



Knowledge grows

# Product Guide





# Preface

## International Strength, Local Service

Yara Animal Nutrition, as a subsidiary of Yara, is constantly developing its performance culture based on the core values of Ambition, Trust, Accountability and Teamwork – which recognizes and promotes high performance and high ethical standards among leaders and employees at all levels.

- We are dedicated to conducting our business according to our Code of Conduct and Ethics Program, as well as the universally accepted principles in the areas of human rights, labour, environment and anti-corruption set out by the United Nations Global Compact.
- We set high standards for our conduct and compliance, not least regarding health, environment, safety and product stewardship. We foster a performance culture focused on encouraging dialogue to continuously improve work and skills.
- We recognize that the recruitment, development, and retention of the right people and expertise levels are crucial. Diversity in our workforce will attract and retain top talent, and encourage all employees to contribute to their full potential.

Yara Animal Nutrition is an ISO 9001- and ISO 14001-certified company that conforms to the requirements of the AFMA Code of Conduct, and constantly delivers quality products according to specifications. Yara Animal Nutrition's products comply with the highest international standards. Therefore our clients have the assurance that our products comply with the same strict standards as the best products currently available on the international market. Together with enhanced product innovation, technical support and excellent R & D resources, Yara Animal Nutrition offers superior animal feed nutrition. The company is actively involved in research and development programmes to improve and expand its product range to meet the changing demands of the market.

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# Terminology



<b>TDN</b>	Total Digestible Nutrients are expressed as a percentage and is an indication of the energy value in the feed source or mixture		crude protein, and represents nitrogen not originating from natural protein, e.g. urea and ammonium sulphate
<b>ME</b>	Metabolisable energy is expressed in megajoule per kilogram (MJ/kg) and is a measure of the energy value in a feed source or mixture	<b>% from NPN</b>	That percentage of protein originating from NPN
<b>CP</b>	Crude protein, expressed as a percentage ( $N \times 6,25$ )	<b>CF</b>	Fibre is expressed as a percentage of the total
<b>RDP</b>	Rumen Degradable Protein is expressed as a percentage unit or as a percentage of the crude protein. It indicates the fraction of the protein, which is broken down in the rumen	<b>DM</b>	Dry Matter is expressed as a percentage (moisture-free fraction) of the total
<b>NDP</b>	Non-Degradable Protein is expressed as a percentage unit or as a percentage of the crude protein. It indicates the fraction of the protein that is not broken down in the rumen, but that flows through to the lower digestive tract (so-called Bypass Protein)	<b>Ca</b>	Calcium is expressed as a percentage of the total
<b>NPN</b>	Non-Protein Nitrogen (N) is expressed as a percentage unit or as a percentage of the	<b>P</b>	Phosphate is expressed as a percentage of the total
		<b>Mg</b>	Magnesium is expressed as a percentage of the total
		<b>S</b>	Sulphur is expressed as a percentage of the total
		<b>N</b>	Nitrogen is expressed as a percentage of the total
		<b>g/kg BW</b>	Gram per kilogram bodyweight



## Quality of feed phosphates

### What does quality mean?

Quality of feed phosphates plays an important role with regard to the following:

- For the client: A product of consistent value (consistent over time in composition, utilization by the animal and physical characteristics). Under or over formulation can therefore be eliminated to a large extent.
- For the animal: The animal needs enough of the appropriate nutrients at the appropriate time (for bone formation, fertility and other metabolic functions). Only a reliable product can give this assurance.
- For the environment: A high-quality feed phosphate source reduces the excess excretion of unutilised phosphate in the environment.

### How do we obtain a quality product?

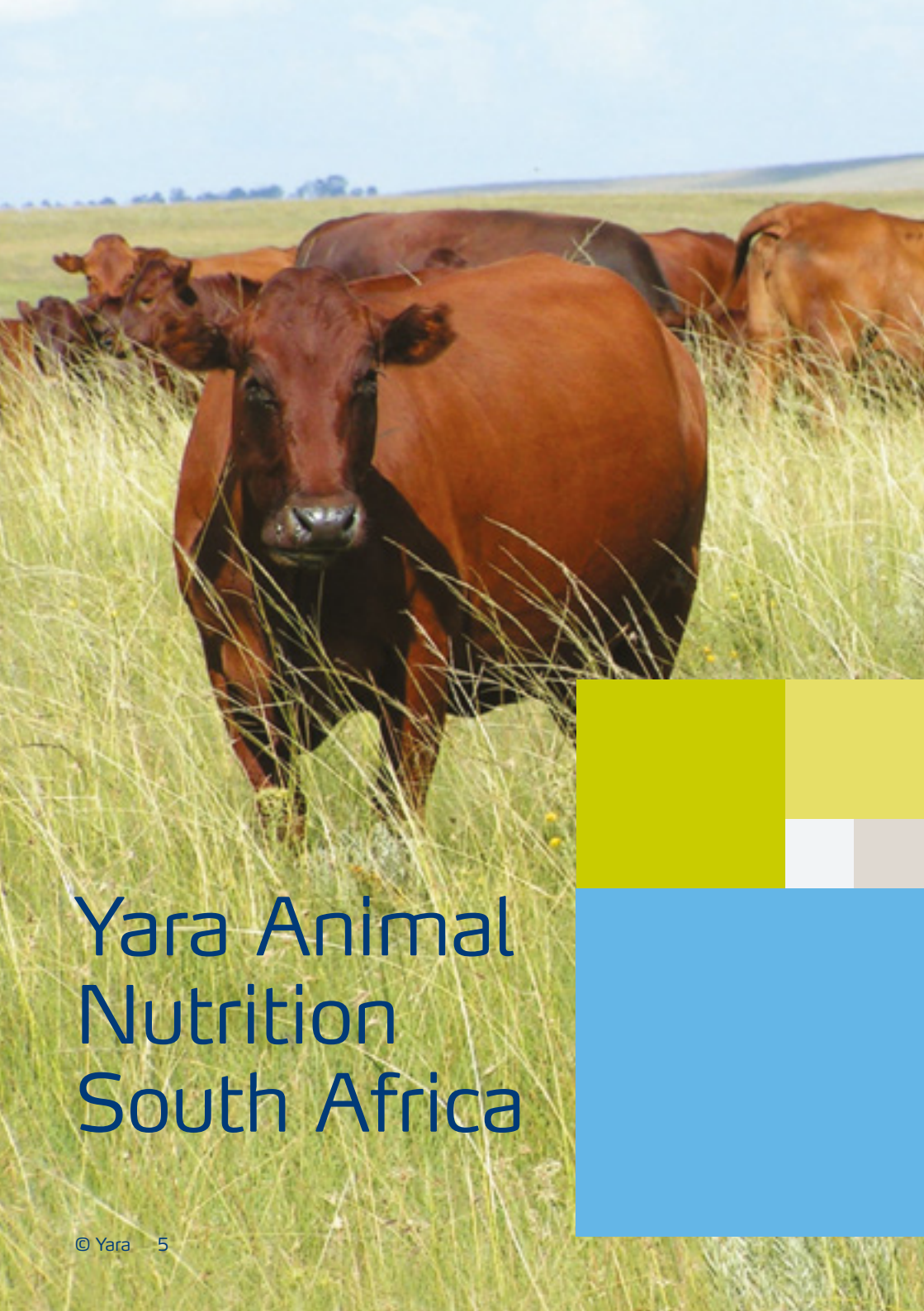
Product quality can be ensured by the following:

- **Quality raw materials** - Yara Animal Nutrition uses only high-quality raw materials.

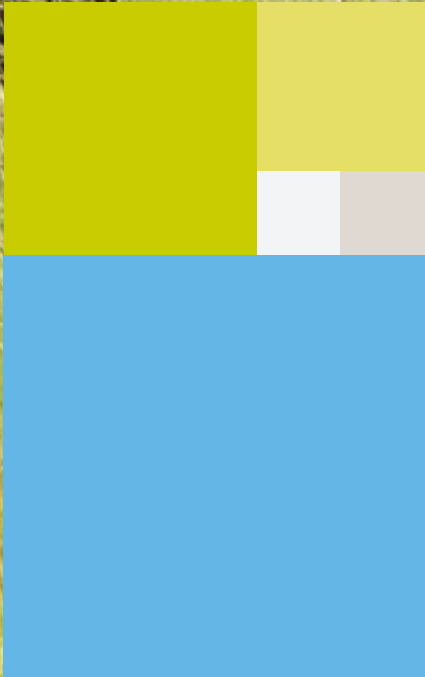
- **Phosphoric acid** - Only defluorinated phosphoric acid (low in fluorine and other heavy metals) is used. (Heavy metals that are constantly monitored are fluorine, cadmium and arsenic).
- **Lime source** - Good quality (highly reactive) lime sources for an effective reaction process are used.
- **Controlled production process** - The production process is of a chemical nature. The control of the reaction is critical in forming high-quality products. Factors such as the type of plant, reaction conditions (pressure temperature, moisture, etc.), supervision and control are important.
- **Effective quality monitoring** – Yara Animal Nutrition has a laboratory at the production plant that performs product analyses 24 hours per day. Quality assurance is therefore guaranteed.
- **Animal studies** – Animal studies was performed to obtain useful values for feed formulations (digestible or available phosphate content). Values for monogastric animals are available. However, the principle applies that a source that shows the best biological value for one species should also prove the best for the other species.

### Your Choice!

Ensure that feed phosphates of a consistently high quality of a company such as Yara Animal Nutrition, are used. Obtain peace of mind that what is presented in the bag guarantees quality and will ensure consistently high production performance. Do not compromise on quality that can have a detrimental effect on the short- and long-term performance of your animals!



# Yara Animal Nutrition South Africa





## Product Descriptions

- Kimtrafos 6/12 Grandé
- PhosSure 6/12
- PhosPro 17
- Kynofos 18 Grandé
- Kynofos 21
- Kalori 3000
- Feed Grade Sulphur
- Feed Grade Urea



# Kimtrafos 6/12 Grandé

## Phosphate trace-mineral supplement and concentrate

Reg. No. P6: V23311, P12: V18670 (Act 36/1947)  
 Packed in 25 kg and 50 kg bags  
 Namibian Reg. No. P6: N-FF 2614, P12: N-FF 0539

South African soils and natural pastures are, in general, deficient in available phosphorous. Research results have shown that phosphate supplementation is essential for optimal growth and reproduction of farm animals on phosphorous-deficient pastures. Kimtrafos is a phosphate trace-mineral concentrate and supplement with a distinctive molasses smell and taste, in which the most important minerals have been supplemented in the correct ratio to phosphorous. The phosphate in Kimtrafos 6/12 Grandé is a high quality monocalcium phosphate. Kimtrafos 6/12 Grandé is in a convenient granular form, which makes the product dust-free for easy handling and mixing.

### Composition

	Kimtrafos 6 Grandé	Kimtrafos 12 Grandé	Kimtrafos 12 Grandé with salt
	(g/kg)	(g/kg)	(g/kg)
Phosphorus (min)	60	120	60
Calcium (max)	120	240	120
Fluorine (max)	0.55	1.1	0.55
	(mg/kg)	(mg/kg)	(mg/kg)
Cobalt	3	6	3
Copper	150	300	150
Iodine	15	30	15
Manganese	600	1200	600
Zinc	600	1200	600
Selenium	3	6	3



## Mixing instructions with Kimtrafos 12 Grandé

Kimtrafos 12 Grandé	1 x 50 kg
Salt	1 x 50 kg
Feed Grade Sulphur (optional)	1 x 5 kg

## Kimtrafos 6 Grandé

Kimtrafos 6 Grandé already contains the correct amount of salt to regulate intake and can be fed to animals unmixed.

