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THE BRAZILIAN PLANT-BASED MEATS INDUSTRIAL FLOURISHMENT

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The Brazilian Plant-Based Meats Industrial Flourishment

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“Animal Liberation is Human Liberation too”

(Peter Singer)

ABSTRACT

The increasing global demand for meat in the 2020s threatens the sustainability and continuity of the food system. While reducing meat consumption is essential, stimulating changes in dietary patterns is complex, and promoting vegetarianism is not suffice. Plant-based meats are a novel food category that has been developed to replicate the culinary, sensory, and nutritional characteristics of traditional animal tissues. Silicon Valley-based food tech startups have added novel food technology to formerly 1960s-developed grain extrusion and texturing industrial processes to create plant-based meats with the potential to expand the consumption of vegetable proteins, thereby saving animals, the environment, the climate, our current food system, and human lives. A collaborative market narrative has sustained the nascent food category, attracting investors interested not only in greening their portfolio but also in disruptive innovation with multiplicative potential. In light of this international food market scenario, we inquired about the role of the Brazilian agrifood sector in this novel food category and how the local foodscape would incorporate it. Brazil's agribusiness is highly productive, particularly in exporting commoditized grains and meats. However, innovation is hindered, especially in food manufacturing instances. Financial flows in Latin America are less fluid than those established in the northern hemisphere, constraining innovation development and implementation. Although prosumer and activist entrepreneur enterprises are working on plant-based meats in Brazil, the country remained on the periphery of the emerging meat substitute industry. The Good Food Institute and FAIRR's multi-level actuation clarified the association between investments in plant-based meats and ESG, while also increasing pressure on global meat corporations and investors to gradually transform the animal farming system, directly impacting the formation and configuration of the Brazilian assemblage. Through an ethnographic study, we report the assembly of a unique conjuncture in Brazil that allowed the flourishing of the plant-based meat industry through the collaboration of various actors with different and sometimes even contrary interests. By following institutional events and mapping market devices, we describe this assemblage as being strategically mediated and partly mirrored in market events previously occurred in the United States. We demonstrate a multi-actor collaborative implementation of an innovative modus operandi, detailing Future Farm, JBS, Archer Daniels Midland, Marfrig, and The Good Food Institute Brasil, and other performative actors in the Brazilian plant-based meat industry. Thus, we explain how this assemblage overcame presupposed weaknesses and obstacles inherent to the Brazilian food industry by mobilizing multiple market devices to construct a shared narrative that framed, guided, and gave meaning to performances and market practices such as unprecedented collaborations, startup modus operandi, international learning, launch speed, competitiveness, and innovation across the whole value chain. Far from primarily focusing on consumers or food technology itself, the assemblage is embedded in the financial market interests. We conclude that the newly flourishing Brazilian plant-based meat industry enhances the chances of a sustainable transformation in the global food system. The study's findings are meaningful to policymakers, investors, and stakeholders in the global food system, mainly for those positioned in other peripheral countries or contexts.

KEYWORDS: Food Innovation, Market Ethnography, Brazilian Agrifood Industry, Alternative Proteins, Plant-Based Meats, Fazenda Futuro, Future Farm, Incrível Seara JBS, ADM, Marfrig, GFI.

