UNIT : THE GROWING AND FINISHING ANIMAL – NUTRITION AND FEEDING

INTRODUCTION

Feed is a major cost in any beef system. Appropriate nutrition and feeding at all the key stages can ensure optimum growth rates and finishing whilst keeping costs down in order to ensure profitability.

KEY PHASES IN THE PRODUCTION CYCLE

- THE REARING PERIOD – the time up to 200kg liveweight normally covers rearing – on the cow or artificially – up to weaning
- THE GROWING PERIOD – for a period of up to 12-15 months after rearing the animal's body frame gets longer and taller as bone and muscle grow.
- THE FINISHING PERIOD – during the final phase of development, a short period of weight gain in animals that are usually well grown ensures the best yield of meat and required fat cover for slaughter.

THE LIKELY MARKET

Rearing and feeding must be aimed at a particular market as cattle finish at different weight, fat cover and age depending on :

- Breed
- Sex
- System

Market	Typical age	Typical carcase weight	Type of animal
Butchers	16-24 months	250-320 kg	Heifers and steers
Supermarket	16-30 months	280-380kg	Heifers and steers
Manufacturing	12-30 months	280-400 kg	Bulls, heifers and steers

NUTRITION AND FEEDING

All animals need :

- Energy
- Fibre
- Protein
- Minerals and vitamins

The amount and proportion of each varies according to their stage and rate of growth or rate of finishing.

FEEDING FOR GROWTH – growing animals can have high feed intake in relation to bodyweight and can thrive on moderate quality forage, depending on the rate of weight gain expected. Rations should be high in

- Fibre – structural e.g. straw and digestible e.g. sugar beet
- Protein – 15-16%
- Minerals and vitamins – esp calcium for bone / carcase growth

- **Moderate energy density** e.g. low in starch to avoid animals getting fat before growing size or frame – required weight gain 0.7-1.3kg liveweight per day
    - Intensive systems
        - Good quality grazing – high quality grass or grass / clover pastures and, possibly, forage crops such as stubble turnips or kale
        - High quality forage – silage or hay cut at an immature stage or silages made from wholecrop wheat or maize
    - Extensive systems
        - Moderate quality grazing – long term leys and permanent pastures with or without clover
        - Extended grazing – including rationed forage crops such as stubble turnips or kale
        - Deferred grazing – grass accumulatedv from mid-summer for grazing in early winter

- Stubbles – winter stubbles often provide sufficient browsing when supplemented with straw, hay, silage or arable by-products such as potatoes
- Mature forage – silage or hay cut at a mature stage or straw will suit many systems best when housed

Typical ration (kg / day) for store cattle weighing 350kg

Feed	Silage	Straw, sugar beet pulp and maize gluten
Silage	20.0	
Barley straw		3.5
Concentrates	1.5	
Sugar beet pulp		1.5
Maize gluten		2.5

* plus minerals

FEEDING TO FINISH – finishing animals have lower feed intake in relation to bodyweight and muat be offered high energy diets in order to achieve high weight gains and the laying down of fat. Rations should be high in

- Energy e.g. cereals

But lower in

- Protein – 12-15%
- Minerals and vitamins – esp balanced to avoid urinary calculi (stones in the urethra) – Calcium (Ca) : Phosphorus (P) > 1.5 : 1 (or add salt to the ration to encourage drinking)

- **High energy density** e.g. high in starch to ensure rapid weight gain and efficient conversion of feed – required weight gain more than 1.4kg liveweight per day
    - High quality grazing – grass in summer, but possibly forage crops like stubble turnips or kale in autumn and winter, provide quality grazing for rapid gain in weight and condition

- High quality fodder – housed cattle will require high quality fodder and/or supplementation with concentrates in order to gain weight and finish rapidly
- High quality cereal or concentrate diets

Typical cereal-based diets for finishing cattle (kg/tonne) – often ad-lib with straw

Feed	Ration 1	Ration 2
Barley	825	670
Rape meal	125	130
Sugar beet pulp		150
Molasses	25	25
Minerals	25	25
ME (MJ/kg DM)	12.7	12.5
Crude Protein (g/kg DM)	150	150