## Feeding Recommendations

### 1. Ruminants

- Feed *ad lib* to cattle, sheep and/or game on natural green (rainy season) pastures or with high-quality hay.

### Minimum recommended intake for Kimtrafos 12 Grandé with salt/ Kimtrafos 6 Grandé

Type of animal	Cattle (g/day)	Sheep (g/day)
Non-lactating, adult	100	18
Growing, late pregnancy	125	22
Lactating	200-240	36

### 2. Horses

- As a lick supplement for horses, mix with salt as indicated above and feed *ad lib* in a lick trough.
- Where a complete ration is fed to adult horses, Kimtrafos 12 Grandé may be included to increase the phosphorus content and supply additional trace minerals. Contact a Yara Animal Nutrition Nutritionist.

### Substitution of Kimtrafos 12 Grandé with other P products:

See table on page 15 for the substitution of different P products with one another.

# PhosSure 6/12



## Weather-resistant phosphate trace-mineral supplement and concentrate

Reg. No. P6: V11350, P12: V12858 (Act 36/1947)  
Packed In 25 kg and 50 kg bags  
Namibian Reg. No. P6: N-FF 0540, P12: N-FF 0541

It is a well-known fact that phosphorous supplementation is essential to achieve good growth and reproduction of farm animals on grazing that is deficient in phosphorous. High intakes of a phosphate (P) lick are therefore important to ensure sufficient P intakes. Intake is however often a problem, especially in high-rainfall areas, because licks that have become wet is often unpalatable and can even become mouldy.

To overcome the problems in high-rainfall areas, Yara AN developed PhosSure. PhosSure is a phosphate trace-mineral concentrate or supplement enriched with a molasses byproduct that gives the product a distinctive molasses smell and taste to ensure sufficient P intake.

PhosSure also has the unique characteristic that it is weather resistant. When rain falls on PhosSure, a hard crust is formed on top of the product. Animals quickly learn to break through this crust and continue to eat the dry, undamaged lick underneath. The phosphate in PhosSure is in the form of a high-quality monocalcium-phosphate. PhosSure also contains increased levels of the most important trace-minerals in the correct ratio to phosphorous.

## Composition

	PhosSure 6	PhosSure 12	PhosSure 12 with salt
	(g/kg)	(g/kg)	(g/kg)
Phosphorus (min)	60	120	60
Calcium (max)	120	240	120
	(mg/kg)	(mg/kg)	(mg/kg)
Cobalt	3	6	3
Copper	300	600	300
Iodine	15	30	15
Manganese	1200	2400	1200
Zinc	1200	2400	1200
Selenium	8	16	8

## Mixing instructions with PhosSure 12

PhosSure 12	1 x 50 kg
Salt	1 x 50 kg
Feed Grade Sulphur	1 x 5 kg

## PhosSure 6

PhosSure 6 already contains the correct amount of salt to regulate intake and can be fed to animals unmixed.

## Feeding Recommendations

### 1. Ruminants

- Feed *ad lib* to cattle, sheep and/or game on natural green (rainy season) pastures or with high-quality hay.

## Minimum recommended intake for PhosSure 12 with salt/ PhosSure 6

Type of animal	Cattle (g/day)	Sheep (g/day)
Non-lactating, adult	100	18
Growing, late pregnancy	125	22
Lactating	200-240	36

## Substitution of PhosSure 12 with other P products:

See table on page 15 for the substitution of different P products with one another.



# PhosPro 17

## Phosphate-salt-trace mineral and protein supplement

Reg. No. V24441 (Act 36/1947)  
 Packed in 25 kg and 50 kg bags  
 Namibian Reg No. N-FF 2806

It is a well-known fact that phosphate supplements are essential for the improvement of growth and reproduction of farm animals on grazing that is deficient in phosphorous (P). High intakes of a P-lick are therefore important to insure sufficient phosphate intake.

During late summer, when the quality of grass starts to decline, but also throughout the year when grass's quality is poor, it is necessary to supplement a small amount of protein to ensure optimal activity of the microbes in the rumen.

PhosPro 17 is weather resistant because of the addition of a molasses byproduct which also gives it a pleasant smell and taste to ensure sufficient lick and therefore P-intake. PhosPro 17 contains all the important trace minerals in the correct ratio to phosphorus. PhosPro 17 further contains a small amount of urea to supply the rumen microbes with protein to ensure optimal intake of grazing.

## Composition

Nutrient	PhosPro 17
	(g/kg)
Protein (min)	170
Supplied by urea (max)	100%
Moisture (max)	100
Calcium (max)	120
Phosphorus (min)	60
	(mg/kg)
Copper	300
Manganese	1200
Zinc	1200
Cobalt	3
Iodine	15
Selenium	8

## Feeding Recommendations

PhosPro 17 is a ready-mixed product and can therefore, without any further mixing, be fed to cattle, sheep and goats during summer or autumn.

Type of animal	Cattle (g/day)	Sheep/Goats (g/day)
Non-lactating, adult	100	18
Growing, late pregnancy	125	22
Lactating	200-240	36

# Kynofos 18 Grandé



## Dicalcium-phosphate concentrate

Reg. No. V3255 (Act 36/1947)

Packed in 50 kg bags

Namibian Reg No. N-FF 0543

Kynofos 18 Grandé has over the years proven itself as a convenient, reliable source of phosphate for the supplementation of phosphorus on grazing that is deficient in P, as well as for the mixing of complete feeds.

Kynofos 18 Grandé has a high biological availability and is in a convenient, free flowing granular form for easy handling and mixing. Kynofos 18 Grandé contains no trace minerals and it is recommended that a premix package is added should it be used as a lick for ruminants.

### Composition

	Guaranteed Analysis	Typical Analysis
	(g/kg)	(g/kg)
Phosphorus (min)	180	183
Calcium (max)	240	240
Fluorine (max)	1.0	0.8
	(mg/kg)	(mg/kg)
Cadmium (max)	3.0	2.0
Arsenic (max)	8.5	3.0

## Feeding Recommendations

### 1. Monogastrics

- Kynofos 18 Grandé may be used as phosphate supplement in the diet of monogastric animals. Level of inclusion is dependent on the composition of the other raw materials used in the diet.

### 2. Ruminants

#### Salt-phosphate lick for rainy season

Kynofos 18 Grandé	2 x 50 kg
Salt	2 x 50 kg
Kalori 3000	1 x 25 kg
Feed-grade Sulphur	12 kg

#### Composition

	(g/kg)
Calcium (max)	110.80
Phosphorus (min)	76.1
Sulphur	50.4

## Application

Feed *ad lib* to cattle, sheep, goats and game that have free access to high quality grazing and/or roughage.

## Recommended Intake

Type of animal	(g/kg)
Cattle	80 - 160
Sheep/goats	14 - 28

Kynofos 18 Grandé is also recommended as an inorganic P-supplement in various other mixtures, e.g. winter licks and fattening rations. Contact a Yara Animal Nutrition Nutritionist for recommendations.

### Substitution of Kynofos 18 Grandé with other P products;

See table on page 15 for the substitution of different P products with one another.

# Kynofos 21



## Monocalcium-phosphate concentrate

Reg. No.V2851 (Act 36/1947)  
Packed in 25 kg, 50 kg and 1 ton bags and bulk  
Namibian Reg.No. N-FF 0545

Kynofos 21 is a high-quality, defluorinated calcium phosphate (P) that contains approximately three parts P from monocalcium phosphate (75%) and one part P from dicalcium phosphate (25%). The high biological efficiency of this product benefits all farm animals. The high phosphorous content of Kynofos 21 ensures a low unit cost of phosphorous as well as savings in packaging, transport and storage costs. The high phosphorous content also allows for easy incorporation into diets.

### Composition

	Guaranteed Analysis	Typical Analysis
	(g/kg)	(g/kg)
Phosphorus (min)	210	215
Calcium (max)	180	164
Fluorine (max)	1.8	0.8
Aluminium (max)	10	1.4
	(mg/kg)	(mg/kg)
Cadmium (max)	8.0	2.0
Arsenic (max)	10	3.0

### Physical Properties

Kynofos 21 consists of fine, grey-coloured granules. The product is free flowing and dust free, allowing for ease of handling and mixing.

## Particle Size

90% of particle diameters are within the range of 0.5 and 2.0 mm.

## Feeding Recommendations

Kynofos 21 is ideally suited for supplementing the phosphorous in balanced feeds for cattle, sheep, goats, pigs, poultry, horses\* and aquaculture. The product may also be used to mix phosphate supplements for grazing animals.

\* Contact your Yara Animal Nutrition Nutritionist for assistance in this regard.

## Mixing instructions Rainy season supplement

Raw materials	P7 without lime	P8 with lime	P9 without lime
	kg/mixture		
Kynofos 21	100	100	100
Salt	150	100	100
Kalori 3000	25	25	25
Feed Lime	-	25	-
Composition	(g/kg)	(g/kg)	(g/kg)
Phosphorus	76,6	84,3	93,6
Calcium	62,3	104,5	76,1

## Minimum Recommended Intake

Type of animal	(g/kg)
Cattle	80 - 150
Sheep/goats	18 - 30

## Supplement for Dairy Cows Before Calving

Kynofos 21 can be used as a supplement for dry cows when there is a possibility of milk fever during the gestation period.

### Mix as Follows

Raw materials	kg/mixture
Kynofos 21	100
Salt	50
Maize Meal	50

Feed 250 g/cow/day during the last 1 - 2 weeks before calving.

## Other Uses of Kynofos 21

Refer to “Various types of licks for ruminants” on page 23 and “Monogastric species” on page 52.

### Substitution of different P products with one another to supply the same amount of Ca and P

	Kimtrafos 12 Grandé / PhosSure 12	Kynofos 18 Grandé + lime	Kynofos 21 + lime
Kimtrafos 12 Grandé (50kg) / PhosSure 12 (50kg)	-	35 kg + 10 kg <sup>1</sup>	30 kg + 15 kg <sup>1</sup>
Kynofos 21 (50kg)	75 kg <sup>2</sup>	-	45 kg + 5 kg <sup>1</sup>
Kynofos 21 (50kg)	90 kg <sup>2,3</sup>	60 kg <sup>1,2</sup>	-

1. No trace-minerals included.
2. Remove all feed lime from the original ration.
3. Can become 100 kg in winter maintenance licks.





# Kalori 3000

## Molasses byproduct-based powder concentrate

Reg. No.V2809 (Act 36/1947)  
Packed in 25 kg bags  
Namibian Reg. No. N-FF 0546

Kalori 3000 is a spray-dried molasses byproduct in a convenient powder form that can be added to licks and mixed feeds. This product is suitable for all farm animals. Kalori 3000 increases the palatability of rations, reduces dust and also acts as a binding agent in licks, blocks and pelleted feeds.

### Composition

	g/kg
Protein (min)	90
Fibre (max)	7
Calcium	45 - 70
Phosphorus	2.5 - 4.5
Moisture (max)	40

## Feeding Recommendations

Kalori 3000 may be used as follows:

- Complete mixed rations for ruminants, horses, pigs and poultry.
- For improving palatability of licks (stimulates voluntary intake).
- For reducing wind losses.
- For the treatment of low-quality roughages to improve palatability. (See pg. 44)
- As a binding agent for pelleting feeds.
- For reducing dust.

