

# Spreading fertiliser precisely: new products and challenges

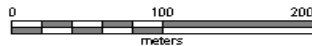
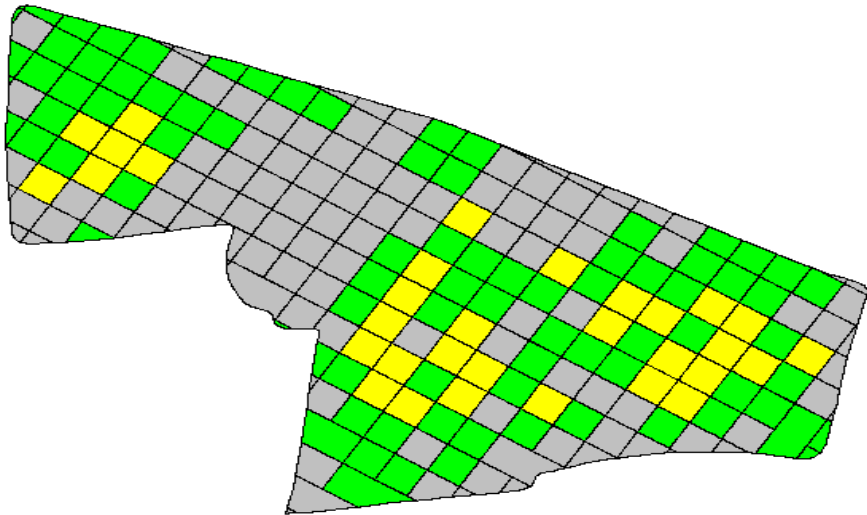
**Soil Fertility Conference 2016**

**Dermot Forristal**  
*Teagasc CELUP*  
*Oak Park Crops Research*

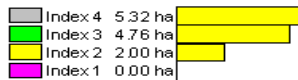


But are we more precise today ?

# Precision Fertiliser ?



**Client:** Collins, John  
**Farm:** Cappoquinn Estate  
**Field:** johncollins  
**Crop:** 2015 Oats  
**Name:** cappelquin soil sample result:  
**Type:** Soil Test  
**Date:** 14/09/2015  
**Min:** 3.4 ppm  
**Max:** 87.0 ppm  
**Avg:** 13.2 ppm



- ▶ Grid soil testing
- ▶ Spatially variable application P, K and lime

# Precision Fertiliser ?

Not always clear cut benefits !

More immediate Concern:

Apply Fertiliser Evenly and Precisely



# Outline

## ◆ Precise fertiliser application

## ◆ Urea spreading

- ▶ Fertiliser characteristics
- ▶ Spread Patterns
- ▶ Machine design
- ▶ Setting / Adjustment



**Striping: Need to Spread Evenly**



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**Lodging: Need to Spread Evenly**



# Challenges

## ◆ Wide bout widths:

▶ 12m ▶ 18m ▶ 24m ▶ 27/28m ▶ 30m ▶ 42m ?

## ◆ Machine testing: Field vs Test Hall

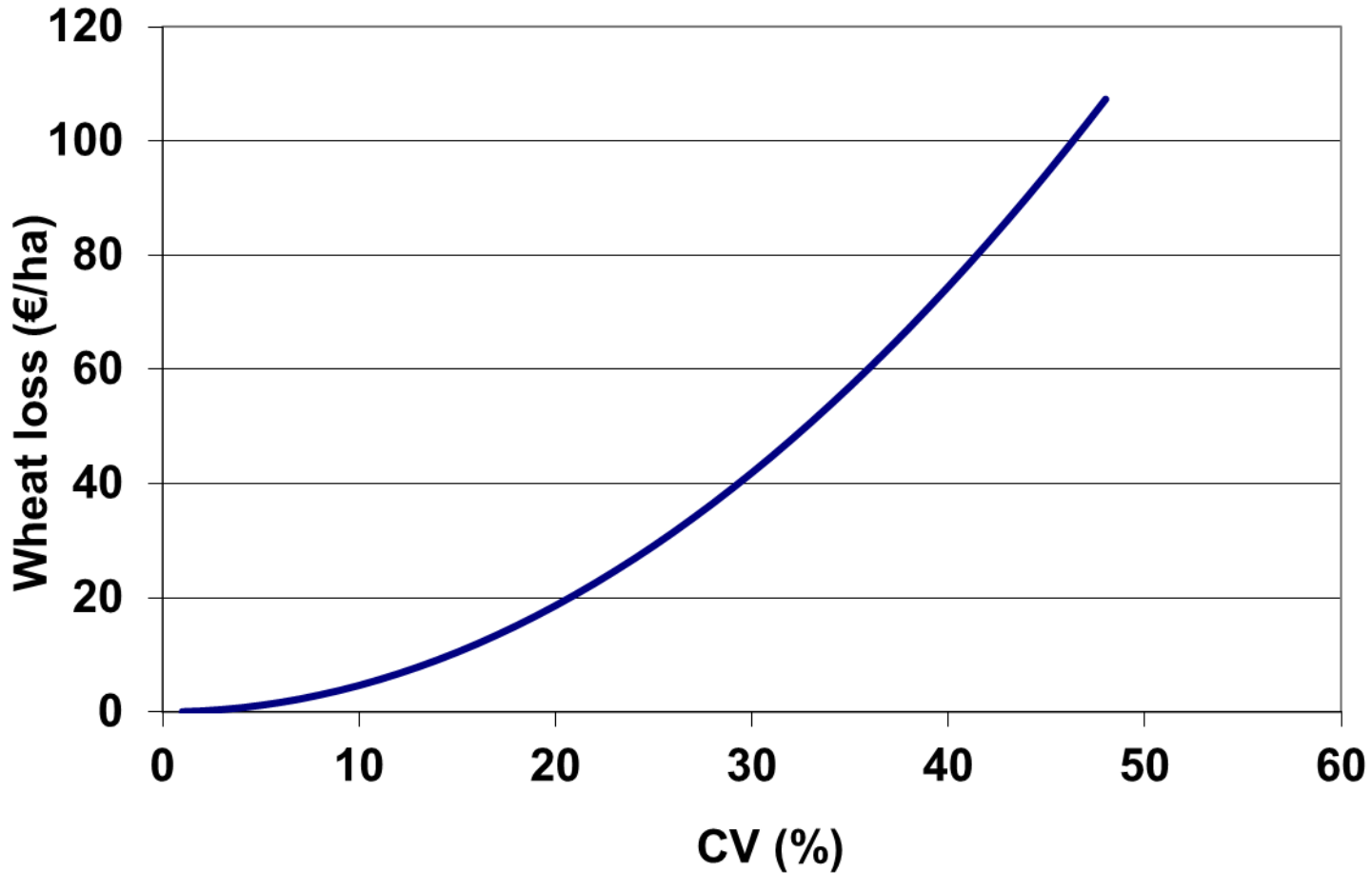
## ◆ UREA: More difficult to spread.

## ◆ All 3 in combination – biggest challenge

# Even Spreading

- ◆ Machine design
  - ◆ Fertiliser characteristics (Urea is different)
  - ◆ Machine setting
  - ◆ Field conditions
- 
- ◆ Evenness assessed by coefficient of variation (CV)

# CV & Wheat loss(€/ha): Sample



# Likely losses

## ◆ Poor spreading:

- ▶ If visible  $CV = 30\% - 50\%$  ?
- ▶ Loss in WW: €38 - €100/ha
- ▶ 5% to 10% = €3.20/ha

## ◆ Lodging and quality

- ▶ Lodging – big loss potential
- ▶ Quality – malting barley, milling wheat, all

# Fertiliser

# UREA

# Fertiliser characteristics

- ◆ **Granule size, shape, density and strength Influences:**
  - Movement on disc
  - Throw off from vanes
  - Movement through air
  - Breakage into smaller particles and dust



# Fertiliser characteristics

- ◆ **Size:** Larger: Captures more energy – easier throw
- ◆ **Shape:** Rounded: Rolls easier on disc; smoother through air
- ◆ **Strength:** Prevents breaking to dust / smaller particles
  
- ◆ **Ideal:**
  - ▶ 80% of particles in 2-5 mm range
  - ▶ Rounded and smooth
  - ▶ Blend components : mean particle size within 10% of overall mean
  - ▶ Strong particles that do not break
  
- ◆ **Interaction between fertiliser and spreader**

# Fertiliser characteristics

## Density:

- High density: A given size with more weight to capture more energy
- Golf ball v table tennis ball
- Distance and wind



