Global protein market outlook

*Investment opportunities in a fast changing world*

Nan-Dirk Mulder, 26 June 2019
Rabobank: The financial link in the Food and Agri industry with animal protein as a key focus industry

135
Clients around the globe

14/20
14 of the Top 20 global Animal Protein companies are Rabobank clients

# of Rabobank relationships with global Animal Protein companies:

53
Pork & Beef

40
Poultry

42
Seafood
One of the largest F&A research hubs in the world and the world’s leading F&A financial services provider

Unique combination of strategic business development and in-depth research

F&A coverage from farm to fork, across rural and wholesale sectors

Broad knowledge of innovation, strategic development and risk-reward balances along the value chain

Vast global network with access to all players in the market

Global team of experts with real-time insights into local markets

of local experts
Worldwide 35% more demand for animal protein in next 20 years

**Global animal protein demand projections 2017-2037f**

CAGR: 2017-2037f
- Eggs: CAGR +1.6%
- Beef: CAGR +1.1%
- Pork: CAGR +1.0%
- Poultry: CAGR +2.0%
- Seafood: CAGR +1.2%

Source: Rabobank analysis based on USDA, FAO and local statistics, 2018
Aquaculture is the fastest growing animal protein industry and 2/3 Asia based

**Poultry and aquaculture: key drivers**

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<thead>
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<tbody>
<tr>
<td>Poultry</td>
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<td></td>
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<td></td>
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<tr>
<td>Fish from capture</td>
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<tr>
<td>Fish from aquaculture</td>
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CAGR: +2.8%
CAGR: +0.2%
CAGR: +4.9%

**Global aquaculture supply by region**

- China
- Other SEA producers
- Rest of world

Source: Rabobank analysis based on FAO, USDA and local statistics, 2019
Consumer demand is changing when economies develop further.
The expansion of the new mega cities

Global urbanisation: many of the leading cities in Asia

India’s mega city 2030 economy compared to mid-income economies

Source: FAO, Rabobank projection based on FAO and McKinsey, 2019
90% of global growth is in emerging markets; 60% in Asia

Source: Rabobank analysis based on USDA, FAO and local statistics, 2019
Dairy demand growth is very much Asia focussed

Global dairy demand outlook 2018-2023

- Source: Various sources, Rabobank
- China include Taiwan and Hong Kong
Global agricultural land use is declining; while especially Asia has limited resources.

Available land and water per capita

Worldwide land use 1961-2015

Source: Rabobank, FAO 2019

Source: FAO/Rabobank analysis 2019
Global food supply challenge: more focus on yield and efficiency

- Animal protein demand
- Food demand
- Biofuel demand

- Meat supply
- Food supply
- Fuel supply

- Livestock/poultry supply
- Grains and oilseed supply

Land use

+60% in 2050

Expansion
Efficiency
Yield

Efficiency
Cultivation
Yield

Further decline

Source: Rabobank, 2019
Emerging market growth and challenges are driving to modern farming

- Higher incomes and welfare
- Modern distribution
- Food safety
- Animal disease threat
- High feed prices/limited resources

- Modern value chain
- Larger companies
- Vertical integration
- Efficiency
- Yield
- Value chain management
- Sustainability

More modern compound feed demand
Efficiency improvement is and will remain a key focus of the industry

