Macro Minerals

Magnesium (Mg): Magnesium plays a crucial role in mobilising calcium from bones and increasing gut absorption, to reduce milk fever. Low levels of magnesium can also cause slow calving. Magnesium is not stored in the body, so it is very important that it be fed right up to calving.

After calving Mg supplementation is required especially on lush spring or autumn grass to prevent grass tetany.

Phosphorous (P): Makes up approx. 30% of total minerals in the body. A phosphorous deficiency can severely affect reproduction causing silent heats, irregular oestrus and low conception rates. Low phosphorous is also associated with pica – i.e. eating stones etc.

Sodium (Na): Aids in nutrient transfer, waste removal, involved in muscle and heart contraction, rumen and blood pH. Deficiency signs are urine licking, reduced male fertility, lower milk production and depraved eating behaviour.

Calcium (Ca): Calcium maintains normal muscle function and a deficiency can cause difficult calvings and retained placentas. Obviously once a cow is lactating the requirement for calcium increases dramatically, it is a deficiency in calcium that causes milk fever. A cow is unable to physically consume her calcium requirement, she has to mobilise it from her own bones. In order for her to be able to do this post calving, she has to start pre calving. Magnesium aids in this process and this is why minerals high in magnesium are fed pre calving. If calcium is fed pre calving, it meets her pre-calving requirement and she won't have started the process of mobilising calcium from her bones and this will lead to a deficiency after calving, therefore - **Do not feed calcium pre calving.**

Micro Minerals

Copper (Cu): Deficiency can lead to small weak calves, scours and decreased milk. In weanlings, it can cause poor growth rates.

Selenium (Se): One of the few elements that can pass through the placenta from the cow to the calf. It is important as a deficiency can cause muscular dystrophy (weakening and wasting of muscle). Some areas are high in Se, so you should test your silage to ensure you do not cause a toxicity. A deficiency can also cause an issue with retained placentas.

Iodine (I): Deficiency can cause small weak calves, dead or hairless calves, or calves that do not want to suck. The animal will have low immunity. It can also lead to poor reproductive performance. It is also not stored in the body and needs to be fed right up to calving.

Cobalt (Co): Involved in the synthesis of B12 by the rumen, deficiencies are more often seen in sheep. Can cause a rough coat, poor appetite and anaemia.

Manganese (Mn): A deficiency can affect growth, bone formation and the nervous system leading to poor growth, reproduction and bowing of the joints.

Zinc (Zn): Plays a role in the immune system and repair of damaged tissues, while it is also involved in the synthesis and metabolism of proteins and carbohydrates, teat keratin formation. A deficiency can lead to poor skin, mastitis, slow healing of wounds, bad hooves and stiff joints. It can also lead to lower conception rates.

Vitamins

Vitamin A: Increases disease resistance and stimulates the immune system. Cows that have a deficiency in vitamin A can also produce dead, weak or blind calves because vitamin A is needed for normal growth and development including growth of the foetus. Again it is passed through the colostrum. Can also cause retained placentas.

Vitamin D3: Essential in calcium and phosphorous metabolism. Promotes growth and mineralisation of healthy bones, therefore plays an important role in the prevention of milk fever.

Vitamin E: Required for good health and immune function. If fed pre calving it elevates the level in colostrum and helps to keep your calves heathy. It does not pass through the placenta, so calves must get adequate colostrum.

Oxide v's Sulphate Minerals

Bioavailability of sulphates and chlorides is generally greater than bioavailability of oxides. One exception is magnesium oxide, which is absorbed well enough to be used in beef cattle minerals. However, avoid mineral supplements that use copper oxide, which is poorly absorbed. Iron oxide is also poorly absorbed and is generally used to add colour to the mineral mix.

Boluses: Boluses will only cover trace elements, they do not cover macro minerals as macro minerals are fed in grams, the requirement is too large to be covered by boluses or injectables.

Catch crops: Bolus with a high Iodine bolus to cover length on crop, have a good mineral thereafter. Catch crops are high in calcium, have cows removed at least a month pre calving.

What are protected minerals?