## Guidelines for Use

### Complete mixed rations

Add 25 to 75 kg Kalori 3000 per tonne to any of the rations in the guide to increase the palatability thereof.

- **Pelleting:** Increase pellet quality. Include 1 - 2.5% (dependent on composition of formulation). Contact a Yara Animal Nutrition Nutritionist for advice.
- **As an additive to licks:** Between 5 and 10% Kalori 3000 may be added to licks to bind the lick and improve the palatability and energy content thereof. See Yara Animal Nutrition's self-mix recipes on page 23 - 33.
- **Kalori 3000 Syrup:** Mix with Urea and water to make a syrup. See page 45 for the recipe.



# Feed Grade Sulphur

## Sulphur Supplement for Ruminants (Concentrate)

Reg. No. V16738 (Act 36/1947)  
Packed in 25 kg bags  
Namibian Reg. No. N-FF 0537

Sulphur can be found in varying amounts in natural proteins. A sulphur deficiency could occur in rations when part of the protein is derived from non-protein nitrogen (NPN, e.g. urea). In these cases it is necessary to supply supplementary sulphur in the diet.

### Composition

	(g/kg)
Sulphur (min)	995
Arsenic (max)	0.02

## Feeding Recommendations

- Sulphur should be added in feed mixes containing non-protein nitrogen (NPN) at a level determined by the urea content of the ration. The nitrogen-to-sulphur ratio in the body is 10:1, and to retain this ratio the following rule of thumb is recommended: **2 - 2.5 kg sulphur per 50 kg urea in any ration.** *Consult your Yara Animal Nutrition Nutritionist for a specific recommendation.*
- Feed Grade Sulphur and Feed Grade Urea may both be added to low-quality roughage to improve the conversion of NPN to protein. Normally **1 kg sulphur per tonne roughage** is recommended. This addition will lead to the optimal utilisation of the treated roughage. (See page 44.)
- Feed Grade Sulphur may be added to salt/phosphate licks as a preventative measure against prussic acid poisoning in wilted pastures. **5% Feed Grade Sulphur** is usually recommended.



# Feed Grade Urea

## Protein Equivalent Supplement for Ruminants (Concentrate)

Reg. No.V15681 (Act 36/1947)  
Packed in 25 kg, 50 kg and 1 ton bags and bulk  
Namibian Reg. No. N-FF 0538

Feed Grade Urea is an economical substitute for protein in rations for cattle, sheep and goats due to its high protein (\*N) concentration and relatively low cost compared to natural protein sources.

Feed Grade Urea has a distinctive green colour and a fine particle size that prevents segregation in mixed feeds- 85% of the particles have a diameter of between 0.5 and 2 mm. Feed Grade Urea is only recommended for use by ruminants (cattle, sheep and goats) and has no nutritional value for monogastric animals such as poultry and pigs.

\*N (*nitrogen*) as NPN

### Composition

	g/kg		mg/kg
Protein equivalent (min)	2870	Arsenic (max)	1
Biuret (max)	15	Iron (max)	1
Moisture (max)	5	Lead (max)	10
Free ammonia (max)	0.25		
Formaldehyde (max)	0.185		

## Adjustment

Feed Grade Urea has a bitter taste and can cause urea poisoning. Therefore animals should be slowly adapted to the ration over a period of at least 10 days.

## IMPORTANT

Please read the warning on the urea bag before using it in feed or lick mixtures, or contact your Yara Animal Nutrition Nutritionist.

## Application of Urea in Licks

Refer to page 26 for Yara lick and page 24 - 43 for other examples of urea-containing licks and mixtures.

## Precautions

The following precautions should be taken when feeding urea-containing licks:

- Sufficient grazing and/or roughage should be available at all times.
- Keep lick troughs full. A constant daily intake prevents overeating that could result in poisoning.
- Hungry animals must not have free access to urea-containing licks.
- Before feeding a lick containing urea, feed a plain salt/phosphate lick for at least 7 days.
- Protect the lick against rain. Urea is highly soluble, and animals drinking such a solution may be poisoned.
- Vinegar is an effective remedy against urea poisoning.

**Dose:** Mix vinegar with equal amounts of water and give half a bottle to calves or large sheep, or 2 to 4 bottles per head of cattle (1 bottle vinegar = 750 ml).

If vinegar is not available, use twice the quantity of cold water. Be careful not to get any liquid into the lungs of the affected animal. Sugar may also be given with this mix.

Yara Animal Nutrition Feed Grade Urea may also be used for the following applications:

1. The treatment of low-quality roughage (page 44)
2. In finishing rations for cattle and sheep



# Ruminant Supplements

- General principles of lick supplementation
- Supplementation of trace minerals
- Various types of licks for ruminants
- Dairy meals
- Calf starter-meal/growth meal
- Finishing cattle and sheep in the feedlot
- Creep feeding
- Silage
- Treatment of low-quality roughage
- Chocolate maize
- Kalori 3000 syrup
- Game feeding
- Plans for lick troughs and feed troughs for cattle and sheep
- Typical composition of South African raw materials for ruminants

# General Principles of Lick Supplementation

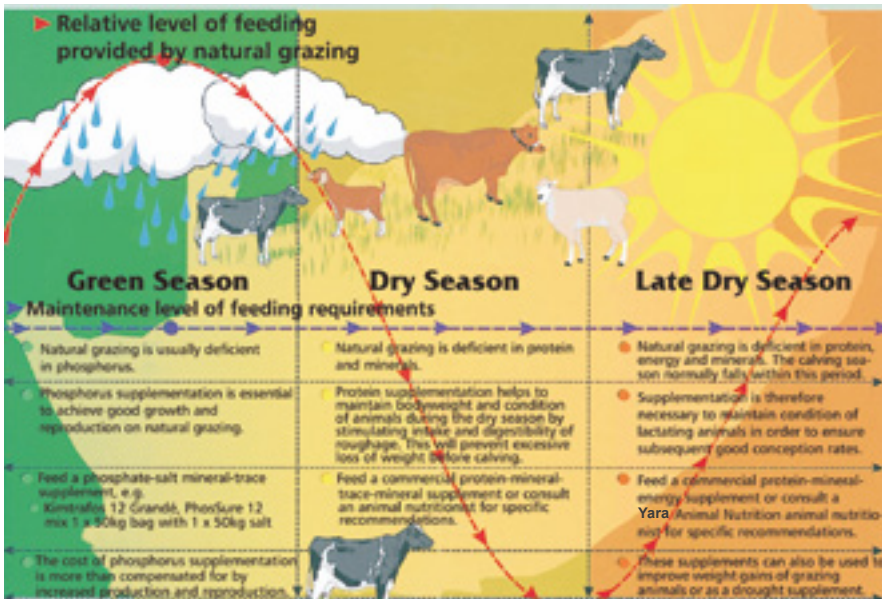
Meat production in South Africa is based on natural pastures with changing nutritional values under irregular and often low rainfall. The nutrition of cattle/sheep has to be seen against the background of natural grazing with its deficiencies and strong seasonal characteristics.

As a result of the seasonal nature of the rainfall, every year is characterised by a period of ample grazing followed by a dry period where grazing is not only scarce, but the nutritional content and digestibility thereof is also very low.

Supplements on pastures must therefore have the following objectives:  
(See seasonal graph)

- Supplement mineral deficiencies throughout the year.
- Supplement protein deficiencies in order for the animal to be able to utilise the available dry season grazing more effectively.
- Supplement protein and energy deficiencies in critical production stadia of beef cattle when there is a shortage of both nutrients on pastures.

This seasonal graph combines the quality of the grazing, the seasons and management practices. This seasonal graph may be used by beef producers as a guide to lick supplementation management.



# Supplementation of Trace Minerals

Natural pastures in South Africa are in general deficient in available phosphate. Apart from this deficiency, certain areas show deficiencies in certain trace minerals. Yara Animal Nutrition's Kimtrafos 6/12 Grandé and PhosSure 6/12 contain the most important trace minerals to prevent any possible deficiencies.

## Function and deficiency symptoms of trace minerals in livestock

Trace Minerals	Functions	Symptoms
<b>Cobalt (Co)</b>	Essential in the production of vitamin B12; Reproduction and growth.	Loss of appetite; Loss of mass; Pica; Serious anaemia; Listlessness; Low fertility; Finer wool fibre.
<b>Copper (Cu)</b>	Important for growth, formation of haemoglobin and iron absorption; Oxygen metabolism; Maintenance of fertility.	Anaemia; Poor growth and a decline in wool production; Bone fractures (e.g. bowleggedness); Diarrhoea; Depigmentation of wool/hair; Lameness; Loss of curls in wool.
<b>Iodine (I)</b>	Important for a healthy thyroid gland; Development of the central nervous system; Essential for energy metabolism; Prevents foot rot.	<b>Adult animals:</b> Enlargement of the thyroid gland; Swelling in the neck; Low conception; Premature ageing; Low production; Sluggishness. <b>Young animals:</b> Born with an enlarged thyroid gland; Born without hair (wool).
<b>Manganese (Mn)</b>	Important for growth and fertility; Enzyme activator; Calcification of bone.	Retarded growth; Skeleton abnormalities; Ataxia (coordination problems); Reduced reproduction (oestrus); Slipped tendon (Perosis); Rusty looking, dull hair; Degeneration of testes.
<b>Zinc (Zn)</b>	Important for growth and healthy skin; Immune system (biological role); Prevents foot rot; Enzyme activator.	Poor reproduction; Parakeratosis (mangy skin); Wool and hair loss; Foot rot; Wool eating; Low resistance against ineffectual diseases; Excessive saliva production.
<b>Selenium (Se)</b>	Important for growth, fertility; Prevention of diseases; Survival of young animals.	Lamb stunting; White myopathy; Retained placentas; Premature birth; Insufficient growth. Important for growth, fertility; Prevention of diseases; Survival of young animals.

# Various Types of Licks for Ruminants

## 1) Green Season (rainy season)

Green pastures are normally deficient in minerals for optimal animal production. The limiting nutrients that are supplemented by mineral licks are phosphate and trace minerals.

### Mineral licks for cattle, sheep, goats and game

	Phosphate Licks				
Raw Materials Lick wheel no. 1	Kimtrafos 12 Grandé	PhosSure 12	Kynofos 21	Kimtrafos 6 Grandé	PhosSure 6
Kynofos 21	-	-	200	-	-
Kimtrafos 12 Grandé	500	-	-	-	-
Kimtrafos 6 Grandé	-	-	-	1000	-
PhosSure 12	-	500	-	-	-
PhosSure 6	-	-	-	-	1000
Kalori 3000	-	-	50	-	-
Feed Grade Sulphur	50	50	25	-	-
Salt	450	450	300	-	-
<b>Total</b>	<b>1000</b>	<b>1000</b>	<b>575</b>	<b>1000</b>	<b>1000</b>
Estimated Composition					
Ca (%) (Max)	12	12	5.96	12	12
P (%)	6.0	6.0	7.43	6.0	6.0
S (%)	5.0	5.0	4.33	-	-
Recommended Intake	g/day	g/day	g/day	g/day	g/day
Cattle	100-240	100-240	80-200	100-240	100-240
Sheep & Goats	18-36	18-36	14-28	18-36	18-36
Game g/kg BW*/day	0.6	0.6	0.5	0.6	0.6

\* Bodyweight

## 2) Transition for Lick Cattle

Transition licks are used to successfully bridge the transition from green pastures, when phosphorus is most deficient, to dry, mature grazing, when protein is most deficient. Most species of grass go to seed during the month of maximum rainfall, where after the protein level starts decreasing. A transition lick is therefore a salt-phosphate supplement to which a small amount of urea is added to supplement protein. Kalori 3000 (easily fermentable energy source) and Feed Grade Sulphur are also added to the lick to ensure the optimum utilisation of urea.



