COMPO EXPERT®

EXPERTS FOR GROWTH

Challenges related to Biodegradable Coatings in the Fertilizers Industry

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Warsaw, October 23rd, 2019

Agenda

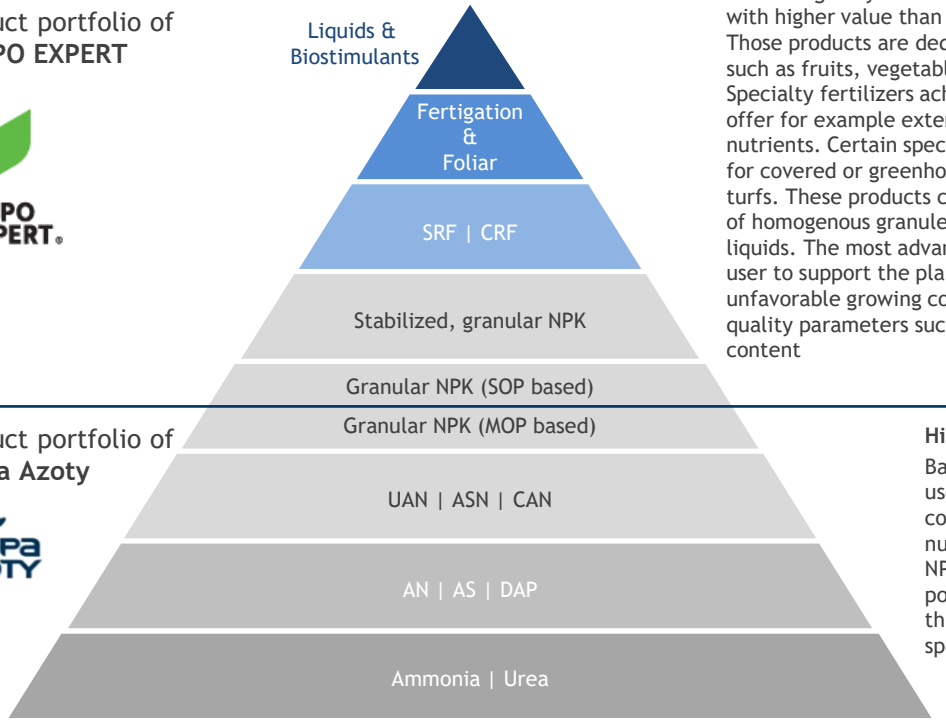
1. COMPO EXPERT – Brief Introduction
2. Coated Fertilizers
3. New Regulatory Framework
4. Major Challenges