Minerals interact with one another in the diet and some may cause others to be bound in the rumen and therefore they are not able to be absorbed or is unavailable to the animal. A common example is high molybdenum which locks up copper. In this scenario, you can use what is called protected cooper, which basically means that it is already bound at manufacturing to another compound allowing it to pass though the rumen and be absorbed in the small intestine. These are call organic or chelated forms.

Table 1: Showing Suckler Cow requirement pre calving (Higher spec dairy mineral: feed to suckler cow at 100gms per day)

Macro Minerals	**Required g/day**	**What you see on label**	**Feeding 100grams/day**	**Feeding 120gms/day**	
*Magnesium	17 - 20g	17%	17g	20g	If potassium levels are high in silage may need to increase to 30g
Calcium	0g	0 – 2%	0g	0g	
**Phosphorous	4.5g	4.0%	4g	4.8g	>3% if feeding straw
Sodium	15g	13%	13g	16g	
Micro Minerals / Trace Elements	**Required mg/day**	**What you see on label**	**Feeding 100grams/day**	**Feeding 120gms/day**	
Copper***	200 – 400mg	2,700 mg/kg	270 mg	324 mg	1/3 protected if high Mo, Su, Fe see note
Selenium	4 – 6mg	50 mg/kg	5 mg	6 mg	Issue re toxicity
Iodine	20 – 60mg	500 mg/kg	50 mg	60 mg	NB for sucking reflex
Cobalt	5 – 10mg	100 mg/kg	10 mg	12 mg	
Manganese	335 – 415mg	1,000 mg/kg	100 mg	120 mg	
Zinc****	335 – 600mg	5,400 mg/kg	540 mg	648 mg	1/3 protected if high Fe
Vitamins	**Required iu/day**				
A		400,000 iu/kg	400,000 iu	480,000 iu	
D3		100,000 iu/kg	10,000 iu	12,000 iu	NB in Milk Fever
E		2,000 iu/kg	200 iu	240 iu	Keep higher on straw diet

The lower end of the scale is for routine feeding, the higher end if advised if stock are at risk of a severe deficiency.

*If potassium (K) levels are high in silage, could have to increase magnesium levels to 30 – 40g

**If feeding straw ensure the phosphorous level is >3%

***If you have high Molybdenum (Mo) >3.0ppm, Sulphur (S) >0.3% or Iron (Fe) >400ppm, then having protected Cu can be an advantage

****If you have high Iron (Fe) >400ppm, then having protected Zn can be an advantage

Last year's minerals: if bags are clean, dry and unbroken – feed first, it's the Vitamins and organic elements that will go off first.

Cost per tonne:

Every extra €200 per tonne of mineral will cost an extra €1.20 per cow for a 60-day period.

Mineral cost €1200 per tonne is €1.20 per kg. Feed 100gms per day for 60 days = 6KG. Total cost €7.20

Mineral cost €1400 per tonne is €1.40 per kg. Feed 100gms per day for 60 days = 6KG. Total cost €8.40

Feeding out:

- Feed for 60 days pre calving or longer. Many problems with minerals are caused by feeding the incorrect rate for too short a time, not by the spec of the mineral itself. Measure out the total needed and adjust if the number of animals change. It is a good practical guide to monitor the number of bags being used – a 25kg bag should feed 35 cows for 1 week.
- Dust on top of the silage, all cows must be able to feed at the same time. Best if split and fed morning and evening.
- Feed post calving until turned out to grass. Post calving feed higher calcium mineral to help with milk production.