Transition Lick	
Raw Materials	kg/mixtures Lick wheel no. 3
Salt	450
Kimtrafos 12 Grandé / PhosSure 12	300
Kalori 3000	125
Feed Grade Urea	75
Feed Grade Sulphur	5
<b>Total</b>	<b>955</b>
Estimated Composition	
Crude protein (%)	23.7
Ca (%)	6.6
P (%)	3.8
Recommended Intake	g/day
Cattle	200-300
Sheep	20-30

### 3) Dry Season

#### a) Early dry season.

Protein licks in this season assist in maintaining bodyweight and condition of cattle/sheep during the dry season. Protein supplementation stimulates the intake of dry, low-quality winter grass to ensure that “cheap energy” in the grass can be utilised. The licks provide adequate protein and phosphorus to ensure optimal reproduction in breeding animals. The ideal ratio of sulphur to nitrogen in these licks leads to improved utilisation of Non-Protein Nitrogen (NPN), and therefore it also enhances the conversion of NPN to protein.

A transition lick provides sufficient protein and phosphorus to grazing cattle for the optimum utilisation and digestion of mature summer grazing that has gone to seed.

### Early dry season supplementation for cattle, sheep and goats

Early Dry Season Supplementation				
Raw Materials	With Oilcake	With Oilcake Lick wheel no.6	Without Oilcake (Cattle) Lick wheel no.5	Without Oilcake (Sheep)
Maize-meal	250	250	250	250
Oilcake	150	100	-	-
Feed Grade Urea	100	150	150	100
Kimtrafos 12 Grandé / PhosSure 12	100	150	150	125
Kalori 3000	50	50	50	50
Molasses meal	-	-	-	80
Feed Grade Sulphur	5	7	7	5
Salt	350	350	350	350
<b>Total</b>	<b>1005</b>	<b>1057</b>	<b>957</b>	<b>960</b>
Estimated Composition				
Crude Protein (%)	36.7	46.6	47.5	33.05
From NPN (%)	77.5	88.7	95.6	90.46
ME (MJ/kg)	5.25	4.4	3.8	4.37
Ca (%)	2.7	3.7	4.1	3.43
P (%)	1.4	1.9	2.0	1.65
S (%)	0.5	0.7	0.8	0.5
Recommended Intake	g/day	g/day	g/day	g/day
Cattle	450-650	350-500	350-500	-
Sheep & goats	80-120	-*	-*	100-120

\* Not suitable for sheep

**Supplemented under the following conditions:**

- Maintenance of early-pregnant beef cows and sheep without calves or lambs in autumn/winter.
- Maintenance of bodyweight and condition of cattle and sheep on dry grazing.

*Feed to cattle or sheep that have free access to grazing and/or roughage.*

**Regulate Intakes.** Depending on intakes, salt inclusion may be adjusted accordingly.

**WARNING:** These licks contain urea. Hungry animals must not have access to urea containing licks. Gradually introduce them to the lick until it is ensured that the recommended intake will not be exceeded.

**b) Late dry season**

These licks are suitable for usage in the late dry season when the quality of grazing is at its lowest. This usually coincides with an overall shortage in available grazing. These two factors lead to low dry-matter intakes that prohibit production. For optimal reproduction it is essential to maintain the body condition of reproducing animals during this period. The correct supplementation of protein, energy and minerals is required.

**Protein supplement for late dry season for cattle and sheep**

Raw materials	Late Dry Season	
	Kg/mixture (a) Lick wheel no.4	Kg/mixture (b)
Maize-meal	300	450
Oilcake	300	200
Feed Grade Urea	100*	100
Kimtrafos 12 Grandé /PhosSure 12	75	100
Kalori 3000	25	50
Feed Grade Sulphur	5	5
Salt	300	300
<b>Total</b>	<b>1105</b>	<b>1205</b>
Estimated Composition	Mixture A	Mixture B
Crude Protein (%)	38.7	32.91
ME (MJ/kg)	6.6	6.89
Ca (%)	1.8	2.28
P (%)	1.1	1.25
S (%)	0.5	0.46
Recommended Intake	g/day	g/day
Cattle	500-600	600-700
Sheep & Goats	150-170	170-200

\* For Sheep: Feed Grade Urea can be reduced to 50 – 75 kg during the winter/drought periods when available roughage is low.

**Supplemented under the following circumstances:**

- Particularly suitable for mid-/late-pregnant beef cows without calves in a poor condition.

**c) Dry-season licks and rations for cattle that can be mixed with feed Grade Urea:**

**Yara Lick**

Raw materials	Mixture A kg	Mixture B kg
Salt	6 x 50 kg	6 x 50 kg
Maize-meal	2 x 60 kg	2 x 60 kg
Feed Grade Urea**	2 x 50 kg	2 x 50 kg
Kimtrafos 12 Grandé /PhosSure 12	2 x 50 kg	-
Kynofos 21	-	1.5 x 50 kg
Feed Grade Sulphur	5 kg	5 kg
Feed Lime	-	25 kg
<b>Total</b>	<b>625 kg</b>	<b>625 kg</b>
Estimated composition	Mixture A	Mixture B
Crude Protein (%)	47.5	47.51
ME (MJ/kg)	2.40	2.40
Ca (%)	3.84	3.36
P (%)	1.97	2.57
S(%)	16.00	16.00
Feed Grade Urea (%)	0.8	0.8
Recommended Intake	g/day	g/day
Cattle	350-500	350-500

\*\* Adjustment- see page 19

25 kg Kalori 3000 can be added to the above mixtures to enhance palatability and to bind dust. If PhosSure 12 is used as a source of phosphate, no Kalori 3000 must be added to the mixtures.

When the lick is fed for the first time, use only one bag of urea instead of two. After the first 10 days the next bag can be added to the mixture.

**Precautions**

See the precautions on page 19 when urea-containing licks are fed.

## 4) Production Licks

These supplements are provided in situations where additional performance above maintenance is required. The composition of production licks varies depending on the production purpose, the type of animal and the quality of the available grazing.

*Please note* these licks may be given during any season of the year.

### a) Production Licks for cattle and sheep, goats and game in the summer and/ or on fertilised pastures

Spring/Summer Production			
Raw materials	Fertilized pastures Lick wheel no.7	Natural green + 50 kg Lucerne Lick wheel no.8	Natural Pastures (game) Lick wheel no.9
Maize-meal	750	700	750
Oilcake	250	200	150
Feed Grade Urea	-	25	25
Kimtrafos 12 Grandé /PhosSure 12	75	100	75
Kalori 3000	50	25	50
Feed Grade Sulphur	5	5	2
Salt	200	200	250
<b>Total</b>	<b>1330</b>	<b>1255</b>	<b>1252</b>
Estimated composition			
Crude Protein (%)	12.0	16.4	15.1
From NPN (%)	-	37.0	39.0
ME (MJ/kg)	9.5	9.0	8.8
Ca (%)	1.6	2.1	1.7
P (%)	1.0	1.3	1.0
S (%)	0.5	0.5	0.2
Recommended Intake	g/day	g/day	g/day
Cattle	800-1000	1000-1500	-
Sheep & Goats	150-200	150-200	-
Game g/kg BW*/day	-	2.5-3.0	1.8

\*BW - bodyweight

Supplemented under the following conditions:

- Growth of calves/lambs on summer and cultivated pastures.
- Feed to cattle, sheep or goats that have free access to grazing and/or roughage.

### Regulate Intakes

Depending on intakes, salt inclusion may be adjusted accordingly.

## b) Winter and summer production licks with specific production objectives

Raw materials	Winter Production		Summer Production
	Growth Lick wheel no.11	Lactating Lick wheel no.12	Growth Lick wheel no.2
Maize-meal	300	200	700
Oilcake	400	400	200
Feed Grade Urea	50	75	75
Kimtrafos 12 Grandé /PhosSure 12	75	75	100
Kalori 3000	25	25	25
Feed Grade Sulphur	3	5	5
Salt	200	250	200
<b>Total</b>	<b>1053</b>	<b>1030</b>	<b>1305</b>
<b>Estimated composition</b>			
Crude Protein (%)	30.6	37.4	26.8
From NPN (%)	47.4	58.1	63.7
ME (MJ/kg)	7.4	6.9	8.6
Ca (%)	1.9	2.0	2.0
P (%)	1.3	1.3	1.2
S (%)	0.3	0.5	0.5
<b>Recommended Intake</b>	<b>g/day</b>	<b>g/day</b>	<b>g/day</b>
Cattle	1000-2000	800-1200	800-1200
Sheep & Goats	150-200	150-200	150-200

Supplemented under the following conditions:

- Where rapid weight gain on summer grazing is required.
- In winter for beef cows or sheep with calves/lambs.
- Flushing before mating.
- Feed to cattle, sheep or goats that have free access to grazing and/or roughage.

**Regulate Intakes.** Depending on intakes, salt inclusion may be adjusted accordingly.

**WARNING:** These licks contain urea. Hungry animals must not have access to urea containing licks. Gradually introduce them to the lick until it is ensured that the recommended intake will not be exceeded.

### c) Production lick for wool growth

#### General

- The nutritional status of the sheep influences the quality of the wool fibre.
- The feeding level of the ewe during pregnancy influences the wool production ability of the lamb. The nutrition of the pregnant wool-producing ewe is therefore critical.
- Sufficient levels of energy and protein are essential for sustained high wool production.
- Sulphur supplementation combined with urea in a lick is essential for the formation of sulphur-containing amino acids in wool.

#### Wool Production Lick (Lick wheel no. 10)

Item	Kg / Mixture	Estimated Composition
Maize-meal	400	ME = 8.04 MJ/kg
Cottonseed oilcake	250	CP = 28.8%
Fish-meal	50	
Feed Grade Urea	50	NPN (of % CP) = 55.2%
Kimtrafos 12 Grandé/PhosSure 12	75	
Feed Grade Sulphur	4	Ca = 2.1%
Kalori 3000	25	
Salt	200	P = 1.3%
<b>TOTAL</b>	<b>1054</b>	S = 0.5%
<b>Intake g/day (sheep and goats)</b>	<b>150-200</b>	

Feed to sheep that have free access to grazing and/or roughage.

**Regulate intakes.** Depending on intakes, salt inclusion may be adjusted accordingly.

**WARNING:** These licks contain urea. Hungry animals must not have access to urea containing licks. Gradually introduce them to the lick until it is ensured that the recommended intake will not be exceeded.

