

FERTILIZER APPLICATION: DRIVING THE FUTURE WITH INNOVATIONS

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History of Fertilizer

By definition fertilizer refers to

- substances, or
- mixtures of substances

dedicated to

- replenish, or
- complement

nutrients for cultivated plants

Goal: Optimization of available nutrients

- improve yield amount
- improve quality

Traditional agriculture: organic fertilizer, with many names and types used since thousands of years

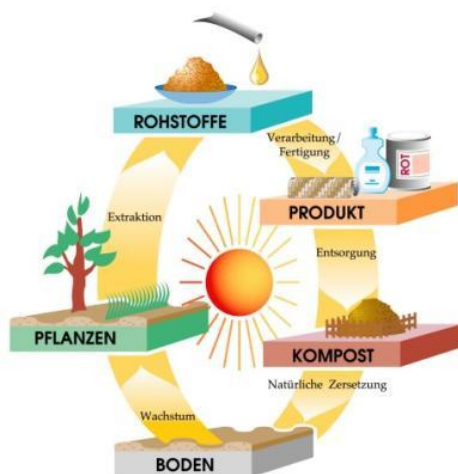
- manure, liquid manure
- dung, mulch, muck, slurry

Later in time also other substances came to use

- ashes
- lime

→ limited availability

- sustainable with tendency to closed loop
- impossible to „get more out than in“

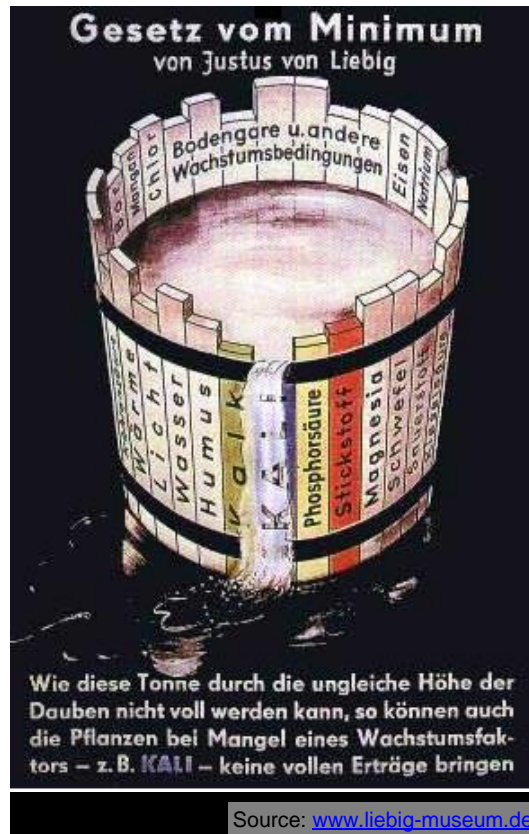


Science I:

1840 Justus von Liebig was able to prove (plant) growth and development enhancing effects of e.g. nitrogen, phosphate, potassium

- Liebig's „minimum principle“
- raising interest in guano as nitrogen deliverer
- prospering guano exports from South-America
- guano stocks limited (finite / deployed faster than replenished)
- demand growing with population increase

~ 1900: 20 years until N-demand will exceed N-availability [1]



Science II:

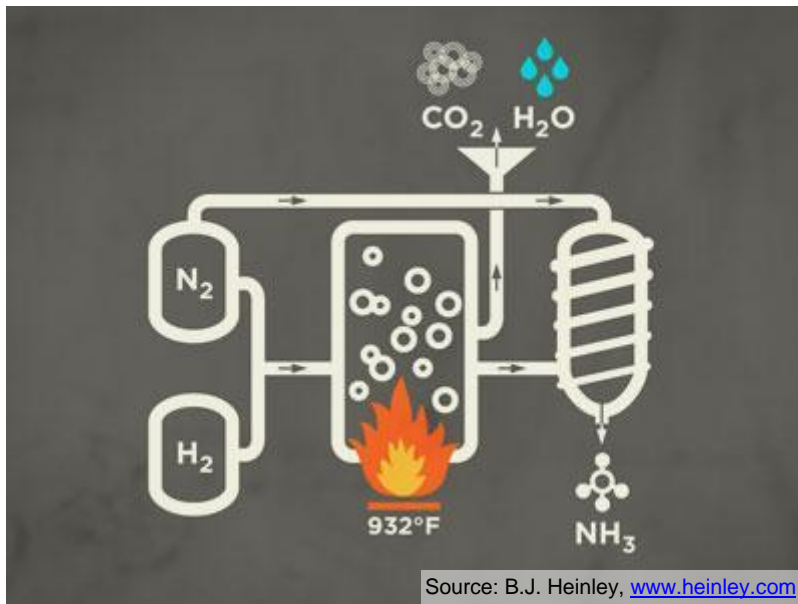
Haber-Bosch process patented in 1910 by BASF

- catalytic synthesis of ammonia
- ammonia as the basis for production of mineral fertilizer (and dynamite)

A total of three (3) Nobel-Prices was awarded for this milestone!