COMPO EXPERT – Brief Introduction

COMPO EXPERT as part of Grupa Azoty

FERTILIZERS VALUE PYRAMID

Product portfolio of **COMPO EXPERT**



Product portfolio of **Grupa Azoty**

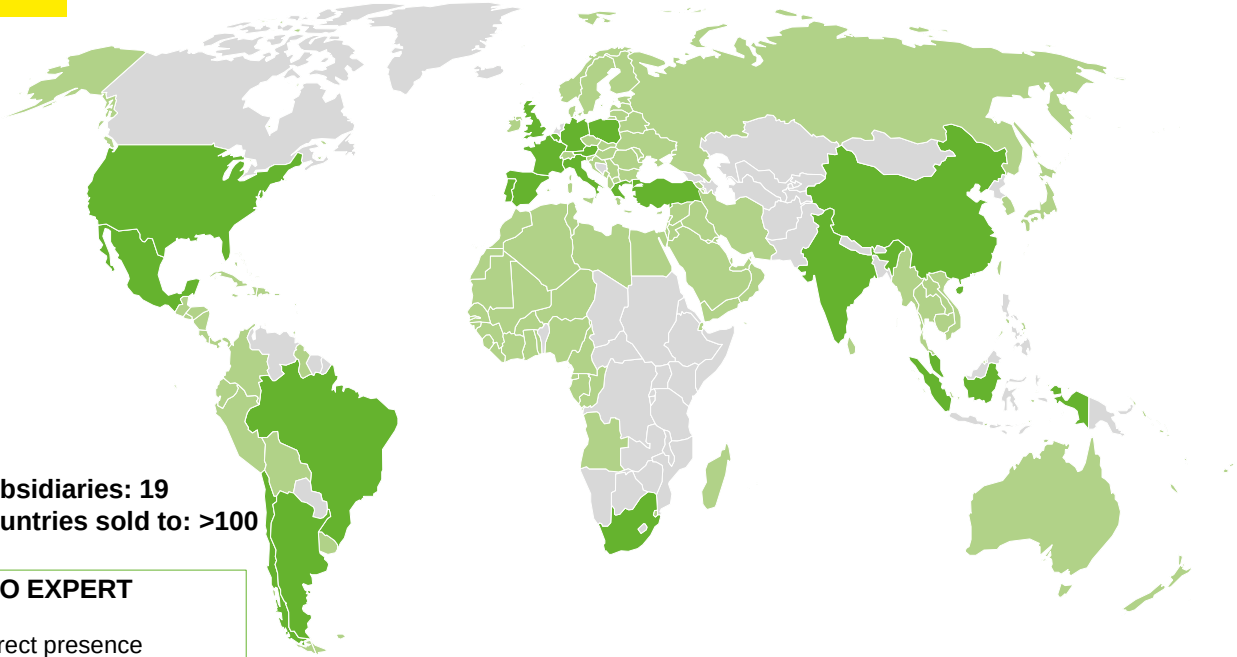
Specialty fertilizers

Technologically advanced, agrochemical products with higher value than high-volume fertilizers. Those products are dedicated to high-value crops such as fruits, vegetables, ornamental plants. Specialty fertilizers achieve higher prices but offer for example extended release time of nutrients. Certain specialty products can be used for covered or greenhouse crops, as well as for turfs. These products can be applied in the form of homogenous granules or fertigation / foliar liquids. The most advanced products allow the user to support the plant development under the unfavorable growing conditions and to improve quality parameters such as color, fruit size, sugar content

High-volume fertilizers

Basic fertilizers commonly used on the market usually containing one or two nutrients. In case of granular NPK, they are based on potassium chloride (MOP) and, thus, achieve lower price than specialty fertilizers

COMPO EXPERT _Geographical Presence



# of subsidiaries: 19
# of countries sold to: >100

COMPO EXPERT

- Direct presence
- Export markets

STATE-OF-THE-ART PRODUCTION SITES

KREFELD IMPRESSION

SRF

VALL D'UIXÓ IMPRESSION

COMPO EXPERT offers a complete portfolio of specialty products

	PRODUCT GROUP	APPLICATIONS	KEY BRANDS
	**Liquids & Biostimulants**	▪ All crops ▪ Applied as foliar spray or via fertigation system ▪ Adverse growing conditions	Basfoliar® Vitanica®
	**Fertigation & Foliar**	▪ Fertigated crops under cover and in open field	Hakaphos® NovaTec® Solub
	**SRF & CRF**	▪ Turf ▪ Nurseries ▪ Planting market	Floranid® Basacote®
	**Granular NPK**	▪ Soil application ▪ Dissolved by precipitation ▪ Chloride sensitive crops ▪ High value crops	Blaukorn® NovaTec®

Coated Fertilizers

Coated Fertilizers

- Coated fertilizers are controlled release fertilizers (**CRF**) which release nutrients gradually over a long time period

- Longterm effect depending on the longevity which is linked directly to the thickness of the polymer coating

Guarantees a longterm and consistent nutrient supply for nursery plants and plantations

Principles & Characteristics

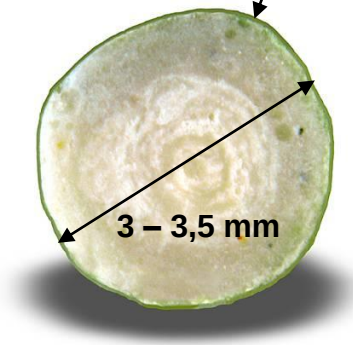
The fertilizer granule is covered by a thin polymer layer

Water penetrates slowly through the coating...

... and dissolves the nutrients.

These start to leave the granule by a diffusion process. The coating ensures a controlled nutrient release (functionality period).