## Fertiliser Types

**Most:** 1kg / litre

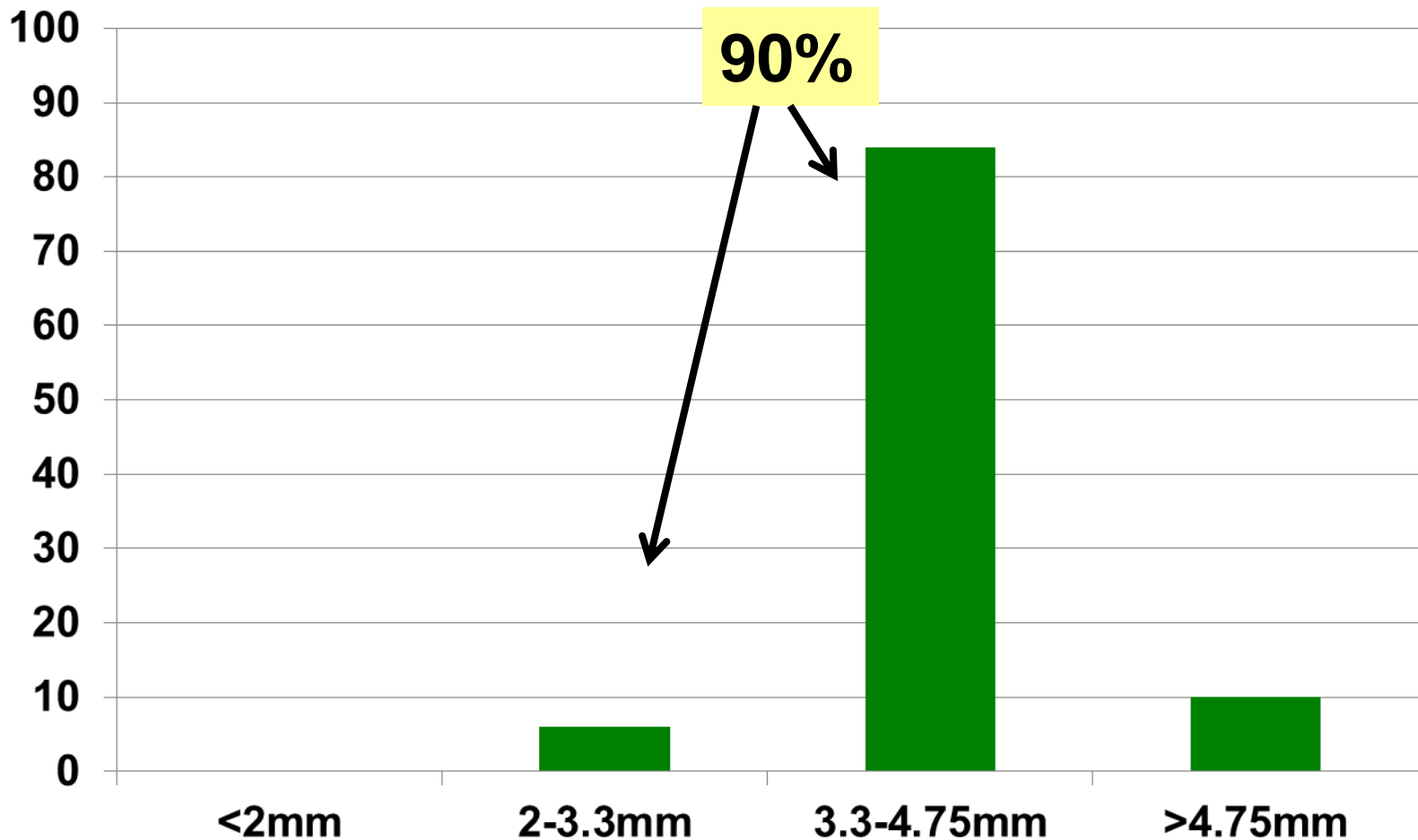
**Urea:** 0.7- 0.8 kg / litre



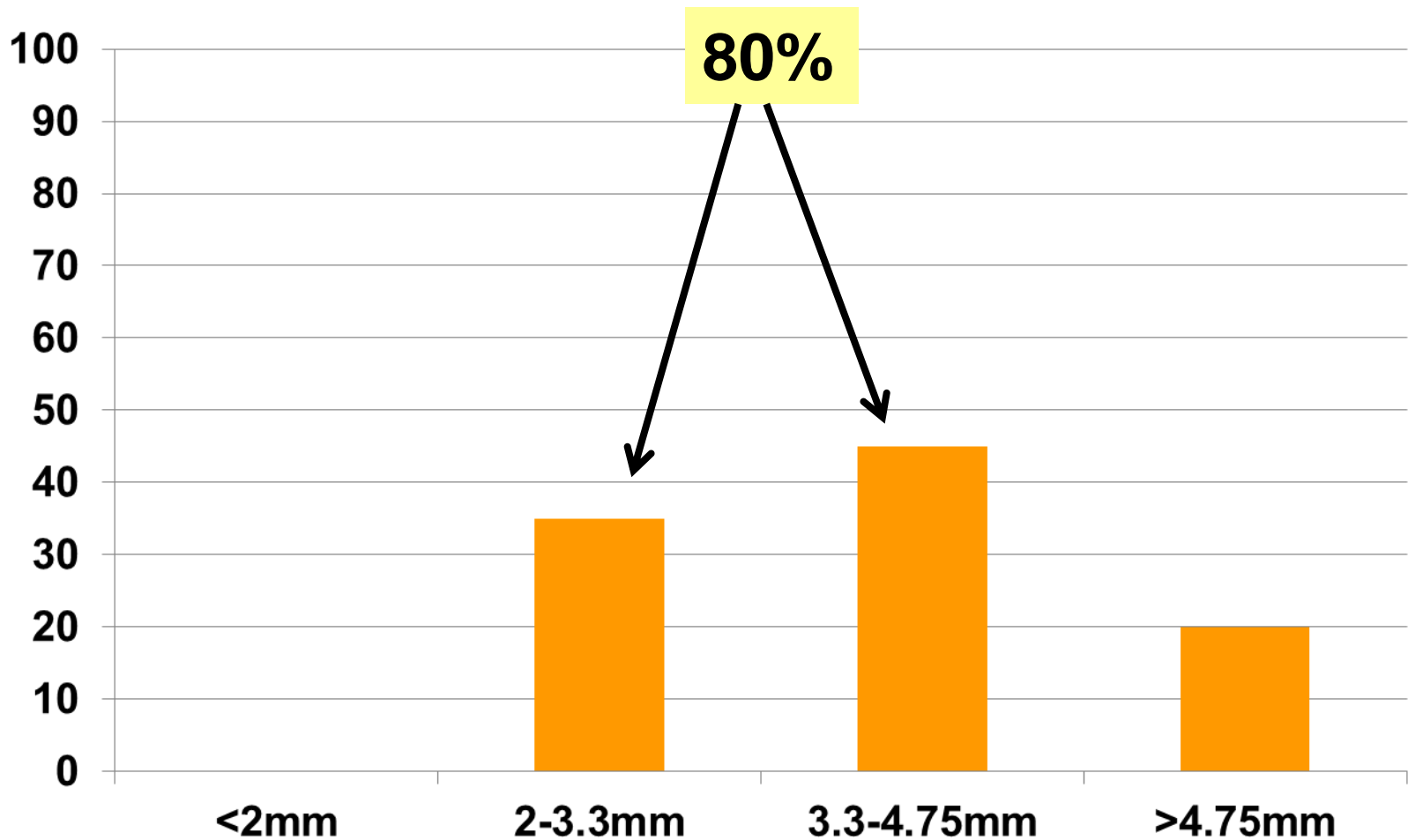
# Urea

- ◆ Lower Density – All Urea
- ◆ Different size distribution: not always poorer
- ◆ Particle Strength: may be weaker
  
- ◆ Huge variation in size distribution and strength
  - ◆ Depends on manufacturing plant
  - ◆ Lots of options available to Irish suppliers
  - ◆ Farmers must seek good physical quality

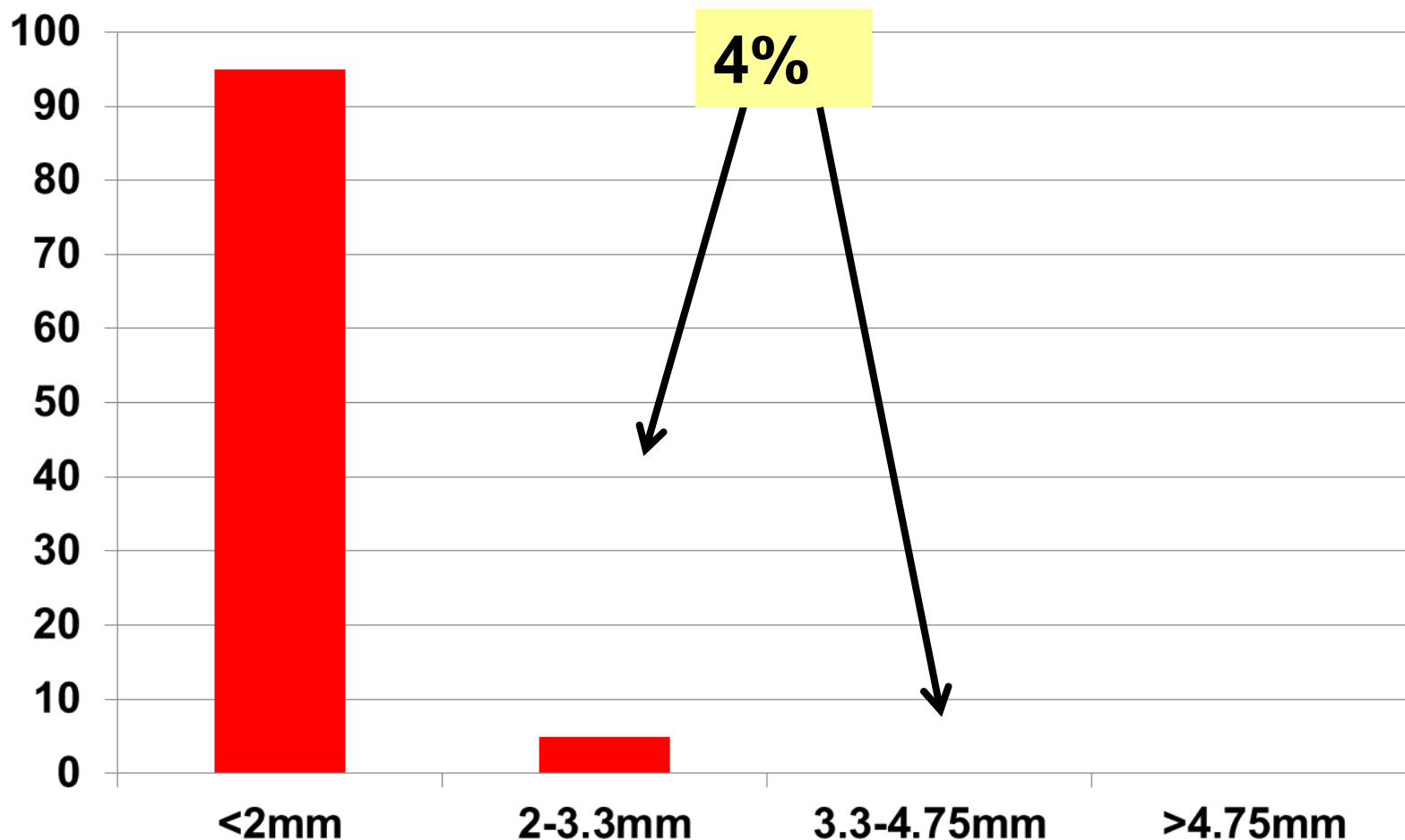
# CAN: Size distribution (%)