Availability of mineral fertilizer

- is the foundation of modern agriculture
- is one of the pillars of modern society



Availability of mineral fertilizer made it possible

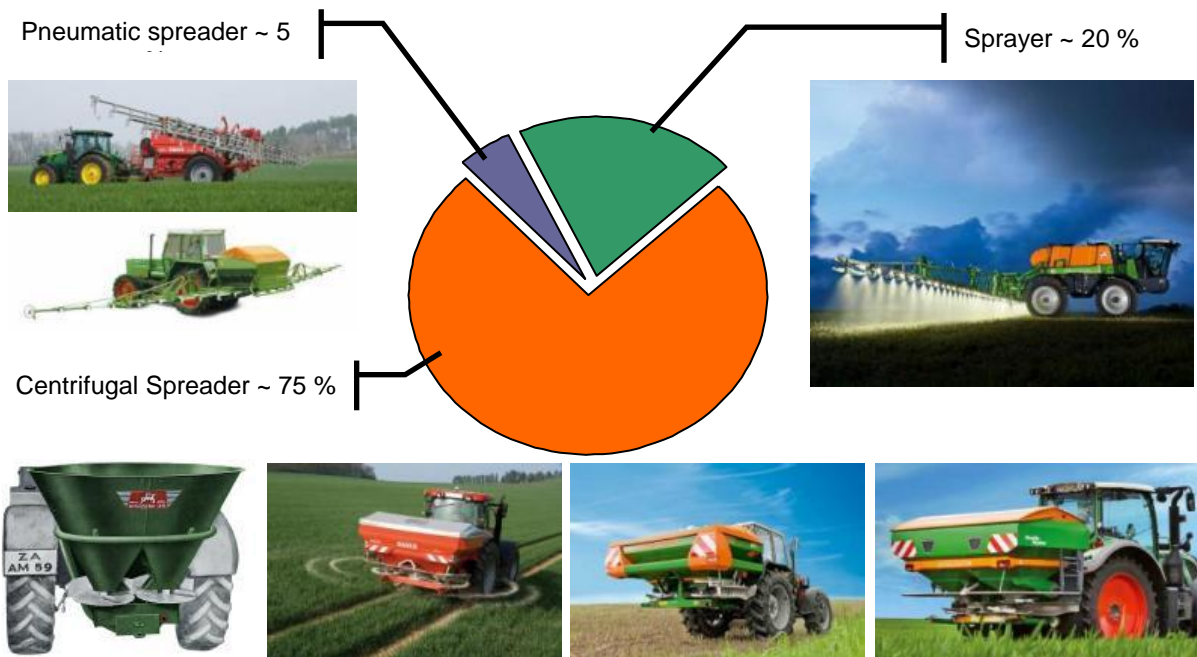
- to exactly know what you apply
- increase yield and quality
- to apply at any time, as demand of the plant growth

