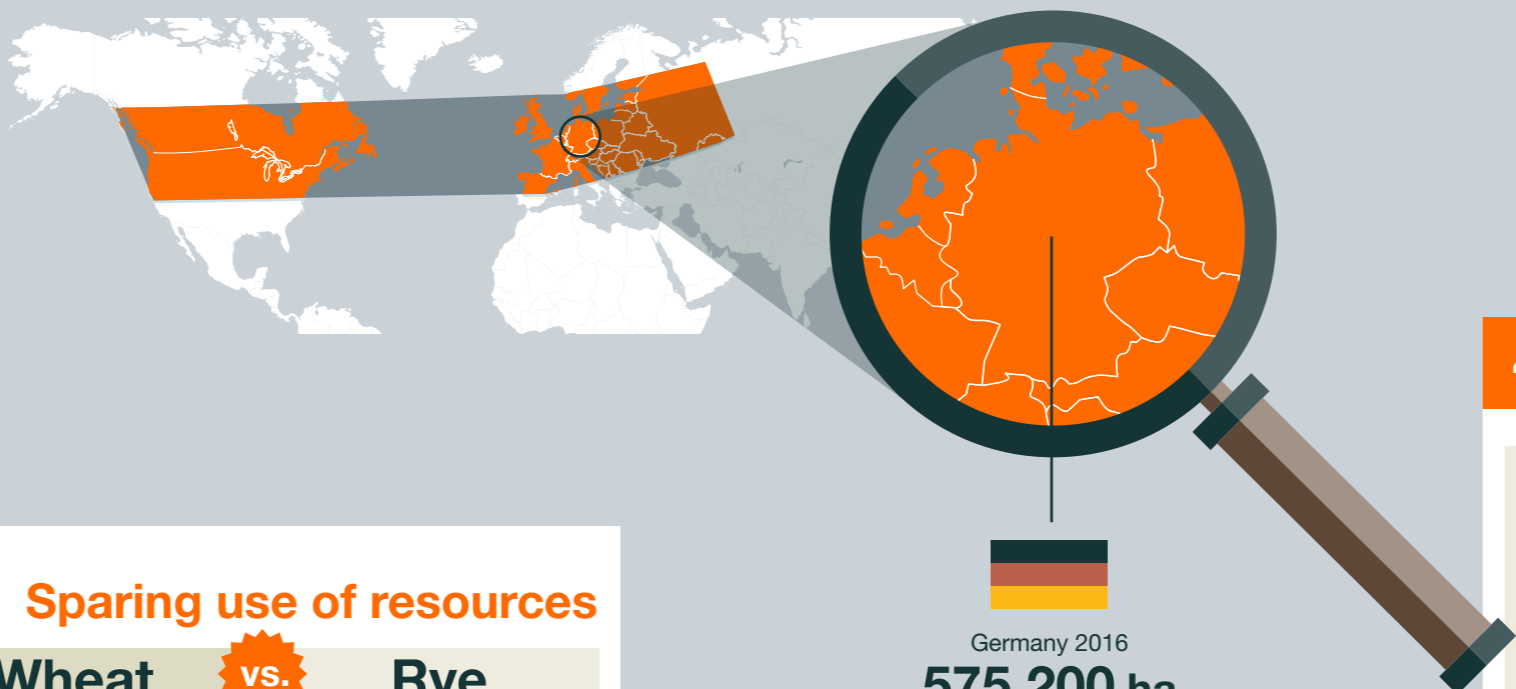
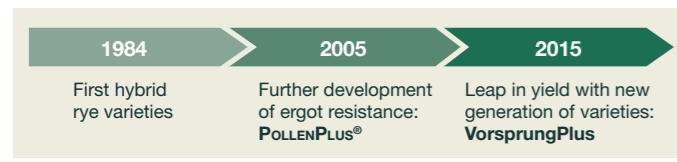


Rye delivers sustainability



1 Yield progress

KWS' continuous work on breeding progress



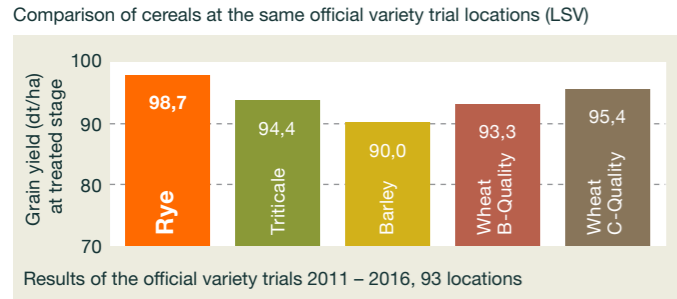
The formula for success in hybrid breeding