Examples

Analytical Constituents

Constituent	%
Calcium	<1.00
Phosphorous	4.00
Sodium	12.50
Magnesium	25.00

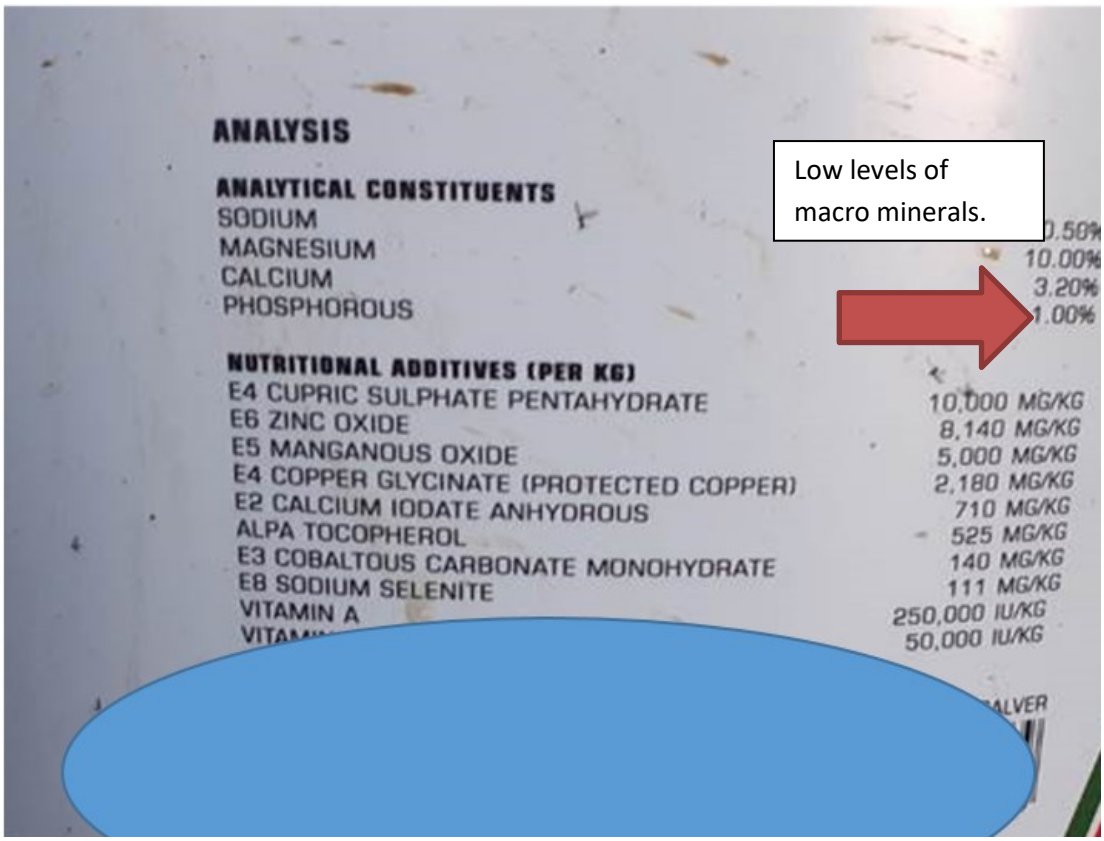
Excellent levels of Macro minerals

Composition: Magnesium Oxide, Sodium Chloride, Magnesium Phosphate

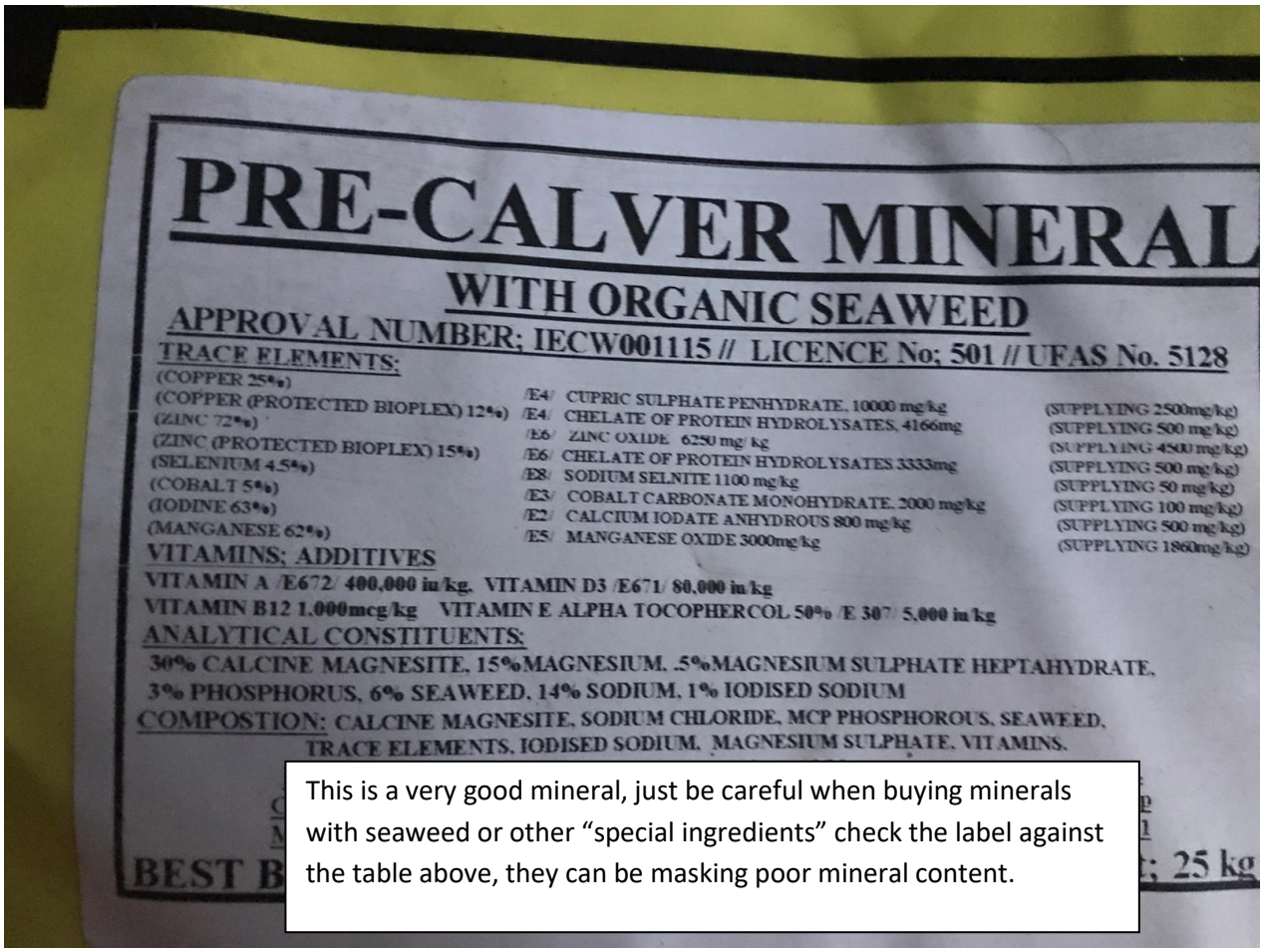
Additives Per Kg

Vitamins	Per Kg	Per 100 g
3a672a Vitamin A	400,000 IU	40,000 IU
3a671 Vitamin D3	300,000 IU	30,000 IU
3a700 Vitamin E (alphatocopherol)	7,500 mg	750 mg
Natural Anti-Oxidants (Vitamin E Equivalent)	2,500 mg	250 mg
Vitamin B12	1,500 µg	150 µg
Trace Elements	**Per Kg**	**Per 100 g**
Iodine as 3b202 calcium Iodate Anhydrous	500 mg	50 mg
Cobalt as 3b304 Coated Granulated Cobalt Carbonate	80 mg	8 mg
Copper as 3b405 Copper Sulphate Pentahydrate	1,500 mg	150 mg
Chelate as 3b407 Copper Chelate of Protein Hydrolysates	1,500 mg	150 mg
Manganese as 3b502 Manganese Oxide	4,500 mg	450 mg
Zinc as 3b603 Zinc Oxide	5,500 mg	550 mg
Zinc as 3b612 Zinc Chelate of Protein Hydrolysates	1,500 mg	150 mg
