

# Animal Feeds: Nonprotein Nitrogen (NPN) Supplements

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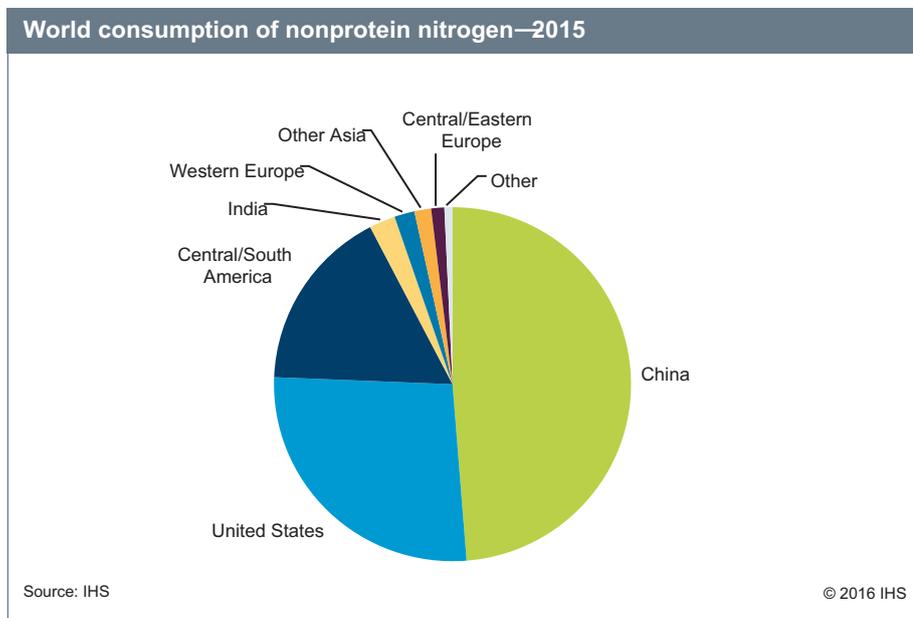
## Abstract

China, the United States, and Central and South America account for the vast majority of the world consumption of nonprotein nitrogen (NPN) in animal feeds. China, the United States, and Central and South America together accounted for just over 92% of world NPN consumption in 2015. Although many regions have large populations of cattle, most of these regions consume very small quantities of NPN, particularly the Middle East, Africa, and Mexico.

Beef and dairy cattle are the primary consumers of NPN. Beef cattle accounted for 80% and dairy cattle for 20% of urea consumption. Urea is mixed in total mixed rations for feedlot and dairy cattle. Urea is also used in forage programs where cattle are on pasture, but also fed liquid feed, cubes, or blocks that contain around 30% protein, nearly half from urea.

The cattle population in the United States and Central and South America has gradually declined since 2007–08, which weighs on NPN consumption in these regions. On the other hand, the cattle population in China has been increasing steadily, which supports NPN demand.

The following pie chart shows world consumption of nonprotein nitrogen:



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Competing products include DDGS (distiller's dried grains with solubles). In the United States, growth in the consumption of NPN in the feed market has resumed during the past two years after bottoming out from a continuous decline that began a decade ago. The exponential growth of the fuel ethanol industry resulted in flooded supply of DDGS as a coproduct. The majority of DDGS went to the cattle industry as a cheaper feed supplement option for energy and protein, reducing demand for NPN, which is also a source of crude protein supplement for ruminant animals. However, because corn oil has been qualified as a biodiesel feedstock since 2013, more ethanol plants have installed facilities to extract corn oil from distiller's grains. As a result, the nutritional value of DDGS is reduced. The animal feed industry noticed animal performance issues after feeding them the low-oil-content DDGS.

In China, NPN consumption in the feed market has matured as growth normalizes. Demand will be driven primarily by the mild growth of Chinese cattle populations over the next few years. Although China also produces DDGS as a coproduct of the corn ethanol industry, DDGS use in the animal feed market is mainly in the duck and fish subsectors.

In 2015, urea accounted for 85% of the world consumption of NPN. It is followed by liquid ammonium polyphosphate, which is used as a source of nitrogen and phosphorus in liquid protein supplements. Ammonium sulfate is the third-largest NPN consumed worldwide, and is used to some degree in many of the regions as a component of compounded cattle feeds.

Overall, cattle population and animal nutrition formulation (i.e., DDGS for its NPN substitution effect, or per-cattle feed consumption) are the major factors determining NPN consumption.

World consumption of NPN animal feeds is forecast to grow at an average annual rate of almost 2% during 2015–20, led by growth in the consumption of urea. In Central and South America, Brazil drives NPN consumption, with urea being used widely. In Other Asia, urea is the primary product used for NPN; India is the major producer and consumer of feed urea. India's feed industry is transforming from small fragmented farms to large organized farms with increasing knowledge of animal nutrition. NPN utilization in ruminant animals is growing from a relatively low base.

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