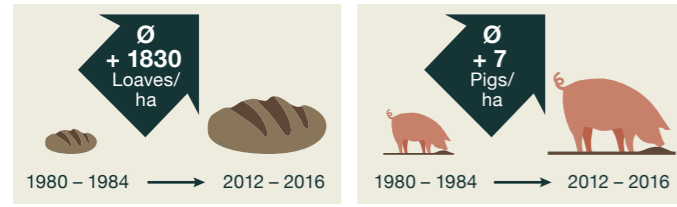
Higher yield in hybrid breeding



Highest yield among cereals



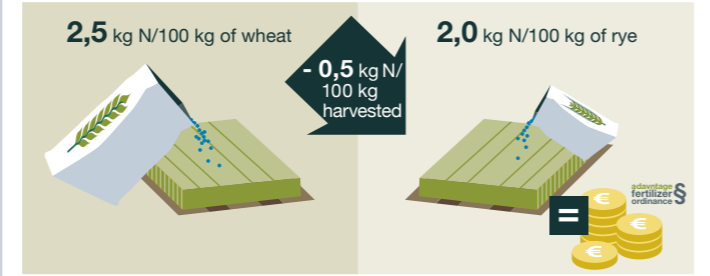
Leap in yield since introduction of hybrid rye (1984)