RESUMO

A crescente demanda global por carne projetada para a década de 2020 ameaça a sustentabilidade e a continuidade do sistema alimentar humano. Embora a redução do consumo de carne seja essencial, estimular mudanças nos padrões alimentares é complexo e promover o vegetarianismo não é suficiente. As carnes vegetais são uma nova categoria de alimentos desenvolvida para replicar as características culinárias, sensoriais e nutricionais das carnes animais em seus cortes e produtos mais tradicionais. As foodtech do Vale do Silício adicionaram novas tecnologias de alimentos a processos industriais de extrusão e texturização de grãos datados da década de 1960 para criar carnes vegetais com potencial de expandir o consumo de proteínas vegetais para além dos nichos vegetarianos, salvando assim os animais, o meio ambiente, o clima, nosso sistema alimentar atual e vidas humanas. Uma narrativa de mercado colaborativa sustentou a nascente categoria de alimentos, atraindo investidores interessados não apenas em esverdear seu portfólio, mas também em inovação disruptiva com potencial de crescimento exponencial. Diante desse cenário do mercado internacional de alimentos, indagamos sobre o papel do setor agroalimentar brasileiro junto a essa nova categoria de alimentos e como a paisagem alimentar local a incorporaria. O agronegócio brasileiro é altamente produtivo, principalmente na exportação de grãos comoditizados e carnes, também consideradas commodities. No entanto, a inovação é travada, especialmente nas instâncias de processamento de alimentos. Os fluxos financeiros na América Latina são menos fluidos do que os estabelecidos no hemisfério norte, restringindo o desenvolvimento e a implementação de inovações. Embora iniciativas prosumidoras e de empreendedorismo ativista tenham iniciado projetos de carnes vegetais no Brasil, inicialmente a indústria brasileira e o mercado alimentar local estavam à margem da emergente indústria de substitutos da carne. A atuação multinível do Good Food Institute e do FAIRR esclareceu a associação entre investimentos em carnes vegetais e ESG, ao mesmo tempo em que aumentou a pressão sobre as companhias globais de processamento de carnes e investidores para transformar gradativamente o sistema pecuário; o que impactou diretamente a formação e configuração da assemblage brasileira de carnes vegetais. Por meio de um estudo etnográfico, relatamos a assemblagem de uma conjuntura única no Brasil que permitiu o florescimento da indústria de carnes vegetais por meio da colaboração de diversos atores com interesses variados e por vezes até contrários. Ao acompanhar eventos institucionais e mapear dispositivos de mercado, descrevemos essa assemblagem como sendo estrategicamente mediada e parcialmente espelhada em eventos de mercado ocorridos anteriormente nos Estados Unidos. Demonstramos a implementação colaborativa dessa indústria detalhando os casos de Fazenda Futuro, JBS, Archer Daniels Midland, Marfrig e The Good Food Institute Brasil, e outros atores performativos na indústria brasileira de carne vegetais. Assim, explicamos como essa assemblagem superou fragilidades e obstáculos pressupostos inerentes à indústria alimentar brasileira ao mobilizar múltiplos dispositivos de mercado para construir uma narrativa compartilhada que emoldurasse, orientasse e desse sentido a performances e práticas de mercado como colaborações inéditas, startup modus operandi, aprendizado internacional, aceleração de lançamentos, competitividade e inovação em toda a cadeia de valor. Ao invés de se sustentar nas demandas dos consumidores ou na própria tecnologia de alimentos, essa assemblagem está pautada pela lógica do mercado financeiro. Concluímos que a recém-florescida indústria brasileira de carnes vegetais aumenta as chances de uma transformação sustentável no sistema alimentar global. As descobertas do estudo são significativas para políticas públicas, investidores e stakeholders do sistema alimentar, principalmente para aqueles posicionados em outros países ou contextos periféricos.

PALAVRAS-CHAVE: Inovação em Alimentos; Etnografia de Mercado; Agroindústria Alimentar Brasileira; Proteínas Alternativas; Carnes Vegetais; Fazenda Futuro, JBS, ADM Marfrig, GFI.