**Benchmark costs in broiler production in 2017**

<table>
<thead>
<tr>
<th>Country</th>
<th>Feed price (EURct/kg)</th>
<th>DOC (EURct/kg)</th>
<th>Feed conversion</th>
<th>Weight</th>
<th>Wage EUR/hour</th>
<th>Processing costs</th>
<th>Total cost whole chicken</th>
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<tbody>
<tr>
<td>China</td>
<td>37.5</td>
<td>23.5</td>
<td>1.85</td>
<td>2.0</td>
<td>3</td>
<td>19</td>
<td>154</td>
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<tr>
<td>France</td>
<td>29.2</td>
<td>30.3</td>
<td>1.67</td>
<td>1.9</td>
<td>20</td>
<td>31</td>
<td>154</td>
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<tr>
<td>Netherlands</td>
<td>31.1</td>
<td>31.1</td>
<td>1.58</td>
<td>2.4</td>
<td>22</td>
<td>33</td>
<td>147</td>
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<tr>
<td>Spain</td>
<td>31.5</td>
<td>32.0</td>
<td>1.72</td>
<td>2.6</td>
<td>14</td>
<td>27</td>
<td>144</td>
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<tr>
<td>Hungary</td>
<td>30.2</td>
<td>30.9</td>
<td>1.63</td>
<td>2.3</td>
<td>5</td>
<td>21</td>
<td>136</td>
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<tr>
<td>Poland</td>
<td>31.4</td>
<td>31.5</td>
<td>1.62</td>
<td>2.3</td>
<td>6</td>
<td>22</td>
<td>134</td>
</tr>
<tr>
<td>Thailand</td>
<td>29.6</td>
<td>28.9</td>
<td>1.68</td>
<td>2.4</td>
<td>2</td>
<td>17</td>
<td>120</td>
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<tr>
<td>US</td>
<td>24.1</td>
<td>27.0</td>
<td>1.83</td>
<td>2.7</td>
<td>14</td>
<td>25</td>
<td>117</td>
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<tr>
<td>Ukraine</td>
<td>24.2</td>
<td>32.0</td>
<td>1.74</td>
<td>2.5</td>
<td>2</td>
<td>18</td>
<td>112</td>
</tr>
<tr>
<td>Brazil</td>
<td>24.4</td>
<td>22.3</td>
<td>1.79</td>
<td>2.6</td>
<td>3</td>
<td>17</td>
<td>108</td>
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Source: Rabobank analysis based on WUR/LEI, 2019

**Upside in milk yield comparison**

![Graph showing milk yield comparison](source: Rabobank analysis based on WUR/LEI, 2019)
More West – East trade flows to supply Asian markets

Rabobank 2018 global pork trade map

Rabobank 2018 global poultry trade map

Source: Rabobank, 2019

Source: Rabobank, 2019
Global grains and oilseed markets: China ASF, US-China trade war, improved supply

Global Soybean imports

Global Soybean exports

Source: Rabobank analysis based on USDA, FAO and local statistics, 2019
Social changes can impact the outlook for animal protein markets

**Meat substitutes retail sales**

- Meat substitutes share <0.5% in global protein markets
- Global CAGR: +4.4%

**Carbon footprint of food products**

Source: Rabobank analysis based on Euromonitor, 2019

Source: Rabobank analysis based on WUR, 2019
Social concern driven changes are rising globally and impact industry

Selected regional social concern driven changes:
- Canada: ban on pig gestation
- Alberta: Phase out of battery cages
- California Jan 2015 cage ban
- EU: 2012 conventional cage ban, 2012, sow houses
- D: Germany Initiative Tierwohl
- US - EU Antibiotics
- Client based push to non cage eggs
- Brazil discussion about cage ban
- China: Antibiotics, melamine scandals
- ACT, WA: Bans on cage houses and sow stalls
- Europe: chicken concepts
- Brazil discussion about cage ban

Themes with big global impact:
- Animal welfare
- Environment and community
- Production methods
- Health

Source: Rabobank analysis, 2019
Online is changing the food industry more than ever

Confidence in opinion leaders in Germany, 2017

On-line food sales in United States

On-line food sales in China (CNY million)

Rabobank analysis, 2019

USD 16 billion CAGR: +21%
USD 40 billion CAGR: +40%

Source: Rabobank analysis, 2019
Market demand is changing; more concepts and higher standards

**Europe: animal welfare driven change; NL example**

**US: Customer driven shift to concepts**

Source: Company Announcements, Rabobank Estimates, 2019
Rising investment opportunities in alternative protein segment

Alternative proteins market segmentation

- Traditional meat replacers
  - Quorn
  - Tofurky
  - Garden Gourmet
- Start up meat replacers
  - IMPOSSIBLE
  - SuperMeat
  - JUST
  - GFI
  - Mvincia
- Meat ingredient replacements
  - Protifex
  - CALYSTA
- Feed ingredient replacers
  - EntoCycle

