Alternative Proteins: Hope or Hype?

Potential Implications for Animal Agriculture

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Alternative protein options are proliferating.

Plant-based products are gaining traction.

Demand for alternative proteins is global.

Regulation and supply chain are potential constraints.

What does this mean for animal protein?
Plant-based proteins still relatively small

Source: Euromonitor, Rabobank 2020
Growth in alt proteins has been massive

Source: Euromonitor, Rabobank 2019

5-Year CAGR
US +10%
EU 15%

USD mln
1400
1200
1000
800
600
400
200
0


in billions

2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030

Tofu/Temppeh  Veggie Burger  "New" Entrants
Multiple drivers of alt protein growth

1. **Consumers striving to find “better-for-you” products**
   - Plant-based products have health halo
   - Growing backlash on heavily processed items
   - Next generation of products will be better

2. **Growing interest in sustainable production**
   - Conflicting studies on animal footprint generate confusion
   - Industry impact on water, land and air under scrutiny

3. **Consumers looking for “new and exciting”**
   - Younger generations increasingly experimental
   - Global market driving interest
   - Influencers have changed

4. **Consumers looking for more versatile protein options**
   - Proteins viewed as an ingredient; not center-of-the-plate
   - Ingredients tailored to meet nutritional or religious goals

5. **Animal welfare advocates are gaining traction**
   - A small, but vocal minority of advocates toward veganism
   - Shrinking involvement in agriculture distances consumer from source

Source: Rabobank, 2019
Health goals driving protein choices

2/3 of consumers looking for healthier protein options

- Better-for-me: 66%
- Better for the animal: 29%
- Better-for-the-planet: 28%
- Better-for-the-farmers/workers: 26%
- No interest in any better-for-items: 20%

Health #1 for baby boomers

Environmental impact #1 for millennials

Source: NAMI, 2019
Battle over health is heating up

Chipotle says Beyond Meat is too processed to put in its stores - July, 2019

Whole Foods CEO says plant-based 'meat' is unhealthy - August, 2019

How ultra-processed food took over your shopping basket - February, 2020

The New York Times

_Eat Less Red Meat, Scientists Said. Now Some Believe That Was Bad Advice._
Nutritional benefits are underwhelming

Calorie counts are similar, but sodium differences are significant

Fat levels are mixed, while beef outperforms on protein

Source: Company reports, USDA and Barclays, 2020
US consumers seeking higher protein

...yet few consumers able to identify animals as a source

- 45% failed to identify beef as high protein
- 58% failed to identify chicken as high protein
- 64% failed to identify pork as high protein

Source NAMI, Stanford, Rabobank 2019
Protein needs could outpace supply

Source: UN, FAO, and Rabobank, 2019
Animal productivity gains overlooked

Industry water use
-20% in 20 years

Carbon Footprint
-8% Hogs
-16% Beef

20-year productivity change in the US

<table>
<thead>
<tr>
<th>Industry</th>
<th>Hogs</th>
<th>Dairy</th>
<th>Broilers</th>
<th>Beef</th>
<th>Layers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation Herd</td>
<td>-15%</td>
<td>-4%</td>
<td>15%</td>
<td>-13%</td>
<td>3%</td>
</tr>
<tr>
<td>Production</td>
<td>43%</td>
<td>38%</td>
<td>63%</td>
<td>25%</td>
<td>41%</td>
</tr>
</tbody>
</table>

Source: Animal Ag Alliance, Rabobank, 2019
The Future is Flexitarian
Flexitarians are driving alt protein trends

2019 Market Segmentation (in millions)

Who Are America’s Vegans & Vegetarians?
"In terms of eating preferences, do you consider yourself vegan, vegetarian?"

