsafe/Vytelle Feed Intake Hardware & Software and Growsafe Beef Hardware & Software to allow individual animal feed intake and partial in-pen weight measurements to be recorded.

Code of Practice

Individual animal identification in accordance with the prescriptions of the relevant Society requirements and the feeding system manufacturer (Growsafe/Vytelle) protocol must be utilised.

7.4 Ration

The ration offered must be balanced for all essential nutrients and be of suitable energy and protein levels so as not to inhibit potential animal performance and must be delivered in a format that minimises ingredient selection.

Commercially available feed additives or supplements may be included in a ration to minimise health risks, to provide essential nutrients lacking in the base ration, or to ensure that the ration meets the minimum standards for metabolizable energy and crude protein, provided they are included within the manufacturers' recommendations or to accepted industry standards.

Code of practice

The ration must be analysed for level of metabolizable energy (MJ ME/kg dry matter), dry matter content and crude protein (%) by a licensed feed analysis service prior to testing and whenever there are major changes in ingredient source to ensure it falls within the acceptable range. During the test, a random sample of the feed must be taken at least every second week. The random samples taken must be bulked and analysed following the test to determine average feed composition.

Feed additives or supplements included in the ration must be recorded.

The ration must consist of a minimum of 9.0 MJ metabolizable 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 are stipulated in the Code of Practice to ensure that potential growth rates are not restricted. It is recommended that for a post-weaning test operators aim to provide a ration as close to 10 MJ ME/kg DM as possible, and for progeny tests or animals during the finishing phase, as close to 12 MJ ME/kg DM as possible. This will help to ensure rations used in different tests are as similar as possible and non-genetic variation is minimised.

Care should be taken to ensure the ration is suitable for the class of stock. Young growing animals should not be fed rations containing excessive levels of energy. If a high energy finishing ration is fed for a specific test including a substantial grain component (>40%), it is

recommended that buffers be included in the ration and progressive increases from low to high grain content during the pre-test period be adopted.

It is strongly recommended that feed analyses performed before the commencement of test are conducted in sufficient time to modify the intended ration if there is a risk that the ration could fall outside the stipulated levels which could cause the data generated to be rejected.

8. Duration

8.1 Pre-test Adjustment Period

An adjustment period is necessary to allow all animals in the test 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. Caution must be used to ensure that no animals reach an age unacceptable for the intended test prior to commencement of the test.

Shy feeders or poor performers may have to be excluded before the test commences.

Code of practice

Irrespective of the test duration, a 21-day adjustment period is required during which the animals are fed with the same ration to be used during the test for the purposes of rumen adaptation, with a minimum of a 10-day period (part of the 21), within the test pen to also ensure environmental adaptation.

8.2 Alternative test durations

8.2.1 70-days: A test duration of 70 days with a minimum of 63 days of usable data is required.

8.2.2 49-days: A test duration of 49 days with a minimum of 45 days of usable data is required.

Code of practice

The duration of the test must be for a minimum of either 49 or 70 days on a constant ration, with the proviso of a minimum of 45 or 63 days of usable data respectively. A maximum total of 5 or 7 days respectively when data is not recorded within a maximum of 70-day or 91-day period respectively is allowable for the duration of the test (allowable extension of test period to ensure sufficient usable data).

9. Data recording

9.1 Weight recording

In addition to the daily (continuous) individual feed intake measured and the daily (continuous) partial in-pen body weight measurement recorded by the installed Growsafe

system, animals must be weighed (full body weight) at the following intervals as a minimum to provide the live-weight gain during the test:

9.1.1 70--day Test

- each animal must be weighed at the start and end of the test period and at 14-day intervals in-between (yielding a total of 7 full body weights).

9.1.2 49-day Test

- start of test,
- during week four of actual test period,
- within one week before day 49 of test.

Animals must not be fasted before weighing.

Animals may be removed in groups from the pens where they are maintained for the purpose of capturing full body weight. All animals must be treated in a similar manner and denied access to any feed during this time.

9.2 In-pen measurements

The total daily feed intake by each animal shall be measured for the duration of the test. The minimum number of valid daily feed intake measurements as prescribed by Vytelle/ Growsafe shall apply.

During the test period, it is strongly recommended that animal performance be monitored by way of regular checks. Sick animals may have to be removed from the test.

Faulty equipment, causing loss of reliable data, such as feeding units, scales or identification systems may also be detected in time to allow repairs before the test is invalidated. It is strongly recommended that a back-up power source and spare or reserve weighing, recording and computing requirements are available for emergency use.

