



Rabobank

Why US bakeries need to prepare for the low-carbon economy and how they can

Lowering emissions for environmental and financial sustainability

RaboResearch

Food & Agribusiness
far.rabobank.com

JP Frossard

Analyst – Consumer Foods
+1 (929) 697-5548

Eric Gibson

Analyst – Sustainability,
Farm Inputs & Crop
Production
+1 (314) 438-8566

Matthew Lewis

Analyst – Sustainability,
Consumer Foods,
Packaging & Logistics
+1 (614) 309-7337

Contents

Leading US bakeries commit to emissions targets	1	Initiatives to curb emissions in bakery	6
Where is the pressure coming from?	3	Conclusion: Building a business case for green bread	8
Current footprint of American bread	5		

Commercial bakeries in the US have started feeling pressure from their institutional clients (foodservice players and retailers) to account for and ultimately reduce greenhouse gas (GHG) emissions. This will require changes within and outside bakery facilities, from improved wheat-farming techniques to equipment and ingredient innovation. This report discusses:

- The drivers behind bakeries’ increased concerns about GHG emissions.
- The current environmental footprint and initiatives of bakeries.
- The potential impacts for bakeries and ingredient manufacturers.
- The opportunities for bakeries to contribute to global GHG-reduction efforts while reducing commercial and regulatory risks.

Leading US bakeries commit to emissions targets

Reducing GHG emissions has become a top priority for governments in most industrial and developing economies, as exemplified by the intensification of the international environmental agenda, the creation of globally recognizable measurement standards, and the establishment of incentives to support transitioning to a low-carbon economy. Many governments have made pledges in global forums, although how they plan to approach implementation varies in style and intensity. The current US administration has focused on a carrot-and-stick approach materialized in the form of the Inflation Reduction Act, which has dedicated nearly USD 400 billion in incentives for clean energy and other green initiatives. The USDA’s Partnership for Climate-Smart Commodities is set to provide an additional USD 3.1 billion to support sustainable production practices across the agricultural food value chain. Local authorities are also launching initiatives.

In this context, food manufacturers are increasingly requested to account for – and eventually reduce – the greenhouse gas (GHG) emissions generated during the production and commercialization of their baked goods. This includes accounting for processes, like soil preparation and ingredient production, that are beyond their control and occur far from their facilities. Leading bakery players are already engaging and becoming vocal about improved sustainability practices, taking significant action in their operations (manufacturing, procurement, distribution) and committing to massive emissions cuts and even carbon neutrality in the upcoming years (see table 1).

Table 1: North American bakeries' targets, 2024

Company	Stated target (SBTi*)
Campbell Soup Company (owner of Pepperidge Farm)	Reduce scope 1 and 2 emissions by 42% and scope 3 emissions by 25% by 2030 (from a 2020 baseline).
Grupo Bimbo	Reduce scope 1 emissions 50% by 2030, reach 100% renewable electricity by 2025, and reduce scope 3 emissions 28% by 2030 (2019 baseline).
Mile Hi Bakery (acquired by Grupo Bimbo)	Reduce scope 1 and 2 emissions by 50% by 2030 (2018 baseline) and measure and reduce scope 3 emissions. Committed to reach net-zero by 2050, reducing scope 1, 2, and 3 emissions by 90% by 2050 (2018 baseline).
Company	Stated target (non-SBTi*)
Aspire Bakeries	In-house initiatives on scopes 1 and 2; committed to engage its key suppliers to reduce scope 3 emissions.
Flowers Foods	20% reduction in scope 1 and 2 emissions by 2030 (2020 baseline).
Rich Products Corporation	Reduce scope 1 and 2 emissions by 25% by 2025 (2016 baseline).