- Vegetarian
- Vegan

Age
- 18-29: 7% Vegetarian, 8% Vegan
- 30-49: 3% Vegetarian, 4% Vegan
- 50-64: 3% Vegetarian, 3% Vegan
- 65+: 2% Vegetarian, 3% Vegan

Annual income
- Less than $20,000: 9% Vegetarian, 4% Vegan
- $30,000-$74,999: 5% Vegetarian, 2% Vegan
- $75,000+: 4% Vegetarian, 2% Vegan

Political ideology
- Conservative: 2% Vegetarian, 2% Vegan
- Moderate: 3% Vegetarian, 1% Vegan
- Liberal: 11% Vegetarian, 5% Vegan

54% trying to reduce their meat consumption

24% of all consumers purchased plant-based meat

Best description of how you eat today

Meat-eater: 86%
Flexitarian: 10%
Vegan/Vegetarian: 4%

Source: Gallup, NAMI, Rabobank 2019
Flexitarians are the target customer

Youth more likely to change protein source

Consumers reduce, but not eliminate animal protein

Source: Euromonitor, Rabobank 2019
Millennials favor more diverse proteins

Source: American Seafoods/Flemming Research, Rabobank 2018
Populations likely to shift behavior

K-12

- Inconsistent school curriculum
- Meatless Mondays
- Information from people they trust

Colleges & Universities

- More experimental
- Food availability is key
- Establishing buying patterns
- Influence each other

Boomers

- Less likely to shift channels
- Health-focused
- Health professionals influence
- Media and friends are key
Alternative proteins are slowly evolving

- Plant-Based
- Emerging
- Cellular Meat

Today 2030?
Plant-based had been a niche business
Plant-based now a crowded category
Battle of the burgers

Options have evolved

**BEYOND MEAT**
- Pea-based protein, coconut oil, beet juice (for color)
- Both retail and foodservice
- On 6 Continents & 50 countries
- In mainstream retail incl. Kroger, Safeway, Target, Whole Foods
- Beyond Burger; Beyond Sausage & Crumbles
- Chicken strips being reformulated

**IMPOSSIBLE**
- Wheat and potato proteins, canola oil, leghemoglobin (heme) - a genetically-modified ingredient
- Product ‘bleeds’ like a burger
- Focused on foodservice trade
- Recently launched in retail
- Impossible Burger, Breakfast Sausage Sandwiches, Meatballs

Source: Company reports
Go-to-market strategies differ

Foodservice partnerships are key

Source: Company reports
Foodservice a critical entry point

- Low cost trial
- Control and ease of preparation
- Generate buzz
- Not known for health food
- Often sell more beef when offering plant-based
- Still underpenetrated at QSR
Retail opportunity may be more limited

✓ Current premium 3-4x traditional  
  more promotion needed

✓ At home preparation ≠ foodservice  
  more trial may be required

✓ Competition will increase with new entrants  
  will help build redundancy

✓ Retailers introducing private label
Plant-based will over index on-line

Meat-eaters still prefer in-store experience

<table>
<thead>
<tr>
<th>Online shopping by generation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>39%</td>
</tr>
<tr>
<td>Younger Millennials</td>
<td>51%</td>
</tr>
<tr>
<td>Older Millennials</td>
<td>47%</td>
</tr>
<tr>
<td>Gen X</td>
<td>38%</td>
</tr>
<tr>
<td>Boomers</td>
<td>25%</td>
</tr>
</tbody>
</table>

Have purchased groceries online in the past year

- 2015: 29%
- 2018: 38%
- 2019: 39%

Source: NAMI, POM 2019
How will plant “blends” factor

Cons

Crowded category
Low barriers to entry/IP
Make vs. buy

Pros

Limited growth in traditional protein
Double-digit growth in alternatives
Consumers’ willingness to try
Cultivated meat coming soon-ish

Companies have “proof of concept”
Costs lower; but not at scale

Regulation a potential constraint
Industry not aligned on core approach

Consumer acceptance unknown
Likely to be introduced in foodservice, minced

Environmental impacts not fully estimated
Energy, water, & waste impact to be determined
A shorter, but growing list

Logos of companies such as Mission Barns, JUST, SavorEat, Mosameat, Biftek.co, New Age Meats, Meatable, Finless Foods, Integriulture, SuperMeat, FORK&GOODE, FM Cigars, MEMPHIS MEATS, Aleph Farms, BlueNalu, WILDTYPE, and Geltor.
Multiple challenges facing alt proteins

- Consumer Acceptance
- Cost Competitiveness
- Financing
- Distribution
- Regulatory Challenges
Consumer acceptance still unclear

Consumer Willingness to Buy Lab-based Meat

- Very unappealing: 39%
- Somewhat unappealing: 16%
- Neither appealing or unappealing: 17%
- Somewhat appealing: 16%
- Very appealing: 9%
- Don't Know: 4%

Source: NAMI, Power of Meat, 2019
The cost of a lab-grown burger has dropped exponentially in 5 years!