RESUMEN

La creciente demanda mundial de carne proyectada para la década de 2020 amenaza la sostenibilidad y la continuidad del sistema alimentario humano. Si bien reducir el consumo de carne es fundamental, promover cambios en los patrones dietéticos es complejo y promover el vegetarianismo no es suficiente. Las carnes vegetales son una nueva categoría de alimentos desarrollada para replicar las características culinarias, sensoriales y nutricionales de las carnes animales en sus cortes y productos más tradicionales. Foodtechs de Silicon Valley han agregado nuevas tecnologías alimentarias a los procesos industriales de texturizado y extrusión de granos que se remontan a la década de 1960 para crear carnes vegetales con el potencial de expandir el consumo de proteínas vegetales más allá de los nichos vegetarianos, salvando así a los animales, el medio ambiente, el clima, nuestro sistema alimentario actual y vidas humanas. Una narrativa de mercado colaborativa sustentó la naciente categoría de alimentos, atrayendo inversores interesados no solo en ecologizar su cartera, sino también en la innovación disruptiva con un potencial de crecimiento exponencial. Ante este escenario del mercado internacional de alimentos, nos preguntamos por el papel del sector agroalimentario brasileño en esta nueva categoría de alimentos y cómo la incorporaría el panorama alimentario local. La agroindustria brasileña es altamente productiva, principalmente en la exportación de granos y carne mercantilizados, también considerados commodities. Sin embargo, la innovación se frena, especialmente en las instancias de procesamiento de alimentos. Los flujos financieros en América Latina son menos fluidos que los establecidos en el hemisferio norte, lo que restringe el desarrollo e implementación de innovaciones. Aunque las iniciativas empresariales de prosumidores y activistas han iniciado proyectos de carne vegetal en Brasil, inicialmente la industria brasileña y el mercado local de alimentos estaban al margen de la industria emergente de sustitutos de la carne. El trabajo multinivel del Good Food Institute y FAIRR ha aclarado la asociación entre las inversiones en carnes vegetales y ESG, al tiempo que aumenta la presión sobre las empresas mundiales de procesamiento de carne y los inversores para transformar gradualmente el sistema ganadero; lo que impactó directamente en la formación y configuración del assemblage brasileño de carnes vegetales. A través de un estudio etnográfico, reportamos el assemblage de una situación única en Brasil que permitió que la industria de las carnes vegetales floreciera a través de la colaboración de varios actores con intereses variados y, a veces, incluso opuestos. Mediante el seguimiento de eventos institucionales y el mapeo de dispositivos de mercado, describimos este conjunto como mediado estratégicamente y reflejado parcialmente en eventos de mercado pasados en los Estados Unidos. Demostramos la implementación colaborativa de esta industria al detallar los casos de Fazenda Futuro, JBS, Archer Daniels Midland, Marfrig y The Good Food Institute Brasil, y otros actores activos en la industria brasileña de carnes vegetales. Así, explicamos cómo este assemblage superó las debilidades y los supuestos obstáculos inherentes a la industria alimentaria brasileña al movilizar múltiples dispositivos para construir una narrativa compartida que enmarcaría, guiaría y daría sentido a las actuaciones y prácticas de mercado, como colaboraciones inéditas, modus operandi de inicio, aprendizaje internacional, aceleración de lanzamientos, competitividad e innovación en toda la cadena de valor. En lugar de fijar-se en las demandas de consumidores o en la tecnología alimentaria, esta assemblage se guía por las lógicas del mercado financiero. Llegamos a la conclusión de que la industria brasileña de carne vegetal recién floreciente aumenta las posibilidades de una transformación sostenible en el sistema alimentario mundial. Los hallazgos del estudio son significativos para las políticas públicas, los inversionistas y los actores del sistema alimentario, particularmente aquellos ubicados en otros países o contextos periféricos.

PALABRAS CLAVE: Innovación en Alimentos; Etnografía de Mercado; Agroindustria Alimentaria Brasileña; Proteínas Alternativas; Carnes Vegetales; Fazenda Futuro, JBS, ADM Marfrig, GFI.

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ABBREVIATIONS LIST

ABBI: Brazilian BioInnovation Association

ABCD: acronym to refer to ADM, Bunge, Cargill and Louis-Dreyfus Companies

ABInBev: Anheuser-Busch InBev (Global Beverage and Brewing Company)

AAND: Academy of Nutrition and Dietetics

ABIA: Brazilian Food Industry Association

ABIR: Brazilian Soft Drinks and Non-Alcoholic Beverages Industry Association

AD: Anno Domini

ADM: Archer Daniels Midland (Grains Processor/Food Ingredients Global Company)

AFN: alternative food networks

AGN: Alberto Gonçalves Neto (Brazilian Business Consulting)

AI: artificial intelligence

AMR: antimicrobial resistance (largely resulted of the indiscriminate use of antibiotics by intensive livestock activities)

AMSA: American Meat Science Association

Anvisa: Brazilian Health Regulatory Agency

AR5: The Fifth Assessment Report of the United Nations Intergovernmental Panel on Climate Change, completely published in 2014

AR6: The Sixth Assessment Report of the United Nations Intergovernmental Panel on Climate Change, partially published until 2022, based on the latest generation of climate models available at the moment