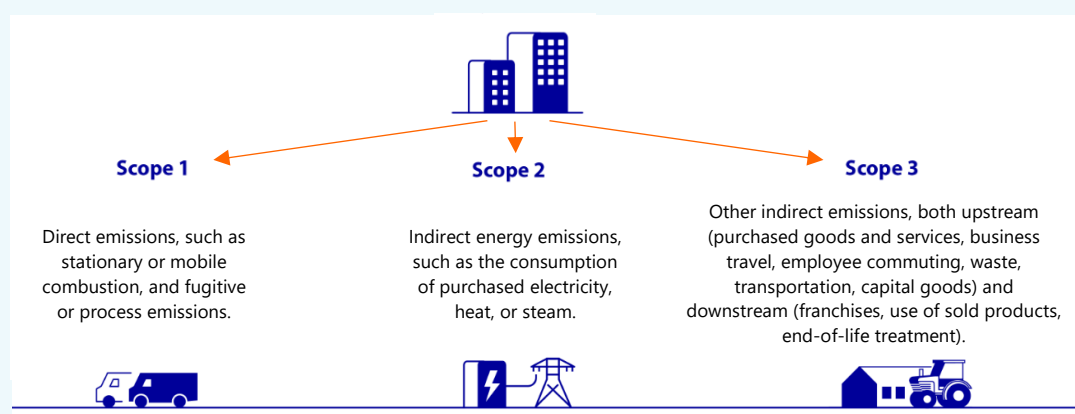
*Science Based Targets initiative (SBTi). Non-SBTi targets refer to self-imposed targets by companies not subjected to the standards set by the SBTi.

Source: SBTi and companies' websites, Rabobank 2024

Box 1: How to account for bakery emissions

According to the Greenhouse Gas Protocol, a company's emissions can be divided into direct and indirect emissions. Direct, or scope 1, emissions come from activities directly owned or controlled by a company. Indirect emissions are a consequence of the company's activities but are controlled or owned by someone else. Indirect emissions can be further subdivided into scope 2 emissions (from the consumption of purchased electricity, heat, or steam) and scope 3 emissions (from the production and transportation of raw material, waste disposal, etc.).

Figure 1: Scope 1, 2, and 3 emissions



Source: GHG Protocol, Rabobank 2024

For example, a bakery would designate any emissions from their company-owned vehicles as scope 1 emissions, the electricity used in the factory as scope 2, and the emissions released during the production of raw material, transportation of these inputs, and employee commuting as scope 3 emissions.

Where is the pressure coming from?

A significant subset of consumers want to shop and eat sustainably but can't analyze every item on the shopping list, as it would be impossible for them to know what's behind each product's manufacturing process. Consequently, institutional buyers and regulators are pushing for emissions disclosure as a way to address this demand and improve consumers' experience. Restaurants and retailers can benefit from assuring consumers they are applying elevated standards when selecting suppliers and curating offerings.

Foodservice chains count on sustainability for differentiation

Large restaurant chains and foodservice suppliers have committed to cutting emissions in an effort to add value and differentiate from peers. As such, they are increasingly looking at their suppliers and partners – food manufacturers, packaging suppliers, third-party operators – as they represent the bulk of emissions in their operations. As an example, McDonald's has committed to drastically cut GHG emissions in their operations (see table 2); however, the company assigns 99.02% of its carbon generation to vendors and franchisees (scope 3). Therefore, the company can only make meaningful changes by addressing emissions generated by its vendors and partners, most of which are outside its direct control. So far, most of the efforts, including participating at the Global Roundtable for Sustainable Beef and supporting sustainable feed sourcing, are being put toward more carbon-intense inputs such as animal protein (beef, chicken, and dairy). However, as a main input for quick-service restaurants, baked goods could come next on the agenda. After all, the high targets require players to fight on all fronts.