However, the fertilizer had to be brought out in the field

- dosage
 - correct amount
- distribution
 - proper location
- in due time

Application equipment

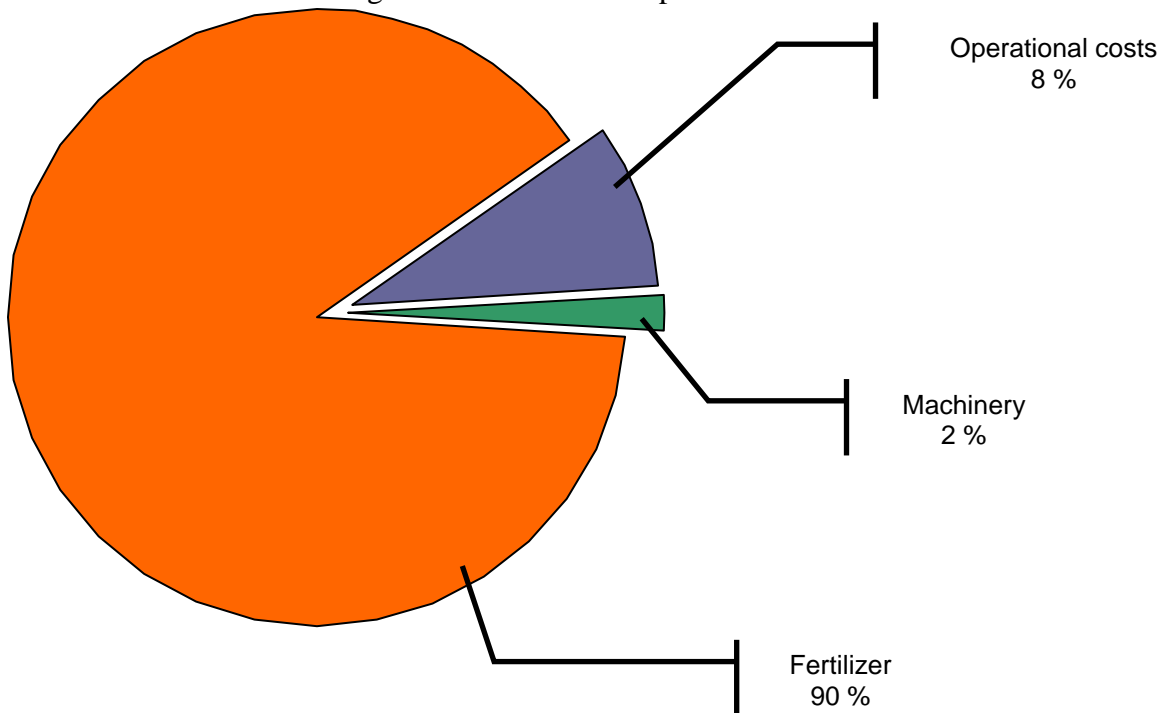
Twin-disc spreaders: A success history



Success story: Background

Fertilizer

- Annual average cost share of a European ~ 1.000 ha cereal farm



- Centrifugal fertilizer spreaders are a comparable cheap way to apply material in the field
- Cost of the material exceeds machinery cost by far
- Spreaders are sold in comparably high numbers
 - little individualization = standard machine

- willingness to invest in more efficient machinery
 - working width
 - precision of application
 - in field
 - boundary situations

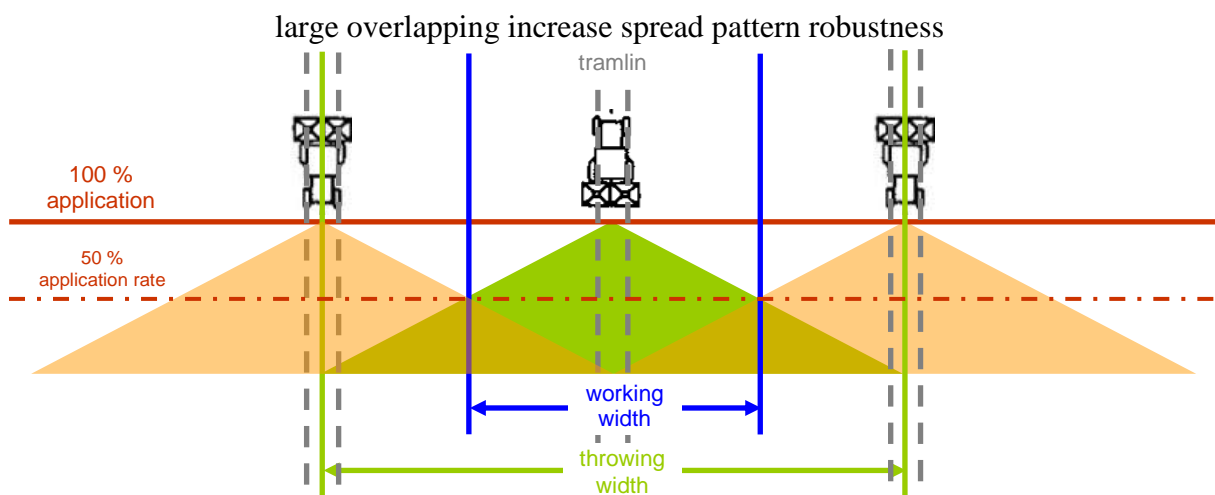
- willingness to invest in effectiveness
 - reduce amount of fertilizer
 - VRA
 - maps
 - sensors
 - sensor overlay