#### d) Production Lick for late-pregnant and lactating ewes on dry grazing/ low-quality roughage

Raw materials	Kg / Mixture	Estimated Composition
Grounded maize / Hominy Chop / Small grains	300	TDN= 56.7% ME = 8.61 MJ/kg CP = 33% Ca = 1.7% P = 0.8%
Cottonseed oilcake	400	
Salt	150	
Feed Grade Urea	50	
Kimtrafos 12 Grandé / PhosSure 12	25	
Feed Lime	20	
Feed Grade Sulphur	3	
Kalori 3000	50	
<b>TOTAL</b>	<b>998</b>	
<b>Intake g/animal/day (Late pregnant ewes)</b>	<b>180-200</b>	
<b>Intake g/animal/day (Lactating ewes)</b>	<b>250-300</b>	

#### e) Production lick for flushing of ewes and cows

##### Sheep

The purpose of flushing in sheep is to obtain optimal ovulation tempos in ewes, which could result in an increased lamb percentage (increased % of multiplets). The purpose of flushing is not to rectify existing problems. Ewes in a poor condition (< 2 condition score) or ewes that are too fat (> 3 condition score) will not benefit from flushing. It is recommended that flushing commences 3 weeks prior to mating.

##### Cattle

The purpose of flushing in cattle is to improve the condition of the beef cow to such an extent that she will be able to re-conceive within 3 months after calving.

During late lactation and early pregnancy, the cow's nutritional needs are low and condition may even be lost. Nutrition is, however, essential during late pregnancy and early lactation with a view to:

- giving birth to a strong calf
- producing sufficient milk for the calf
- resuming regular heat periods within 3 months after calving and re-conception within that period- the ideal is that a cow should calve with a condition score of 3.5 to 4.

The following lick is recommended for flushing:

Raw materials	Kg / Mixture	Estimated Composition
Maize-meal	550	ME = 7.8 MJ/kg
Cottonseed oilcake	150	CP = 27.8%
Feed Grade Urea	75	NPN = 61.2%
Kimtrafos 12 Grandé / PhosSure 12	75	Ca = 1.9%
Feed Grade Sulphur	5	P = 1%
Kalori 3000	50	S = 0.5%
Salt	250	
<b>TOTAL</b>	<b>1155</b>	
<b>Intake (sheep)</b>	<b>100-200 g/day</b>	
<b>Intake (cattle)</b>	<b>800-1200 g/day</b>	

It is not always necessary to mix a lick especially for flushing. If available:

- Rested camps (natural or cultivated pastures or grain-stubble fields) can be used with great success if its energy and protein content is sufficient. If there is a shortage of these two components, it has to be supplemented with a lick.
- Good quality legume pastures (green or dry) plus chocolate grains and/or energy mineral licks can be used.





### f) Production lick for maize stover and crop residues

Crop residues form a large part of the roughage supply to grazing animals during the winter. During the first 2 to 3 weeks animals pick up mainly grain and this can lead to problems such as acidosis. Although a lick can be given to reduce acidosis, it is important for animals to be adapted to high grain diets before they are allowed to graze the crop residues.

Give the lick below at least 14 days before the animals graze the residues for the first time. During these 14 days, animals must have free access to good quality roughage, while they are adapted to maize. The following guidelines for the adaptation to maize can be followed:

Day	Kg maize per head of cattle	g maize per sheep
1 - 4	2	200
5 - 8	4	400
9 - 12	6	600
13 - 14	8	800

### Lick for cattle and sheep on maize stover and crop residues.

Raw materials	Kg / Mixture	Estimated composition
Molasses meal	160	ME = 4.65 MJ/kg
Salt	350	
Cottonseed oilcake	350	CP = 26.2%
Kimtrafos 12 Grandé	100	Derived from Urea = 47%
Feed Grade Urea	50	Ca = 2.91%
Feed Lime	15	P = 1.44%
Bicarbonate of soda	50	
Feed Grade Sulphur	5	S = 0.46
<b>Total</b>	<b>1080</b>	
<b>Intake (g/sheep/day)</b>	<b>150 - 250</b>	
<b>Intake (g/cattle/day)</b>	<b>800 - 1200</b>	

- Adapt animals to the lick by slowly increasing the amount given over 10 to 14 days.
- Adapt animals to crop residues before they are allowed to graze the residues.
- Add 5 kg ammonium chloride or 5 kg ammonium sulphate to the above lick if male animals have access to the lick, to prevent bladder stones.

### g) Production lick on soya crop residues

Soya is a protein-rich crop and it is therefore necessary to supplement energy when the residues are grazed. The lick on page 33 can be mixed and used as production lick on harvested soya fields.

## Lick for cattle and sheep on soya crop residues

Raw materials	Kg / Mixture	Estimated composition
Maize meal	650	ME = 8.75 MJ/kg  CP = 10.52 % Derived from Urea = 47%  Ca = 1.78%  P = 0.81%  S = 0.5%
Salt	200	
Cottonseed oilcake	50	
Kimtrafos 12 Grandé	50	
Kalori 3000	25	
Feed Lime	20	
Feed Grade Urea (optional if little or no grain is left)	10	
Feed Grade Sulphur	5	
<b>Total</b>	<b>1010</b>	
<b>Intake (g/sheep/day)</b>	<b>150 - 200</b>	
<b>Intake (g/cattle/day)</b>	<b>800 - 1000</b>	

- Adapt animals to the lick by slowly increasing the amount given over 10 to 14 days.
- If the soya fields have been fertilized with nitrogen, the urea can be left out.

## h) Production lick on green oats

The following lick is an energy-protein production lick for animals grazing green oats.

### Production lick for animals grazing green oats

Raw materials	Kg / Mixture	Estimated composition
Maize meal	600	ME = 9.1 MJ/kg  CP = 19.5 Derived from Urea = 32.2%  Ca = 1.62%  P = 0.88%  S = 0.44%
Cottonseed oilcake	250	
Kimtrafos 12 Grandé	50	
Kalori 3000	50	
Feed Grade Urea	25	
Feed Lime	10	
Feed Grade Sulphur	5	
Salt	150	
<b>Total</b>	<b>1140</b>	
<b>Intake (g/late pregnant ewe/day)</b>	<b>220 - 300</b>	
<b>Intake (g/lactating ewe/day)</b>	<b>300 - 400</b>	
<b>Intake (g/lamb/day)</b>	<b>150 - 200</b>	
<b>Intake (g/calf/day)</b>	<b>1000 - 1250</b>	

# Dairy Meals

Dairy meals serve as a supplement for cows on available pastures. Dairy meals may be fed at any stage of the dairy cow's life. Dairy meals are normally fed in 2 portions per day, depending on the management programme. A dairy meal is a concentrated mixture that mixes easily and, as it contains no roughage, requires no processing (grinding) of roughage. A dairy meal can vary in protein content between 9 and 23%. The choice of the type of dairy meal and the quantity to be fed will depend on the quality of available roughage (natural and cultivated pastures), milk production and stage of lactation of the cows. Such a meal is usually used as follows.

## % CP of dairy meal

### 9% - 12%

- Feed together with very good quality lucerne hay and very good quality cultivated pastures.
- Feed to a maximum of 12 kg/day.

### 15% - 17%

- Feed together with medium-quality pastures. Feed to a maximum of 15 kg/day.

### 19% - 23%

- Feed together with poor quality roughage as well as high-quality silage.
- Feed to a maximum of 15 kg/day.

## Particle size of dairy meals

Dairy meals must be coarsely grounded and particle sizes of 1.6 mm and bigger are recommended. A 13 mm or bigger screen must be used to grind the raw materials as bigger particles will result in less dust and powder.

## Intake guidelines

Roughage quality and production will determine how much dairy meal per cow per day is to be fed. A general guideline is:

Cows producing 25 l of milk	450 g/litre
Cows producing 20 l of milk	400 g/litre
Cows producing 15 l of milk	300 g/litre

## Maximum Inclusion levels for some raw materials in dairy meals

Fish-meal	4 - 5%
Molasses	10%
Cottonseed oilcake meal	25%
Sweet lupine	25%
Urea	1.5%

## Adaptation to urea-containing rations

A reduction in feed intake can be prevented in cows not used to feeds containing urea by gradually adapting the animals to these feeds. When changing from a urea-free dairy meal to a meal containing urea, it is advisable to feed a 50/50 mixture of the two types of dairy meals over a period of approximately 4-6 days.

### Example of Dairy Meals

Raw materials	Dairy 15	Dairy 17	Dairy 19	Dairy 21
Maize-meal	800	750	720	675
Cottonseed oilcake	125	125	150	210
Fish-meal	-	25	50	50
Feed Grade Urea	12	12.5	12.5	12.5
Kimtrafos 12 Grandé /PhosSure 12	20	20	20	10
Feed Lime	10	15	15	15
Kalori 3000	25	25	25	25
Feed Grade Sulphur	1	1	1	1
Salt	5	5	5	5
<b>Total</b>	<b>998</b>	<b>978.5</b>	<b>998.5</b>	<b>1003.5</b>
Estimated composition				
Crude Protein (%)	15.62	17.33	19.29	21.08
Urea (%)	1.28	1.28	1.25	1.25
ME (MJ/kg)	11.06	10.96	10.89	10.9
Ca (%)	0.99	1.29	1.37	1.14
P (%)	0.57	0.63	0.7	0.62

50 kg of the maize meal can be substituted with 50 kg maize bran to make dairy meal less compact and less heavy.

A dairy premix can be added according to the manufacturer's recommendation.

# Starter Meal / Growth Meal

The success of an early-weaning system depends on the degree to which the starter meal and the growth meal are able to meet the nutrient requirements of the young calf. The extent to which the rumen has developed to be able to fulfill the necessary digestive functions also plays a role in the weaning programme.

- From birth until the calf is approximately 3 months old, a calf starter-meal, based on 100% natural protein (e.g. fish-meal and oilcake meal) must be used.
- Between 3 and 6 months of age, the calf must have free access to good quality grazing and a small quantity of good hay. The amount of calf growth meal that is being fed will depend on the quality and availability of the grazing and/or hay.

Very good hay	1 kg meal/day
Good/average hay	1.5 kg meal/day
Poor hay	2 kg meal/day

Between 6 and 12 months of age, a daily supplementation of 1 kg of calf growth-meal should be sufficient.

Requirements for calf starter-meals and precautions to be taken:

- The success of changing from full milk to calf meal depends largely on the palatability of the meal. The following natural protein sources are ranked in order of most palatable to less palatable: Soybean oil cake>Cottonseed oilcake> Fish-meal. Molasses and lucerne enhance the palatability of the meal.
- Calf meal must be consumed dry and never suspended in a liquid.
- Calf meal should contain an animal protein source, e.g. fish-meal or skim milk powder.
- Calves must have access to clean drinking water.
- Intake of meal can be encouraged by placing a handful of meal in the bucket after the calf has drunk milk from it.

## Example of a calf starter-meal

Raw Materials	Kg / Mixture	Estimated Composition
Yellow maize, roughly ground	66	Crude protein = 16.7%  ME = 11.52 MJ/kg  P = 0.7%  Ca = 0.7%
Oilcake meal	16	
Fish-meal	6	
Lucerne meal	11	
Kimtrafos 12 Grandé / PhosSure 12	1	
<b>Total</b>	<b>100 kg</b>	

# Finishing Cattle and Sheep in the Feedlot

The success of a feedlot is dependent on the correct formulation of feeds, the correct feeding practice and the correct feeding-trough management. Finishing diets must be palatable, highly digestible and acceptable to the animals to ensure maximum intake. A feedlot animal is entirely dependent on the feedlot ration to meet its energy, protein, mineral and vitamin requirements. Producers often have useful products on their farms, e.g. grains, hay and crop residues that can be successfully utilised for finishing animals in a feedlot.

