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Sustainable Feeds by adding Green to Global plate

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Charoen Pokphand Group committed to sustainable business

In 2022, Charoen Pokphand Group established the 2030 Sustainability Strategy, Goals, and Indicators for all business groups around the world.

Goal of 2030 is Carbon Neutrality and 2050 is Net Zero.



Trend and Challenge

Projected regional population (billions)

	2000	2050	Growth	%/yr
Asia	3.7	5.3	+43%	+0.7%
Africa	0.8	2.5	+212%	+2.3%
Europe	0.7	0.7	0%	0.0%
Latin America & the Caribbean	0.5	0.7	+40%	+0.7%
Northern America	0.3	0.4	+33%	+0.6%
Oceania	0.03	0.06	+100%	+1.4%
World	6.1	9.7	+60%	+0.9%

These models use trend-based-assumptions showing projected regional growth and chicken meat production



Chicken Meat

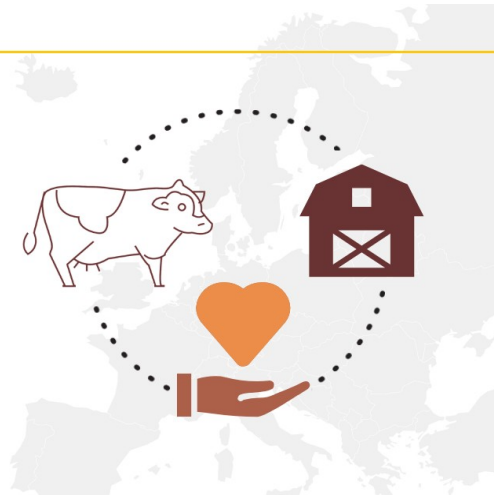
Production (mil.MT)	% of the world	2020	2021	2022	2023	2024f	YoY
United States	21%	20.3	20.4	21.0	21.1	21.2	0.5%
Brazil	15%	13.9	14.5	14.5	14.9	15.1	1.0%
China	13%	14.6	14.7	14.3	14.3	13.9	-3.0%
European Union	11%	11.0	10.8	10.9	11.2	11.2	0.4%
Thailand	3%	3.3	3.2	3.3	3.5	3.5	1.2%
Others	58%	56.9	57.8	58.9	58.6	59.7	1.8%
Total	100%	99.7	101.1	101.8	102.4	103.3	0.9%



Antibiotic growth promoter (AGP)

Freedom from pain, injury and disease

Animal welfare in the EU



Freedom from discomfort



Freedom to express normal behaviour



Freedom from hunger and thirst

5 freedoms of animal welfare



Freedom from fear and distress

CP Foods pledges to improve free antibiotic meat products

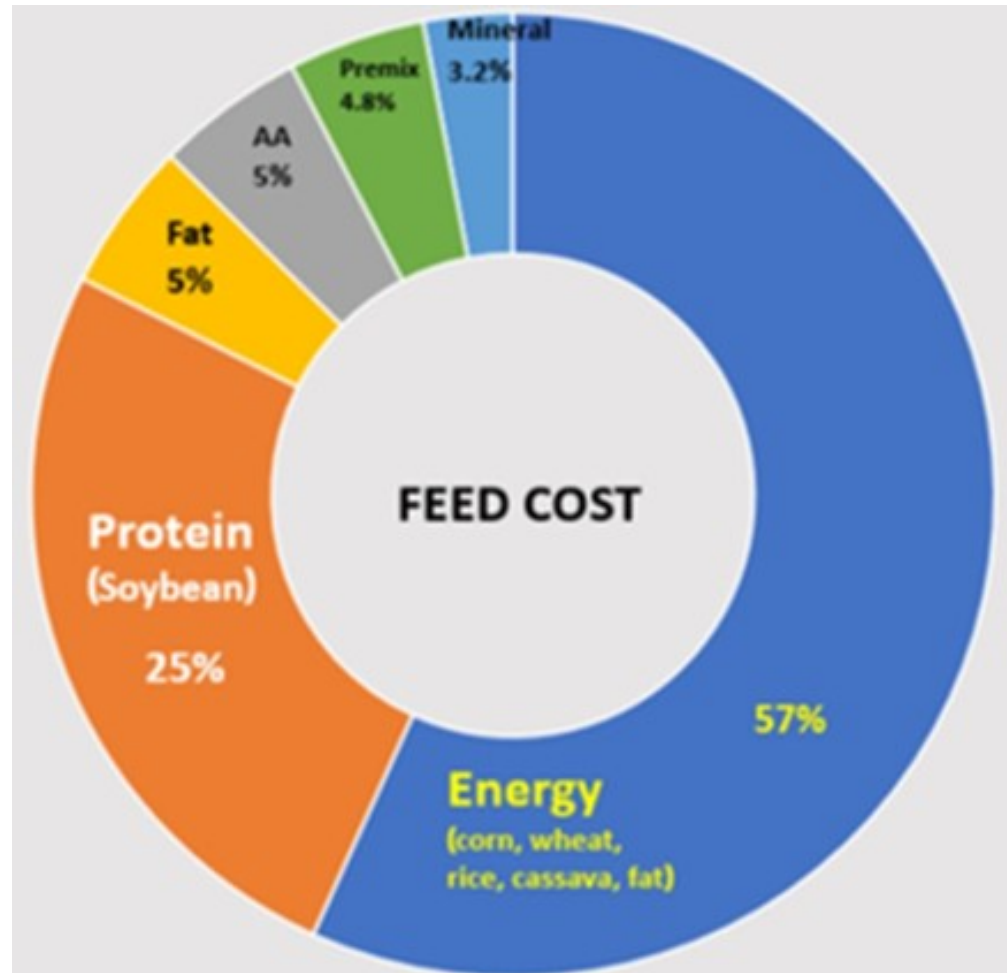
This effort aims to improve animal health and reducing the antibiotics resistance in food products