ASM: Amazon Soy Moratorium (private conservation policy, a zero-deforestation agreement signed by agrifood actors)

BBFAW: Business Benchmark on Farm Animal Welfare

BC: before Christ

BK: Burger King (global fast-food chain)

Bn: billion

BRL: Real, a governamental currency issued by the Central Bank of Brazil

BTC: Bitcoin, free decentralized digital criptocurrency, the foundation of blockchain

BYND: acronym to refer to Beyond Meat startup, more specifically to its stocks on Nasdaq

CCT: Consumer Culture Theory (an interdisciplinary research paradigm withing Marketing Science)

CEO: chief executive officer (we use this to refer or to Gilberto Tomazoni, when explaining JBS or to Marcos Leta, when explaining Future Farm)

CH₄: Methane

CO₂: Carbon Dioxide

CO₂eq: GHG measure translating other gases to carbon dioxide warm potential

Coopavel: Cascavel Agroindustrial Cooperative

Copacol: Our Lady of Consolation Agroindustrial Cooperative

CSR: Corporate Social Responsibility

DIAAS: Digestible Indispensable Amino Acid Score (a quality-protein measure based on human amino acid requirements weighting digestive capacity, proposed as an alternative to PDCAAS method)

Diagro: Brazilian Department of Innovation Support for Agriculture and Livestock

EBITDA: Earnings Before Interest Taxes Depreciation and Amortization (a measure for company profits)

Embrapa: Brazilian Agricultural Research Corporation

ESG: Environmental, Social and Governance

ETH: Ether, the cryptocurrency of Ethereum (an open-source under development solution to smart contracts at blockchain)

EU: European Union

FAIRR: Farm Animal Investment Risk and Return (collaborative investor network)

FAO: Food and Agriculture Organization

FI: Food Ingredients (B2B media and events organization)

FISA: Food Ingredients South America (B2B media and events organization, part of FI)

FTM: FoodTech Movement (Brazilian B2B event joining foodtech startups projects)

GDP: gross domestic product

GFI: Good Food Institute (non-profit institute aimed to promote alternative proteins)

GHG: greenhouse gases

GPA: Brazilian Distribution Company (formerly: Pão de Açúcar Group; latin-american food retail company)

Gt: gross tonnage or gigatonne, equivalent to 1 000 000 000 000 000 grams

Ha: hectares, a unit of area in the metric system equal to 100 ares or 10000 square meters

HMMA: high moisture plant-based meat analogs

IAI: Inter-American Institute for Global Change Research

IBGE: Brazilian Institute for Geography and Statistics

Ibope: Brazilian Institute of Public Opinion and Statistics

IBRAFE: Brazilian Institute of Beans and Pulses

IPCC: Intergovernmental Panel on Climate Change

IPEA: Brazilian Institute of Applied Economic Research

IPO: initial public offering (event in a company offers launch its stocks on the financial market, becoming publicly traded company)

IATP: Agriculture and Trade Policy

IMF: International Monetary Fund

ITAL: Food Technology Institute of São Paulo State Government

JBS: José Batista Sobrinho (Meat Processor/Global Food Company)

LCA: life cycle assessment (a measure to environmental impacts of a product)

MAPA: Brazilian Department of Agriculture, Livestock and Food Supply

MCTI: Brazilian Ministry of Science, Technology and Innovation

MFA: Mercy for Animals (non-profit organization to protect animals used for human consumption and end industrial animal agriculture)

Mt: megatonne or million metric tonne, 1 million (10^6) tonnes, 1,000,000 tonnes, or 1 billion (10^9) kilograms

NDA: Non Disclosure Agreements (confidentiality contractual obligation in a partnership)

N₂O: Nitrous Oxide

OECD: Organisation for Economic Co-operation and Development

OOH: out-of-home advertising media (i.e.: outdoors, displays in public spaces)

PDCAAS: Protein Digestibility-Corrected Amino Acid Score (a quality-protein measure based on human amino acid requirements weighting digestive capacity)

PETA: People for the Ethical Treatment of Animals

PNUMA: United Nations Environment Programme

PULSES: lentils, peas, beans, chickpeas and other dried seeds of legumes rich in protein (the definition sometimes distinguish and excludes soybeans, and sometimes include it).