Table 2: Foodservice players' and retailers' targets, 2024

<i>Company</i>	<i>Scopes 1+2 reduction target</i>	<i>Scope 3 reduction target</i>	<i>Scopes 1+2+3 reduction target</i>
Albertsons Companies	47% (2030)	27.5% (2030)	
Chipotle Mexican Grill	50% (2030)	50% (2030)	
Golden State Foods			22% (2030)
Lidl (Schwartz Group)	55% (2030)		
McDonald's	50.4% (2030)	72% (2050)	
Restaurant Brands International	50% (2030)	50% (2030)	
Sodexo	55% (2030)		
Sysco	27.5% (2030)		
Target			30% (2030)
Kroger	30% (2030)		
Wendy's	47% (2030)	47% (2030)	
US Foods	32.5% (2030)		
Walmart	65% (2030)	1 billion metric tons CO ₂ e (2030)	
Yum! Brands	46% (2030)	46% (2030)	

Source: SBTi, Rabobank 2024

Food retailers are tracking scope 3 already

Leading food retail chains have also made sustainability commitments, and similar to restaurants, they have limited control over the emissions from products on their shelves (private label is the only segment they could actively influence). US grocery leader Walmart has pledged to shave off 1 billion metric tons carbon dioxide equivalent (CO₂e) of scope 3 emissions by 2030; Albertsons committed to reduce sold-product emissions by 27.5% within the same timeframe, in addition to having 63% of its supplier base (by emissions) committed to science-based targets (SBTi) as early as 2026. These expectations will shape retailers' purchasing decisions and shelf space allocations, providing an opportunity for early adopters of climate-related reporting and for goal-setting through food manufacturing.

Table 3: Retailers' targets for suppliers and progress, 2024

<i>Company</i>	<i>Supplier requirement</i>	<i>Current progress</i>
Aldi	75% must set SBTi targets (2025)	NA
Albertsons	63% must set SBTi targets (2026)	NA
Lidl (Schwartz Group)	78% must set SBTi targets (2026)	NA
Target	70% must set SBTi targets (2030)	64% report emissions
Walmart	-	75% report emissions

Source: SBTi, Rabobank 2024

Consumers don't prioritize sustainability but like the idea

Will consumers pay more for more sustainably produced bread? Or will consumers eat more baked goods if they know an item is a low-emission product? These are the main questions that arise when discussing consumers and sustainability, and there is no straightforward answer. According to the American Bakers Association's report, *Life Through the Lens of Bakery (2022)*, two out of three Americans state that sustainability matters to them, but its influence on consumers diminishes when they are choosing whether and what baked goods to buy. Product-related and circumstantial drivers – such as taste, texture, price, brand, and mood/occasion – understandably take precedence in the buying decision. However, this influence increases among younger generations, which take sustainability and companies' sustainability initiatives into account more intensively in their purchasing decisions.¹

California regulators go after scope 3 emissions

Large corporations are already feeling the pressure of regulations related to climate disclosures, and further legislation is likely in the pipeline. Recent bills in the California state senate carry reporting obligations for firms doing business within the state and generating global revenues over USD 1 billion (Senate Bill 253) and USD 500 million (Senate Bill 261). The Climate Corporate Data Accountability Act (Senate Bill 253) also requires the disclosure of scope 1, 2, and 3 emissions as of 2026 (using 2025 data) and will apply to both public and private firms. The Climate-related Financial Risk Act (Senate Bill 261) will similarly apply to public and private companies and seeks to compel large corporations to disclose climate-related risks and any

¹ Sixty-nine percent of surveyed consumers mentioned a company's commitment to responsibly sourced ingredients is somewhat or very important; by age group, this number is 72% for Generation Z, 74% for millennials, 67% for Generation X, and 63% for baby boomers. When asked about the importance of a company's commitment to sustainability goals and planet health, 65% consider it somewhat or very important, on average being 73% for Gen Z, 69% for millennials, 62% for Gen X, and 59% for baby boomers.

mitigation measures in place. Also, in California, the Proposed Amended Rule 1153.1 aims to expand control over emissions from food manufacturers' ovens, a crucial issue to the industry in terms of capex requirement, equipment availability, and operational performance. At a federal level, a recent ruling struck the requirement for reporting scope 3 emissions for public companies regulated by the Securities and Exchange Commission, although many of the largest of these companies will still be required to do so under California and European Union regulations. According to a recent study by Boston Consulting Group surveying over 1,500 global executives, 53% of the companies included currently report scope 3 emissions, up from 34% in a previous survey just three years ago.