Sustainable Feeds

Sustainable feeds

Least cost feed formulation, Good performance and friendly with environment



Key Points

Dietary Energy Sources
(COST) = Net Energy

Dietary Protein Sources
(COST) = SID AA basis

90-95%



(1) Friendly environmental feeds

(2) Herbal Product as feed additive.



Chicken Feed is the hot spot for GHG emissions

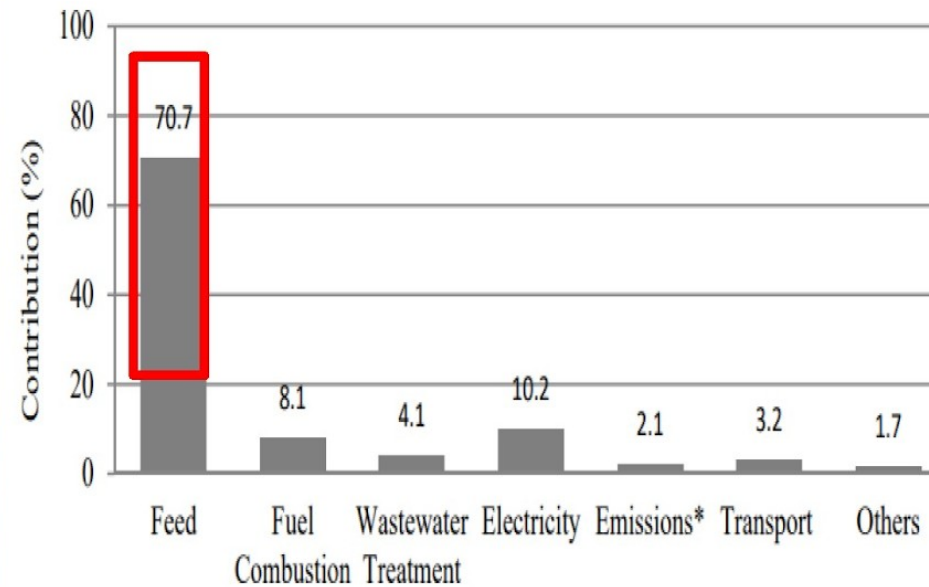
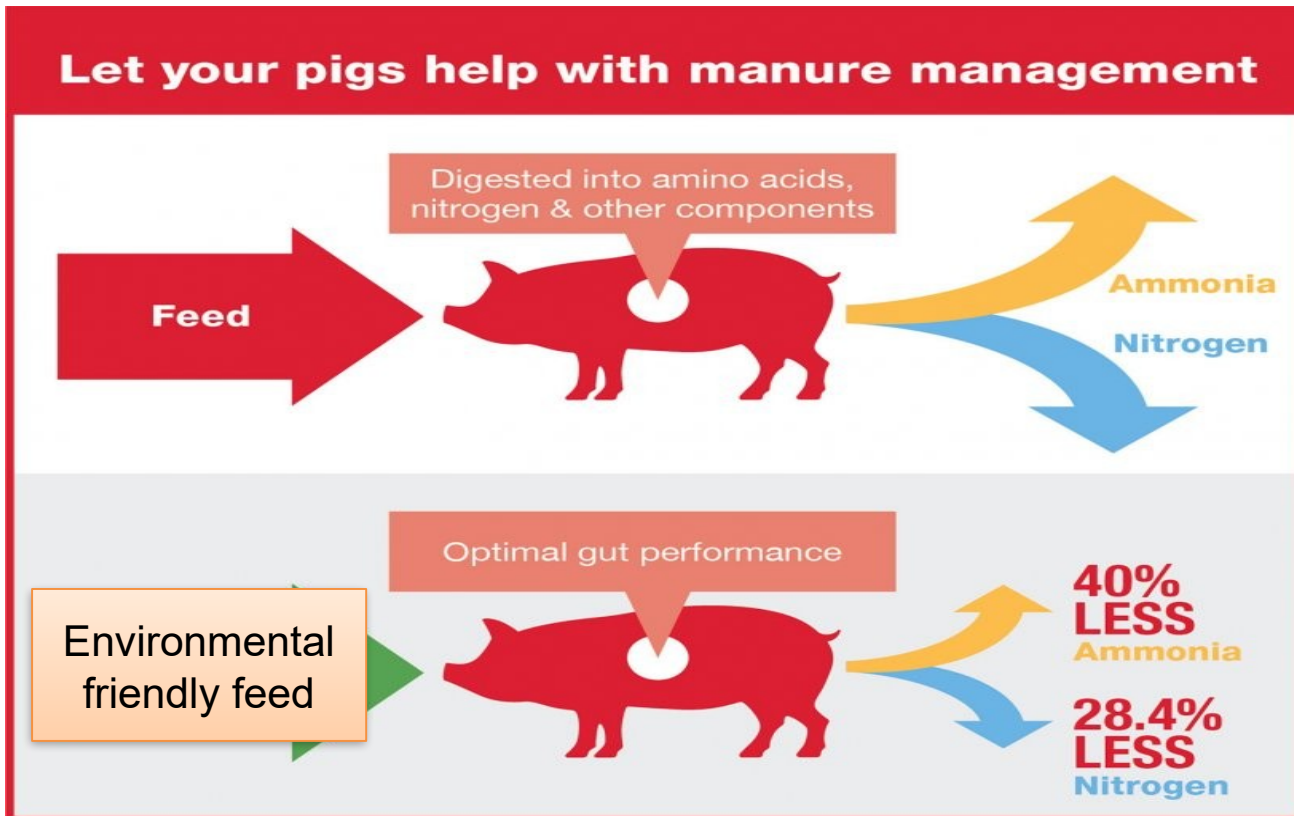