## Guidelines for finishing

### Processing

Before animals are placed in the feedlot, they should be treated as follows:

- Weigh and tag all animals. This will enable the growth rate of individual animals to be monitored.
- Inject vitamin A.
- Vaccinate animals against bacterial diseases.
- Vaccinate animals against viral diseases.
- Implant steers and heifers with a growth stimulant.
- Dose animals with a broad-spectrum dosing agent for the control of internal parasites and dip or spray animals to control external parasites.
- Castrate bulls (optional).
- Clip horns (optional).

### Location and design of a feedlot

- Provide shade away from the feed and water troughs.
- Protect feed troughs from rain.
- Control mud around the feed and water troughs.
- Wet the pens to control dust.
- The feedlot should be erected at a slight angle.

### Feeding space per animal

Type of Animal	Adaption Period	Growth Period
Sheep	250 mm	100 mm
Cattle	400 mm	250 mm

## Floor space per animal

- Cattle: 6.5 - 13 m<sup>2</sup> per head of cattle
- Sheep: 2 - 3 m<sup>2</sup> per sheep

## Nutrition In the feedlot

### Water

- Water intake has a direct influence on feed intake. Clean, cool drinking water must be available to the animals at all times.
- Cattle consume about 25 to 40 litres of water per day and sheep approximately 4 to 6 litres per day.
- Place the water troughs as far away from the feed troughs as possible.

### Roughage

- The purpose of roughage in high-energy finishing diets is merely to ensure a healthy rumen.
- All roughage must be coarsely grounded (13 mm).
- Lower quality roughages such as maize stovers or wheat straw are preferable to high quality roughages such as lucerne.
- To ensure that the intake of concentrates is not adversely affected, less palatable roughage is preferred.
- Management must always ensure that the feedlot ration contains the minimum amount of roughage for normal rumen function.

### Adaptation phase

- Animals must have 10 to 14 days free (*ad lib*) access to good-quality roughage.
- Preferably only roughage must be given on the first day. If animals have already consumed concentrate supplements in the veld, concentrates can already be offered on day one.
- The adaptation diet contains more roughage than the other diets. Start with between 15 and 20% roughage in the diet.

### Growth phase

- Start with the grower diet from day 21.
- Decrease the roughage content by 5%. If the roughage content was at 20% initially, decrease the roughage content to 15%. Accordingly, increase the amount of concentrate (e.g. maize) by 5%.

### Finishing phase

- Decrease the roughage content of the grower diet by 5% and feed this finishing diet for the last 30 days of finishing the animals in the feedlot. Therefore, if the roughage content was 15% in the grower diet, decrease the roughage content to 10% and increase the concentrate accordingly by 5%.

### Treatment of acidosis

- Remove animals from concentrates or concentrates from animals.
- Dose with sodium bicarbonate (1 packet on 350 ml lukewarm water) or dose with an antacid.
- Supplement minerals lost during dehydration.

## Feedlot rations

Firstly, mix your own high-protein concentrate (HPC). The HPC can then be included in the following rations according to recommendation (usually at a 5% inclusion rate).

### Composition of HPC 85

Raw materials	Kg mixture	Composition
Cottonseed oilcake	500	Crude protein 85%
Feed Grade Urea	350	
Kimtrafos 12 Grandé / PhosSure 12	150	
Feed Grade Sulphur	25	
Feed Lime	300	
Salt	75	
<b>Total</b>	<b>1400</b>	

Add an ionophore according to the manufacturer's recommendation.

### HPC 85 on the veld and irrigated pastures

Raw materials	Finishing meal or phase D	Growth meal
HPC 85	50	50
Maize meal / Hominy Chop	700	450
Salt	25	50
Kalori 3000	50	50
<b>Total</b>	<b>825</b>	<b>600</b>
Estimated Composition		
Crude protein (%)	12.4	13.7
% of Urea	34	43.2
Ca (%)	1.01	1.38
P (%)	0.31	0.32
TDN (estimated) %	75	69
ME (MJ/kg) (estimated)	11.5	10.5

The above mentioned mixtures must be available to the animals in feed troughs on the veld. Protect the troughs against rain. Recommended intake is approximately 1 - 3% of bodyweight.

\*Salt can be left out after adaptation.



## Complete Feed for Cattle

Raw materials	Finishing in Feedlot			Phase D	Creep rations for calves	
HPK 85	50	50	50	50	50	50
Maize meal/Hominy Chop	-	700	550	550	850	-
Cottonseed oilcake	-	-	-	-	-	100
Fish-meal	-	-	-	-	50	-
Corn and cob meal	850	-	-	-	-	1000
Lucerne hay (Gr1)	-	-	-	-	150	100
Lucerne hay (Gr2)	-	-	-	300	-	-
Veld hay	-	200	-	-	150	-
Maize silage	-	-	350	-	-	-
Kalori 300	50	50	50	50	50	50
<b>Total</b>	<b>950</b>	<b>1000</b>	<b>1000</b>	<b>950</b>	<b>1300</b>	<b>1300</b>
<b>Estimated Composition (DM Basis)</b>						
Crude protein (%)	12.74	12.56	12.87	16.46	15.39	14.89
% from Urea	29.64	28.56	16.39	22.94	17.93	18.53
Ca (%)	0.94	0.87	0.89	1.31	0.99	0.82
P (%)	0.35	0.34	0.33	0.35	0.42	0.38
TDN (estimate)	72.73	76.13	71.82	71.79	75.67	71.87
ME (MJ/kg)	10.91	11.42	10.78	10.77	11.35	10.78
Fibre (%)	9.43	9.78	12.84	12.65	10.33	11.64

1. Maize meal may be partially replaced by small grains.
2. Lucerne hay may be replaced with other good-quality legumes.
3. Veld hay may be replaced by other roughage, e.g. wheat straw, oat-hay or maize stovers.
4. Maize silage on a 10% moisture basis. To convert to fresh silage, multiply by three.
5. For the first 10 to 14 days of adaptation, palatable roughage should be freely available to animals.
6. 20 - 30 l of water can be added to the rations.
7. For the fattening of young calves, 50 kg cottonseed oilcake can be added to the above mixtures.

## Complete Rations for Sheep

Raw materials	Finishing in Feedlot				Creep feeds for lambs	
HPC 85	50	50	50	50	50	50
Maize meal/Hominy Chop	600	-	500	-	850	850
Cottonseed oilcake	-	-	-	-	-	100
Barley	-	-	-	500	-	-
Oats	-	-	-	200	-	-
Fish-meal	-	-	-	-	50	-
Corn and cob meal	-	800	-	-	-	-
Lucerne hay (GR1)	-	-	-	-	150	100
Lucerne	300	100	200	-	150	150
Maize silage	-	-	200	-	-	-
Wheat-straw	-	-	-	200	-	-
Kalori 3000	50	50	50	50	50	50
<b>Total (kg)</b>	<b>1000</b>	<b>1000</b>	<b>1000</b>	<b>1000</b>	<b>1300</b>	<b>1300</b>
<b>Estimated Composition (DM Basis)</b>						
Crude protein (%)	14.01	12.07	12.14	13.69	15.39	15.17
% from Urea	29.85	29.72	21.11	26.21	17.93	18.19
Ca (%)	0.89	0.91	0.90	0.87	0.99	0.79
P (%)	0.32	0.33	0.31	0.35	0.42	0.39
TDN (estimated)	72.53	70.47	69.73	71.60	75.67	76.53
ME (MJ/kg)	10.88	10.57	10.46	10.74	11.35	11.48
Fibre(%)	13.16	12.24	15.31	13.68	10.33	9.94

- For the fattening of young lambs, 50 - 80 kg cottonseed oilcake can be added to the above mixtures.
- Add 0.5% ammonium sulphate or ammonium chloride if these rations are to be fed to male animals.

## Creep Feeding

Creep feeding is the feeding of an additional and separate source of nutrients to calves and or lambs still nursing their dams. The cow and ewe's milk is high in protein but low in energy, and for this reason creep feeding is especially high in energy, while protein, minerals and vitamins are also supplemented. It is very important for a creep feed to be palatable as to insure optimal intake.

### When to start with creep feeding

Creep feeding can be started when the oldest calf is about two months old. In the case of lambs, creep feed can be given as soon as possible after birth. Lambs will only consume significant amounts of feed from about four weeks of age. These small amounts for calves and lambs are however very important for the establishment of the rumen function as well as the habit of eating.

The following creep feeds can be used for lambs and calves.

### Creep Feed

Raw materials	Kg/mixture	
	With Urea	Without Urea
Maize meal	625	600
Cottonseed oilcake	150	200
Kalori 3000	50	25
Feed Grade Urea	6	-
Kimtrafos 12 Grandé /PhosSure 12	4	10
Feed Grade sulphur	1	1 (optional)
Feed Lime	10	10
Salt	4	10
Lucerne meal	200	200
<b>Total (kg)</b>	<b>1050</b>	<b>1056</b>
Estimated Composition (as is basis)		
Crude protein (%)	15.91	15.38
ME (MJ/kg)	10.82	10.73
P (%)	0.39	0.49
Ca (%)	0.98	0.98
S (%)	0.10	0.10
Fibre (%)	7.42	7.82

Add 5 kg ammonium sulphate or ammonium chloride to these mixtures, if it is to be fed to male animals.

## Silage

Silage is the end product when crops with a relatively high moisture content undergo a process of fermentation. Risks may be eliminated when crops are ensiled, especially those involved in the manufacturing of hay under unpredictable weather conditions. Silage is also a way to preserve feeds and therefore provide feed with a high nutritional value during times when little roughage is available.

Silage has a high moisture content and is therefore a heavy, bulky product. For this reason, silage is expensive to transport and must preferably be produced close to the feeding place.

Silage must be removed and used on a daily basis to prevent secondary fermentation. Secondary fermentation can significantly decrease the quality of the silage within 12 hours of initiation.

The worst enemies of silage are oxygen and water. In order to remove oxygen and water, good bunkers and a heavy tractor are necessary to compact the silage material as soon as possible. A good plastic cover is also required to prevent the penetration of air and rain-water. The ensiling process must be a continuous process and must be completed in the shortest possible time.

The success of silage feeding depends largely on the quality of the silage. This includes:

- The nutrient composition (protein, energy and fibre)
- The fermentation characteristics as reflected by the pH
- The relationship of lactic acid to other organic acids
- The percentage ammonia nitrogen, etc., which influences both the smell and palatability of silage.

The following aspects must be considered in the making of silage:

### **Water-soluble carbohydrates**

Enough water-soluble carbohydrates must be available so that lactic-acid production may lower the pH sufficiently. The ideal pH is determined by the dry-material content of a crop. Recommended pH's are as follows:

DM content 15% - pH = 3.98

DM content 45% - pH = 5.06

### **Moisture content and stage of ensiling**

Moisture content and nutritional value are dependent on the growth stage of a crop. Plant material with a moisture content of 60 - 65% (dry matter 35 - 40%) is recommended for the ensiling process.

### **Ensiling rate**

Shredded plant material must be ensiled quickly to prevent aerobic fermentation and the consequent lowering in quality.

### **Shred length**

A shred length of 20 - 25 mm is recommended for maize and sorghum, while smaller grains should be shredded finely (15 - 20 mm).