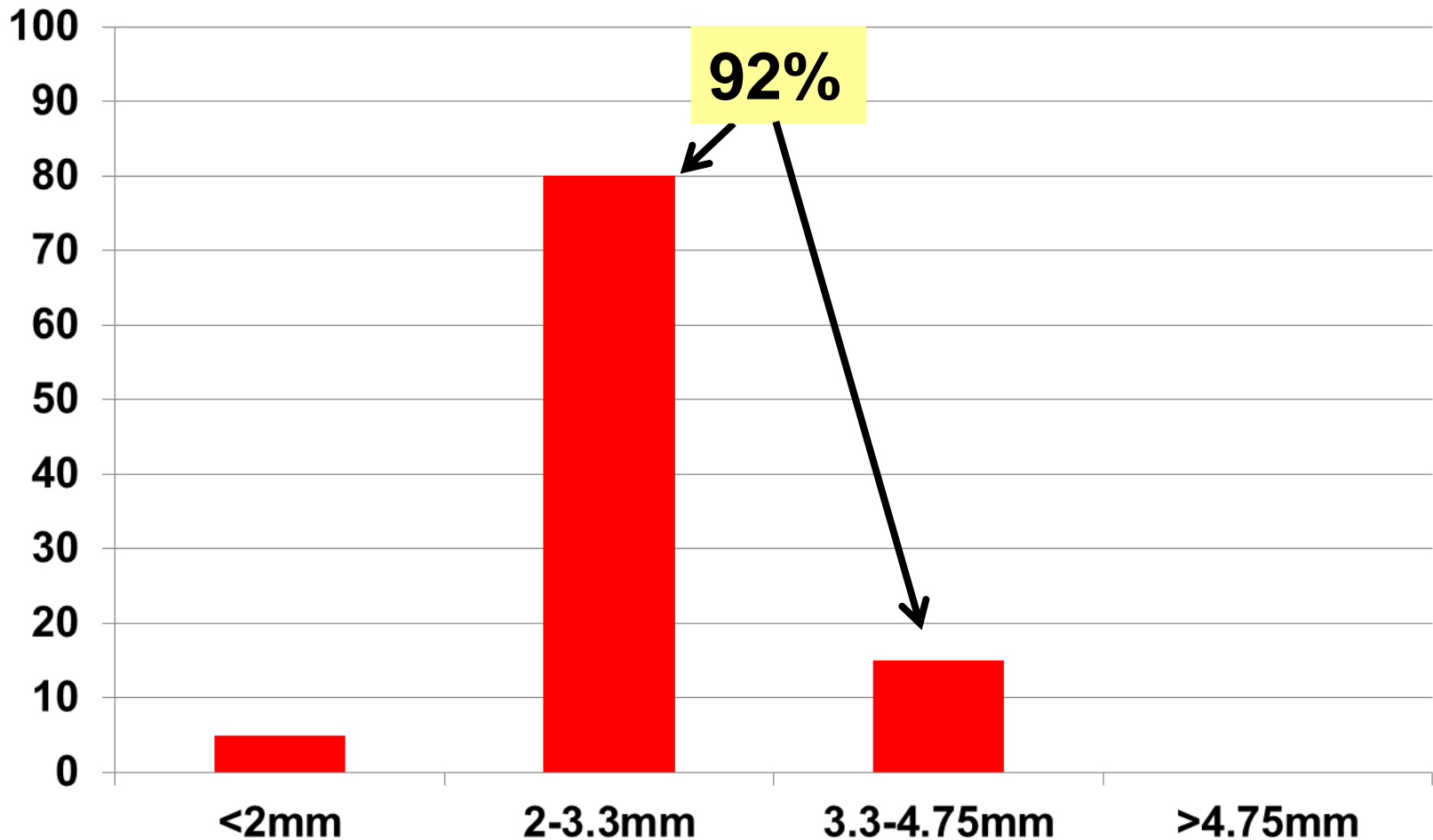
# NPK: Size distribution (%)



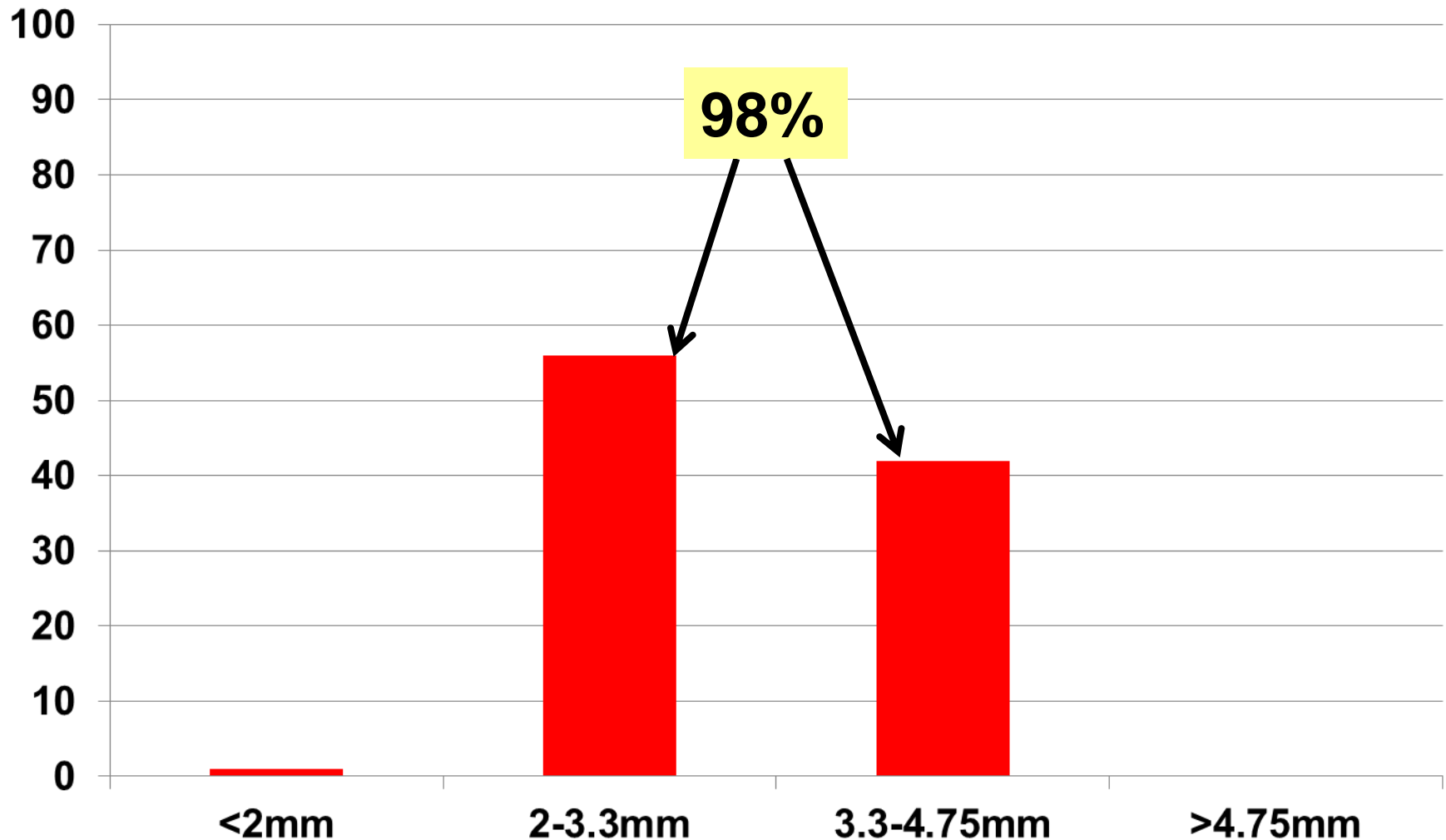
# UREA 1: Size distribution (%)