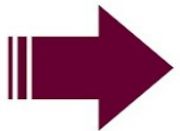
Figure 4. Contribution to GHG emissions from major sources within the processes evaluated in chicken meat production. * Emissions from enteric fermentation and on-farm manure management.

Friendly environmental feeds

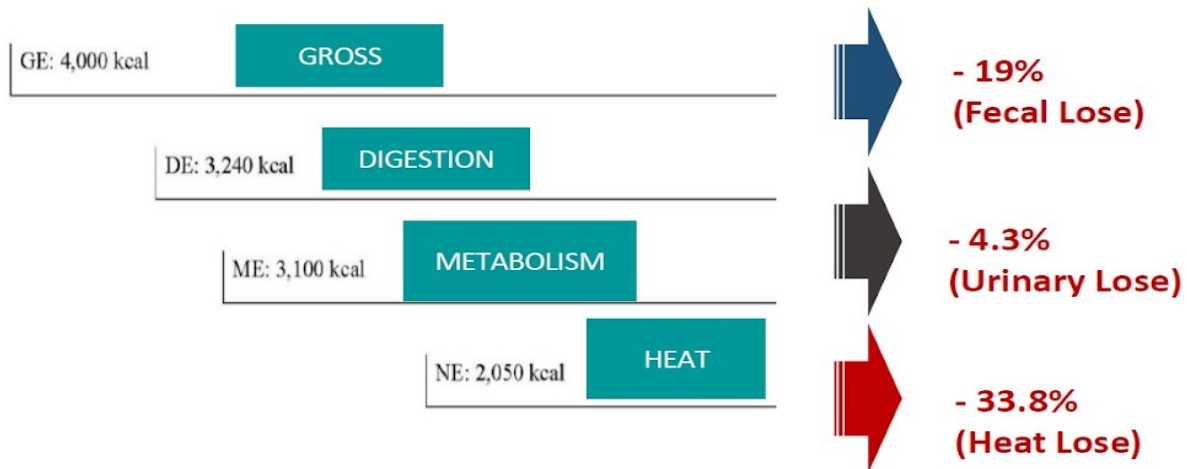
- Feeds can reduce Nitrogen in feces
- They can reduce nearly 40 less ammonia and 28.4 % less nitrogen from manure.