Alternative protein investments

<table>
<thead>
<tr>
<th>Year</th>
<th>Startup</th>
<th>Funding</th>
<th>Protein industry investor</th>
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<tbody>
<tr>
<td>2011</td>
<td>JUST</td>
<td>$387 m</td>
<td>ERMAS UK HOLDINGS</td>
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<tr>
<td>2011</td>
<td>IMPOSSIBLE</td>
<td>$220 m</td>
<td>ERMAS UK HOLDINGS</td>
</tr>
<tr>
<td>2012</td>
<td>CALYSTA</td>
<td>$85 m</td>
<td>ERMAS UK HOLDINGS</td>
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<tr>
<td>2009</td>
<td>BETTER MEAT</td>
<td>$72 m</td>
<td>Tyson</td>
</tr>
<tr>
<td>2015</td>
<td>Mevity</td>
<td>$20 m</td>
<td>Tyson, Cargill</td>
</tr>
<tr>
<td>2015</td>
<td>SuperMeat</td>
<td>$4 m</td>
<td>Tyson</td>
</tr>
</tbody>
</table>

Source: Rabobank analysis, 2019
The move to concept poultry and other proteins leads to different costs

Broiler concepts cost price comparison in NL

A smarter food chain: more circular
New technology will help to solve key supply and social challenges

**Upcoming new technology**

- Smart farming and big data
- Blockchain technology
- Artificial intelligence
- Robotics
- Online, internet of things
- Genomics and gene typing
- Novel feed additives and ingredients

**From intuitive to more fact based decisions**

- Financial and technical performance
- Animal health and welfare
- Environmental impact
- Quality management, horizontal and vertical communication
- Tracking & tracing

- • Growth rates
- • FCR
- • Yields
- • Mortality rates
- • Density
- • Diseases
- • Stress
- • Foot print
- • Efficiency
- • Energy
- • Water usage
- • Value chain co-ordination
- • Benchmarking

From intuitive to fact based decisions

Source: Rabobank analysis, 2019
Animal protein supply chains will change fundamentally in next decade

Food distribution: a future revolution

Value chain models need to change

New distribution models

Horizontal specialisation model
- Grain and oilseeds
- Feed
- Breeding
- Farming
- Processing
- Customer

Semi-Vertically integrated value chain
- Grain and oilseeds
- Feed
- Breeding
- Farming
- Processing
- Customer

Full vertically integrated value chain: feed to poultry
- Grains and oilseeds
- Feed
- Breeding
- Farming
- Processing
- Customer

Multisector – Fully vertically integrated value chain: grains to poultry
- Grains and oilseeds
- Feed
- Breeding
- Farming
- Processing
- Customer

Technologic innovation

Source: Rabobank analysis, 2019
How to supply adequate protein crops to feed rising population?

Global GM/GM free seed market by region

- NAFTA: 16%
- Latin America: 27%
- Europe: 99%
- Asia: 85%
- MEA: 60%

45% of global seed market is GM free

Global protein crop production: alternatives for soy bean?

- Soybean: 47%

Source: Rabobank analysis, Philip McDougall, 2019
Alternative protein sources are promising, but not competitive yet.

- DDGS
- Rapeseed meal
- Sunflower seed meal
- Biofuel by-products
- Field crops
- Synthetic AAs
- Future alternatives
- Concentrates
- Six key limiting amino acids that can be synthesised
- Legumes (pulses)
- Hemp
- Leafy crops
- Algae?
- Yeast based ingredients?
- Insect based ingredients?
- Single cell proteins?
- Soybean meal concentrate
- Expensive?

Source: Rabobank, 2019
Closer linkages between G&O production and (animal) protein

Grains & oilseeds trade → Feed additives → Premix → Compound feed → Animal protein production

Source: Rabobank 2019
Conclusions

Markets
• 35% global growth; 90% in emerging markets
• More poultry and aquaculture
• On-line will change industries
• Alternative and concept protein market to grow significantly

Supply
• Feeding the world requires efficient supply
• Social concerns to drive concept poultry growth
• Need for alternative feed protein sources
• Global reduction of antibiotics use

Technology
• New technology to support industry challenges
• Big new pending innovation can support industry to solve social challenges
Thanks for your attention

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