Assessment of the global and regional markets for SRFs, CRFs, and SNFs

Prepared for IFA by RAMS & Co

IFA / NewAg International Conference on SCRF March 25th, 2019

This market assessment has been prepared for IFA by RAMS & Co. Any references to this report must include a clear reference to “IFA Assessment of the Global Market for slow- and controlled release, stabilized and water-soluble fertilizers prepared by RAMS & Co.”
Agenda

Introduction to RAMS & Co

Approach

Outcome overview

By segment overview

Way forward
Introduction to RAMS & Co

Strategy boutique focused on mining, metals, and materials

Strategy consulting boutique

Based in Paris

Incorporated in 2012

Help building differentiated and resilient growth stories

Cross-fertilize business and technical knowledge

<table>
<thead>
<tr>
<th>Strategy focus</th>
<th>Resources / heavy industries focus</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Corporate strategy</strong></td>
<td><strong>Energy resources</strong></td>
</tr>
<tr>
<td>• Business portfolio allocations</td>
<td>• Oil &amp; gas</td>
</tr>
<tr>
<td>• Growth strategies</td>
<td>• Uranium</td>
</tr>
<tr>
<td>• Corporate resilience enhancement</td>
<td>• Mining and metals</td>
</tr>
<tr>
<td>• Value creation and extraction</td>
<td>• Iron ore / Manganese</td>
</tr>
<tr>
<td>• M&amp;A / partnerships support</td>
<td>• Carbon and stainless steels</td>
</tr>
<tr>
<td></td>
<td>• Non-ferrous metals (copper, zinc, nickel)</td>
</tr>
<tr>
<td></td>
<td>• Bauxite and aluminum</td>
</tr>
<tr>
<td><strong>Business strategies</strong></td>
<td><strong>Chemicals</strong></td>
</tr>
<tr>
<td>• Competitive differentiation</td>
<td>• Chlor-alkalis / soda ash</td>
</tr>
<tr>
<td>• Growth strategies</td>
<td>• Petchems</td>
</tr>
<tr>
<td>• Market oriented capex flexibility</td>
<td>• Coatings (TiO₂, adhesives, pigments, …)</td>
</tr>
<tr>
<td></td>
<td>• Innovation and R&amp;D portfolio</td>
</tr>
<tr>
<td><strong>Commercial excellence</strong></td>
<td><strong>Materials</strong></td>
</tr>
<tr>
<td>• Strategic marketing</td>
<td>• Cement</td>
</tr>
<tr>
<td>• Route to market optimization</td>
<td>• Industrial minerals (kaolin, talc, clays, …)</td>
</tr>
<tr>
<td>• Value-in-use and pricing</td>
<td>• Refractories / advanced ceramics</td>
</tr>
<tr>
<td>• Go-to-market organization</td>
<td></td>
</tr>
</tbody>
</table>
Introduction to RAMS & Co – Fertilizer industry experience

A 15-yr experience in the fertilizer industry

Resources
- Natural gas
- Coal
- Phos. rock
- Potash

Commodity fertilizers
- Urea
- AN
- AS
- DAP/Map
- TSP
- SSP
- NPK

Distribution/retail
- Private networks
- Trading
- Cooperatives
- Animal feeds
- Industrial & food phosphates
- Specialty fertilizers
- Base chemicals (NH₃, nitric acid, sulfuric acid, ...)

Added-value/collateral businesses

Recurrent topics
- Resource access
- Cycle-resilient growth (market agility)
- Disciplined capacity management
- Upstream/downstream integrations
- Routes-to-market (distribution or not)
- Partnerships to secure value (over volume)
- De-commoditization: new products/pricing premium
- Pricing (value-in-use, long term/volume contracts)
- Industrial/specialty markets development

financial institutions:
- Private equities
- Sovereign funds

RAMS & Co’s business coverage

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Way forward
### Approach – Scope

CRF/SRF/SCU/SNF (UI+NI), water soluble solid CN/MAP/MKP/NOP/SOP were assessed as a first set of priorities.