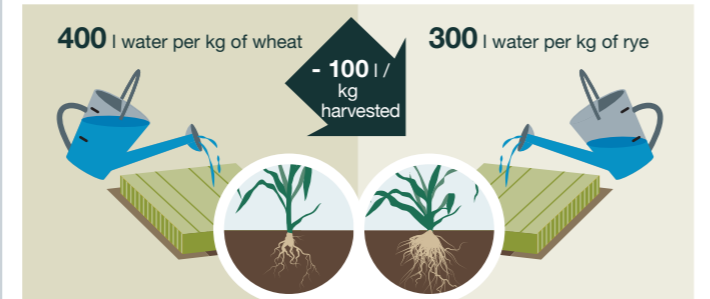
2 Sparing use of resources

Wheat vs. Rye

Rye: lower nitrogen requirements



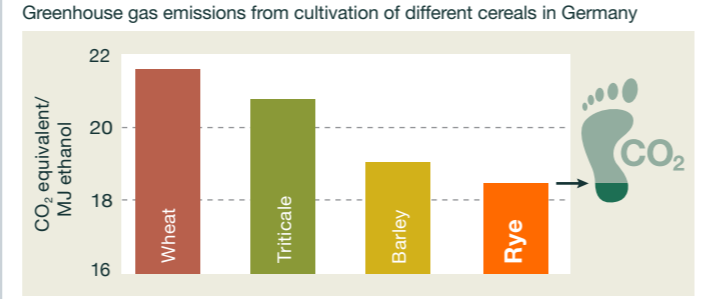
Rye: lower water requirements



Rye: less need for pesticides

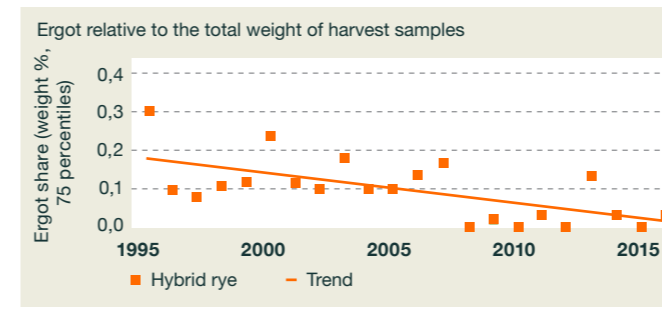


Rye: lowest CO₂ footprint among cereals

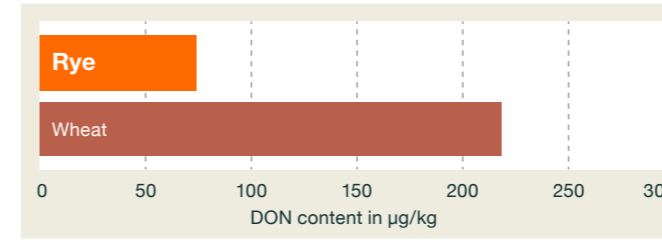


3 Raw material quality

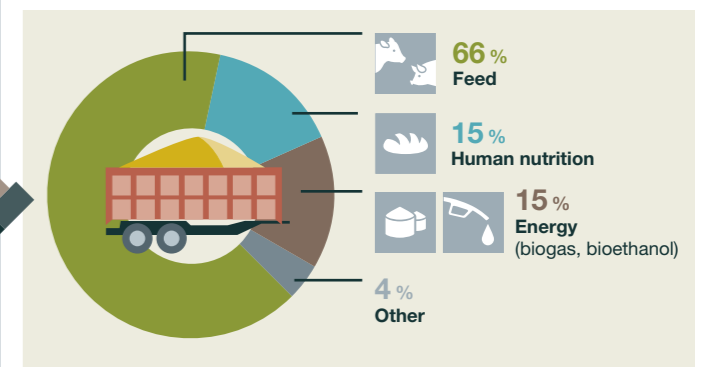
POLLENPLUS® protects against ergot



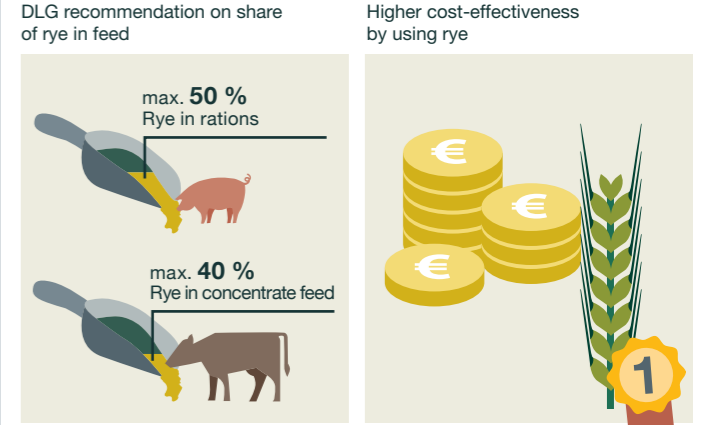
Less risk from Fusarium



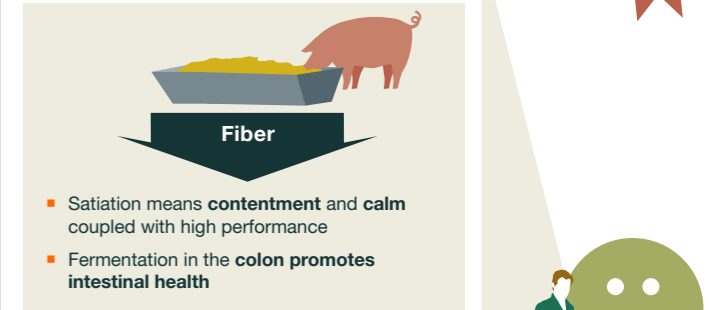
4 Possible uses



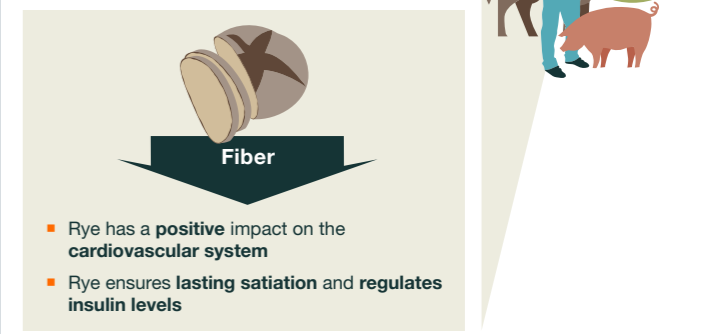
Cut feed costs with rye



Rye for animal welfare



Rye for a healthy diet



1) Yield progress | The formula for success in hybrid breeding (own presentation based on Becker, 2011, and Longin, 2013); Higher yield in hybrid breeding (own allocation of the official trial results 2004 – 2016, KWS LOCHOW, 2017); Yield of the cereals (results of official variety trials (LSV) 2011 – 2016, 93 locations with LSV rye, LSV triticale, LSV barley and LSV wheat (B and C wheat), comparison of the averages for all tested varieties, results for Lower Saxony North Rhine-Westphalia and Schleswig-Holstein calculated from relative values, KWS LOCHOW, 2017); Leap in yield since introduction of hybrid rye (basis for calculation in the Descriptive Variety List (1980 – 1984) vs. (2012 – 2016); 1 loaf ± 1 kg of rye (i.m.a., 2011), 3,500 MJ per pig (LFL Bavaria, 2014))
 2) Sparing use of resources | Nitrogen requirements (draft Fertilizer Ordinance, Dec. 16, 2015, N uptake for wheat 2.51 kg/dt, N uptake for rye 1.96 kg/dt); Water requirements (Lower Saxony State Authority for Mining, Energy and Geology 2011); Need for pesticides (LFL contribution margins and calculation data, LFL Bavaria, 2016); CO₂ footprint (averages for the German NUTS 2 regions (BMEL, 2009))
 3) Raw material quality | POLLENPLUS® (KWS LOCHOW, 2017); Ergot relative to the total weight of harvest samples (MRI Detmold, Special Harvest Investigation 1995 – 2016); less risk from Fusarium (averages of the DON content in harvested wheat and rye 2006 – 2015, own presentation based on the figures from the Bavarian State Institute for Agriculture (KWS LOCHOW, 2017))
 4) Possible uses | (supply balance sheet for wheat 2014/2015, BLE, 2016); Cut feed costs with rye (DLG recommendation on share of rye in feed (DLG, 2006)); Rye for animal welfare (KWS LOCHOW, 2017); Rye for a healthy diet (www.ryeandhealth.org, 2017)