Selenium as 3b801 Sodium Selenite	30 mg	3 mg
3b8.10 Organic Selenium (Selplex)	20 mg	2 mg

Protected trace elements: if you had high Iron (FE) Molybdenum (Mo) or Sulphur (S) the protected trace elements would counteract that.



- Mag and Phosphorous content much too low
- Vitamin D and E low also



Major Minerals			
Calcium %	0.5	0.5	
Phosphorus P%	3	1	
Magnesium %	22	20	
Sodium %	4.85	19	
Trace Elements			
Copper mg/kg	3,500	3,500	
Copper Chelate mg/kg	500		
Copper Carbonate	750	1,000	
Cobalt mg/kg	100	100	
Iodine mg/kg	500	500	
Zinc mg/kg	5,000	5,000	
Chelate	1,000		
Manganese mg/kg	3,500	3,500	
Selenium mg/kg	50	45	
Sel-Plex	10.00		
Vitamins			
Vitamin A iu/kg	600,000	200000	
Vitamin D3 iu/kg	150,000	40,000	
Vitamin E iu/kg	8,000	500	
Vitamin B12 mcg/kg	1,000	1,000	
Vitamin B1 mg/kg	200	100	
Anionic Salts	30%		
Rumen Buffer			
Biotin			
Molasses Included (4%)	Yes	Yes	
Flavour Included	Yes	Yes	
Feeding Rage (g)	120	120	

First one high P, Mg but low Sodium, second one low in Phosphorous.