<table>
<thead>
<tr>
<th>Category</th>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controlled release (CRF)</td>
<td>Polymer coated fertilizers, polymer-sulfur coated (urea, NPK, …)</td>
</tr>
<tr>
<td>Sulfur coated (SCU)</td>
<td>Sulfur coated fertilizers (urea, NPK, …)</td>
</tr>
<tr>
<td>Slow release (SRF)</td>
<td>UF/MU/IBDU/CDU …</td>
</tr>
<tr>
<td>Stabilized nitrogen fertilizers (SNF)</td>
<td>Urease inhibited (NBPT, NPPT, …)</td>
</tr>
<tr>
<td>Water soluble (WSF)</td>
<td>Nitrification inhibited (DCD, DMPP, …)</td>
</tr>
<tr>
<td>Liquid fertilizers</td>
<td>Neem coated</td>
</tr>
<tr>
<td>Enriched fertilizers</td>
<td></td>
</tr>
<tr>
<td>Micronutrient</td>
<td></td>
</tr>
</tbody>
</table>

#### Geographies
- All major countries for assessment build-up
- Communicated as per IFA’s geographical aggregates

#### Specialty Fertilizers WG priority categories
- Neem coated data available from FAI
- Focus on “straight” nutrient, whether further blended into NPK or not
- Reported as a unique category (no product level breakdown)

#### Metrics
- Volumes (product and nutrients)
- Current market size
- Tentative dynamics

#### Secondary Mg nutrient, liquid specialties, and micronutrients left for latter analysis
We developed a first “pièce à casser” of market assessment to create a momentum with members and optimize members’ contributions.

Phase I – “internal” market assessment (Nov-Dec ’18)

- End-users interviews (coops, retailers, …)
- IFA sources / experts
- Market studies
- Trade data
- Players PR/IR communications
- Modeling

First “pièce à casser”
- High level estimates of market sizes
- Key countries / regions estimates
- Identification of drivers shaping the demand

Phase II – sharing/challenging with members (Jan-Feb ’19)

“Early members” contributions
- Meetings
- Interviews

A first “pièce à casser” to:
1. Deliver a first concrete outcome to catalyze interest of members
2. Provide a starter for discussion and create a positive momentum
3. Get a flavor of data collection complexity

Market assessment V0
CRF/SRF/SNF – Interviews

More than 20 efficient interviews with major industry players and WG members, covering about 75% of the global market in scope

External interviews
(10/18-11/18, IFA specialty fertilizers initiative 1st phase)

- 13 Turned down/Not answering
- 14 Interviewed

Numbers of Companies

 WG members interviews
(11/18, IFA specialty fertilizers initiative 2nd phase)

- 2 No answer
- 10 Interviewed
- 75% Interviewed

Numbers of Companies
Share of the global market (volume)

➢ Less but more efficient interviews than last year
➢ US coop and distributors still reluctant
➢ Brazilian distributors and local producers not answering
➢ No answer from a couple of last year participants

➢ High answer rate, eased by IFA introduction
➢ Interesting talks and open discussions
➢ WG members usually sharing their knowledge

Source: interviews, RAMS & Co analysis
Confidence level in estimates, by region

Except for China, several and various sources were available (trade stats, interviews, market studies, web), leading to reliable market estimates.

### Level of confidence in market estimates by region and by product (2018)

<table>
<thead>
<tr>
<th>Region</th>
<th>CRF</th>
<th>SRF</th>
<th>SCU</th>
<th>SNF</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Latin America &amp; The Caribbean</td>
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<td></td>
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<tr>
<td>Western Europe</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Africa</td>
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<tr>
<td>West Asia</td>
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<tr>
<td>East Asia</td>
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<tr>
<td>South Asia</td>
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<td></td>
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<td></td>
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<tr>
<td>Oceania</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Source:** trade stats, interviews, various publications, RAMS & Co analysis

**CRF**
- Transparent trade stats
- Publicly available data
- Consistent feedback from interviews

**SRF**
- Transparent trade stats
- Consistent feedbacks from interviews
- Only few available market studies

**SCU**
- Very few and non-transparent trade stats
- No SCU player interviewed
- Feedback from CRF interviewees

**SNF**
- Numerous and consistent trade stats
- Numerous interviews from non-members
- Consistent feedbacks from interviews

China estimates characterized by high uncertainties, except for SNF (consistent sources).
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By segment overview

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Overview – Global demand growth by product

SCRFs consumption in 2018 reaches 15.7 Mt product (+9% compared to 2016), mainly supported by UI growth (60% of volume growth).