Coating thickness: 40 – 100 micrometers

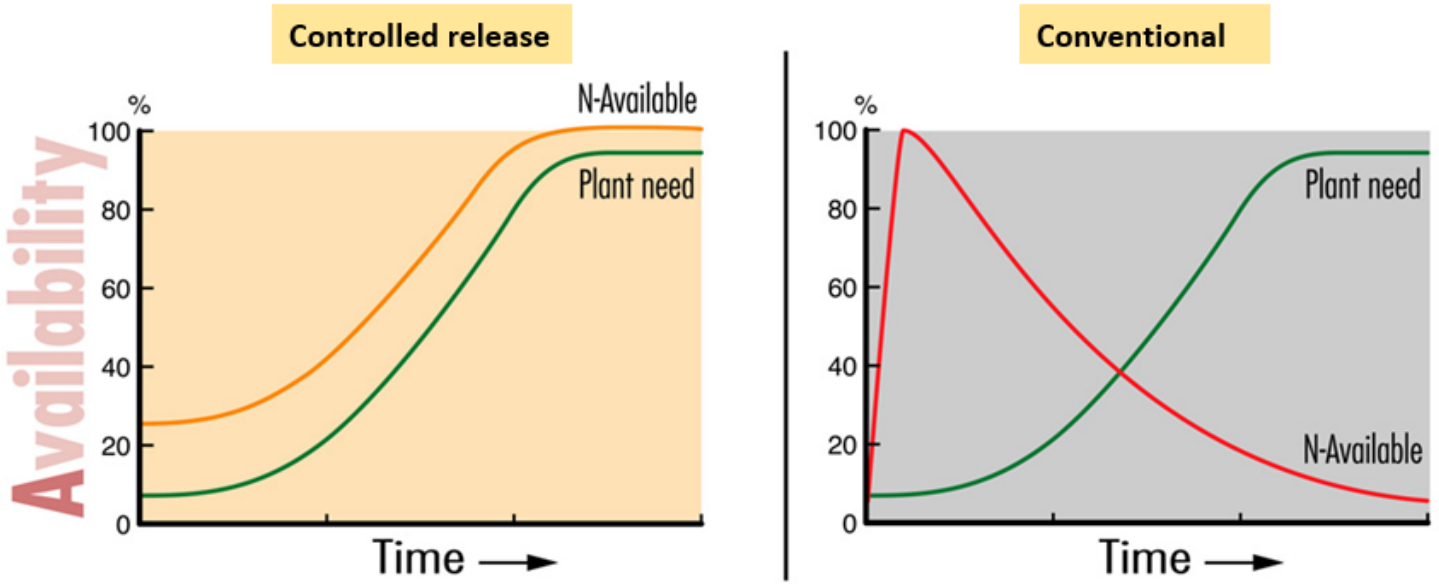


Basacote® Plus
THE MARATHON FERTILIZER

Main Advantages of CRF

- **Benefits of controlled release of nutrients:**
  - Controlled nutrient release depending on temperature & water supply
  - Allows in specific climate/soil types to use 30-40 % less fertilizers due to its efficiency (more with less)
  - Long term feeding / reduced application frequency
  - Replaces multiple applications of common fertilizers
  - Even growth without flush growth peaks
  - No excessive supply of nutrients / no leaching of nutrients
  - Reduces leaching (up to 80 %) as rain/irrigation water can only leach nutrients outside granules (nitrate directive)
  - Reduces volatilization for coated urea (FPR)
  - → High Nutrient Use Efficiency (NUE)