Working principle of a twin-disc spreader

Application quality

„good“ spread-pattern are characterized by

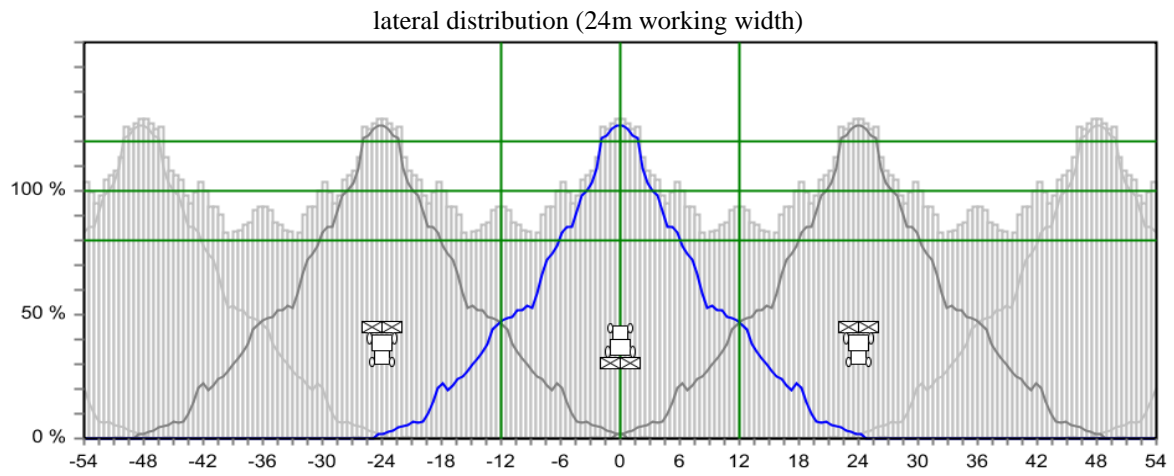
- flat spread-curves
- big overlap



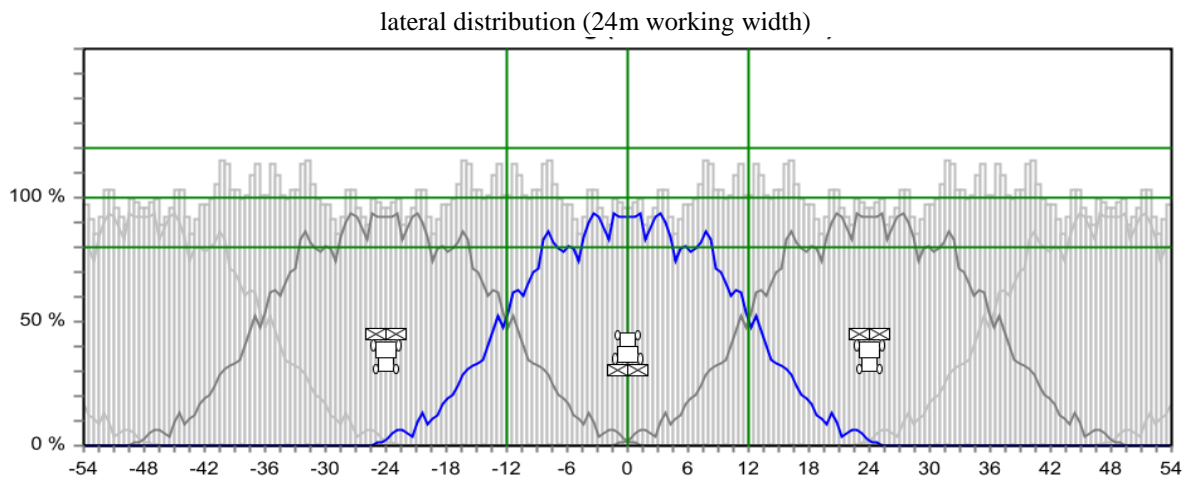
Application quality can be measured

- coefficient of variation (COV) in lateral distribution

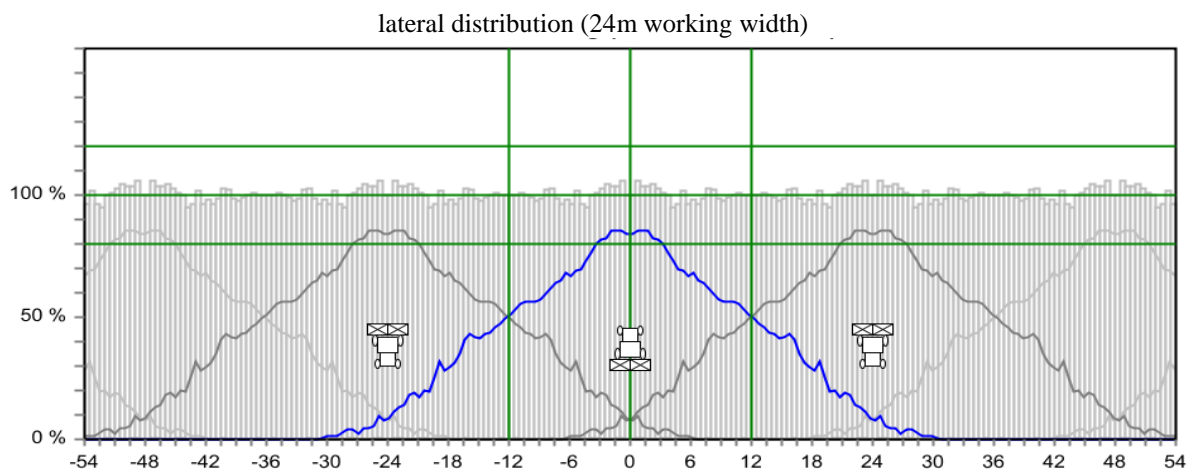
COV < 15 % → not visible in the field



COV < 8 % → settings recommendation



COV < 3 % → Perfect triangular spread pattern!