Current footprint of American bread

We estimate that the manufacture of a US-baked loaf of bread weighing 2lb generates 578 grams CO₂e (or 1.25lb). This is slightly less than the 589g CO₂e from an identical UK-baked bread, according to a 2017 study. Final emissions numbers vary, primarily according to local farming techniques and energy sources.

Wheat flour production constitutes the majority of bread's environmental footprint, contributing over half of the GHG associated with bread. Energy used during baking and manufacturing is the next largest contributor.

Below, we estimate a loaf of bread's emissions per scope; it's important to consider that each operation will have a unique emissions profile. Factors such as fleet ownership and distance relative to sourced materials and destination of final marketed products can significantly change absolute and proportional emissions figures.

Table 4: Breakdown of emissions for bread production, from wheat cultivation to shelf placement

Scope 1	Scope 2	Scope 3
On-site storage (refrigerants released into atmosphere)	Purchased electricity for the bakery facility	Wheat cultivation and milling
Fleet of owned vehicles		Third-party distribution
		Packaging
~9%	~19%	~72%

Source: Rabobank internal calculations based on different sources, including *The environmental impact of fertilizer embodied in a wheat-to-bread supply chain* (Goucher, L., Bruce, R., Cameron, D. et al., 2017); Field to Market, National Indicators Report (2021), McKinsey & Company 2024

Box 2: Why bread?

This report focuses primarily on breadmaking for three main reasons. Firstly, it is a relatively simple manufacturing process that uses few inputs (wheat flour, water, yeast, salt, packaging, energy). Secondly, it is a vastly consumed food staple with high household penetration. Bread is a universal and culturally significant product. Thirdly, the bakery supply chain counts on global players – bakeries and suppliers – that are expected to dedicate efforts to drive changes in the product's lifecycle and share experiences globally. Many are already working on ambitious targets.

The price sensitivity and low margins characteristic of staple products are the main deterrents for targets. Nevertheless, many premium products and brands in the market (organic bread, for instance) show good sales performance, even under high premiums. From a marketing standpoint, sustainability claims – although not a major sales driver – can be added to other premium claims to add value for more demanding consumers.

According to the UN's Food and Agriculture Organization, among traditional crops, wheat ranks as the second-most carbon-intensive, behind rice and followed by sugarcane. Fertilizers, specifically nitrogen-based, typically represent between 40% and 60% of wheat emissions; that translates to up to 35% of a loaf's total emissions. It's essential to understand that different breads utilize different quantities of ingredients and various flours, which are the result of varying wheat species. These factors, including timing of crop and regionality, may also influence the product's need for nitrogen and, ultimately, its emissions.

Initiatives to curb emissions in bakery

Scopes 1 and 2 are less significant but low(er) hanging fruits

Food manufacturers usually target scope 1 and 2 initiatives first, as they are within their control. The bakery industry is a benchmark with noteworthy initiatives in place.

Globally, Grupo Bimbo counts on over 5,000 trucks powered by sustainable fuel, including 2,500 electric trucks (scope 1). Distribution of fresh-baked goods fits well with an electrified fleet, as trucks cover relatively short distances (manufacturing close to final users) and return to the warehouse at the end of the day, allowing more frequent recharging and therefore requiring less battery capacity. Moreover, Bimbo has set a target to use 100% renewable energy in its facilities globally as early as 2025; they are already over 92% and on track to achieve this scope 2 milestone.

Flowers Foods' scope 1 initiatives include upgrading the lighting system to LED lights and investing in heat recovery (i.e., reusing heat from ovens in other steps of production, such as water heating and proofing boxes).