TYPICAL FEEDS

- Grazed grass – usually the mainstay during the growing period as it is usually the cheapest form of feed
- Silage or hay – usually the major winter feed source – nutritional quality needs to be high for rapid growth or finishing but more moderate quality would be acceptable for lower growth rates in 'store' cattle. Wholecrop wheat or maize can provide a feed that is somewhere between grass silage and concentrates
- Straw – can play an important part in the winter diet of growing cattle when supplemented as well as providing essential fibre when chopped in the diet of finishing cattle
- Forage crops – particularly in out wintering systems, crops such as stubble turnips or kale allow for the production of high quality feeds, heavy stocking and a cheaper winter feeding alternative. Cereals grown as forages can produce high quality silage and root crops such as fodder beet can be high yielding and high in energy

- By-products e.g. bread, biscuit and breakfast cereals and maize gluten as well as root crops such as potatoes or surplus sugar beet can be very effective energy rich feeds while distillers grains or pot ale syrup can supply protein
- Concentrates – often play a vital role in finishing diets and can be cereals such as wheat, triticale, barley or oats for energy and soya, lupins, beans, peas, linseed or rape meal for protein. The alternatives are formulated blends or compounds which are convenient but often expensive

TOP ENERGY FEEDS

Feed	Energy content - ME MJ/kg DM	Starch %	Sugar %
Maize (grain)	14.3	71	-
Wheat	13.8	69	-
Bread	14	69	-
Potatoes	13.5	62	8
Barley	13.2	59	-
Biscuit meal	15	49	9
Sugar beet	12.3	-	69
Fodder beet*	12.1	-	65
Maize silage*	11.8	35	-
Beet pulp	12.5	-	20
Wholecrop wheat*	11	25	-
Wheat feed	11.5	27.5	-

* remember that these values are on a dry matter basis

TOP PROTEIN FEEDS

Feed	Energy content - ME MJ/kg DM	Crude Protein %	Starch and sugar %
Maize or wheat distillers	14.8 / 13.5	28 / 32	-

Soya	13.8	52	14
Lupins	14.3	38	13
Beans	13.8	29	47
Peas	12.8	24	53
Linseed	13	37	11
Rapeseed meal	12.1	38.5	14.5
Urea	0	287	0
Maize silage*	11.8	35	-
Beet pulp	12.5	-	20

FEED CONVERSION EFFICIENCY

The more weight and condition an animal can gain from a given amount of feed the better its Feed Conversion Efficiency (FCE) - an important factor in a profitable system. FCE is affected by a number of factors :

- Animal age and weight – FCE falls as animals get older and heavier – the longer it takes to finish the poorer feed conversion will be and it is often difficult to justify keeping animals to very heavy weights

Animal liveweight (kg)	**Likely FCE (kg of feed dry matter for each kg of liveweight gain)**
450	8.3 : 1
550	9.6 : 1
650	10.7 : 1 **
750	12.5 : 1

** difficult to justify economically beyond this point

- Animal health and wellbeing – worms, lameness and even low levels of a range of diseases as well as stress can reduce efficiency – animals need to be healthy and free from stress if they are to perform well

- Feed and feeding – a balanced diet, fresh feed and plenty of feeding space all increase efficiency – the diet should be balanced for

- Fibre – short fibre e.g. chopped starw in the diet ensures that the rumen is active and healthy, avoiding excessive acidity for instance
- Energy – a combination of starch e.g. cereals and digestive fibre e.g. sugar beet increases weight gains
- Protein – protein degradability must match the energy source to ensure a healthy and active population of microorganisms in the rumen e.g. rapemeal or urea are rapidly degraded in the rumen and match cereals or potatoes well
- Minerals and vitamins

FINISHING SYSTEM

- Cereal Beef Systems ('Barley Beef' or 'Bull Beef')
- Grass / Cereal Beef Systems
- Maize silage / Wholecrop Beef / Alternative Feeds and Fodder Systems
- Finishing of store and suckled calves

Cereal Beef (often known as 'Barley Beef') – cattle (usually dairy or dairy cross-bred bulls – heifers as well as steers from early maturing breeds get too fat at light weights) housed throughout and fed an all-concentrate ration – these concentrates normally being rolled or crimped cereals. Cattle are offered the concentrate on an ad-lib basis and are usually slaughtered before 12 months of age :