9.2 Data Collection and Recording

Records must be taken and stored in a format appropriate to Growsafe/Vytelle requirements and suitable for incorporation into the BREEDPLAN data format requirements.

Code of practice

Provision must be made to have available adequate back-up facilities or resources to ensure that interruptions to data collection or recording are minimised.

The following records are required for each animal:

- Mandatory background information specified previously.
- Weighing dates and individual animal weights as specified.
- Average daily weight gains (Full body weights measured shall be submitted to Growsafe/Vytelle as described in 9.1 to enable Growsafe/Vytelle to calculate the ADG by regression from the full body weight data).
- Feed intake data. Minimum requirement is total feed intake per animal per day.
- Feed analysis results - including date of analysis, laboratory, ME and CP /kg DM as specified previously.
- Feed additives or supplements included in the ration.
- Details of interruptions to data collection or recording.
- All health treatments administered, and details of sick animals.
- Individual pen or group pen for each animal.

9.3 Scrotal measurement

Code of practice

The scrotal circumference of all bulls in test shall be measured and recorded during the last week of the test. To ensure comparability of data, scrotal measurements for any one test shall be taken by the same person. Scrotal circumference measurement should be done at a date to ensure the youngest animal in the test is older than 300 days at day of measurement.

9.4 Structural assessment

Recommended practice

The relevant Breed Society should be notified of all tests and their planned completion dates on or before commencement of the test. The Breed Society is encouraged to arrange for a TA (Technical Advisor) trained and appointed by the Society to inspect and score each test animal structurally before the end of the test in accordance with the current standard practice applicable within the Society. To ensure comparability of data structural soundness scoring for any one test shall be taken by the same person adequately trained by the Society TA.

9.5 Scan data

Code of practice

Ultrasonic scan data shall be collected for each test animal during the last week of the test. Ultrasonic scan data shall be collected by a Technician accredited by the ARC or the LRF. Scan data collection should be done at a date to ensure the youngest animal in the test is older than 300 days at day of measurement.

9.6 DNA sample

Code of practice

A DNA sample (blood, tissue or hair follicle) of each animal tested shall be collected prior to end-of test. The DNA sample shall be collected by the test station within standard veterinary practices. Each Society shall arrange for the establishment of a DNA bank with a suitable

Service provider. The test station shall be accountable to deliver the test sample to the DNA storage bank nominated by the Society.

9.7 Data submission to Intergis

Code of practice

Each Breed Society shall provide the relevant data as agreed to between the Society and the ARC for incorporation into the Intergis database. Test stations are not accountable for the interface between the Society and Intergis as managed by ARC.

10. Data input specifications

To calculate NFI, and ultimately BREEDPLAN EBVs for NFI, data must be loaded onto centralised databases. This will happen in a two-step process.

10.1 Data input

The raw detailed data from a feed intake test shall be submitted to Vytelle for either the 49-day period or 70-day period, clearly distinguishing between the two data sets. Vytelle will check the data for compliance to test requirements which will be processed into a summarized form. The adjusted data produced by Vytelle (as described in Code of Practice 9.2) will be submitted to the relevant Breed Society for loading onto their respective ILR2 databases. This data will be used to calculate BREEDPLAN EBVs for NFI when these become available for the Breed. Reports of results for individual animals will be produced and sent to the test station submitting the data.

Code of practice

Only data submitted electronically in a format specified by ABRI/BREEDPLAN from time to time will be accepted for loading onto the Breed Society database.

Once in the correct format, the data file should be sent in electronically to the Breed Society with subject heading 'NFI data'. A copy of the ration analysis report should be sent to the Breed Society. Data will not be processed until the ration analysis report is received. Contact details should be supplied so that receipt of the data and ration analysis report can be acknowledged.

The Breed Society will endeavour to process the data within a maximum of 10 working days of receiving the data in the correct format.

10.2 Test Sheet

This sheet contains information specific to each test (defined as a group of animals fed using the same ration and feeding system at the same time). The sheet should contain one row of information laid out as follows.