# UREA 2: Size distribution

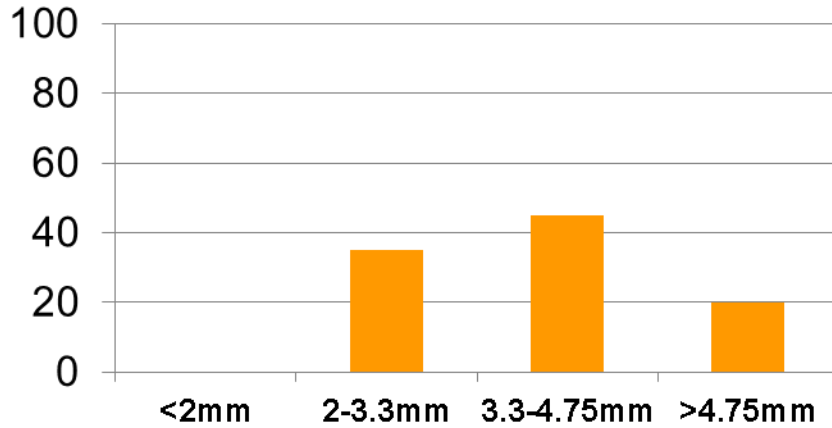


# Urea 3: Size distribution

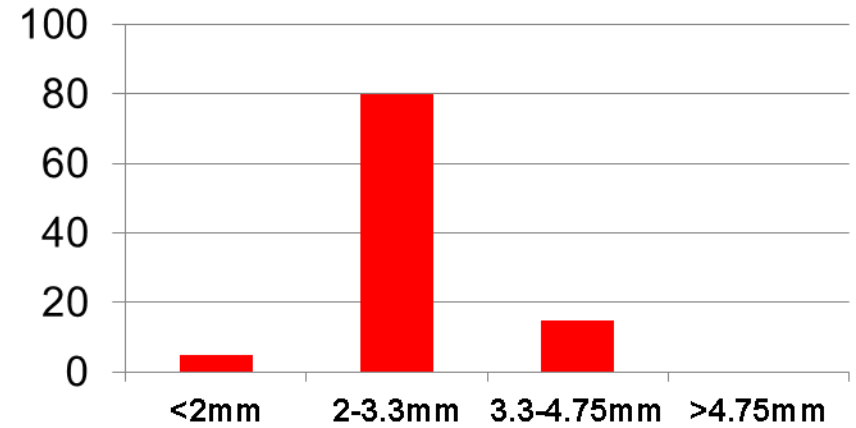


# Size distribution

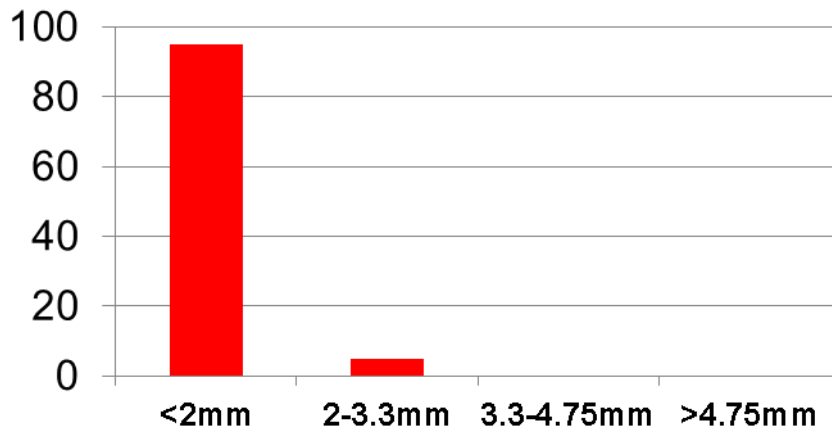
## NPK



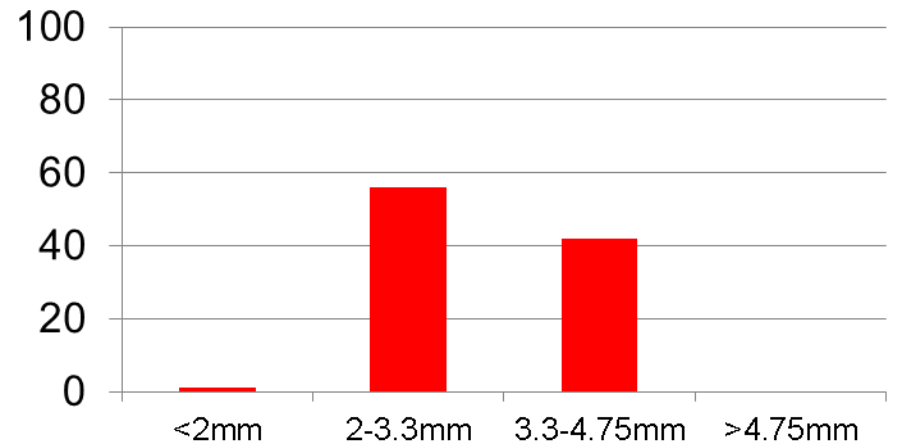
## Urea 2



## Urea 1



## Urea 3



# Fertiliser characteristics

- ◆ Prills or Granules - not really important
- ◆ Depends on size, shape, density