Main Advantages of CRF



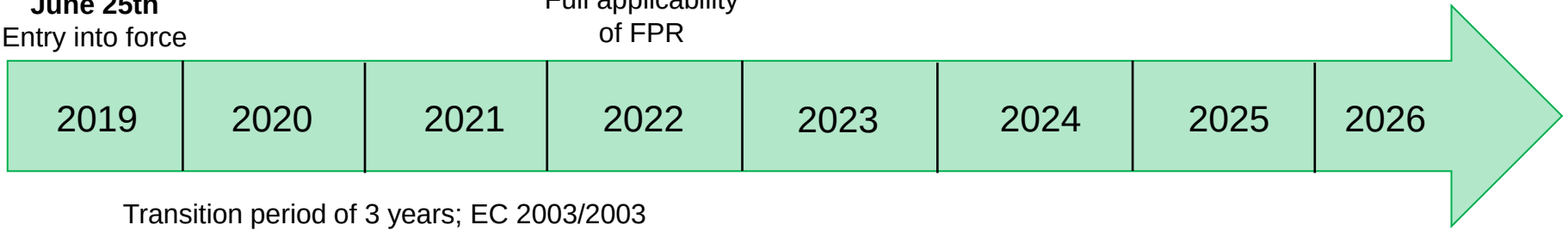
Source: Fertilizers Europe

New Regulatory Framework

New Regulatory Framework – Fertilizing Product Regulation

May 22nd
Final approval of the Council;
June 25th
Entry into force

July 16th
Full applicability of FPR



Transition period of 3 years; EC 2003/2003 still applicable; Implementation of infrastructure (Notification/Conformity)

New Regulatory Framework - CRF

_ Coating materials are generally allowed according to the FPR,

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New Regulatory Framework - CRF

Annex II, Part II, CMC 9 (1):

CMC 9: POLYMERS OTHER THAN NUTRIENT POLYMERS

1. An EU fertilising product may contain polymers other than nutrient polymers only in cases where the purpose of the polymer is:

(a) to control the water penetration into nutrient particles and thus the release of nutrients (in which case the polymer is commonly referred to as a 'coating agent'),

(b) to increase the water retention capacity or wettability of the EU fertilising product, or

(c) to bind material in an EU fertilising product belonging to PFC 4.

New Regulatory Framework - CRF

_ Coating materials are generally allowed according to the FPR,

_ **but…**

1. They have to comply with biodegradability criteria from July 16th, 2026 on, or are banned from the market

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New Regulatory Framework - CRF

Annex II, Part II, CMC 9
(2):

2. From 16 July 2026, the polymers referred to in point 1(a) and (b) shall comply with the biodegradability criteria established by delegated acts referred to in Article 42(6). In the absence of such criteria, an EU fertilising product placed on the market after that date shall not contain such polymers.

New Regulatory Framework - CRF

_ Coating materials are generally allowed according to the FPR,

_ **but…**

1. They have to comply with biodegradability criteria from July 16th, 2026 on, or are banned from the market
2. Neither biodegradability criteria, nor test methods are existing yet
3. Both shall be implemented by the Commission through a delegated act by July 16th, 2024

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New Regulatory Framework - CRF

Chapter 6, Article 42 (6):

6. By 16 July 2024, the Commission shall assess biodegradability criteria for polymers referred to in point 2 of component material category 9 in Part II of Annex II and test methods to verify compliance with those criteria and, where appropriate, shall adopt delegated acts pursuant to paragraph 1 which lay down those criteria.

New Regulatory Framework - CRF

_ Coating materials are generally allowed according to the FPR,

_ **but…**

1. They have to comply with biodegradability criteria from July 16th, 2026 on, or are banned from the market
2. Neither biodegradability criteria, nor test methods are existing yet
3. Both shall be implemented by the Commission through a delegated act by July 16th, 2024
4. A rough frame of the general expectations was defined, though

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New Regulatory Framework - CRF

Chapter 6, Article 42 (6):

Such criteria shall ensure that:

(a) the polymer is capable of undergoing physical and biological decomposition in natural soil conditions and aquatic environments across the Union, so that it ultimately decomposes only into carbon dioxide, biomass and water;

(b) the polymer has at least 90 % of the organic carbon converted into carbon dioxide in a maximum period of 48 months after the end of the claimed functionality period of the EU fertilising product indicated on the label, and as compared to an appropriate standard in the biodegradation test; and