Cost of cultured meat, ($/lb)

Source: Rabobank, 2019
Regulation is a potential disruptor

- USDA and FDA appear aligned
- Legal challenges to define “meat” at state level
- Global regulations vary
- Hard to adapt labeling for a moving target
- Industry players not always in agreement Alliance for Meat, Poultry, & Seafood Innovation
What is “Meat”?

Got Almond Milk? Dairy Farms Protest Milk Label on Nondairy Drinks

“The reasonable consumer (indeed, even the least sophisticated consumer) does not think soymilk comes from a cow.”

US District Judge Vince Chhabria

Cattlemen's group has a beef with 'fake meat'

Dairy producers in a food fight over "fake milk"
Different than plant-based milk?

Market penetration of plant-based milk

<table>
<thead>
<tr>
<th>Region</th>
<th>Milk Alternatives Penetration</th>
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<tbody>
<tr>
<td>Asia Pacific</td>
<td>15%</td>
</tr>
<tr>
<td>N. America</td>
<td>13%</td>
</tr>
<tr>
<td>World</td>
<td>10%</td>
</tr>
<tr>
<td>W. Europe</td>
<td>9%</td>
</tr>
<tr>
<td>Australasia</td>
<td>5%</td>
</tr>
<tr>
<td>L. America</td>
<td>3%</td>
</tr>
<tr>
<td>ME &amp; Africa</td>
<td>1%</td>
</tr>
<tr>
<td>E. Europe</td>
<td>1%</td>
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Fluid milk sales by market, in billions USD

<table>
<thead>
<tr>
<th>Region</th>
<th>Fluid Milk Sales (in billions USD)</th>
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</thead>
<tbody>
<tr>
<td>Asia Pacific</td>
<td>76</td>
</tr>
<tr>
<td>N. America</td>
<td>21</td>
</tr>
<tr>
<td>World</td>
<td>178</td>
</tr>
<tr>
<td>W. Europe</td>
<td>26</td>
</tr>
<tr>
<td>Australasia</td>
<td>5</td>
</tr>
<tr>
<td>L. America</td>
<td>22</td>
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<tr>
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<td>19</td>
</tr>
<tr>
<td>E. Europe</td>
<td>9</td>
</tr>
</tbody>
</table>

Source: Euromonitor, Food Intolerance Network, Rabobank, 2019

North American milk alternatives penetration
13% dollars, 5% volume

Lactose intolerance in global population

Source: Euromonitor, Food Intolerance Network, Rabobank, 2019
## Supply chain will be critical

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Technology</th>
<th>Processing</th>
<th>Packaging</th>
<th>Distribution</th>
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<tbody>
<tr>
<td>Soy</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Pea</td>
<td></td>
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</tr>
<tr>
<td>Mycoprotein</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Soy**
- Widely used
- Limited supply constraints
- US and South America
- Health-concerns (estrogen)
- GMO soy concerns

**Pea**
- Rising in popularity
- Grown in France, growing in Canada and US
- Short-term supply constraints
- Some glyphosate concerns

**Mycoprotein**
- Non-GMO fungus-based product
- Gaining in popularity
- Requires significant processing/fermentation
- Ultra - sustainable

**Other**
- Includes mung beans, chickpeas, and lentil
- Sustainability concerns in some cases
- Supply constraints
Dietary trends tend to be cyclical

Could alternative proteins have staying power or is this a fad?

- 1980s: Low fat, low cholesterol
- 1990s: Presence of positives
- 2000’s: Functional foods
- 2010’s: Whole foods, less processed
- 2020+: Environmental impact?
Alternative protein impact in early innings

- Alternative protein products will only get better
- Competition in the meat case will get more intense
- Lead on health & sustainability
- If you can’t be them, do you join them?
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