Specialty fertilizers demand, by category
*(Mt product, 2016 & 2018 estimates)*

<table>
<thead>
<tr>
<th>Stabilized nitrogen (SNF)</th>
<th>2016</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control release (CRF)</td>
<td>1.9</td>
<td>2.1</td>
</tr>
<tr>
<td>Slow release (SRF)</td>
<td>1.7</td>
<td>1.8</td>
</tr>
<tr>
<td>Sulfur coated (SCU)</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Urease inhibited (UI)</td>
<td>7.4</td>
<td>8.2</td>
</tr>
<tr>
<td>Nitrification inhibited (NI)</td>
<td>2.4</td>
<td>2.6</td>
</tr>
</tbody>
</table>

Source: various publications, interviews, trade stats, RAMS & Co analysis
Overview – Demand, nutrient wise

Nutrient wise, 2018 SCRFs demand reaches 6.8 Mt nutrients (against 6.3 Mt in 2016) or 3.6% of total nutrient consumption. 75% is nitrogen driven by SNFs, ...

Specialty fertilizers demand, in nutrient volumes
(2018 SF demand estimates – totals in Mt nutrient)

Excluding WSF, 6.8 Mt nutrients in Specialty Fertilizers, reaching 20.9 Mt when including NCU against 6.3 and 16 Mt respectively

Source: interviews, trade stats, various publications, RAMS & Co analysis
Overview – Demand, value wise

... however it represents ~6% of the global market wholesale revenue (WSF excl.).

Wholesale revenue ($B, 2018)

Added value on top of commodity ($B, 2018)

➢ 5.8% of the total fertilizer wholesale revenues (WSF excl.)
➢ 2.8% added-value on top of “commodity” nutrients (WSF excl.)

Source: interviews, trade stats, various publications, RAMS & Co analysis
Overview – 2016-2018 SCRFs & SNFs drivers and highlights

Global dynamic remains positive regarding SCRFs and SNFs demand drivers, despite specific circumstances likely to have locally hindered their development

<table>
<thead>
<tr>
<th>CRF</th>
<th>SRF</th>
<th>SNF</th>
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<tbody>
<tr>
<td>Base fertilizer</td>
<td></td>
<td></td>
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<tr>
<td>Cropping system</td>
<td></td>
<td></td>
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<tr>
<td>Regulation</td>
<td></td>
<td></td>
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<tr>
<td>Value-in-use</td>
<td></td>
<td></td>
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</tbody>
</table>

**Base fertilizer**

<table>
<thead>
<tr>
<th><strong>CRF</strong></th>
<th><strong>SRF</strong></th>
<th><strong>SNF</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Global urea demand slightly growing over the past two years:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Declining in China</td>
<td></td>
<td></td>
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<tr>
<td>• Flat in the US, EU</td>
<td></td>
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<tr>
<td>• Growing in Brazil</td>
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<td></td>
</tr>
<tr>
<td>Major Ammonia decline in the US</td>
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</tr>
</tbody>
</table>

**Cropping system**

<table>
<thead>
<tr>
<th><strong>CRF</strong></th>
<th><strong>SRF</strong></th>
<th><strong>SNF</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Declining golf course demand in most of the world</td>
<td></td>
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<tr>
<td>• Slightly growing landscape (booming maintenance in the US although still a small market)</td>
<td></td>
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<tr>
<td>• Growing consumer market</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• New product by Pursell &amp; Stamicarbon to compete with ESN® in NA in broad-acre agri</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• CRF tests still on going in Australia, Malaysia, Indonesia.</td>
<td></td>
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<tr>
<td>• Tests in Brazilian sugar cane nurseries potentially opening a huge potential</td>
<td></td>
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</tr>
</tbody>
</table>

**Regulation**

<table>
<thead>
<tr>
<th><strong>CRF</strong></th>
<th><strong>SRF</strong></th>
<th><strong>SNF</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>2019 European fertilizer regulation hindering CRF development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Several regulation to push for NUE improvement:</td>
<td></td>
<td></td>
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<tr>
<td>• RenovaBio in Brazil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 2020 regulation in Germany</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Blue Sky clear policy in China</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• GHG reduction emissions policies</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Value-in-use**