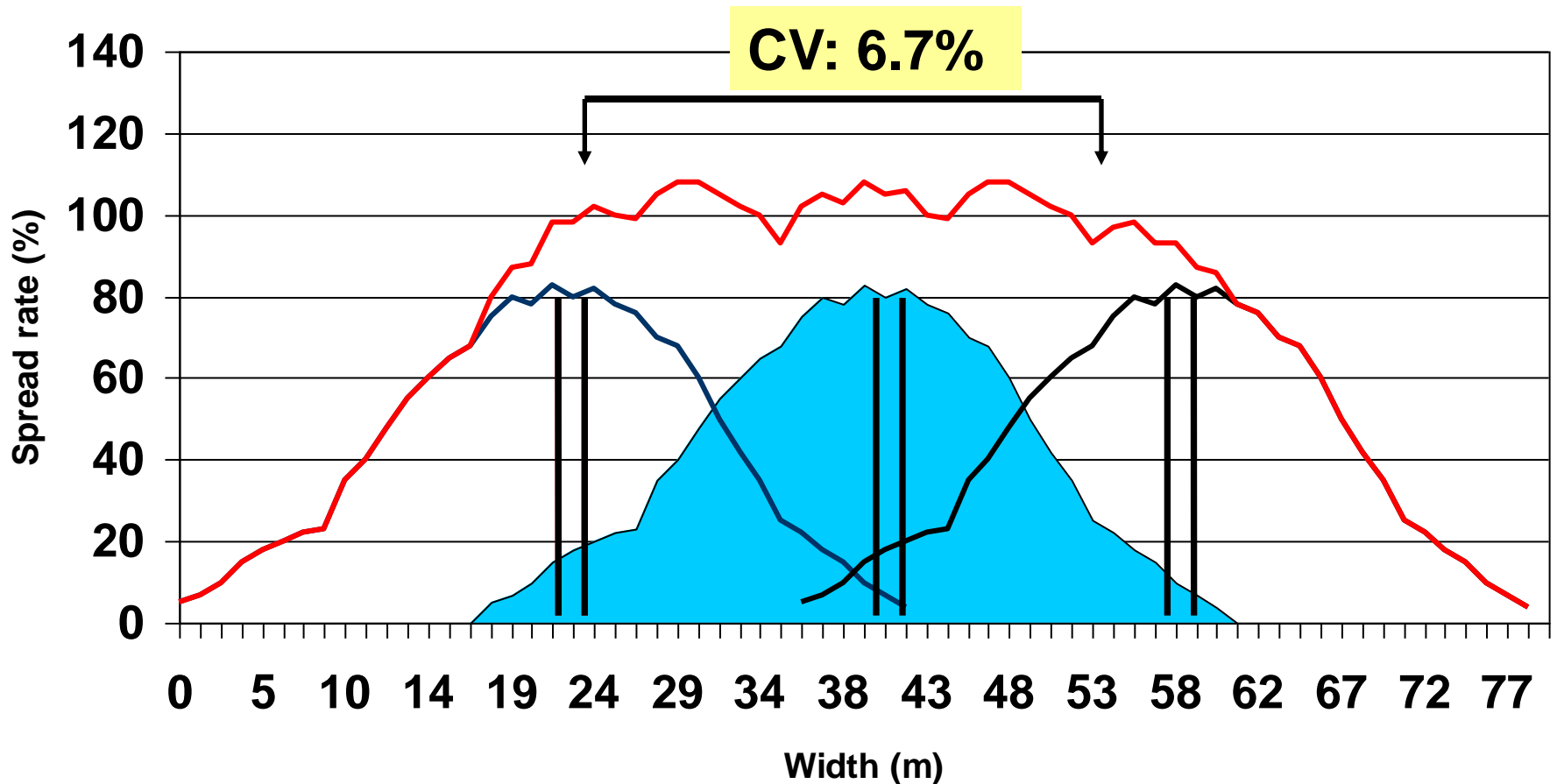
**Granules - Large**

**Prills - Large**

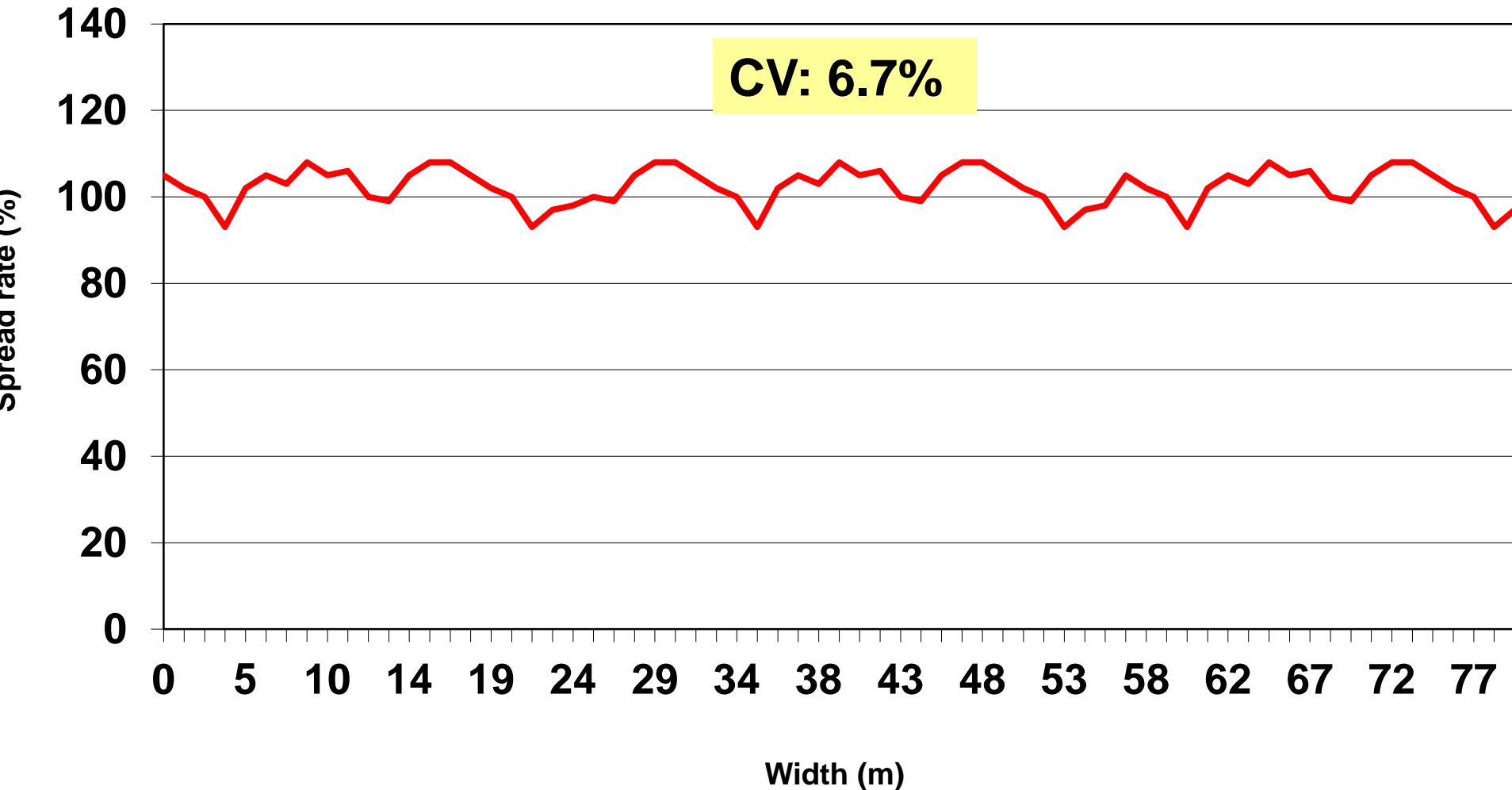
**Prills - Small**



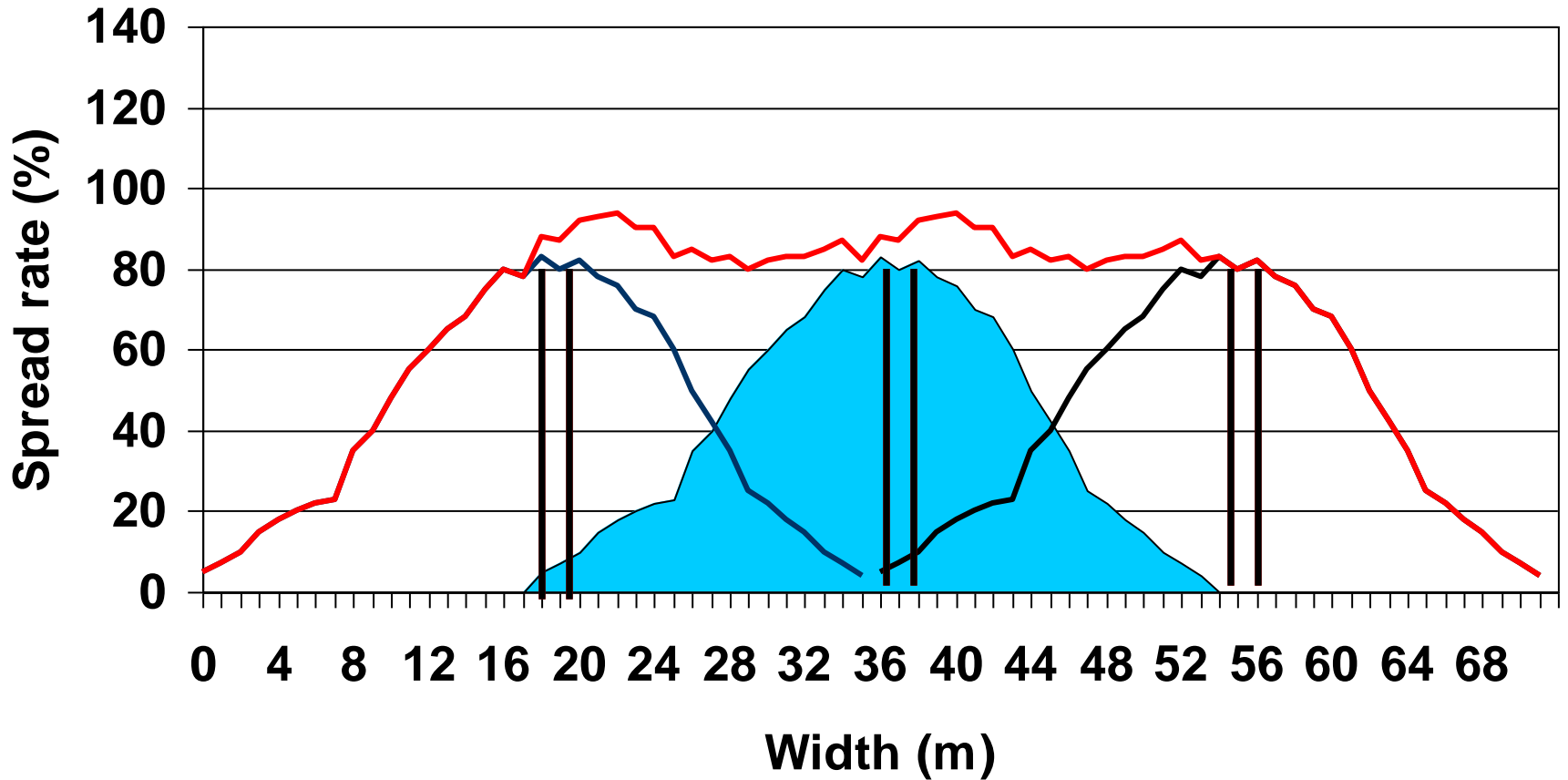
# Good Quality Fertiliser: Triangular



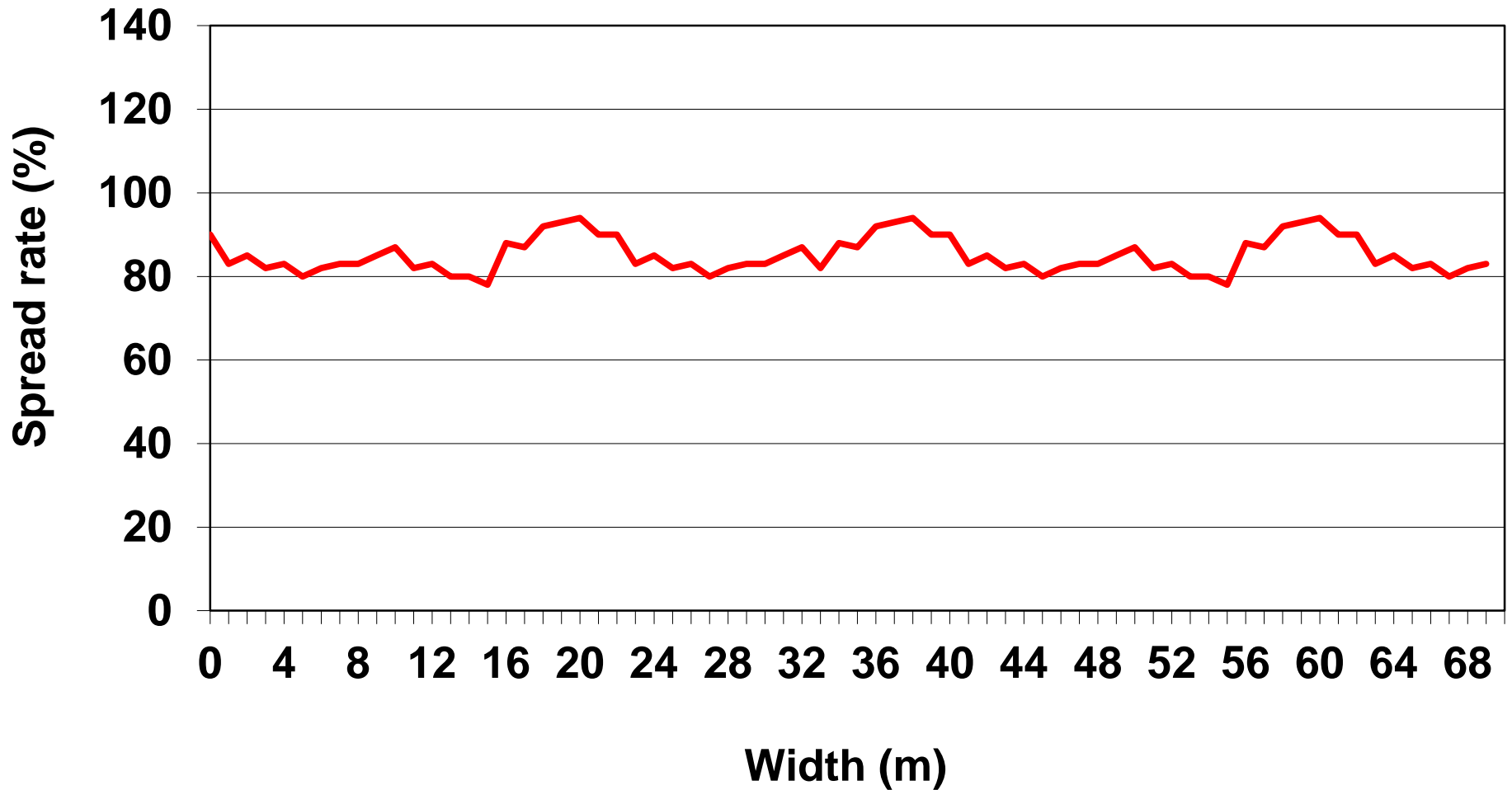