Environmental Friendly Feeds

GE
(4,000 kcal; 100%)  **NE_p**
(1,250 kcal; 31%)

Feces	Urine	Heat increment	NE _m	NE _p
760	140	1,050	800	1,250



Energy
Net



Approximate energy utilization of growing pigs fed a corn-soybean meal-based feeds ([Kil, 2008](#)). NE_p = Netenergy for production.

Least Cost Feed Formulation

Growing pig (As fed) 50-75kg	Amount
Corn	77.64
SBM (46% cp)	15.31
Palm oil	2.11
Rice bran (full fat)	1.80
MDCP (P-22%)	0.92
Limestone	0.94
Salt	0.30
DL-Met	0.08
L-Thr	0.14
L-Lys 78%	0.46
Premix	0.25
Total in diet	100
Cost/kg	14.2

Total AA balance		SID AA balance	
Lys/Lys	100	Lys/Lys	100
Met/Lys	31.42	Met/Lys	29.71
Met+Cys/Lys	52.38	Met+Cys/Lys	56.89
Thr/Lys	65.20	Thr/Lys	62.19
Trp/Lys	13.80	Trp/Lys	12.98
Total AA Balance STD		SID AA Balance STD	
Lys/Lys	100	Lys/Lys	100
Met/Lys	28.86	Met/Lys	28.23
Met+Cys/Lys	58.76	Met+Cys/Lys	56.47
Thr/Lys	65.97	Thr/Lys	61.17
Trp/Lys	17.52	Trp/Lys	17.64

		Different%		
GE kcal/kg	3889.50			
DE kcal/kg	3381.25	13.06		
ME kcal/kg	3271.74	3.23		
NE kcal/kg	2543.80	22.24	Total Energy Lose	38.55%
CP%	13.80			
CP %	13.80			
Lys%	0.965			
SID Lys%	0.888	7.91	SIDLys/total Lys	
Met%	0.303			
SID Met%	0.286	5.43	SIDMet/total Met	
Met+Cys%	0.558			
SID Met+Cys%	0.505	9.42	SIDMet+Cys/total Met+Cys	
Thr%	0.629			
SID Thr%	0.552	12.16	SIDThr/total Thr	
Ca%	0.600		Protein Lose	10%
Total P%	0.519			
Avail. P%	0.285	45.06	Total P/Avail.P	
Ca/Avail.P	2.102			
DEB	141.53			
Crude fiber%	2.896			
NDF%	10.69			
ADF%	3.398	68.21	NDF/ADF	
Lignin%	0.561			
NSPi%	9.758			
Starch%	50.85	88.59	Starch/fat	
Total sugar%	2.788			
Insoluble ash%	0.100			
Moisture%	12.71			
Hemicellulose (NDF-ADF)	7.293			
Cellulose (NDF-Lignin-Hemicellulose)	2.836			
Total Ash	2.747			
Total	99.39			

Protein (Lys):Energy ratio



GHG Mitigation Potentials in the livestock sector

Greenhouse gas mitigation potentials in the livestock sector

Mario Herrero^{1*}, Benjamin Henderson², Petr Havlík³, Philip K. Thornton⁴, Richard T. Conant⁵, Pete Smith⁶, Stefan Winiwiler⁷, Alexander N. Hristov⁸, Pierre Gerber⁹, Margaret Giff¹⁰, Klaus Butterbach-Bahl¹¹, Hugu Valin¹², Tara Garnett¹³ and Elke Stehfest¹⁴