Stage	Daily liveweight gain (kg)		Kg feed / kg gain	
	Bulls	Steers	Bulls	Steers
Weaning – 3 months	1.0	0.9	2.7	2.8
3 months – 6 months	1.3	1.2	4.0	4.3
6 months - slaughter	1.4	1.3	6.1	6.6

As the cattle get older and larger their rate of growth increases but their efficiency of converting food into weight falls and they must be kept growing without any check and

finished quickly. From weaning to 3 months of age they will consume about 150kg of calf concentrate and up to 1750kg of cereal and protein supplement from then to slaughter.

Grass / Cereal Beef – reared calves are finished at 18-24 months of age, depending on the time of year born and / or the system practiced if they are turned out to grass (steers and heifers) or in as little as 14-16 months if they kept indoors on grass silage instead (steers or bulls). For autumn / winter born calves on an 18 month system the targets would be :

Stage	Daily liveweight gain (kg)
Weaning to turnout (6 weeks-6 months)	0.75
Grazing (6-12 months)	0.8-0.9
Finishing winter (12-18 months)	0.8-0.9

The proportions of silage and cereals fed in the finishing winter can affect :

- Daily liveweight gain
- Finishing weight and age
- The amonts of cereals and silage fed

Daily feed			
Cereals / concentrate (kg)	2.4	2.8	3.2
Silage (kg)**	21	20	19
Animal performance			
Daily gain (kg)	0.7	0.8	0.9
Finishing period (days)	285	220	165
Slaughter weight (kg)	525	500	475
Feed used per animal			
Concentrates (kg)	670	620	525
Silage (tonnes)**	6.0	4.4	3.2

** Silage – 25% DM; D Value 62

Cattle fed more concentrates in their daily ration will :

- Finish quicker
- Finish at lighter weights
- Eat less concentrates
- Eat less silage

The feeding system chosen will depend on :

- Target market / finishing weight
- Silage availability
- Concentrate prices

Late winter and spring born calves do not fit this system as, instead of spending the rearing and finishing periods indoors during the winter, they will be reared in spring and summer and should be finished in the following late summer and early autumn when grass quality and quantity can be limiting – such cattle often have to be fed concentrates while grazing or need to be brought indoors to finish at 20 months +.

Alternative forage and fodder – maize and wholecrop silages offer a high energy alternative to grass silage and can play an important role as can root crops such as fodder beet. These feeds tend to be fed in rearing and finishing systems that can be nearly as intensive as cereal beef.

Store cattle finishing systems – depending on breed, sex, age and target slaughter age and weight, weaned suckled calves or store cattle can be finished on any of the diets outlined above e.g. weaned spring born bull calves on a cereal beef or maize ration indoors, steers on grass or silage / cereal diets and steers and heifers on grass or silage with concentrates as necessary.

FEED BUDGETING

Forward planning will allow the best use to be made of feed in stock as well as the opportunity to look around for the best value alternative feeds if either the quality or quantity of feed is lacking.

- Class of livestock – cows, heifers, bulls, suckling calves
- Number of animals
- Target production

- Length of the feeding period
- Available feed and feed quality (analysis)
- Requirements
- Alternative feeds and value for money
- Alternative feeding strategy – if fodder is in short supply, a higher concentrate diet will result in reduced fodder intake per day and a shorter feeding period as the animals will finish sooner (but at lighter weights)

CONCLUSION

- The key phases are the rearing period (up to approx 200kg), the growing period (up to 12-15 months of age except on very intensive systems) and the finishing period
- The likely market depends on breed and sex of animal and the feeding system adopted
- Nutrition and feeding needs to ensure the correct balance of energy, fibre, protein as well as minerals and vitamins
- Feeds can range from grazed grass to a range of alternative grazed and preserved forages to concentrates and the correct choice depends on both the system operated and prices
- Efficient feed conversion is necessary to ensure profitability otherwise the cost of feeding can become greater than the value of the weight gain
- Routine feed budgeting can allow efficient planning and the best use of feed.

INFORMATION SOURCES

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