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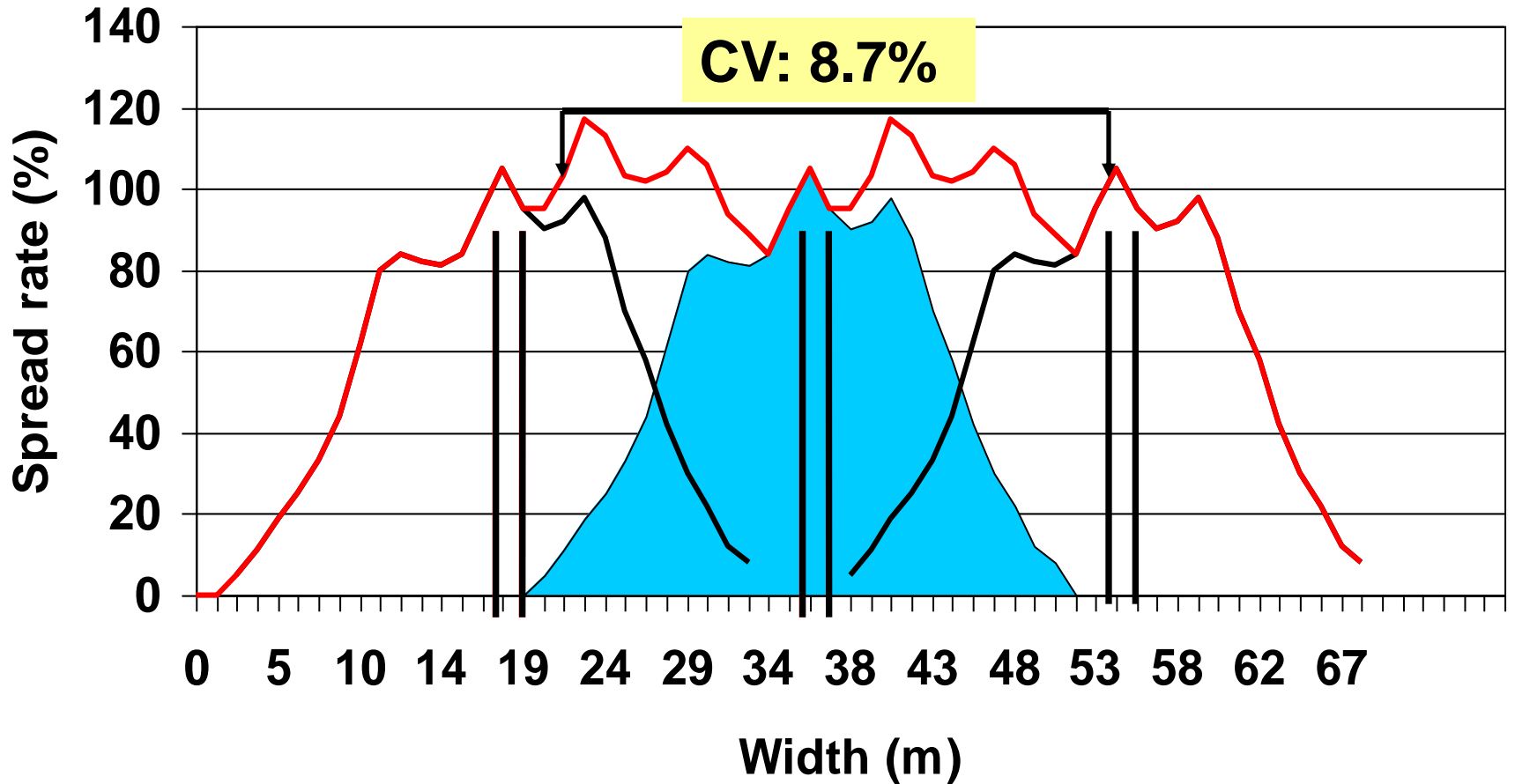
# Good Quality Fert: Windy conditions



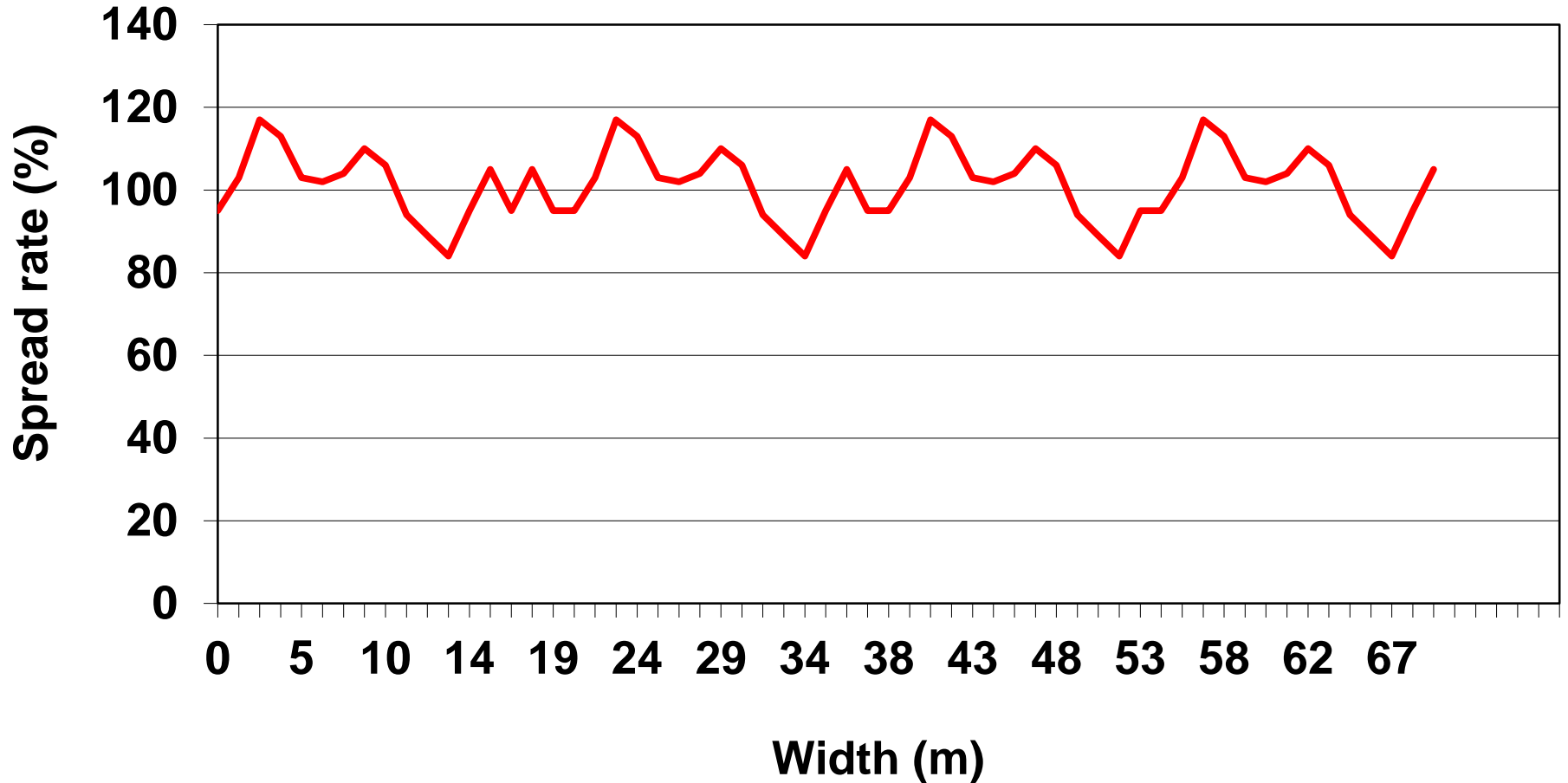
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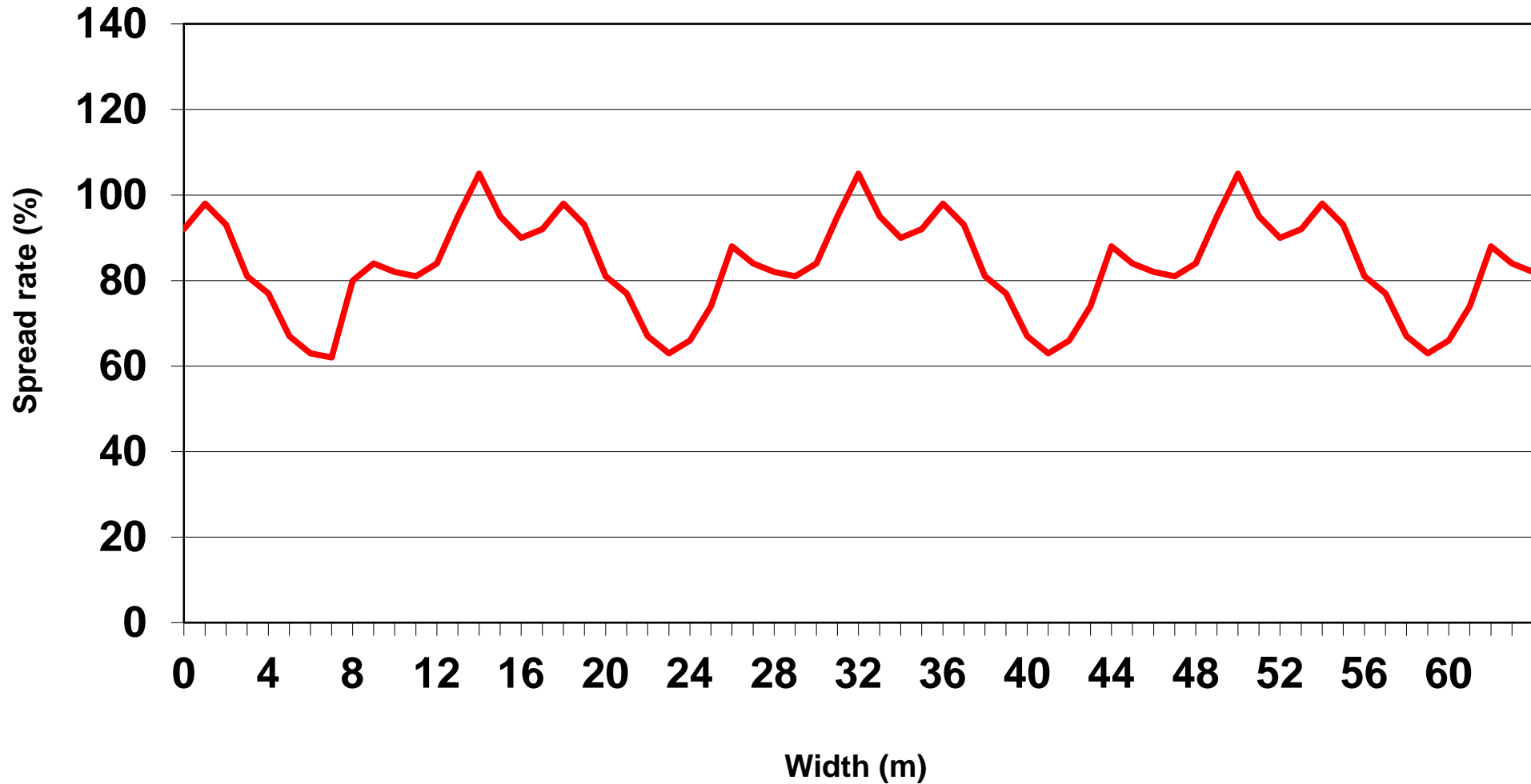
# Poorer Quality Fertiliser: Shouldered



