



## What is Cropkare?

Cropkare is a concentrated multi-nutrient compound fertiliser. It is made from a sustainable and renewable fuel from poultry litter, that is burned to generate electricity, leaving a nutrient-rich by product.

Cropkare contains all the nutrients except nitrogen that were present in the poultry litter, recycling these nutrients to the soil.

Cropkare is a valuable source of immediately available and long-term forms of phosphate and potash. It also contains useful amounts of secondary nutrients and trace elements.

Cropkare is inorganic, has no smell and can be used where appropriate as an alternative to superphosphate and muriate of potash based fertilisers.

An application of 500 kg Cropkare/ha supplies 60 kg  $P_2O_5$ /ha, 60 kg  $K_2O$ /ha, 30 kg  $MgO$ /ha and 25 kg  $SO_3$ /ha.

### The typical analysis of Cropkare is:

Phosphate ( $P_2O_5$ ): 12%  
Potash ( $K_2O$ ): 12%  
Magnesium ( $MgO$ ): 6%  
Sulphur ( $SO_3$ ): 5%  
Calcium ( $CaO$ ): 29%  
Sodium ( $Na_2O$ ): 2.3%

Plus a full range of trace elements including: boron, copper, iron, manganese, molybdenum, selenium, zinc.



[ NATURAL  CHOICE ]



## Why use Cropkare?

Phosphate and potash use on UK crops has been falling for more than ten years. Since the mid-1990s, more phosphate and potash has been removed in the main arable crops every year than has been applied in fertilisers. Recent price increases are likely to make things worse and, if present trends continue, there will be a return to the serious phosphate and potash deficiencies in crops that were common in the past.

A recent summary by NRM of soil samples they had analysed showed 23% of arable and 30% of grassland samples had a P Index lower than target and 37% of arable and 43% of grassland samples had a K Index lower than target.

Good supplies of phosphate and potash are essential for the efficient use of nitrogen by crops and grass. Any deficiency can mean money wasted on nitrogen and greater risk of leaching of the nitrate that is not taken up.

Soil P and K Indices should be monitored by sampling every 3-5 years. Target soil



**P deficiency in wheat**



**K deficiency in wheat**

Indices that will ensure full yield of crops or grass are 2 for P and 2- for K. If an Index falls below the target, yield will be at risk. Often, full yield can not be achieved at a low Index even where recommended amounts of phosphate or potash are applied. So, it is false economy to allow Indices to fall to 0 or 1 and then apply extra fertiliser to raise them – and it may take many years to increase an Index by 1 and in the meantime, profit will be lost.

Cropkare is a competitive and consistent source of phosphate, potash and other nutrients.



## What does Cropkare contain?

### Phosphate

Provides an effective, immediate and long lasting supply to growing crops, ensuring full yield potential and response to nitrogen can be achieved. Phosphate is essential for good establishment and early growth. Typically, Cropkare contains 12%  $P_2O_5$ .

### Potash

Provides immediate and extended release. Potash is essential for water relations in plants and a good supply improves drought tolerance. Applications of potash are especially important for, or following, exhaustive crops like silage grass and high yielding cereals. Typically, Cropkare contains 12%  $K_2O$ .

### Magnesium

Essential in all crops for the formation of chlorophyll for photosynthesis. An adequate supply of magnesium is essential for grassland where deficiency can cause grass staggers (hypomagnesaemia) in livestock. Cropkare contains typically 6%  $MgO$  at which a 500 kg/ha application would supply 30 kg  $MgO$ /ha.

### Sulphur

Sulphur is an essential component of proteins in all crops. Deficiency of sulphur can reduce nitrogen uptake and affect the quality of protein, especially important in breadmaking wheat. Cropkare contains typically 5%  $SO_3$  so a 500 kg/ha application would supply 25 kg  $SO_3$ /ha.

### Calcium

Regular applications help maintain soil pH and so uptake of other nutrients. Cropkare contains typically 29%  $CaO$ . The Neutralising Value is typically 25%.

### Sodium

Can help improve the palatability of permanent grassland and leys for dairy cows and other livestock. Some crops, for example sugar beet, root brassicas and carrots have a particular requirement for sodium. Cropkare typically contains 2.3%  $Na_2O$ .