The livestock sector supports about 1.3 billion producers and retailers, and contributes 40–50% of agricultural GDP. We estimated that between 1990 and 2005, the livestock sector was responsible for greenhouse gas emissions of 6.6–7.0 GtCO₂e yr⁻¹. Livestock accounts for up to half of the technical mitigation potential of the agriculture, forestry and land-use sectors, through management options that sustainably intensify livestock production, promote carbon sequestration in rangelands and reduce emissions from manure, and through reductions in the demand for livestock products. The economic potential of these main abatement alternatives is less than 50% of what is technically possible because of adoption constraints, costs and consumer trade-offs. The mitigation potential of reductions in livestock product consumption is large, but their economic potential is unknown at present. More research and investment are needed to increase the affordability and adoption of mitigation practices, to moderate consumption of livestock products where appropriate, and to avoid negative impacts on livelihoods, ecosystems activities and the environment.

The livestock sector is large. Twenty billion animals make use of 30% of the terrestrial land area for grazing, and half of global arable land is devoted to producing animal feed¹ and 50% of freshwater is used to provide direct livestock and economic benefits to at least 1.3 billion producers and retailers². In some economic activities, livestock contributes up to 50% of agricultural GDP globally³. The livestock sector is also very diverse. Global per capita consumption of livestock products has more than doubled in the past 40 years⁴. Increasing human population, income and urbanization are projected to drive increases in the consumption of milk and meat over the next 20 years, at least at previously observed rates⁵, with most of the growth projected to occur in the developing world. In response to these demand trends, the sector has managed to significantly increase production. Beef and milk production have more than doubled over the past 40 years and ruminant production (type and gender) has grown in place by a factor of five or more⁶. Intensification of production, in terms of increased livestock and/or crop productivity, has played a pivotal role in raising the output per unit of land and animal⁷. For example, in the USA, 80% more milk is produced now than in the 1980s with about 80% fewer cows⁸. Although intensification has occurred in some regions, agricultural land expansion has also been an important component of production growth in places such as Africa and Latin America. These trends, if uncontrolled, could drive significant increases in greenhouse gas (GHG) emissions, deforestation, loss of biodiversity and other negative impacts on the environment⁹.

Here we review the mitigation potential of a number of field-level management options for mitigating GHG emissions in livestock production. Our review incorporates new supply-side information, such as changes in the structure of livestock production systems, with information about how policies that reduce demand for animal protein might contribute to emissions reductions. The analysis of supply and demand-side mitigation potentials is central to understanding the ways in which the components of our food systems interact and how livestock emissions could evolve and be managed in the future. We focus on temperate systems in livestock systems, as we do not address CO₂ from energy use.

Mitigation potentials were estimated for the following 12 technical and management interventions: (1) intensification and the associated structural changes of livestock systems; and (2) moderation of demand for livestock products.

We estimate that these options have the technical potential to mitigate a substantial proportion of emissions from livestock. However, their economic mitigation potential may be far smaller due to adoption barriers and costs of the technical options, underinvestment in the livestock sector and a lack of effective policies or political will for promoting healthy levels of consumption of livestock products in the diets of developed and developing country populations. We conclude with a discussion on research needs for improving the feasibility and adoption of mitigation options in livestock systems to lower GHG emissions without jeopardizing rural economies and livelihoods.

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Mitigation potentials

1. Technical and management interventions

- Use of feed additives
- Improve feed digestibility
- Soil carbon sequestration in grasslands

2. Increased livestock and crop/pasture productivity

- Animal productivity and health
- Avoid deforestation due to intensification

3. Moderation of demand for livestock products

- The production of beef protein requires about 50 times more land than the production of vegetable proteins, and GHG emissions excluding land-use change are about 100 times higher.
- The 2030 mitigation potentials for animal GHG emissions at unit costs of US\$20, US\$50 and US\$100 per tCO₂e were estimated to be 175, 200 and 225 MtCO₂ yr⁻¹, respectively

Feed Additives



Use of Methane Inhibitors

Use of Herbal extracts

Use of Bee propolis extract

Use of Saponins and Yeast

Use of Ionophores

Use of Organic acids

Use of Exogenous enzymes

Use of Nanoparticles

Use of Algae



Phytogenic Feed Additive (Supplement)

Phytogenics are a group of natural and non-antibiotic growth promoters used as feed additives, contain a large number of substances with antimicrobial, antiviral and antioxidant activities.



The potential benefits of using phytogenics in poultry nutrition are: increased feed intake, stimulation of digestion, increased growth performance, reduced incidence of disease, improved reproductive parameters, improved feed efficiency, increased profitability and reducing poultry house emissions.