Optimizing results of a twin-disc spreader

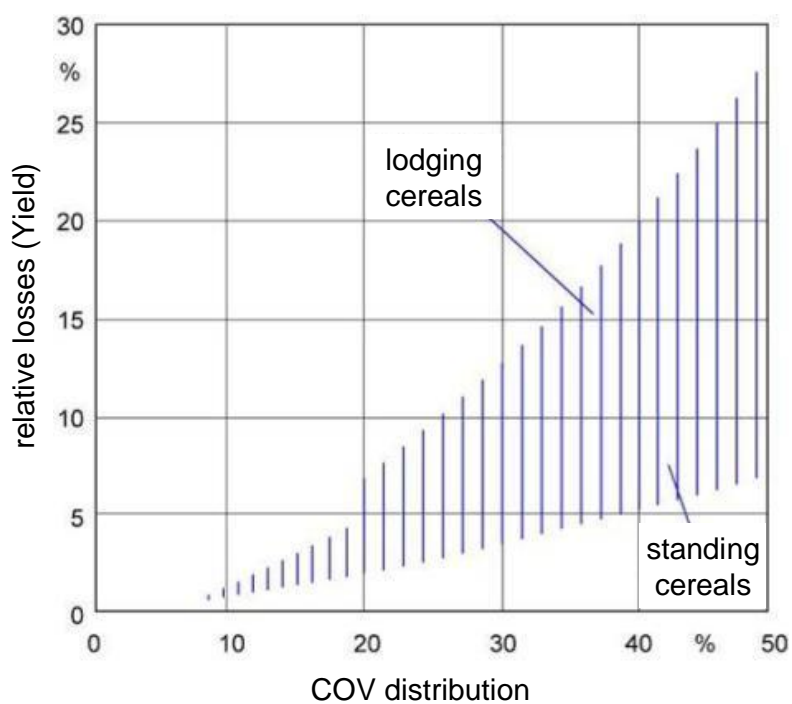
2010: new spreading test hall in Gaste

- 120 spread tests per day
- up to 72 m throwing width
- 3D spread patterns



Effects of application quality

Losses due to bad lateral distribution of fertilizer (lodging)



Milestones in Fertilizer Application

1958: Twin-disc spreader ZA

1968: first quantity effect-free fertilizer spreader ZA-S

1979: new swivel blades ZA-F

1981: first exchangeable disc ZA-U

1990: new adjustable vanes ZA-M

2000: 52 m working-width ZA-M Ultra

2013: 54 m working width ZA-TS

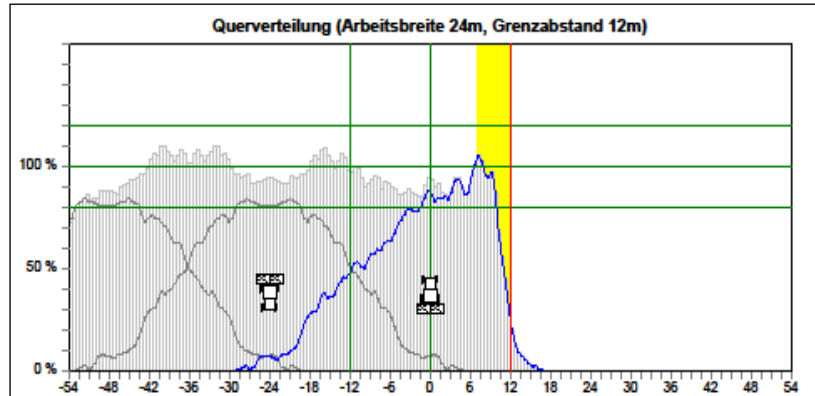
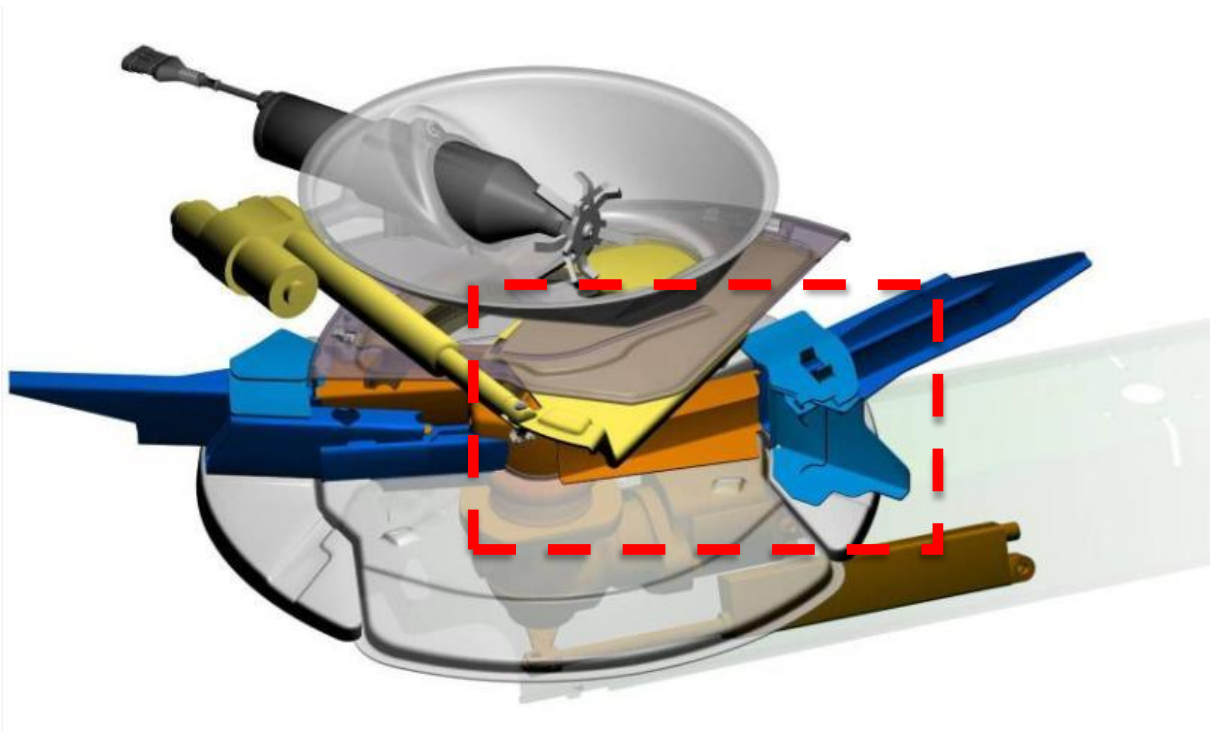