Has protected Copper, Zinc, and Selenium, excellent if you have high Iron, Molybdenum.

Very high level of vitamins in the first mineral, whereas the second has very low levels of vitamins A & D3.

Analytical Constituents			
Calcium	%	1	1
Magnesium**	%	30	25
Phosphorous	%	4	3
Sodium	%	3.8	10.8
Trace Elements			
Cobalt	mg/kg	100	100
Chelated Copper ***	mg/kg	2,500	2,000
Copper Total	mg/kg	3,000	3,000
Iodine	mg/kg	500	500
Manganese Total	mg/kg	3,350	3,350
Organic Selenium*	mg/kg	20	10
Selenium Total	mg/kg	50	50
Chelated Zinc ***	mg/kg	2,500	750
Zinc Total	mg/kg	8,050	7,950
Vitamins			
Vitamin A	iu/kg	800,000	500,000
Vitamin D3	iu/kg	300,000	200,000
Vitamin E	mg/kg	10,000	5,000
Vit b12	mcg/kg	2,000	1,500
Nicotinic	mg/kg	4,000	
Vit B6	mg/kg	250	
Pantothenic	mg/kg	500	
Vit B1		500	250
Biotin	mg/kg	50	
Yeast		Yes	
Feeding Rate	g/cow/d	100 - 120	100-120

First one is very high in macro minerals, the second is more the level for a suckler cow, could be fed 80gms per day up to 2 weeks from calving and then up to 100g per day.

Has protected Copper, Zinc, and Selenium, excellent if you have high Iron, Molybdenum

Very high level of vitamins in the first mineral, whereas the second has a good level for suckler cows

How about mineral buckets?

The issue with buckets is getting the volume into the cow and the variability of intake. Also feeding buckets outside can attract badgers, they love the molasses in the buckets.

So how do you use your Silage Mineral Analysis?

		Interpretation of Guide Values					Analytical Result	
Analyte	Units	Very Low (VL)	Low (L)	Normal (N)	High (H)	Very High (VH)	VALUE	STATUS
Phosphorus	%	0.14	0.21	0.38	0.58		0.25	N
Potassium	%	0.9	1.4	2.6	3.8		1.56	N
Calcium	%	0.25	0.4	0.75	1.26		0.51	N
Magnesium	%	0.09	0.13	0.23	0.35		0.12	L
Sodium	%	0.16	0.24	0.44	0.7		0.34	N
Sulphur*	%	0.09	0.13	0.25	0.4		0.17	N
Manganese	mg/kg	50	80	150	230		41	VL
Copper	mg/kg	4	6	10	18		5.3	L
Zinc	mg/kg	20	30	56	85		18	VL
Iron*	mg/kg	150	220	480	700		59	VL
Molybdenum*	mg/kg	0.7	1.3	2.4	3.6		0.9	L
Selenium	µg/kg	50	75	150	250		44	VL
Iodine	µg/kg	100	150	300	450		158	N
Cobalt	µg/kg	50	100	200	300		29	VL