### Trace elements

Cropkare contains the trace elements - iron, manganese, boron, copper, zinc, molybdenum and chlorine – that are needed by all crops plus selenium that is often deficient in livestock.



## What secondary nutrients are in Cropkare?

Cropkare contains the secondary nutrients and trace elements that are essential for healthy crops and livestock.

### Sulphur

Until recently, crops and grass were well supplied with sulphur from lower concentration fertilisers and from deposition from the air. Changes to fertiliser production and reduction in sulphur emission from industry now leave many crops deficient in sulphur. Second cut silage and oilseed rape are particularly demanding and were the first to suffer. Now deficiencies are also found in many other crops, particularly cereals and vegetables.

Cropkare contains around 5%  $\text{SO}_3$  so every 100 kg/ha applied supplies 5 kg  $\text{SO}_3$ /ha. A typical application of 500 kg/ha would supply around half of the sulphur needed by a high yielding cereal or first cut silage.

### Magnesium

Magnesium is essential for all crops and grass. A good supply of magnesium is essential for livestock and a deficiency can lead to grass staggers or hypomagnesaemia.

Cropkare contains around 6% MgO so every 100 kg/ha supplies 6 kg MgO/ha. A typical application of 500 kg/ha would supply 30 kg MgO/ha to help maintain soil reserves.

### Sodium

Sodium is beneficial to some crops – sugar beet, carrots, celery – and is essential for livestock. Often, herbage provides too little sodium and grass palatability and nutritional value suffer.

Cropkare contains around 2.3%  $\text{Na}_2\text{O}$  so every 100 kg/ha contributes 2.3 kg  $\text{Na}_2\text{O}$ /ha to the needs of crops and livestock.



## What trace elements are in Cropkare?

### Trace elements

Cropkare contains the full range of trace elements needed by crops and grass. In crops, deficiencies of manganese, boron and copper are most common. Grass rarely suffers from trace element deficiency but the herbage may contain too little copper and selenium to meet livestock needs.

The trace elements supplied by a typical application of 500 kg/ha meet, or exceed, the amounts removed by most crops.

	Content (ppm in Cropkare)	Every 100 kg of Cropkare supplies (g/ha)	9 t/ha wheat grain typically removes (g/ha)*	7 t/ha silage DM typically removes (g/ha)**
Boron	98	10		70
Copper	291	29	70	20
Iron	4500	450	550	500
Manganese	1800	180	350	800
Molybdenum	11	1		5
Selenium	3	0.3	0.2	1.2
Zinc	1662	166	50	150

\* Soil and soil fertility. Troeh, F R and Thompson, L M. Blackwell Publishing, 2005. Evidence of low selenium concentrations in UK bread-making wheat grain. Adams, M L, Lombi, E, Zhao, F and McGath, S P (2002). Journal of the Science of Food and Agriculture, 82, 1160-1165.

\*\* Nutrient elements in grassland. Whitehead, D C. CABI Publishing, 2000.



## Is Cropkare safe to use?

As the poultry litter is subjected only to incineration, the elements in Cropkare are only those that were in the litter. However, every batch of Cropkare is sampled and analysed for nutrients and metals. This regular monitoring gives the user confidence in the product.

Whilst poultry litter can simply be applied to land, regulations apply to the products of incineration if they are to be used as a fertiliser. To comply with regulations,

and to provide confidence to users, the metal concentrations in Cropkare are regularly measured and results compared with statutory application limits. In the table below, application rates of metals in Cropkare (based on analyses of four shiploads) are compared with statutory limits set by the Sludge (Use in Agriculture) Regulations. In all cases, even at high rates of application of Cropkare, applications of metals are much smaller than the limits.

Cropkare applied (kg/ha)	250	500	750	1000	Statutory limit (average per year over ten years)
	<b>Metal application rate (g/ha/year)</b>				
Arsenic	0.9	1.8	2.6	3.5	700*
Cadmium	0.3	0.6	0.9	1.2	150
Chromium	4.2	8.4	12.6	16.7	15000*
Copper	73	146	218	291	7500
Lead	2.9	5.9	8.8	11.7	15000
Mercury	0.3	0.5	0.7	1.0	100
Nickel	3.8	7.7	11.5	15.4	3000
Zinc	416	831	1247	1663	15000

\* Limit stated in the Code of Practice for Agricultural Use of Sewage Sludge.