<table>
<thead>
<tr>
<th><strong>CRF</strong></th>
<th><strong>SRF</strong></th>
<th><strong>SNF</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Higher crops price leading to improved focus on yields, hence favoring SF use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Higher fertilizer price leading to improved focus on fertilizer consumption, hence favoring SF use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• CRF &amp; SRF still characterized by a high price premium, hindering their development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cautiously recovering crops price</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Slightly recovering urea price</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Highly competitive market (new formulation &amp; active ingredients)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• In mature markets (EU, NA), market share competition rather than volume growth</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Source:** Interviews, various publications, RAMS & Co analysis
Agenda

Introduction to RAMS & Co

Approach

Outcome overview

By segment overview

Way forward
Outcomes on CRF

Demand is estimated at 830kt product excl. China (820 kt in 2016). Except in North America, demand remains mainly driven by turf, nurseries and high value crops.

Key CRF market drivers

Value-in-use
- Higher crops price leading to improved focus on yields
- Higher fertilizer price leading to improved focus on fertilizer consumption
- However, CRF price premium still considered as high

Regulation
2019 European regulation hindering local CRF demand

Cropping system
- Declining golf courses
- Growing consumer landscape
- Slightly growing landscape market

Specific cases
- North America: CRF used in grain crops (two local products)
- Japan: high labor costs → CRF used in rice
- Australia: tests in sugar cane
- Indonesia: tests in palm oil

CRF worldwide consumption by region
(2018 estimates, kt product – regional total figures)

North America
- 650kt
- <1%

Europe
- 50kt ESN® mainly in corn
- <1%

East Asia
- 3-4%

Lat. Am. & The Car.
- 10-15

Africa
- 5-10

Oceania
- 6-8

Regional breakdown
- 5% Others
- 63% East Asia
- 30% North America
- 2% Europe

Regional annual growth
2016-2018 period

Europe: Western and Central Europe

Source: various publications, trade data, interviews, RAMS & Co analysis
Outcomes on SRF

Low digit growth of SRF global demand outside China, still driven by professional and consumer turf. Global estimate around 280-330 kt, excl. China.

Key SRF market drivers

- **Value-in-use**
  - Higher crops price leading to improved focus on yields
  - Higher fertilizer price leading to improved focus on fertilizer consumption
  - Lower price premium than CRF but lower efficiency
  - Usually sold in blends with conventional fertilizers, lowering cost

- **Cropping system**
  - Declining golf courses
  - Growing consumer landscape
  - Slightly growing landscape market

- **Specific cases**
  - Use of SRF in rice in South China (acid and warm soils making SRF efficient)

SRF worldwide consumption by region

(2018 estimates, kt product – regional total figures)

- **North America**: 150-200 kt, ~1%
- **Europe**: 90-100 kt, ~1%
- **East Asia**: 1500 kt, 3-4%
- **West Asia**: Max. 10 kt
- **Lat. Am. & The Car.**: Max. 1
- **Oceania**: 5-10 kt

Regional breakdown

- **SRF**
  - North America: 3-4%
  - Europe: Flat
  - East Asia: Max. 10%
  - Others (West Asia, Lat. Am. & The Car., Oceania): Flat

Value-in-use

- Higher crops price leading to improved focus on yields
- Higher fertilizer price leading to improved focus on fertilizer consumption
- Lower price premium than CRF but lower efficiency
- Usually sold in blends with conventional fertilizers, lowering cost

Cropping system

- Declining golf courses
- Growing consumer landscape
- Slightly growing landscape market

Specific cases

- Use of SRF in rice in South China (acid and warm soils making SRF efficient)
Outcomes on SCU

Demand is estimated at 50kt product, excl. China. Gradually being replaced by PSCU (CRF), SCU does not travel well and is sometimes characterized by integrity issues.