	1910	1915	1958	1968	1980	1990	2000	2013
	manual labor	Michel	ZA	ZA-S	ZA-U	ZA-M	ZA-M Ultra	ZA-TS
Speed	< 3 km/h	5 km/h	5-6 km/h	10 km/h	8 km/h	12 km/h	15 km/h	30 km/h
working width	2-3 m	4-5 m	10 m	15 m	24 m	36 m	52 m	54 m
capacity	< 30 kg	300 kg	500 kg	1.500 kg	2.000 kg	3.500 kg	5.000 kg	5.500 kg
strength	0,4 ha/h 4 ha/d	0,8 ha/h 8 ha/d	2 ha/h 20 ha/d	5 ha/h 50 ha/d	8,5 ha/h 85 ha/d	20 ha/h 200 ha/d	40 ha/h 400 ha/d	50 ha/h 500 ha/d

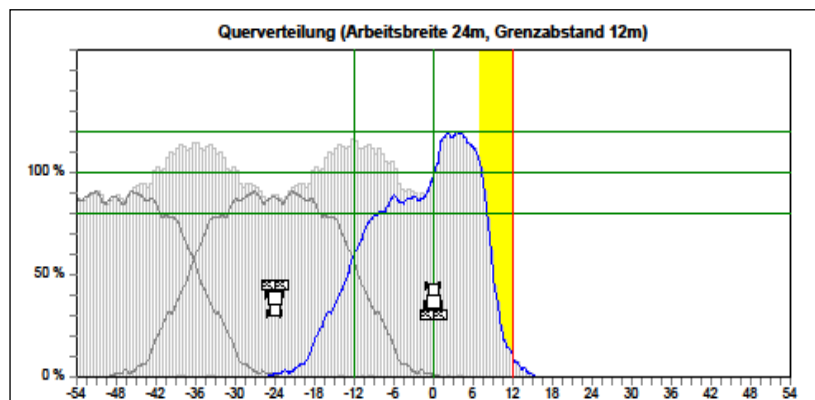
Amazone ZA-TS



New boundary spreading system AutoTS of the ZA-TS



Amazone Auto TS



conventional system (market standard)

Innovations

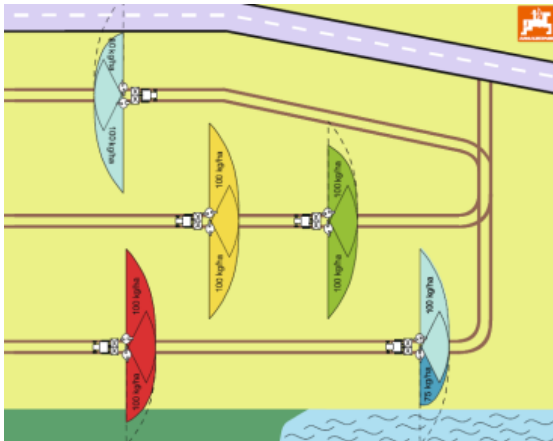
- Profis
- Hydro
- GPS-Switch
- GPS-Track
- WindControl
- HeadlandControl
- Argus

ZA-M profis - Fertilizer spreader with online weight system

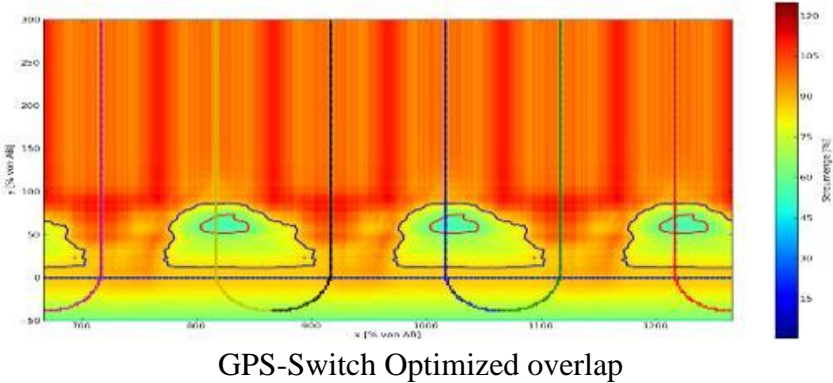
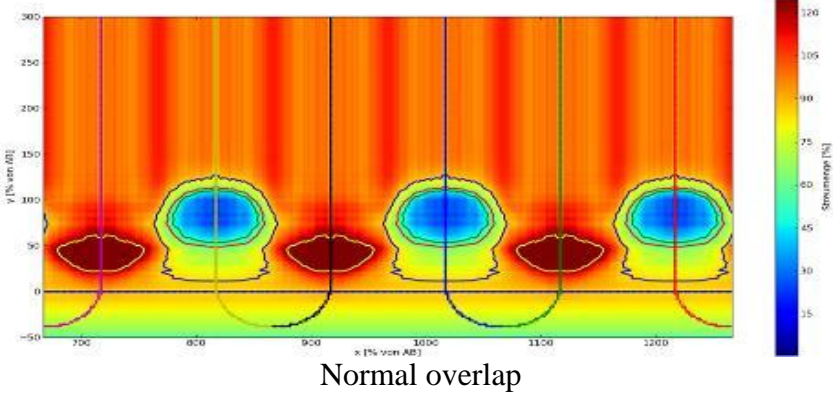
permanent control of the value