Preference for PhytoGenics without chemicals

	Essential Oils/Extracts	NR-SBP*
* Process	Solvent Extraction or Distillation	No such process
Active compounds	2 to 3	Many
Mode of Action	Single Target	Multiple Target
Cost	Very High	Low
CFP	Very High	Very Low



*NR-SBP, which is a registered Trademark concept of Natural Remedies Pvt Ltd. It constitutes of a category of PhytoGenics which is different from Essential oils & extracts

Relative Feed additive (supplement) to sustainable feed



Feed supplement has 2 effects to sustainability and environment.

- *Direct effect when NR-SBP replace synthetic choline chloride can reduce carbon emissions.*
- *Performance Improvement effect uses for antioxidant, antistress and adaptogenic.*

Impact on Carbon Footprint due to Greener alternative of choline chloride

Impact Category	Unit	NR-SBP Natural choline	Synthetic Choline Chloride-60%
Global Warming Potential	kg CO ₂ eq	579	1,020
Freshwater Eutrophication	kg P eq	0.144	0.204
Terrestrial Acidification	kg SO ₂ eq	2.45	3.41
Mineral resource scarcity	kg Cu eq	0.495	34.7
Water consumption	m ³	4.06	2.43
Freshwater ecotoxicity	kg 1,4-DCB	8.69	18.2
Human carcinogenic toxicity	kg 1,4-DCB	5.27	244



CFP Reduction by replacing Choline Chloride with NR-SBP

NR-SBP Green choline Carbon Footprint is 0.579kg CO₂e per kg

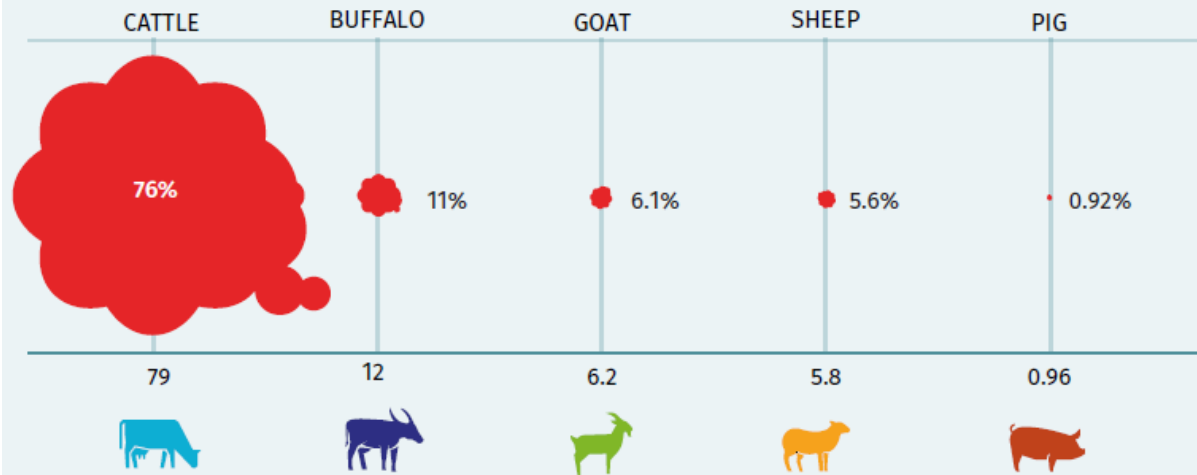


C.P Group Has Contributed Towards Reducing 56,805,220 Kg CO₂e in 2023 (Carbon Dioxide Equivalent) By Using NR-SBP Green choline for complete Choline chloride replacement