# Poorer Quality Fertiliser: Shouldered



# Poor Quality Fert: Windy conditions



# Urea-generally

- ◆ **Variable product**
- ◆ **Density is always a challenge**
- ◆ **More sensitive to wind**
- ◆ **Will not throw as far as similarly sized high density product. - May restrict tramline / bout width**
- ◆ **Will suit some machines more than others**
- ◆ **Needs careful setting**

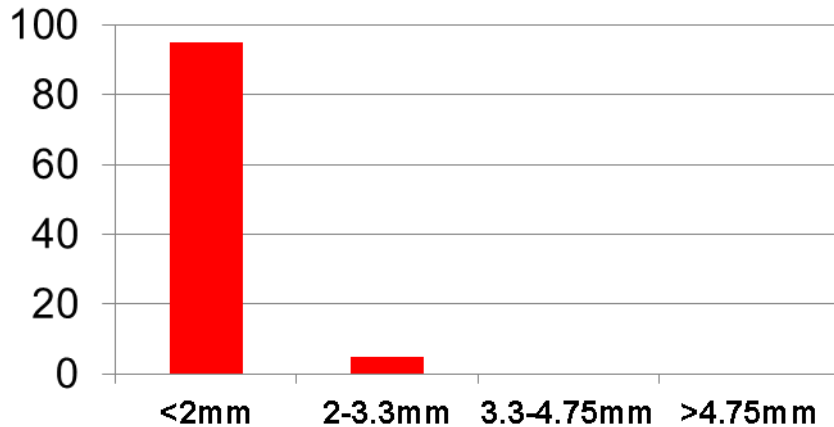


# UREA

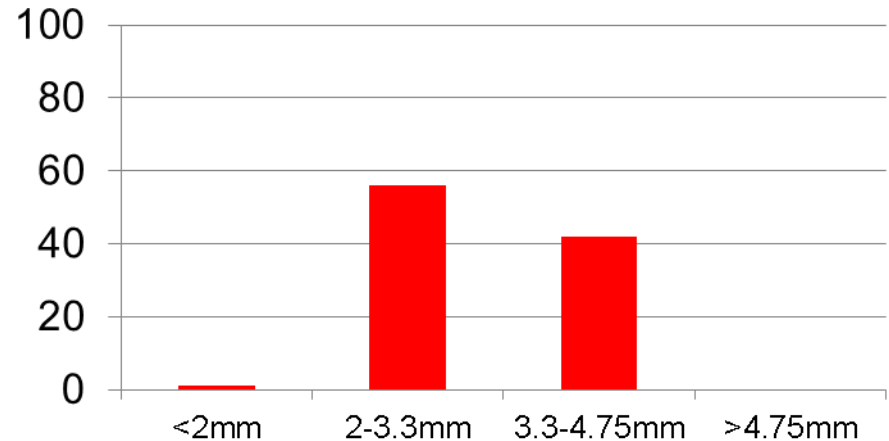
## Getting the best spread.

# Get the best physical quality

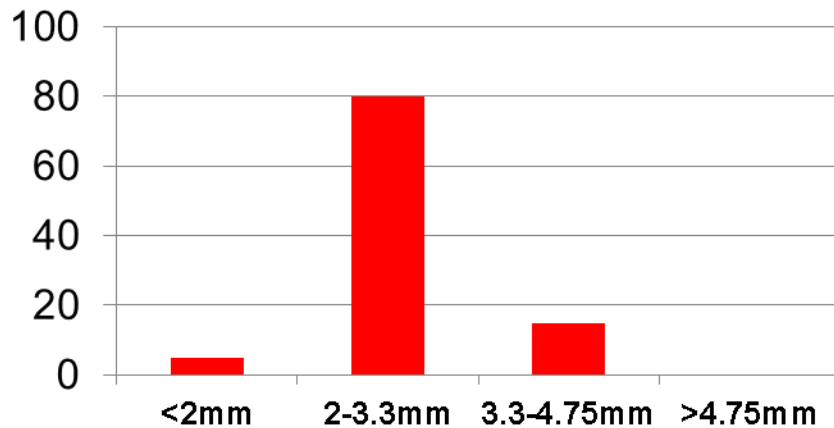
## Urea 1



## Urea 3



## Urea 2



- **Good Size distribution**
- **Good granule strength**
- **Density (limited scope)**
- **Specify and test**
- **Not just 'Granular Urea'**



**Get a Good  
Spreader!**



# Good Spreader

## ◆ Good basic spread pattern

- ▶ Triangular – wide base –wide overlap
- ▶ Capable of required bout width with Urea
- ▶ **Supported by test results – preferably independent**

## ◆ Easy to set for fertiliser and bout width

- ▶ Simple and/or clear method
- ▶ Good supporting material
  - ▶ Fert classification and setting



# Setting for fertiliser and bout

## ◆ Machine Setting - some of:

- ▶ Disc type,
- ▶ Vane type, length, number, angle
- ▶ Disc speed
- ▶ Fertiliser drop position
- ▶ Spreader / Disc angle and height over crop

## ◆ Depends on

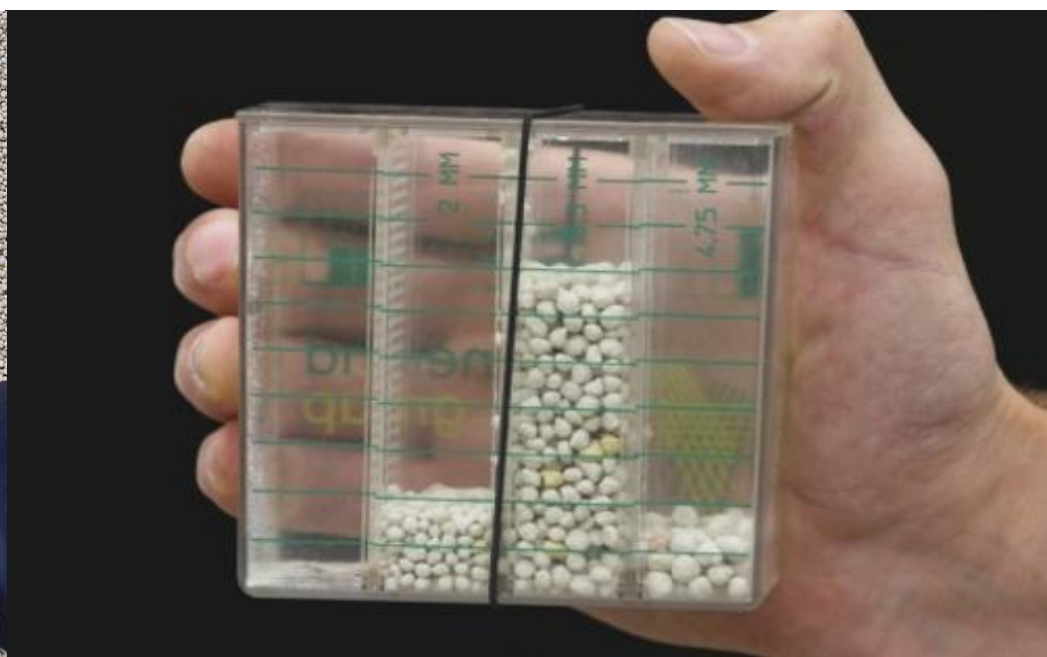
- ▶ Machine Type
- ▶ Fertiliser and bout width

# Setting resources 1: Test halls

- Facilitates fertiliser testing
- Huge numbers of products
- But 'perfect' conditions



# Setting resources 2: characterisation





# Setting resources 3: Matching product



1

2

3

4

5

Machine >> Field settings >> Fertiliser properties >> Fertiliser list >> Chart

RO-M GEOspread - Basic application | 18 mtr | 200 kg/ha | 12 km/h

Granule size (mm)	< 2	2-3,3	3,3-4,75	> 4,75	Sum
Distribution (%)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Density	<input type="text"/> kg/ltr				