Key SCU market drivers

- **Value-in-use**
  - Integrity issues (burst and lock-off risks)
  - Low ability to travel
  - SCU being replaced progressively by PSCU

- **Cropping system**
  - Declining golf courses
  - Growing consumer landscape
  - Slightly growing landscape market

SCU worldwide consumption by region
(2018 estimates, kt product – regional total figures)

<table>
<thead>
<tr>
<th>Region</th>
<th>SCU Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>Max. 10</td>
</tr>
<tr>
<td>Europe</td>
<td>Flat</td>
</tr>
<tr>
<td>East Asia</td>
<td>1000</td>
</tr>
<tr>
<td>West Asia</td>
<td>Flat</td>
</tr>
<tr>
<td>Lat. Am. &amp; The Car.</td>
<td>Flat</td>
</tr>
<tr>
<td>Oceania</td>
<td>Max. 10</td>
</tr>
<tr>
<td>Others</td>
<td>5%</td>
</tr>
</tbody>
</table>

Regional breakdown

- 95% East Asia
- 5% Others

Source: various publications, trade data, interviews, RAMS & Co analysis
Outcomes on SNF (UI + NI)

SNF global consumption is estimated at 10.7 Mt product (8.2 UI-treated and 2.6 NI-treated) against 9.8 Mt in 2016. Maturity rates vary widely from a country to another and depends on local specificities.

Key SNF market drivers

**Base fertilizer use**
- Global urea demand slightly growing over the past two years:
  - Declining in China
  - Flat in the US, EU
  - Growing in Brazil
- Major NH₃ decline in the US

**Climate and soil conditions**
- Inhibitors efficiency and application rate highly dependent on soil conditions
- No change since 2016

**Regulation**
- Several regulations favoring SNF
  - RenovaBio in Brazil
  - 2020 regulation in Germany
  - Blue Sky clear policy in China
  - GHG reduction emissions policies

**Value-in-use**
- Recovering urea, crops price
- Highly competitive market
- EU & US: market share competition rather than growth

SNF worldwide consumption by region
(2018 estimates, kt product – regional total figures)

**Regional breakdown**

- Others: 7%
- East Asia: 24%
- Europe: 7%
- Lat. Am.: 18%
- North America: 65%

Source: various publications, trade data, interviews, RAMS & Co analysis
Outcomes on NCU

2015 regulation made it mandatory for all producers to coat 100% of produced urea with neem cake or neem oil. It is estimated that 100% of applied urea in India is now coated with neem (against 75% in 2016).

Key NCU market drivers

Regulation in India
- Before 2015: min. 35% coated urea
- March 2015: min. 75% coated urea
- May 2015: 100% coated urea

Value-in-use
- Nitrification inhibitors contained in neem oil and neem cake
  - Better yields in grain crops with NCU vs not treated urea
  - Lower application rates for the same yield

NCU worldwide consumption by region
(2018 estimates, kt product – regional total figures)

Regional breakdown

Source: various publications, trade data, interviews, RAMS & Co analysis
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Overview – Forecasted vs actual growth

Actual growth is lower than forecasted one, due to regulation uncertainties regarding CRF, to deep trends regarding SRF, and to local circumstances regarding SNF.

<table>
<thead>
<tr>
<th>CRF</th>
<th>SRF</th>
<th>SNF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Forecasted 10-yr growth, per year</strong></td>
<td><strong>Forecasted 10-yr growth, per year</strong></td>
<td><strong>Forecasted 10-yr growth, per year</strong></td>
</tr>
<tr>
<td>15%</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>8%</td>
<td>7%</td>
<td>10%</td>
</tr>
<tr>
<td>2016-18 growth 2%</td>
<td>2016-18 growth 3.2%</td>
<td>2016-18 growth 5%</td>
</tr>
<tr>
<td><strong>Potential market by 2026</strong></td>
<td><strong>Potential market by 2026</strong></td>
<td><strong>Potential market by 2026</strong></td>
</tr>
<tr>
<td>4.5 Mt (mid-range growth)</td>
<td>4.2 Mt (mid-range growth)</td>
<td>27 Mt (mid-range growth)</td>
</tr>
</tbody>
</table>

- ESN® production outage preventing demand to be fully addressed
- European regulation hindering CRF development
- Lower cost CRF suitable for broad-acre agriculture not yet significantly released
- Potential in Australia, Brazil, Indonesia and Malaysia not yet realized

- Flat turf & landscape market
- No further market penetration for rice in China
- Not yet used in plantation with labor shortage (palm oil in East Asia)