Record Structure for NFE Feed Intake import format 4014

Number	Field name	Type	Description	Purpose
1 A	Record Identifier	A1	Always "F"	ABRI record identifier
2 B	ILR2 Breed Society Code	A5	Describes the ILR2 database that the animal belongs to.	Must match the standard codes in Table 1.
3 C	Test Station	A3	Accredited Test Station code	Check against Table 2
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) eg. 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	Used for verification of animal match
7 G	Sire ID	A19	Breed society identifier of sire	Used for verification of animal match
8 H	Birthdate	A8	(yyyymmdd)	Used for verification of animal match
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 234 for 23.4 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 (ie. 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. Standardised to 10 MJ ME/kg DM	Input as *100 (ie. 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

Shaded fields are optional – if given, these will be used to ensure correct match of animal on ILR2.

NOTES:

- 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.

ILR2 breed Society Codes

South Africa

SABB	Brahman
SABF	Braford
SABG	Brangus
SALL	Limousin
SASI	Simmentaler
SASM	Simbra
SAWY	Wagyu

Namibia

NABB	Brahman
NABG	Brangus
NALL	Limousin
NASG	Santa Gertrudis

List of Feed Intake Growsafe/Vytelle Test Stations and their codes:

619	IRENE FASE C1 SENTRUM
GTS	GENTEC SOL – NAMIBIA
ECM	LIVESTOCK ALLIANCE BEEF EFFICIENCY CENTRE (LABEC)
ZMG	ZIMEYER GENETICS CENTRE
UFS*	UNIVERSITY OF THE FREE STATE EXPERIMENTAL FARM

* to be confirmed

The following data checks and validations are performed with import 4014:

- Check that ILR2 Breed Society code matches current ILR2 society code.
- Check if Test Station is registered in person’s table.
- Check that Test ID field is not empty.
- Check that Animal ID exists.
- Check that Tattoo/Tag on import data matches the value in the animal table.
- Check that Sire matches Sire on the animal’s table.
- Check that Date of Birth matches date of birth on table.
- Check that SEX matches the SEX on table.
- Check that value for Test Feeding Procedure is A or M
- Check that value for Test Weighing Method is A or M
- Check Ration Energy Density: valid values are 50 – 180.
- Check that Start Date is a Date
- Check that End Date is a Date
- Check that Feed Intake Test Period is between 63 and 77 days (longer test) or 45 and 56 (shorter test)
- Check if data has already been imported.

- Check that Number of Weigh Records is between 5 and 78
- Check that Daily Mean Count is between 10 and 200
- Check that Imported Start Weight is between 120 and 800
- Check that Imported End Weight is between 200 and 800
- Check that Daily Weight Gain is between 0.5 and 4.0 kg / day.
- Check that Daily Feed Intake is between 300 and 2500.
- Check that Herd Test Type is either 'P' or 'F', not blank.

10.3 Animal Sheet

This sheet contains information specific to each animal within the test. Each animal should be represented by one row.


11. Genomic reference population data collection

Code of practice

Breeders shall be required to authorise the test facility (on behalf of the Society) to collect DNA samples (blood, tissue or hair follicle samples) from tested animals for potential future use in Genomic evaluations/ reference population studies.

12 Glossary of terms

Accreditation	Following a successful audit in accordance with this manual, data submitted to BREEDPLAN will be accepted for calculation of EBVs.
ABRI	Agricultural Business Research Institute at University of New England (UNE) Armidale. Is responsible for data processing and commercial operation of BREEDPLAN.
AGBU	Animal Genetics and Breeding Unit at joint institute of NSW Agriculture and UNE. Is responsible for research, development, and management of BREEDPLAN.
Application for accreditation	Application to ARC to be accredited as a testing facility, accepting the requirements of the Standards Manual and outlining the procedures adopted to meet those requirements.
ARC	Animal Research Council with head office based in Irene, Gauteng.
BREEDPLAN	The Australian genetic evaluation system for Beef Cattle.
Code of Practice	The minimum requirements that must be met in each case to achieve accreditation.
EBV	Estimated Breeding Value. A measure of an animal's genetic merit for a given trait provided by BREEDPLAN.
GROUP BREEDPLAN	System providing genetic analysis and comparison across herds within a breed.
LRF	Livestock Registering Federation
NFE	Net Feed Efficiency. Refers to the difference in animals feed intake independent of requirements for growth rate and body weight.
NFI-P	Residual Feed Intake (post wean). The trait calculated by phenotypic adjustment of feed intake for body weight and growth as a measure of NFE for an animal within the post wean age ranges.
NFI-F	Residual Feed Intake (Finishing). The trait calculated by phenotypic adjustment of feed intake for body weight and growth as a measure of NFE for an animal within the finishing age ranges.
Test	Measurement and recording of individual animals feed intake and body weight over a specified period for the purpose of determining NFI.

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