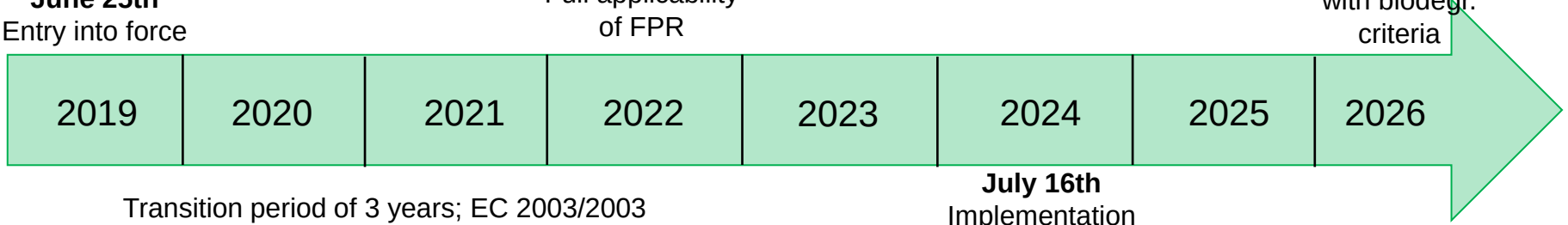
(c) the use of polymers does not lead to accumulation of plastics in the environment.

New Regulatory Framework – Fertilizing Product Regulation

May 22nd
Final approval of the Council;
June 25th
Entry into force

July 16th
Full applicability of FPR

July 16th
Full compliance with biodegr. criteria



Transition period of 3 years; EC 2003/2003 still applicable; Implementation of infrastructure (Notification/Conformity)

July 16th
Implementation of biodegr. criteria and test methods

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Major Challenges

Challenge 1

- During the functionality period an intact coating is needed to avoid uncontrolled nutrient release, which could result in
  - Nutrient over-supply
  - Root burning
  - Plant death
  - N-Leaching
- The functionality period ranges between 3 months and 15 months
- How can we manage to have a coating material, which is completely intact for more than 1 year, and then degrades completely within 4 years?
- Such a material is simply not existing yet

Challenge 2

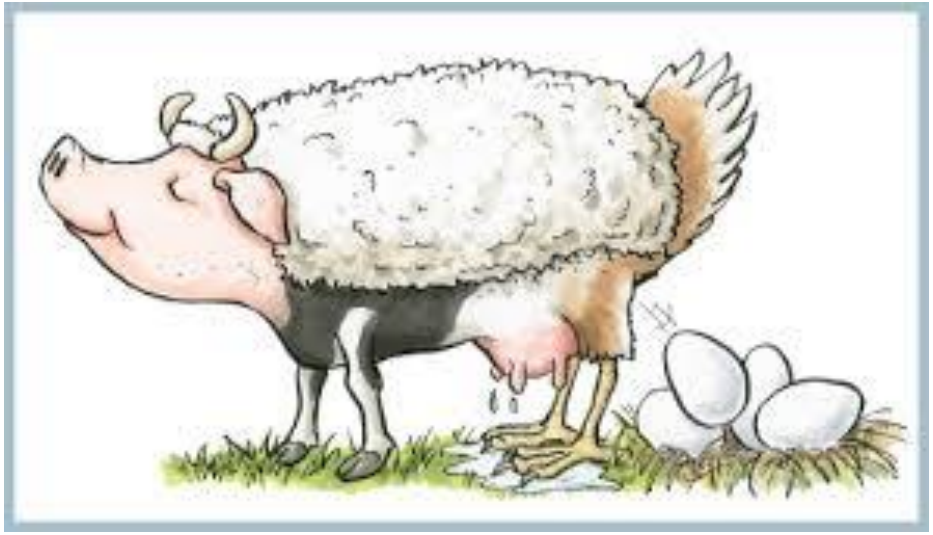
- The CRF industry is working on the development of a new coating material with highest priority
- The development is based on the limited information we have
  - degradation into carbon dioxide, biomass and water
  - > 90% degradation within 48 months after the end of the functionality period
- Until no criteria are set, even a potential successful development stays uncertain (target is not defined)
- Considering all developmental steps (material screening, material formulation, technical tests, production tests, plant trials, biodegradation tests) time is running tight

Challenge 3

- The biodegradability of a new, technically suitable coating material must be tested in order to comply with the set criteria
- According to the current given frame, a real-time test would take more than 4 years
- But there is no test assessed yet, neither real-time, nor accelerated
- The industry currently relys on test methods for completely different biodegradable materials or own methods
- Until no test methods were assessed, potential biodegradability of a coating material stays uncertain

Major Challenges

1. We need a tight coating during functionality, but fast degradation afterwards
2. We have to develop a coating material, but biodegradability criteria are not even defined
3. We have to test biodegradation of the new material, but no testing methods are existing



Thank you!

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