Q&A: questions and answers

R&D: research and development (practices applied to product or service management)

SEBRAE: Brazilian Micro and Small Enterprises' Support Service (non-profit institute)

SEEG: Sistema de Estimativas de Emissões de Gases de Efeito Estufa – Brasil

STS: Science and Technology Studies

SVB: Brazilian Vegetarian Society

SDGs: Sustainable Development Goals

TEA: techno-economic analyses

TVP: texturized vegetable protein

TSP: texturized soy protein (the most common type of TVP), commonly recognized as soy ground meat

UFPR: Federal University of Paraná

U.K.: The United Kingdom of Great Britain and Northern Ireland

UN: United Nations

UNFCCC: United Nations Framework Convention on Climate Change

U.S.: United States of America

USD: United States Dollar, a governmental currency issued by the Federal Reserve

USDA: United States Department of Agriculture

WHO: World Health Organization

WRI: World Resources Institute

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1 INTRODUCTION

Scientific developments render it possible to increase access and measure the complex environmental impacts of human activities and their externalities in such a way that there is a growing recognition that “food production is the largest cause of global environmental change” (Willett et al., 2019, p. 449). Considering GHG emissions and land use – which increases deforestation pressures, animal farming is significantly the most impactful in the whole food system (Poore & Nemecek, 2018). Half of the world's agricultural production is destined to feed livestock animals; the rest is used for human food, biofuels, energy, and industrial uses such as clothing, furniture, etc. (Organisation for Economic Cooperation and Development [OECD] & Food and Agriculture Organization of the United Nations [FAO], 2022). Meat and its livestock production system are increasingly recognized as a threat to food system sustainability since it has significantly larger environmental footprints than other food categories (Allenden et al., 2022), being significantly more resource-intensive (Leite, Caldeira, Watzl & Wollgast, 2020). Projections of raising meat demand and livestock production in the next three decades operate as an impeditive to the food supply for all humanity in a scenario of global warming (IPCC, 2022; Willett et al., 2019).

Studies from diverse sciences estimate that global adoption of plant-based protein-oriented diets could minimize climate (IPCC, 2022) and environmental (Godfray et al., 2018) problems, improving health at individual and collective levels (Carrero et al., 2020; Lonnie & Johnstone, 2020; Tomova et al., 2019), making the global economy more efficient (Springmann et al., 2016), reduce food scarcity (Willett et al., 2019) and solving ethical and animal welfare problems (Singer, 2015; Coulter & Milburn, 2022), improving food ethics. In addition, by reducing animal production and consumption, humanity would still reduce risks of new pandemics emergence (Sandhu et al., 2021), minimize antimicrobial resistance in humans¹ (Innes et al., 2020; Ozdemir, 2022), reduce human mortality (Springmann et al., 2018), improving economy and well-being for all, especially for poorer human populations (Springmann et al., 2016).

However, there are projections of increase in global meat demand. An 11% increase in global meat production is estimated from 2021 to 2031 (OECD/FAO, 2022). Therefore, diverse actors project that livestock production will continue expanding through the 2020s

¹ The extensive use of antibiotics in livestock is a growing threat to human health and the effectiveness of available medicines. More than 80% of antibiotics commercialized in the U.S. are used in livestock (Ozdemir, 2022).

(Ministério da Agricultura, Pecuária e Abastecimento [MAPA], 2020; OECD/FAO, 2022). If this happens, it will be next to impossible to achieve the SDGs, the Paris Agreement, and scientific targets to guarantee food system production to all human contingent in the future (IPCC, 2022; Willett et al., 2019; OECD/FAO, 2022). Unless these projections don't happen; unless dietary patterns change – or a new way to produce meat is established...

Changes in human diets are hard to implement, largely because that food is intrinsic to culture and identity (Beverland, 2014), and meat, particularly, is considered the food par excellence in the Western (Ribeiro & Corção, 2013; Oliver, 2021). Besides the symbolic and cultural aspects, food is a material resource, scarce, commoditized, the thing most subjected to consumption, embedded in a system of complex, heavy, accelerated, globalized, disputed, and concentrated flows (Van Bommel & Parizeau, 2020; Marsden, Hebinck & Mathijs, 2018; Wesz Jr, 2016; Ericksen, 2008).