- Long-run forecast maintained

- Penetration in China not taken off
- US and EU market (62% of 2018 global SNF market) characterized by market share competition through innovation rather than new acres treatment

- Long-run forecast maintained

- Long-run forecast should be downsized

Source: various publications, interviews, trade stats, RAMS & Co analysis
Demand dynamics – High level estimates for CRF

### Historical market dynamics

<table>
<thead>
<tr>
<th>Year</th>
<th>North America</th>
<th>Latin America</th>
<th>Europe</th>
<th>China</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>0.3</td>
<td>0.6</td>
<td>0.4</td>
<td>0.6</td>
<td>0.4</td>
</tr>
<tr>
<td>2016</td>
<td>0.4</td>
<td>0.7</td>
<td>0.4</td>
<td>1.2</td>
<td>1.3</td>
</tr>
<tr>
<td>2018</td>
<td>0.4</td>
<td>0.6</td>
<td>0.4</td>
<td>1.2</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Average growth per year: 2% p.a.

### Current demand drivers

#### Historical growth drivers
- Cost efficient product development for corn in the US
- High labor cost / low mechanization markets
- Government pressure to improve nutrient use efficiency in China
- Nitrogen pollution regulation in the US (Florida / California)

#### Potential growth enablers
- Lower cost technologies and scale benefits, enabling lower sales prices
- Palm oil / rice / sugar cane development

#### Potential growth disablers
- Biodegradability regulation in Europe (likely)

### Potential 10yr growth

- **Average growth per year**: 15%
- **2016-18 growth**: 8%
- **Potential market by 2026**: 4.5 Mt (mid-range growth)

*China share of the growth: ~70%

**Underlying growth support for CRF linked to macro-trends on wealth, food habits, resource scarcity (water, land, labor), population growth**

Source: various publications, trade data, interviews, RAMS & Co analysis
Demand dynamics – *High level estimates for SRF*

**Historical market dynamics**

- **SRF**
  - 2006: 0.3 Mt
  - 2016: 1.4 Mt
  - 2018: 1.5 Mt
  - Average growth per year: 3.2% p.a.

**Current demand drivers**

- **Historical growth drivers**
  - Government pressure to improve nutrient use efficiency in China
  - Market penetration for rice in South China
  - Turf / golf and nurseries growth

- **Potential growth enablers**
  - Higher penetration in rice in Asian countries
  - Labor shortage in plantation / low mechanization systems

- **Potential growth disablers**
  - Little room for cost competitiveness to enlarge accessible markets

**Potential 10yr growth**

- **Average growth per year**
  - 2016-18 growth: 12%
  - 2016-18 growth: 7%

- **Potential market by 2026**
  - 4.2 Mt (mid-range growth)

  **China share of the growth**: ~95%

*Source: various publications, trade data, interviews, RAMS & Co analysis*
Demand dynamics – *High level estimates for SNF*

**Historical market dynamics**

<table>
<thead>
<tr>
<th>SNF</th>
<th>2006</th>
<th>2016</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
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<tr>
<td>Others</td>
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<td>0.9</td>
<td>0.9</td>
</tr>
</tbody>
</table>

- **16% p.a.**
- **5% p.a.**

**Current demand drivers**

**Historical growth drivers**
- Low price premium compared to commodities
- High urea / ammonia prices (2010-15) increasing benefits
- Environmental regulations
- Government pressure to improve nutrient use efficiency in China
- AN (nitrate / storage) regulations

**Potential growth enablers**
- Huge potential in China and Asian cropping systems (urea intense)
- SNF European regulations by 2020 to boost stabilizer demand

**Potential growth disablers**
- US market more likely on a slower growth path (early adoption/innovator phase completed)
- Current low urea prices do not favor fast penetration in cost sensitive markets (Asia)

**Potential 10yr growth**

- **Average growth per year**
  - 2016-18 growth: 12%
  - 2018-26 growth: 10%

- **Potential market by 2026**
  - 27 Mt (mid-range growth)

- **China share of the growth:** ~35%

**Underlying growth support for SNF linked to macro-trends on wealth, food habits, resource scarcity (water, land, labor):**
- Corn, wheat, rice production
- Fertilizer intensity

Source: various publications, trade data, interviews, RAMS & Co analysis