Having control over emissions ultimately means assuming costs. The initiatives mentioned above are capital-intensive for bakeries but can also be cost-saving in the long run. The same rationale has been a constant in the expansion and construction of new manufacturing lines throughout food manufacturing, as new plants and equipment represent an opportunity to improve scope 1 and 2 footprints and other sustainability metrics while simultaneously improving overall efficiency. Players can benefit from federal incentives and favorable financing instruments from private financing institutions for sustainable practices, taking into account both long-term financial savings and the commercial benefits of improved sustainability practices.

New ingredients and techniques can also help reduce emissions with no upfront capex. One example is Lallemand Baking's Bake Time Reduction Solution, an added enzyme that reduces bake time – and consequently energy use – by up to 30%, while keeping crust formation and overall physical attributes. The enzyme reduces the water-level requirement for bread, bun, and roll dough, requiring less evaporation in the baking process and decreasing water consumption (also a crucial sustainability metric for players across the chain). Besides savings on energy and water bills, reducing baking time allows capacity expansion without capex. Asked about the costs of the enzyme, Lallemand mentioned that – while potential savings vary across different bakeries and locations (given different efficiency levels and water and energy costs) – the solution can be cost-neutral or even beneficial to the costs of product sold.

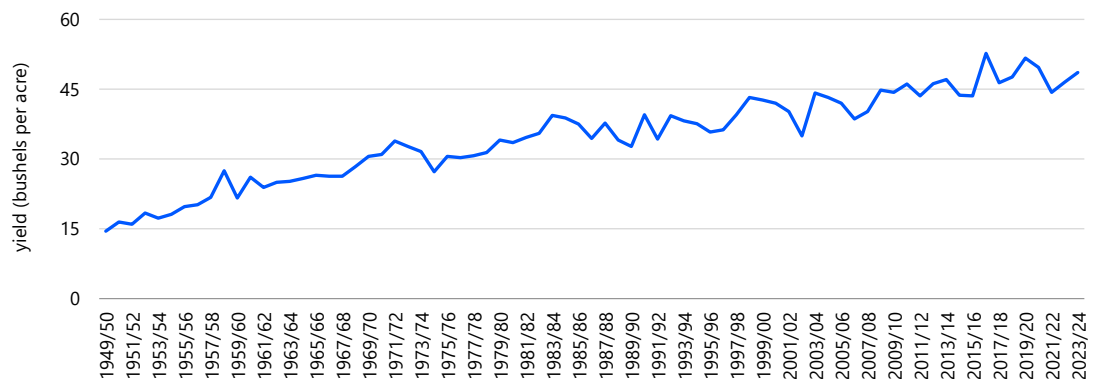
Scope 3 initiatives can move the needle

Scope 3 represents the bulk of emissions, and addressing them requires looking further into the supply chain and working with growers, millers, ingredient manufacturers, and traders on improving practices, most notably in wheat fields. Scope 3 initiatives require bakeries to dedicate resources to tracking and incentivizing (e.g., price premiums, offtake agreements, research grants) best practices in the supply chain, many of which are highlighted below, instead of investing in their own facilities.

Reduction in synthetic fertilizers

Innovation, including the use of enhanced-efficiency fertilizers, has led to yearly increases in US wheat productivity of roughly 15% since 2000. However, the most significant opportunity to improve wheat emissions starts with reducing the use of synthetic nitrogen to boost yields. Alternative nutrient options, such as manure and other animal waste products and biological inputs, can reduce or replace synthetic options, reducing scope 3 emissions. Farmers should manage products accordingly, as each operation requires its own production strategy.