Vegetarian movements fail in expanding their habits towards mainstreaming plant-based diets, despite their expansion, remaining as alternative-consumption niches (Beverland, 2014; Lazarin, 2018; Statista, 2022). Humans are neither carnivores nor herbivores, but omnivores and flavor preferences involve physiological and cultural constructions, resulting in complex neurophysiological mechanisms toward food choices (Berthoud, Morrison, Ackroff & Sclafani, 2021). Dietary consuetude is framed by particular micro dispositions of food availability, individual affordability, beliefs, acquirements, values, priorities, and so on. Furthermore, to adopt the consumption of plant-based proteins daily to the point of being able to deny or significantly reduce meat intake, consumers have to overtake a series of transformations in their everyday practices, considering the meat-centric foodscape (Oliver, 2021), which in turn demands unconventional learnings and doings (Lazarin, 2018; Twine, 2018; Hirth, 2021).

In Brazil (and we suppose that the same occurs in other Western countries, in which animal-based foods are protagonists in the foodscape and food-chains) vegan restaurants and products to substitute meat and even milk are frequently launched in local markets, usually by activist entrepreneurs who start food production and retailing activities through a prosumeristic dynamic. Sometimes called “*vegepreneurs*” (Klein, 2012), these prosumers propose an ethics reconfiguration to the food market, instituting varied levels of political engagement, and consumption and production instances reconnection (Niederle & Schubert, 2020). These efforts, however, do not evolve towards the broad foodscape, remaining limited to meeting part of specific alternative demands of consumers, i.e., a niche, or performing as unusual experiences, i.e., food escapism. This limited reach is due to consumers – even when

expanding their performances towards a prosumer role – lack the abilities that are situated with other actors that perform such a complex system (Dalmoro, Matos & Barcellos, 2021; Weijo, Martin, Arnould, 2018; Marsden, et al., 2018). Thus, performing a lasting and broadened change in the food market requires the collaboration of other actors and diverse device mobilization (Fuentes & Fuentes, 2017; Twine, 2018; Brunori, Galli & Grando, 2020).

The global food system is currently structured in financialized fluxes (Fairbairn, 2015). Financialization is a performative logic in the food system that instills the ability to mobilize multiple actors, practices, resources, flows, and devices (Marsden, et al., 2018; Fairbairn, 2015). From this conception, we observed the emergence of a transformation potentiality, aligning food technology innovation and capital market movements: the industrial design and market introduction of novel food processes to produce using plant-origin ingredients products analogous to those of animal origin.

Throughout the 2010s, alongside the growing understanding and awareness of meat production environmental and climate impacts (Lazarin, 2018; FAIRR, 2019; 2022; IPCC, 2022), added to the rise of shareholders' interest in CSR and ESG (Hinze & Sump, 2019; Reis & Molento, 2020; FAIRR, 2019; 2022) combined with the greed for disruptive business (Fairbairn, Kish, Guthman, 2022), plus the increasing availability of innovation and technology applied to food (Zimberoff, 2021; Boukid, Rosell, Rosene, Bover-Cid & Castellari, 2021), some foodtech startups emerge in California, proposing the production of meat directly from plants. For producing meat without animal tissue exploitation, these startups jointed well-established food technology with novel food research findings (Boukid, et al., 2022; Kustar & Patino-Echeverri, 2021). Beyond isolating and texturizing protein from legumes, these foodtechs explored flavor and juiciness applications, delivering meat analogs products as simulacra that replicated the consumption experience hitherto produced from animal tissue, providing equal or even superior nutritional value (Bloomberg, 2019).

Beyond Meat² and Impossible Foods³ are the two exponent brands of this new emerging food category: the plant-based meats. Instead of meeting a consumer demand, i.e., the vegetarian niche, this food product category arises to produce meat directly through plant-based ingredients and materialize itself as a food solution. What at first appears to be just a marketing narrative for the same vegan products has gained propulsion after consumer experimentation and broad stakeholder engagement.

² Founded in 2009, the first product launched in 2012 (see note 6) went publicly traded in 2019 (see attachment 1).

³ Founded in 2011, the first product launched in 2016.