The incineration of the poultry litter in the power station destroys all pathogens that were present in the poultry litter.

Cropkare has no smell so application does not cause odour problems.



## How is Cropkare produced?

Cropkare is produced at a new, state-of-the-art electricity power station, which uses only deep litter poultry manure for fuel. The poultry litter is incinerated at temperatures higher than 850°C in a fluidised bed combustion system. This destroys pathogens in the manure leaving in Cropkare all of the nutrients, except nitrogen, that were in the manure.

The poultry litter fuel is closely monitored for chemical composition and every delivery to the power station can be traced to the particular poultry farm from which it was sent. Every batch of Cropkare is sampled and analysed for nutrient contents.



[ NATURAL  CHOICE ]



## How does Cropkare benefit the environment?

Cropkare comes from an environmentally beneficial process that produces electricity from a sustainable and renewable resource.

The power station burns poultry litter to generate some 36 MW of electrical power. This is renewable energy that helps reduce reliance on non-renewable oil and coal. Because the carbon in the litter was fixed from the air recently, burning it does not add new carbon dioxide into the atmosphere so helps reduce accumulation of greenhouse gases.

Cropkare recycles the nutrients in the poultry manure which were in the poultry feed and the crops that supplied it.

Recycling nutrients in this way reduces the need for non-renewable mined phosphate and potash.

Cropkare is delivered in bulk with no packaging or waste materials to dispose of.

## Why choose Cropkare?

- An environmentally friendly fertiliser with a traceable analysis.
- Consistent in terms of its nutrient content and physical characteristics.
- Regular analysis to confirm the consistency of the nutrients.
- Can be used on ALL arable and grassland crops
- Cropkare is an extremely cost-effective and reliable source of phosphate and potash.

[ NATURAL  CHOICE ]



## Recommendations

### To increase soil P Index

Use normal recommendations for Index 2 plus 700 kg Cropkare/ha until soil Index reaches 2. Check soil Indices by regular soil sampling every 3-5 years.

### To meet annual crop requirements

Annual requirements for phosphate and potash depend on the crop grown and soil Indices. Recommendations for different Indices are given in Defra RB209 and are summarised in Tables A and B.

Many soils have different Indices for phosphate and potash. Where one Index is lower than the target for crop growth (2 for P, 2- for K), apply Cropkare to meet requirement at the lowest Index. Check Indices by soil sampling every 3-5 years (typically, cost of soil analysis is around 20p/ha/year).

The following table shows typical recommendations for Cropkare use in different crops. For more detail, or to refine use in a particular situation, refer to the RB209 recommendations summarised in Tables A and B.

### Typical recommendations for Cropkare

	Cropkare kg/ha	Supplying kg P <sub>2</sub> O <sub>5</sub> /ha	Supplying kg K <sub>2</sub> O/ha
<b>Winter wheat/barley</b>			
Straw incorporated			
Index 0 or 1	800	96	96
Index 2	450	54	54
Straw removed			
Index 0 or 1	875	105	105
Index 2	700	84	84
<b>Spring barley</b>			
Straw incorporated			
Index 0 or 1	750	90	90
Index 2	350	42	42

*Continued on next page*



## Typical recommendations for Cropkare (continued)

	Cropkare kg/ha	Supplying kg P <sub>2</sub> O <sub>5</sub> /ha	Supplying kg K <sub>2</sub> O/ha
<b>Spring barley</b>			
<b>Straw removed</b>			
Index 0 or 1	850	101	102
Index 2	600	72	72
<b>Winter oilseed rape</b>			
Index 0 or 1	750	90	90
Index 2	400	48	48
<b>Peas/beans</b>			
Index 0 or 1	650	78	78
Index 2	300	36	36
<b>Sugar beet</b>			
Index 0 or 1	875	105	105
Index 2	650	78	78
<b>Forage rape, stubble turnips</b>			
Index 0 or 1	700	84	84
Index 2	650	78	78
<b>Fodder beet, mangels</b>			
Index 0 or 1	1000	120	120
Index 2	900	108	108
<b>Grass</b>			
<b>Establishment</b>			
Index 0 or 1	800	96	96
Index 2	400	48	48
<b>Grazing (whole year)</b>			
Index 0 or 1	400	48	48
Index 2	250	30	30
<b>First cut silage (spring)</b>			
Index 0 or 1	600	72	72
Index 2	350	42	42