Figure 2: Innovation and enhanced crop inputs have supported consistent increases in US wheat productivity



Source: USDA, Rabobank 2024

Improved farming techniques

Among the farming techniques that could directly reduce emissions in fields, we highlight:

- Conservation tillage: No-till and reduced-till farming consume less fuel, resulting in lower GHG emissions. They also support soil health practices.
- Cover cropping: Cover crops can benefit soil health and contribute to weed suppression and nutrient management.
- Crop rotations: Alternating crops allows for more diverse practices, which may enhance soil health and promote biodiversity.

These practices are commonly included under regenerative agriculture, which many food manufacturers and some bakeries have embraced. Grupo Bimbo has pledged to achieve 100% sourcing of key ingredients from land farmed with regenerative agriculture practices by 2050. The benefits of regenerative agriculture go beyond reduced GHG emissions and include improved soil health, biodiversity, reduced erosion, and enhanced ecological health.

Innovation and reformulation

Innovation can significantly support reducing scope 3 emissions. Wheat and most traditional grains are annual crops, which means they are harvested and replanted every year. Making them perennial crops – i.e., plants standing on the field for many years – would eliminate the need for tillage, cover crops, and replanting, as well as reduce soil erosion. It would also reduce the need for fertilizers, as deeper roots allow nutrients to be collected in deeper – and previously inaccessible – layers of soil.

The first product made from perennial wheat is already available in retail: King Arthur Baking Company's whole wheat flour blend, a premium product packaged in a green bag with many sustainability claims. It was developed by Washington State University's Breadlab research institute. It combined wheat and wheatgrass into a new species under classical plant-breeding techniques (no gene modification) capable of resisting weather throughout the seasons and successive harvestings. Although limited in acreage for now – primarily because of lower yields, which researchers are working to fix – it represents a promising path to optimizing agricultural inputs and soil use.

Besides improving wheat-growing methods, bakeries could explore alternative base ingredients to replace or complement traditional wheat. One opportunity comes from the University of Minnesota's Forever Green Initiative: A perennial intermediate wheatgrass named Kernza² has a similar gluten profile to wheat and is already under commercialization for baking and other applications. Although not a perfect replacement for wheat in leavened products, researchers argue that modestly including Kernza in bread production (5% to 10% of total flour) is possible without significantly affecting product performance and the overall manufacturing process.

Box 3: Size matters when engaging in initiatives

Committing to account for and reduce the emissions from one's own operations and those from third parties under internationally recognized standards requires dedicated resources. Larger corporations have taken the lead in these efforts, also because of increased regulation. Sixty-five percent of US commercial bakeries with over USD 100 million in revenues state they have environmental assessment criteria in place or an equivalent (inclusive but not restricted to GHG emissions) that outlines the organization's impact on the environment and climate to internal and external stakeholders. For bakeries below that revenue threshold, this number is only 16%.

A positive takeaway from the same study is that a higher number of bakery partners have started assessing their own impact: 67% and 53% of ingredient and equipment manufacturers, respectively, mentioned they use such assessments (the number is 47% for all-size bakeries). A main reason for these higher numbers is that ingredient and equipment manufacturers are often large global companies – often publicly traded – that supply a diverse range of clients and geographies with different requirements; what is asked by one becomes available for all.

Although this can be read as discouraging for smaller and regional bakeries, they can benefit from the knowledge of their suppliers to kick off their own assessments. Besides, a relatively shorter supply chain and proximity to the fields reduce the complexity of assessing and influencing farming techniques.

Conclusion: Building a business case for green bread

We firmly believe structural improvements in the sustainability profile of a key food staple like bread can only be achieved if they are also economically sustainable. Bakers navigate on slim margins, most remarkably after the past years of inflation, volatility, and, more recently, volume reduction (see [Bakery bites: Looking back and looking ahead](#)). Executives quite reasonably see the extra costs and additional capex tied to sustainability commitments and initiatives. With this report, we intend to cast light on the long-term business implications and opportunities of including bakery in a broader discussion on sustainability that we can no longer afford to neglect.