[Explanation of distribution \(%\)](#)



Home

Update AutoseApp

Spreading charts

Addresses

Help



RO-M GEOspread



Granular



Mineral



Prilled



Crystalline



Blend



Pellets



Seed/Slug pellets



All shapes

Next >>>

# Setting resources 4: getting setting



**FERTITEST**

**1** Selection Product

**2** Selection Fertiliser

**3** Configuration Spreader

**4** Your settings

◀ Back

## 4. Your settings

Your machine  
**DPX**  
 EXPERT/MAGNUM/1205/1505/1805/GLX

Set of vanes

18-28

Working width

24

Width settings\*

145

Rate settings\*

	250 kg/ha	300 kg/ha	350 kg/ha
10 km/h	28	32	36
12 km/h	32	36	41
14 km/h	36	41	45

Special settings\*

none

## Selected fertiliser :

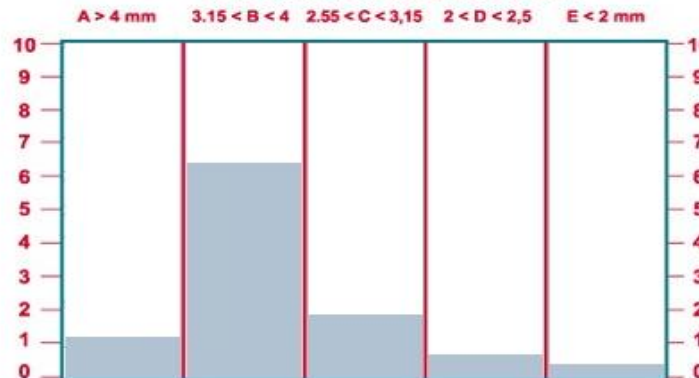
Selected fertiliser :

KOCH FERTILIZER PRODUCTS SAS  
 NUXOR 46 (TB)

Density : 0.74



Your fertiliser in the granulometer



# Field checking of evenness

## ◆ Tray tests

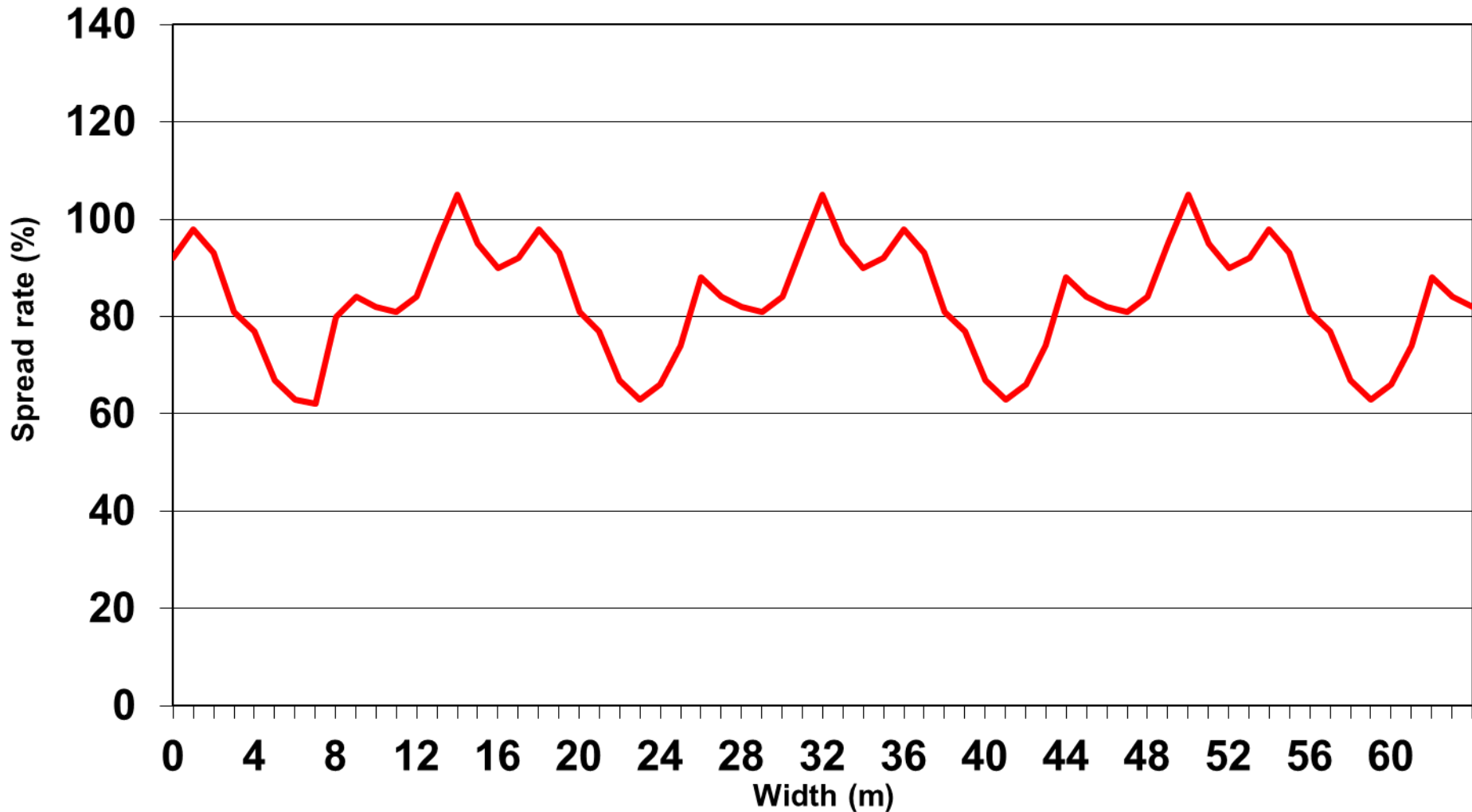
- ▶ Full width to check overall pattern
- ▶ Time consuming and difficult to set up
- ▶ Part widths to indicate correct setting



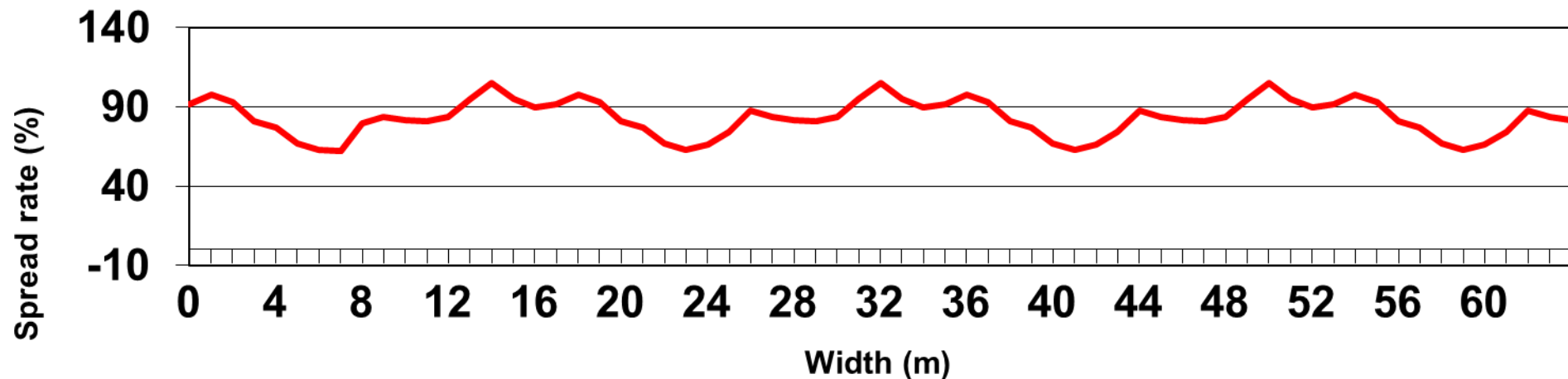
# Challenges !

- ◆ **Spreader manufacturers show best results**
- ◆ **Field vs Test Hall**
  - ▶ **Wind**
  - ▶ **Moving machine, ground contours**
  - ▶ **Machine setting and wear**
  - ▶ **Spreaders differ – good basic patterns: less impact**
- ◆ **Urea**
  - ▶ **More influenced by wind**
  - ▶ **Set precisely and be careful with bout width!**

# Will a manufacturer show this ?



# Same data in the brochure!



- **Change the scale**
- **‘Trick’ of manufacturers (and researchers!)**

# Challenges !

- ◆ Spreader manufacturers show best results
- ◆ **Field vs Test Hall**
  - ▶ Wind
  - ▶ Moving machine, ground contours
  - ▶ Machine setting and wear
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- ◆ **Urea**
  - ▶ More influenced by wind
  - ▶ Set precisely and be careful with bout width!

# Urea Blends – Caution

- ◆ **N + S, N + K, N + P products coming !**
- ◆ **Different density components!**
  - ▶ **Risk of segregation in spreading**
    - ▶ (N near the tractor; S, P , K between trams ??)
  - ▶ **Not impossible to get a good spread, but difficult!**
  - ▶ **Onus is on the manufacturers to provide:**
    - ▶ machine specific information at desired bout width
    - ▶ Even spreading of components must be verified
    - ▶ Some fert supply companies very active in this area



# Conclusions

- ◆ **Urea is a different product for spreading**
  - ▶ **Size distribution (Variable)**
  - ▶ **Density**
  - ▶ **Challenging for wider bout widths and in wind.**
  
- ◆ **To achieve even spreading**
  - ▶ **Select best size distribution (fert suppliers, farmers)**
  - ▶ **Use a good spreader for chosen bout (indep.tests?)**
  - ▶ **Set the spreader correctly for product and bout width**
  - ▶ **Be cautious with wind and bout widths**
  - ▶ **Check the spread evenness**

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