# Treatment of Low-Quality Roughage

The nutritional value of roughage depends on the inherent properties of the crop used, the stage of maturity in which it is cut or grazed and the success achieved with the type of drying process used. These factors influence the voluntary intake of roughage, as the latter is negatively correlated with digestibility and, within certain limits, the crude protein content of the roughage.

The nutritional value of low-quality hay, standing hay and crop residues may be improved significantly by treating it with a mixture of Yara Animal Nutrition Kalori 3000, Feed Grade Urea and Feed Grade Sulphur. This treatment increases digestibility, protein content and voluntary intake of roughage. The following mixture may be used for the treatment of 1 tonne roughage:

## Ingredients

0.75 kg Feed Grade Sulphur  
15 kg Feed Grade Urea  
25 kg Kalori 3000  
200 litres water

## Method

Dissolve the Kalori 3000 in approximately 50 litres (preferably lukewarm) water. Add the urea, sulphur and the rest of the water and stir until both the Kalori and urea have dissolved completely. Pour the syrup mixture over 1 tonne roughage (2 liters syrup over 10 kg roughage).

Treat only enough hay for 4 - 5 days to prevent fungi forming and the escape of urea as ammonia. Bales can be treated prior to transportation to feeding point.

## Spray of low-quality standing hay

The above mentioned mixture may be sprayed with great success over standing hay to improve the voluntary intake, digestibility and protein content thereof.

**Please note:** Do not feed any urea containing licks together with the treated roughage or the treated standing hay.

# Recipe for Chocolate Maize and Kalori 3000 Syrup

## Chocolate Maize

### Ingredients for first mixture

Maize	900 kg
Kalori 3000	25 kg
Water	25-30 litre

### Method

Firstly wet the maize (pour the water in a watering can and sprinkle the maize with it), then sprinkle the Kalori 3000 over the wet maize and mix well.

After wetting the maize, make the following mixture (or it can be mixed first):

### Ingredients for second mixture

Bicarbonate of soda or “New lime kalk”	10 kg
Ammonium Chloride	5 kg
Feed Lime	5 kg
Kimtrafos 12 Grandé	10 kg
Feed Grade Urea	15 kg

### Method

Mix the above ingredients and mix well with the maize and Kalori 3000 mixture.

### Intake

The chocolate maize can be fed at 400 to 600 g per sheep per day.

## Kalori 3000 Syrup

Kalori 3000	600 kg
Water	280 - 400 liter
Feed Grade Urea	100 kg
Kimtrafos 12 Grandé	15 kg
Salt	5 kg

### Method

Dissolve the Feed Grade Urea, Kimtrafos 12 Grandé and salt in a little bit of water and then mix it with the Kalori 3000 and the rest of the water. Slowly add more water until the desired thickness is obtained.

### Intake

Cattle	0.4 - 0.7 liter/animal/day
Sheep	0.06 - 0.10 liter/animal/day

# Game Feeding

## Lick Wheel No. 9

The fencing or demarcation of game to a specific area will restrict and change the animals' free access and selection of plants. In order to keep game in an acceptable condition at all times and to ensure the optimal utilisation of grass and leaves, supplementary lick feeding is required. Animals tend to loose condition quickly, especially during periods of drought and the winter months, and this subsequently impacts negatively on their reproduction and general production. However, the correct supplementation for game is complex, as there are big differences in eating habits and digestive systems. It is important to take note of the eating habits of the types of game on your farm.

Three main groups exist:

- Grazers
- Browsers
- Grazers and browsers

The main objective of game licks is to supplement deficiencies in the veld and to whet the appetite of the grazing animal so that the veld may be utilised better. Other uses of game licks:

- For game in captivity (auction pens, bomas, etc.).
- To lure game to vantage-points as well as from a specific area (e.g. from ridges to plains).
- For game in hiding-places.
- As a general supplement on the veld when grazing becomes scarce in the winter.

## Requirements of game licks and management practices:

1. The condition of game is an indication of the available food as well as the quality and digestibility thereof.
2. Depending on the type of game, game licks must be acceptable for both ruminants and monogastric animals (e.g. zebras, rhinoceros, elephants, bush-pigs and wart hogs).
3. The inclusion of urea is advantageous for cost-effective supplementation for ruminant game. PLEASE NOTE: Only where no monogastric animals have access to the lick.
4. The lick must be palatable and lure the game.
5. The lick must contain the necessary trace minerals and macro minerals. Kimtrafos 12 Grandé or PhosSure 12 gives the necessary supplementation.
6. Salt is supplied as a source of Na and Cl and limits intake.
7. Game graze more selectively than cattle and therefore obtain more protein from pastures. However, in winter the rumen has to be stimulated for better utilisation and grazing. Energy is therefore, especially in the late dry season, a greater challenge with regards to supplementation.

## Example of Game Lick

Elements	Summer Lick (kg/mixture)	Winter Lick (kg/mixture)
Maize-meal	-	550
Feed Grade Urea	-	25
Oilcake meal	-	150
Kimtrafos 12 Grandé /PhosSure 12	500	75
Kalori 3000	-	50
Feed Grade Sulphur	50	2
Lucerne hay	-	100
Salt	450	250
<b>Total</b>	<b>1000</b>	<b>1202</b>
<b>Intake</b>	<b>*0.6</b>	<b>250-500 g/day</b>
Estimated Composition		
Crude Protein (%)	-	15.98
ME (MJ/kg)	-	9.18
Ca (%)	11.8	1.87
P (%)	6.0	1.00
S (%)	5.4	-

\* g/kg bodyweight per day

See production lick for game on page 27.

## Block recipe for game

The making of blocks is relatively easy, but requires some experimentation to obtain the correct hardness to ensure the correct intake. Blocks can be compressed or the fluidity can be increased and then poured into a block form to dry out. Change the amount of water, feed lime and/or Kalori 3000 to obtain the correct hardness.

The order in which the ingredients are mixed can also have a significant influence on the final product. Mix the dry and wet ingredients separately and then mix them together. To ensure proper mixing and binding, products such as the feed lime (preferably calcium hydroxide) and Kalori 3000 can also be mixed into the wet ingredients.



## Energy Block for Game

Ingredient	Kg/mixture			
	1		2	
	kg	%	kg	%
Maize (grounded)	250	20.8	300	24.9
Cottonseed Oilcake	75	6.2	75	6.2
Hominy Chop	50	4.1	-	-
Feed Grade Urea	30	2.5	30	2.5
Kimtrafos 12 Grandé /PhosSure 12	90	7.5	90	7.5
Feed Grade Sulphur	2	0.2	2	0.2
Feed lime	10	0.8	10	0.8
Salt	150	12.4	150	12.4
Kalori 3000	225	18.6	225	18.6
Lucerne hay (finely grounded)	175	14.5	175	14.5
Molasses syrup (25% moisture)	150	12.4	150	12.4
<b>Sub-total</b>	<b>1207</b>	<b>100</b>	<b>1207</b>	<b>100</b>
<b>Water</b>	<b>70</b>	<b>5.8</b>	<b>70</b>	<b>5.8</b>
<b>Total</b>	<b>1276</b>	<b>105.8</b>	<b>1276</b>	<b>105.8</b>
Intake g/day (game)	<b>250 - 450</b>		<b>250 - 450</b>	

## Method:

1. Mix all the dry ingredients.
2. Mix the molasses syrup and water. The amount of water can be slightly adjusted if the block is too wet or too dry. The recommended amount of water (5.8%) seems to give the ideal block.
3. Add the molasses/water mixture to the dry ingredients and mix well, ensuring that all the dry ingredients come into contact with the molasses/water mixture.
4. Pour the mixture into a block form and press well. The stronger the press action, the quicker the block will become dry and hard and the better it will keep its shape.
5. Leave in the sun for 48 hours to dry out and harden.
6. Blocks can be kept under cover during rainy weather. Ensure good ventilation for quicker drying.
7. To obtain the correct weight for the blocks, the wet material must be weighed before it is pressed and again when it is dry, just before use. Adjust the weight of the wet material to give the correct dry block weight.

# Plans for Lick Troughs and Feed Troughs for Cattle and Sheep

Figure 1. Transportable Lick Trough for Cattle (fits on most farm trucks)

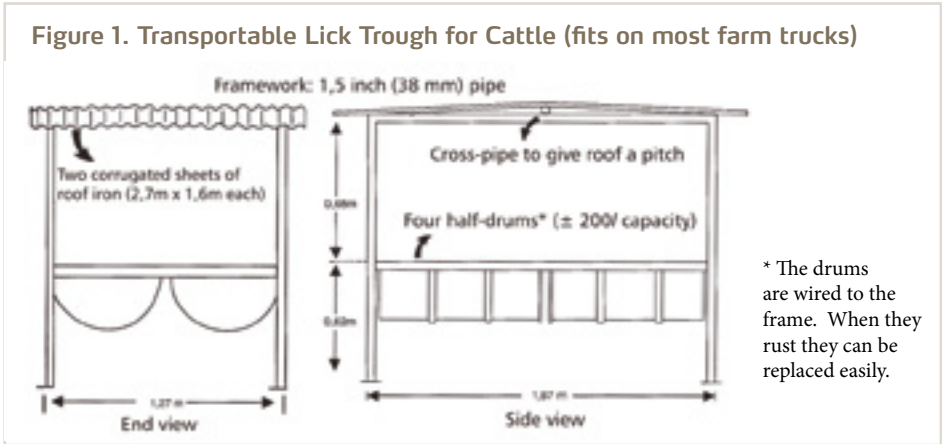


Figure 2. Cross Section of Shelter Trough for Cattle

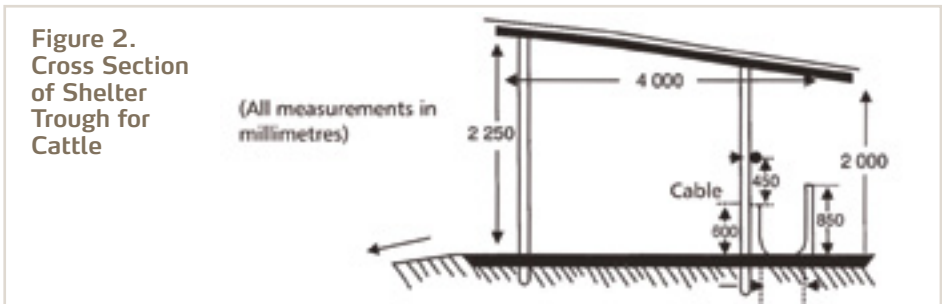
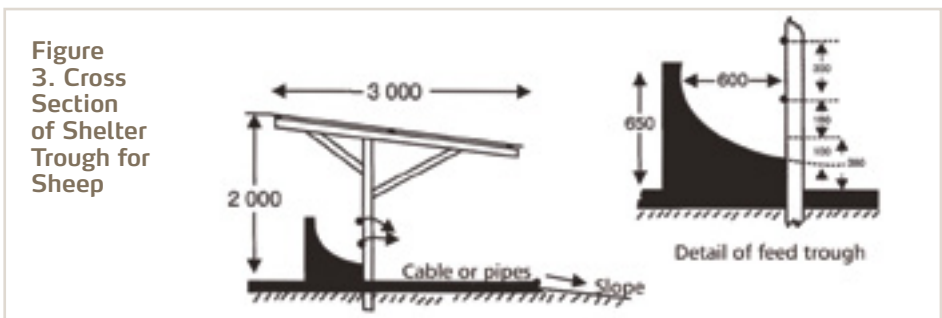