Institutional buyers are expected to continue tightening their sustainability requirements relating to procurement to meet their own targets and existing consumer demand. While consumers' views on sustainability may ebb and flow over the coming years, pressure from shareholders, financial service providers, governments, and society at large will remain constant, if not increase. Additionally, positive sustainability performance provides not only a differentiating factor in a competitive landscape but also a touchpoint on which to develop and maintain strong relationships with large buyers.

² The nonprofit organization The Land Institute has led development of the crop since 2003 and owns the Kernza trade name.

Regulation will remain a key consideration. Regardless of changes in leadership, local legislation and agencies' rulings are already affecting national players and driving change. By taking the lead and improving sustainability practices, private players can prepare for the impacts of upcoming imposed measures. Bakers know their manufacturing and sourcing processes better and are the best equipped to improve the industry's environmental footprint and align with regulations.

Pressure comes from downstream sources, and answers are found mostly upstream. As intermediaries between wheat flour and sandwiches, bakeries will be increasingly assigned the role of making consumers' requests for superior sustainability possible by connecting the dots across the value chain, from farm to plate.

Action on scopes 1 and 2 is becoming imperative for all players in food manufacturing, from both an efficiency and a technological standpoint. Discussion now focuses mostly on addressing scope 3, which is the one that will effectively make the change.

There is no one-size-fits-all recipe for scope 3, except the broad recommendation to work with vendors and clients to align expectations and progress. This gets particularly challenging with regard to improving practices at the farm level and establishing traceability throughout the chain. Some US millers have implemented exciting initiatives with their growers and can support this process.

The sustainability train has left the station, and new concepts are expected to be added to the discussion: biodiversity, regenerative agriculture, water and soil use, the social impact of food, and food production. As leading bakeries in North America continue to blaze the trail toward sustainability, players who do not follow that course may be left behind, watching the gap increase and unable to meet end-user expectations. Commercial bakeries of all sizes should prepare and embed in their long-term strategy and day-to-day operations the sustainability plan that best positions them to meet their business goals.

Imprint

RaboResearch

Food & Agribusiness

far.rabobank.com

JP Frossard	Analyst – Consumer Foods	jp.frossard@rabobank.com +1 (929) 697-5548
Eric Gibson	Analyst – Sustainability, Farm Inputs & Crop Production	eric.gibson@rabobank.com +1 (314) 438-8566
Matthew Lewis	Analyst – Sustainability, Consumer Foods, Packaging & Logistics	matthew.lewis@rabobank.com +1 (614) 309-7337

© 2024 – All rights reserved

This document is meant exclusively for you and does not carry any right of publication or disclosure other than to Coöperatieve Rabobank U.A. ("Rabobank"), registered in Amsterdam. Neither this document nor any of its contents may be distributed, reproduced, or used for any other purpose without the prior written consent of Rabobank. The information in this document reflects prevailing market conditions and our judgement as of this date, all of which may be subject to change. This document is based on public information. The information and opinions contained in this document have been compiled or derived from sources believed to be reliable; however, Rabobank does not guarantee the correctness or completeness of this document, and does not accept any liability in this respect. The information and opinions contained in this document are indicative and for discussion purposes only. No rights may be derived from any potential offers, transactions, commercial ideas, et cetera contained in this document. This document does not constitute an offer, invitation, or recommendation. This document shall not form the basis of, or cannot be relied upon in connection with, any contract or commitment whatsoever. The information in this document is not intended, and may not be understood, as an advice (including, without limitation, an advice within the meaning of article 1:1 and article 4:23 of the Dutch Financial Supervision Act). This document is governed by Dutch law. The competent court in Amsterdam, the Netherlands has exclusive jurisdiction to settle any dispute which may arise out of, or in connection with, this document and/or any discussions or negotiations based on it. This report has been published in line with Rabobank's long-term commitment to international food and agribusiness. It is one of a series of publications undertaken by the global department of RaboResearch Food & Agribusiness.