ZA-M Hydro / GPS-Switch

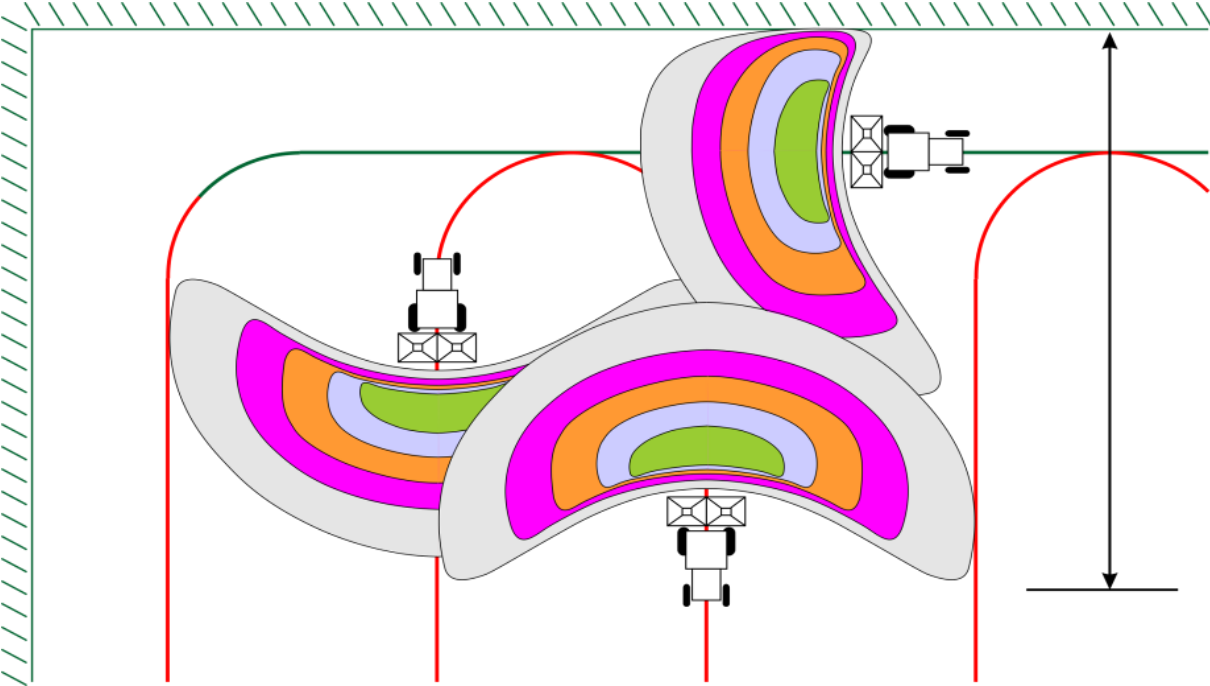


GPS-Switch - Headland



Innovation: GPS-Switch – Headland

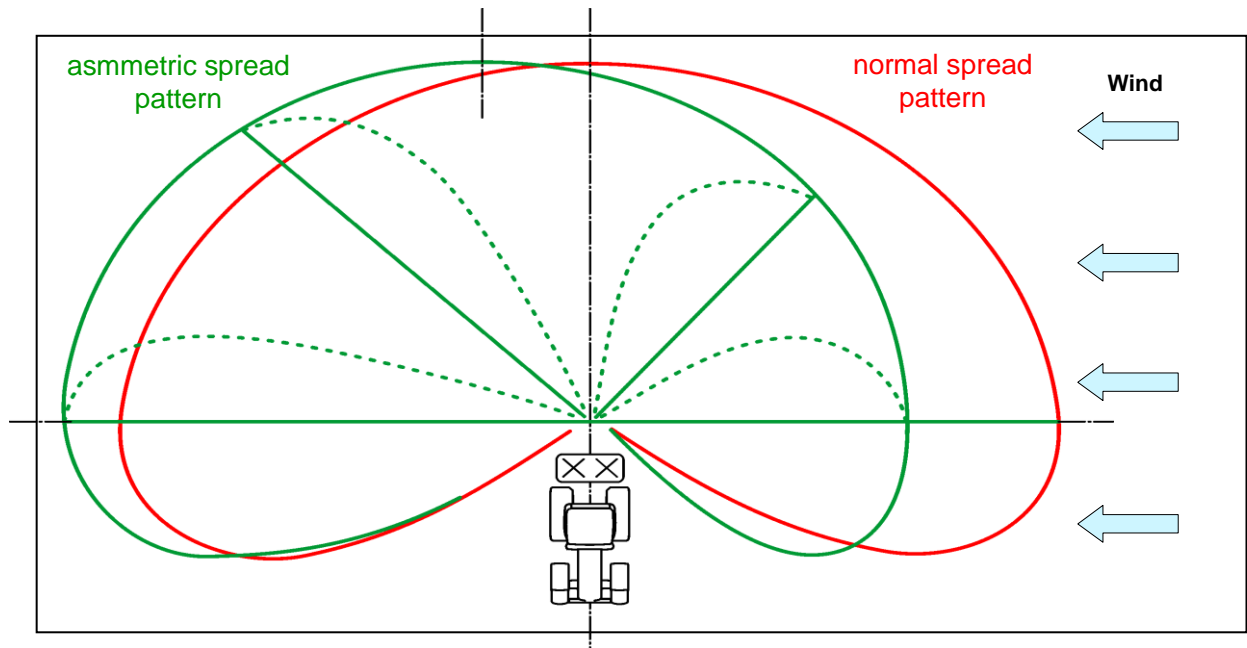
Automtically switchinn on or off ad the Headland