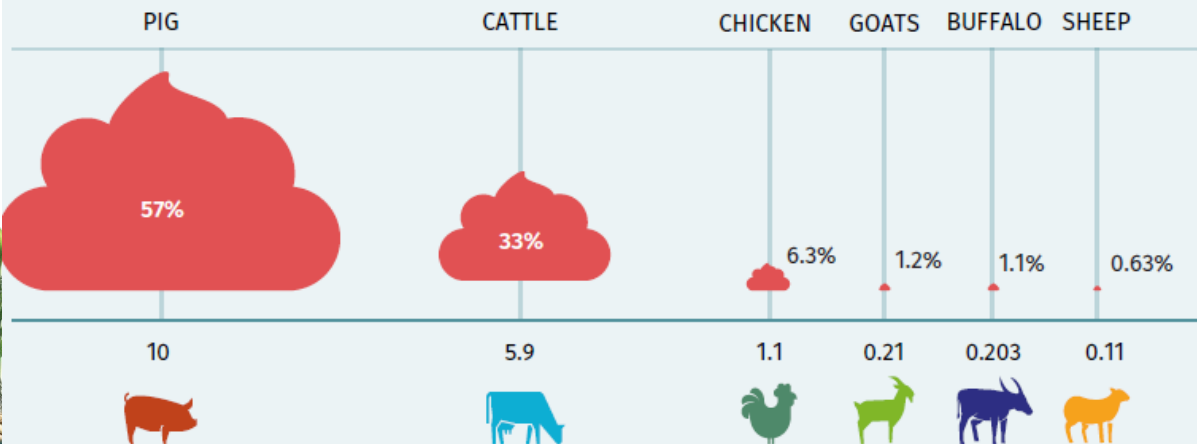


Methane reduction by NRSBP

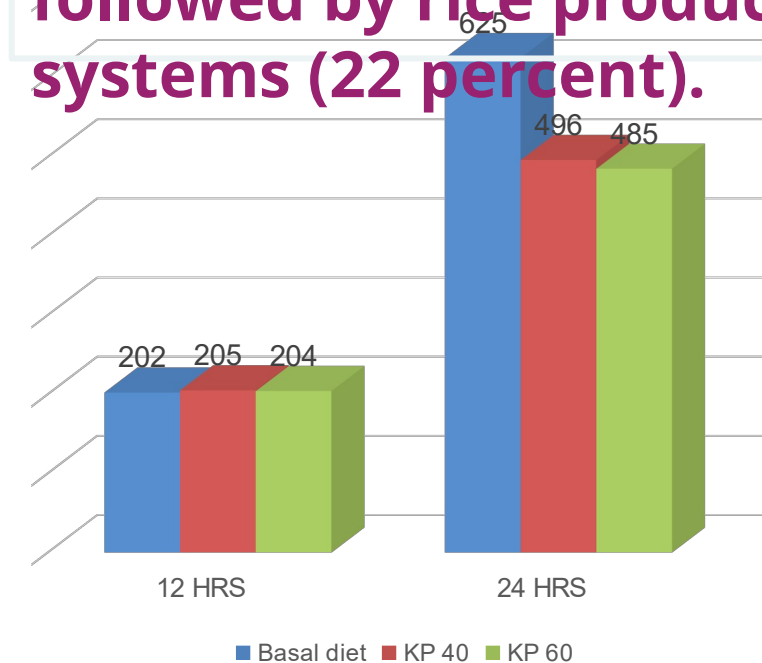
Enteric fermentation (CH₄) - Relative contribution and absolute values (Mt)



Manure Management (CH₄) - Relative contribution and absolute values (Mt)



. Agricultural CH₄ emissions predominately stem from livestock (78 percent), followed by rice production systems (22 percent).



NR-SBP Green choline reduced Methane production by **20%** in 48 hrs

source: RUSITEC-TANUVAS Kolin Plus

Natural adaptogen and defence

1. *Emblica officinalis*

Emblica officinalis fruit is listed as feed material in the Feed Material Register (ID 002004) in dried and powdered form.



2. *Ocimum sanctum*

Ocimum sanctum is listed as feed material in the Feed Material Register (ID 001476) as crude herb, dried and powdered.



3. *Withania somnifera*

Withania somnifera is listed as feed material in the Feed Material Register (ID 001480) as crude herb, dried and powdered.



NR-SBP cortisol reduction

NR-SBP played a pivotal role in reducing stress & aggressiveness in Swine. ***NR - Adaptogen able to reduce 50% cortisol level in 4.8 million pigs in 2023.***



Reference is available on request**



Good animal welfare practices not only promote intrinsic animal wellbeing but also help to make animals healthier. This is a key element for the safety of the food chain considering the close links between animal welfare, animal health and foodborne diseases, in line with the principles of One Health.

It is possible to **produce sustainable feeds** and can achieve Carbon Neutrality and Net Zero. These feeds will be Green feeds which means that we shall **increase natural ingredients or herbal feed supplement** into feed formulas. While nutritionist control feed formulas by **least cost** and performance in the same time over nutrients in manure will be controlled.



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- Natural Remedies Company, India.



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*Muchas Gracias
Khob Khun Khap*