** Elevated values are potential Copper Antagonists*

1. Normal for macro minerals and low in trace minerals. Feed a good quality dry cow for at least 60 days

		Interpretation of Guide Values					Analytical Result	
Analyte	Units	Very Low (VL)	Low (L)	Normal (N)	High (H)	Very High (VH)	VALUE	STATUS
Phosphorus	%	0.14	0.21	0.38	0.58		0.20	L
Potassium	%	0.9	1.4	2.6	3.8		2.15	N
Calcium	%	0.25	0.4	0.75	1.26		0.33	L
Magnesium	%	0.09	0.13	0.23	0.35		0.12	L
Sodium	%	0.16	0.24	0.44	0.7		0.08	VL
Sulphur*	%	0.09	0.13	0.25	0.4		0.14	N
Manganese	mg/kg	50	80	150	230		67	L
Copper	mg/kg	4	6	10	18		5.8	L
Zinc	mg/kg	20	30	56	85		23	L
Iron*	mg/kg	150	220	480	700		1609	VH
Molybdenum*	mg/kg	0.7	1.3	2.4	3.6		0.9	L
Selenium	µg/kg	50	75	150	250		31	VL
Iodine	µg/kg	100	150	300	450		245	N
Cobalt	µg/kg	50	100	200	300		276	H

** Elevated values are potential Copper Antagonists*

2. Low in P, a bit low in S, and high in iron. Review P application to silage ground for next year. Apply Sulphur to silage ground in 2023. Make sure that mineral has >2.5% P, and copper and zinc have protected sources

		Interpretation of Guide Values					Analytical Result	
Analyte	Units	Very Low (VL)	Low (L)	Normal (N)	High (H)	Very High (VH)	VALUE	STATUS
Phosphorus	%	0.14	0.21	0.38	0.58		0.26	N
Potassium	%	0.9	1.4	2.6	3.8		1.29	L
Calcium	%	0.25	0.4	0.75	1.26		0.65	N
Magnesium	%	0.09	0.13	0.23	0.35		0.16	N
Sodium	%	0.16	0.24	0.44	0.7		0.48	H
Sulphur*	%	0.09	0.13	0.25	0.4		0.14	N
Manganese	mg/kg	50	80	150	230		75	L
Copper	mg/kg	4	6	10	18		5.0	L
Zinc	mg/kg	20	30	56	85		21	L
Iron*	mg/kg	150	220	480	700		226	N
Molybdenum*	mg/kg	0.7	1.3	2.4	3.6		1.4	N
Selenium	µg/kg	50	75	150	250		119	N
Iodine	µg/kg	100	150	300	450		332	H
Cobalt	µg/kg	50	100	200	300		118	N

** Elevated values are potential Copper Antagonists*

3. Quite normal profile. Ensure good quality sources of trace minerals. K looks a bit low. Review silage K applications to ensure yield not being limited – K in autumn on silage area if soil test confirms low index

		Interpretation of Guide Values					Analytical Result	
Analyte	*Units*	Very Low (VL)	Low (L)	Normal (N)	High (H)	Very High (VH)	VALUE	STATUS
Phosphorus	%	0.14	0.21	0.38	0.58		0.31	N
Potassium	%	0.9	1.4	2.6	3.8		2.27	N
Calcium	%	0.25	0.4	0.75	1.26		0.74	N
Magnesium	%	0.09	0.13	0.23	0.35		0.15	N
Sodium	%	0.16	0.24	0.44	0.7		0.29	N
Sulphur*	%	0.09	0.13	0.25	0.4		0.21	N
Manganese	*mg/kg*	50	80	150	230		92	N
Copper	*mg/kg*	4	6	10	18		6.9	N
Zinc	*mg/kg*	20	30	56	85		26	L
Iron*	*mg/kg*	150	220	480	700		859	VH
Molybdenum*	*mg/kg*	0.7	1.3	2.4	3.6		1.5	N
Selenium	*µg/kg*	50	75	150	250		62	L
Iodine	*µg/kg*	100	150	300	450		588	VH
Cobalt	*µg/kg*	50	100	200	300		484	VH

* *Elevated values are potential Copper Antagonists*

4. P and K look good, sulphur on target, high iron, low zinc. Ensure a protected zinc and copper source are included

Watch for high levels of sulphur, we recommend to apply 1 unit of sulphur for every 10 units of nitrogen applied to a silage crop as sulphur helps to increase the protein content of the silage. However if the sulphur gets too high it too can lock up copper in the rumen.

Please note: Herds that have had problems in the past should test silage for minerals and their second round grazing swards.

Blood testing: If you want to test for a mineral status of a herd, ensure to test approx. 10 of the group. Do this a month before the critical time, so if you are starting to calve on the 10th of February, test on the 10th of January. If you want to start breeding on the 10th of May, blood your cows/heifers on the 10th of April. This will give you time to correct any issues.