Limit the risk of large working width

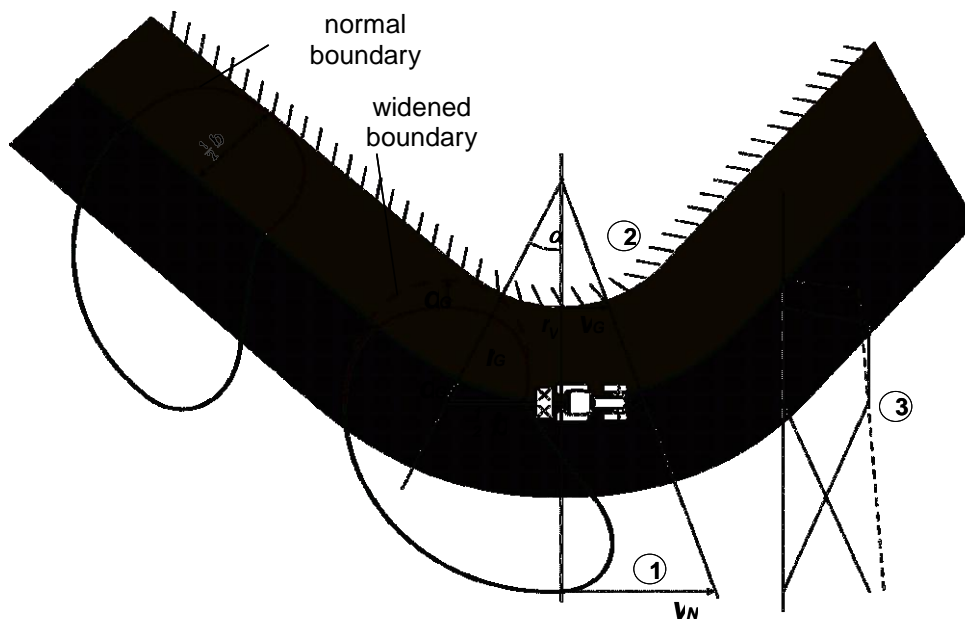


- WindControl
 - compensates spread pattern drift due to wind



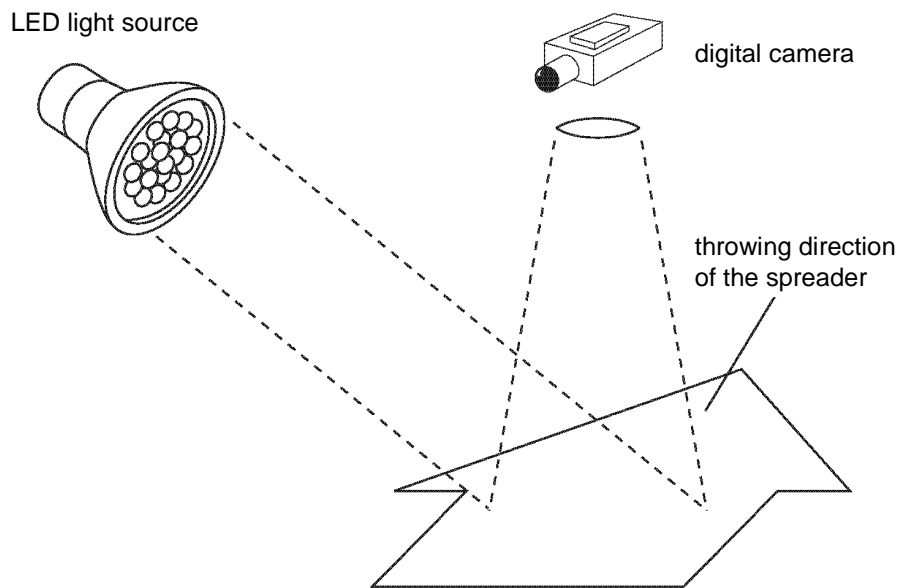
Limit the risk of large working width

- HeadlandControl
 - compensates spread pattern position & direction



Limit the risk of product heterogeneity

- ARGUS
 - system concept



Results



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