**Table A: P<sub>2</sub>O<sub>5</sub> recommendations for typical yields**

	Soil Index				
	0	1	2	3	4
	kg P <sub>2</sub> O <sub>5</sub> /ha				
Winter wheat/barley (straw incorporated)	110	85	60	20	0
Spring wheat/barley, and oats (straw incorporated)	95	70	45	0	0
Winter wheat/barley (straw removed)	120	95	70	20	0
Spring wheat/barley, and oats (straw removed)	105	80	55	0	0
Winter oilseed rape	100	75	50	0	0
Spring oilseed rape, linseed	80	55	30	0	0
Peas and beans	85	60	35	0	0
Potatoes	270	230	180	130	50
Sugar beet	100	75	50	0	0
<b>Forage crops</b>					
Forage maize	110	85	60	20	0
Forage swedes/turnips	100	80	60	40	0-40
Forage rape, stubble turnips	100	90	80	60	40
Fodder beet, mangels	130	120	110	90	60
Kale	130	120	110	90	60
Forage rye/triticale	80	60	40	20	0
<b>Grass</b>					
Grass establishment	120	80	50	30	0
Grazed grass	60	40	20	0	0
First cut silage	90	65	40	20	0
Second cut silage	25	25	25	0	0



**Table B: K<sub>2</sub>O recommendations for typical yields**

	Soil Index					
	0	1	2-	2+	3	4
	kg K <sub>2</sub> O/ha					
Winter wheat/barley (straw incorporated)	95	70	45	20	0	0
Spring wheat/barley, and oats (straw incorporated)	85	60	35	20	0	0
Winter wheat/barley (straw removed)	145	120	95	70	25	0
Spring wheat/barley (straw removed)	130	105	80	55	20	0
Oats (straw removed)	155	130	105	80	35	0
Winter oilseed rape	90	65	40	20	0	0
Spring oilseed rape, linseed	75	50	25	0	0	0
Peas and beans	90	65	40	20	0	0
Maincrop potatoes	350	325	300	275	150	0
Early/seed potatoes	220	195	170	145	50	0
Sugar beet	150	125	100	75	0	0
<b>Forage crops</b>						
Forage maize	230	205	180	155	110	0
Forage swedes/turnips	200	175	150	125	80	0
Forage rape, stubble turnips	100	75	50	25	0	0
Fodder beet, mangels	160	135	110	85	40	0
Kale	250	225	200	175	130	0
Forage rye/triticale	170	145	120	95	50	0
<b>Grass</b>						
Grass establishment	120	80	50	50	30	0
Grazed grass	60	30	0	0	0	0
First cut silage*	60/80	30/80	0/90	0/60	0	0
Second cut silage	120	100	90	60	40	0

\* previous autumn/spring



## Comparison of Cropkare recommendation and crop removal of phosphate and potash at typical yields

	kg/ha				
	Cropkare	Applied		Removal	
		P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
Winter wheat/barley (straw incorporated)	450	54	54	60	45
Spring wheat/barley, and oats (straw incorporated)	350	42	42	45	35
Winter wheat/barley (straw removed)	700	84	84	70	95
Spring wheat/barley, and oats (straw removed)	600	72	72	55	80
Winter oilseed rape	400	48	48	50	40
Spring oilseed rape, linseed				30	25
Peas and beans	300	36	36	35	40
Potatoes				180	300
Sugar beet	650	78	78	50	100
<b>Forage crops</b>					
Forage maize				60	180
Forage swedes/turnips				60	150
Forage rape, stubble turnips	650	78	78	80	50
Fodder beet, mangels	900	108	108	110	110
Kale				110	200
Forage rye/triticale				40	120
<b>Grass</b>					
Grass establishment	400	48	48	50	50
Grazed grass	250	30	30	20	0
First cut silage	350	42	42	40	0/90
Second cut silage				25	90