Figure 3. Cross Section of Shelter Trough for Sheep



# Typical composition of South African Raw Materials for Ruminants

Raw materials	Total protein %	Crude fibre %	Ca %	P %	TDN %	ME MJ/kg	Free Moist. %
<b>ENERGY SOURCES</b>							
Cob meal	8.0	9.0	0.03	0.2	75.0	11.3	12.0
Barley (May)	9.0	6.1	0.06	0.33	78.0	11.8	10.0
Grain sorghum	10.0	1.4	0.03	0.35	80.0	12.1	10.0
Wheat	12.0	2.5	0.04	0.4	80.0	12.1	10.0
Wheat bran	14.0	10.1	0.13	0.9	62.0	9.3	10.0
Molasses syrup (cattle)	5.0	0.0	0.89	0.08	60.0	9.0	25.0
Maize-meal	8.5	2.2	0.02	0.2	82.0	12.4	11.0
Maize stover	5.0	29.20	0.48	0.08	42.5	6.55	15.0
<b>PROTEIN SOURCES</b>							
Feed Grade Urea	287	-	-	-	-	-	0.3
Gluten 20	26.7	8.0	0.13	0.64	75.0	11.3	8.0
Gluten 60	60.0	2.0	0.15	0.45	83.0	12.6	10.0
Cottonseed oilcake	38.0	13.1	0.25	0.9	72.0	10.8	10.0
Soybean oilcake	44.0	7.0	0.25	0.6	75.0	12.3	10.0
Sunflower oilcake	32.0	6.6	0.4	0.8	61.0	9.2	10.0
Fish-meal	60.0	0.5	4.7	2.6	71.0	10.7	8.0
<b>ROUGHAGE SOURCES</b>							
Eragrostis hay (late)	5.0	40.1	0.2	0.10	50.0	7.5	10.0
Finger Grass (hay)	7.0	25.0	0.2	0.1	52	7.8	10.0
Wheat-straw	3.0	38.0	0.16	0.05	38.0	5.7	8.0
Lucerne-hay (av. for SA)	15.0	28.4	1.0	0.2	50.0	7.5	10.0
Lucerne-hay (bef. flowering)	18.0	23.6	1.89	0.27	54.0	8.1	10.0
Maize silage	3.0	8.1	0.1	0.06	24.0	7.5	65.0
Veld grass (high veld - April) - middle winter	1.8	19.7	0.17	0.03	25.0	3.8	50.0
Veld grass (high veld Dec)	3.7	10.7	0.15	0.14	22.0	3.3	65.0

See product descriptions for composition of organic phosphate sources on page 7-15.



# Yara Animal Nutrition South Africa

## Monogastric Species

- Nutritional value of P sources for pig and poultry
- Phosphate requirements of pig and poultry
- Yara Animal Nutrition and the aquaculture Industry



# Nutritional Value of P Sources for Poultry and Pigs

It is generally known that the phosphate content of ordinary feed sources (animal and vegetable sources) can only be utilised partially by poultry and pigs (phytate-bound phosphate in vegetable sources). In the past, it was generally accepted that approximately one third of the plant phosphates were available to the animal. Today it is accepted that there is a fair amount of variation in the utilisation between the different feed sources. Inorganic feed phosphate sources are generally used to make provision for these “deficiencies” in the feed sources. The quality of the various inorganic phosphate sources may however differ, which could influence their utilisation by the animal. The pig and poultry producer should be aware of these differences and should take it into consideration when formulating diets. There are many factors during the manufacturing process that may influence quality and utilisation by the animal.

## Differences between inorganic sources

It has to be borne in mind that there are big differences between different inorganic sources with regard to:

- Chemical composition
- Utilisation by pigs and poultry
- Occurrence of undesirable elements
- Physical properties

## Chemical composition and utilisation

The following table depicts the differences of the total phosphate (P) and calcium (Ca) content between the different inorganic sources. However, it has to be pointed out that values within a specific source may differ among different manufacturers. In this case, the raw materials that are used and the specific manufacturing process play an important role (see page 4).

The table also shows the large differences in P digestibility between the different sources. Not only does differences in utilisation between different sources within species (pigs or poultry) occur, but also among the species. Average digestibility values are shown for the examples mentioned.



# Average Digestibility Values for Inorganic Phosphate Sources

Ingredient	Total P %	Total Ca %	Pigs P Digestibility %	Poultry P Digestibility %*
Monosodium Phosphate	24	0	92.3	92
MCP (Monocalcium Phosphate)	22.7	16	90.8	84
MDCP (Kynofos 21)	21	18	89.2	81
DCP	18	24	78.6	77

\* Some of the values were determined by 10-DLO, in the Netherlands

It can be seen that MCP is better utilised than DCP. The utilisation of an MDCP is influenced by the ratio of MCP to DCP in the product. Yara Animal Nutrition produces an MDCP (KYNOFOS 21) in a ratio of three quarters of P from MCP to a quarter P from DCP (indicated by a water soluble P content of 75%). In principle, the P in an MCP is totally water-soluble (100%) and the P in a DCP is not water-soluble at all (0%). The P water-solubility in an MDCP source is therefore a function of the ratio between MCP and DCP in the source. Producers must therefore be aware that available MDCP sources in the market may vary as far as the ratio between MCP to DCP (as depicted by water-soluble P) and therefore also utilisation by the animal is concerned.

Producers need to compare feed phosphates on digestible P content and formulate accordingly. Cost per unit digestible P should be the main consideration.

## Undesirable elements

The type of rock that is used in the manufacturing of phosphoric acid in order to manufacture the inorganic P sources, contains a number of heavy metals that may be detrimental to animals. Fluorine is probably the most common element that may negatively affect an animal. Yara Animal Nutrition only utilises defluorinated phosphoric acid. Fluorine levels in all Yara Animal Nutrition products are below the maximum levels as prescribed by the South African Animal Feed Act and EU guidelines. All other heavy metal levels in Yara Animal Nutrition products also comply to the set standards as prescribed by both these institutions.

## Physical Properties

Physical properties of an inorganic phosphate source are measured according to the appearance (identification of the product), granulation or particle size (influences free flowing ability and mixability), as well as uniformity (gives constant physical properties). Yara Animal Nutrition's products are strictly controlled in order to present a uniform product with good physical properties.

Using Yara Animal Nutrition's Kynofos products, the producer is sure of a product of measured utilisation by the animal, constant composition (known water-soluble P content) and outstanding physical properties for efficient animal production.





# Phosphate requirements of pigs and poultry

In the past, the phosphate requirements in pigs were defined as total P requirements without taking into consideration the specific P sources that were used in the diet. More information regarding the digestibility (utilisation) of the phosphate component of the different feed sources was obtained during the last few years.

The digestible P values of feed sources necessitated the determination of the digestive (available) P requirements in pigs and poultry. There is still a large variation in requirement values as published, and worldwide research still continues.

The terminology to describe P requirements may be confusing, namely:

<b>Total P requirement:</b>	This is the amount of P needed, taking only the total P content of the feed sources into consideration (only chemical composition).
<b>Available P requirement:</b>	It is the amount of P required, taking into consideration the available P content of the respective feed sources as determined by digestive or bone ash studies.
<b>Non-phytate P requirement:</b>	It is the amount of P required with regard to non bounded phosphate in vegetable sources (P in non phytate form). The non-combined phytate part is regarded as being available to the animal (sources of animal origin and the unavailable fractions of inorganic phosphates are not necessarily taken into consideration).

Phosphate must not be seen in isolation. For example, other minerals such as Ca may affect the utilisation of phosphate when the ratio between the two is too wide (i.e. too much Ca per unit P). This effect especially manifests when the levels of P are too low. At high levels of P, the excess Ca therefore has a smaller negative effect on P utilisation. Under normal conditions a total Ca:P ratio of 1:1 to 1.5:1 is recommended. When the ratio is based on available P levels, a ratio of between 2:1 and 3:1 may be accepted. With laying hens the ratio is much higher (approximately 4:1 for total P and 8:1 when available P is used) due to the higher Ca requirement for efficient shell formation.

## P Requirement in Pigs

Type	Live weight/ production phase	Total phosphate (%) NRC, 1998	Digestible phosphate (%) Jongbloed, 1987	Available phosphate (%) NRC, 1998	
Piglet	1-5 kg	0.7		0.55	
	5-10 kg	0.65		0.40	
	10-20 kg	0.60		0.32	
Growers	20-30 kg	} 0.50	0.30	0.23	
	30-40 kg		0.28		
	40-50 kg		0.26		
	50-60 kg	} 0.45	0.22		0.19
	60-70 kg		0.20		
	70-80 kg		0.19		
	80-90 kg	} 0.40	0.19		0.15
	90-100 kg		0.18		
100-110 kg		0.17			
Sows	Lactating Sow in pig	0.6		0.35	
		0.6		0.35	
Boars		0.6		0.35	
Developing gilts	20-50 kg	0.6		0.31	
	50-110	0.5		0.28	
Developing boars	20-50 kg			0.33	
	50-110 kg			0.25	

## P Requirement in Poultry

Type	Production phase	NRC, 1994	Leeson & Summers, 1997
		Non-phylate phosphate (%)	Available phosphate (%)
Broilers	Starter		0.45
	0-3 weeks	0.45	0.42
	3-6 weeks	0.35	0.40
	6-8 weeks	0.30	0.38
Layers (immature leghorn type)	0-6 weeks	0.40	0.40
	6-12 weeks	0.35	0.37
	12-18 weeks	0.30	
	18 weeks to first egg	0.32	0.43
Layers	Intake (g/hen/day) 80	0.31	0.45
	Intake (g/hen/day) 100	0.25	0.40
	Intake (g/hen/day) 120	0.21	0.35
Brioler breeder (female)	mg/day	350	384-440
Brioler breeder (males)	0-20 weeks	0.45	

Ostriches	Production phase		Smith, 1995 Available phosphate (%)
	Starter 0-8 weeks		0.40-0.45
	Finishing		0.32-0.36
	Breeders		0.35-0.40

# Yara Animal Nutrition and the Aquaculture Industry

Water and environmental pollution, especially phosphate levels and the impact thereof on the environment, increasingly warrant serious consideration. Nature-conservation regulations are becoming harsher, and increasing pressure has been exerted on aqua culture producers to address this problem.

The most effective way to decrease the accumulation of waste products is by developing environmentally friendly feeds and by utilising it discriminately. Feed related pollution components in the form of unutilised nitrogen, phosphates and organic material overload water sources and result in lower quality water. It is the responsibility of the feed manufacturer to develop feeds that adhere to the legal nutritional and environmental requirements (Act 36 of 1947).

The responsibility towards the pollution dilemma, also lies with the producer. He must buy from a feed manufacturer that uses environmentally friendly and highly available raw materials in his products.

Yara Animal Nutrition's MDCP (Kynofos 21) has a high water-solubility and an internationally evaluated bio-availability, which results in minimal unutilised phosphate excretion. The properties of Kynofos 21 are ideal for the formulation of environmentally friendly feeds. Yara Animal Nutrition is committed to the protection of the environment and global reduction in pollution.

## Advantages of high-quality raw materials In aquaculture

- Improve feed-conversion efficiency.
- Limit feed wastage and water pollution.
- Reduce risk of illnesses, sub-optimal growth, low survival and large financial losses.
- Accurate nutrient formulation (prevents over- or under formulation).

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# Notes

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