Putting soybeans and/or peas through wet extrusion systems makes it possible to produce fibrous texturized vegetable proteins, similar to meat in texture and protein quality (Boukid, et al., 2022; López-Moreno, Garcés-Rimón & Miguel, 2022). That's a noting new technology. Vegetal protein extrusion systems were discovered in the 1950s (Anson & Pader, 1955) and significantly improved until the 1980s⁴. The novel food innovation now, at the product level, was the elaboration of specific mixes of aromas, flavors, fats compounds, and additives, including fermentation technologies (Zimmeroff, 2021), at such a level that allowed the mimicry of the animal-based products under the same cooking conditions, replicating the entire consumption experience journey. Thus, plant-based meats would eliminate the need for change on the part of consumers, reducing their resistance to eat more pulses and cut animal-food consumption, which should occur as the production chain scales up and prices become more attractive.

In addition to sensory characteristics, both startups, Beyond Meat and Impossible Foods, implemented innovation in designing marketing strategies according to what their products were intended to be: equal to or better than animal-based meat products. So, the advertising discourses try to de-nichify, promoting plant-based meat products, not as vegans and healthier or greener alternatives, but primarily as tastier (in addition to healthier, greener, and saving animals) (Bloomberg, 2019). Converging on the de-nichification strategy, positions in stores were initially carefully designed to be side-by-side with regular meat products (Fuentes & Fuentes, 2017), as well as the position in the menus and general food service availability. The products themselves, branding, and marketing strategies turned Beyond Meat and Impossible Foods in such a frisson, not only with media and consumers but with investors too, greedy for the sparse disruptive solutions in the multibillion-dollar meat market (Fairbairn, et al., 2022).

Even highly processed, the two plant-based meat leading products ensure the same or superior nutrition and significantly smaller environmental footprints. Submitted to a life cycle assessment analysis (LCA), the plant-based meat burger produced by Beyond Meat emitted 90% less GHG, used 93% less land, and had a 99% lower water footprint compared with a similar U.S. beef burger (Heller & Keoleain, 2018). The Impossible Foods burger emitted 89% less GHG and used 96% less land and 87% less water than a similar animal-based beef patty (Khan et al., 2019). Thus, after reviewing LCAs of the novel food category, Kustar and Patino-Echeverri (2021, p.1) conclude that:

⁴ By ADM and Wenger firms (as their respective directors explained in the sixteenth and seventeenth meetings that compose the data corpus of this study).

environmental benefits of vegan and vegetarian diets are not affected by the consumption of highly processed plant-based burgers. Consumers reduce land use, water use, and greenhouse gas emissions between 87% and 96% by choosing a Beyond or Impossible burger instead of a regular beef patty. These results are robust to the uncertainties associated with a variety of beef production systems; there is no indication that a situation or condition may make beef burgers more environmentally friendly than these two plant-based alternatives.

These conclusions from plant-based meats LCA conciliate with Poore & Nemecek's (2018, p. 4) propositions, that “the impacts of the lowest-impact animal products exceed average impacts of substitute vegetable proteins across GHG emissions, eutrophication [...] of water [...] and land use”. These conclusions inferring the benefits of plant-based meats in comparison to animal-based meats were reiterated and advanced by succeeding studies confirming environmental gains (Detzel et al., 2021) and presuming socio-economic improvements (Varela-Ortega, Blanco-Gutiérrez, Manners & Detzel, 2022).

Since 2016, after the referred plant-based burgers launch in the U.S., we have been following the emergence of this novel food product category, along with news flow daily accompaniment. We inferred that even more important than achieving an identical taste of a meat product was the ability to raise funding, including from meat processors – i.e., Tyson Foods was one of the main early investors in Beyond Meat). Additionally, it is essential that the novel startups properly be inserted in the heavy food supply and logistics chains (Van Bommel & Parizeau, 2020), a great challenge for the creative startups' teams highly focused on innovation, finance, and technology – after 2020, such challenging has been consolidating as a protruding barrier to Beyond Meat (Shanker, 2022).

Beyond Meat and Impossible Foods went from utopic proposals to materialized and available market options in a few years. Initially limited to 20/80 beef patties burgers⁵, the plant-based products were gradually expanding in the U.S. food market, conquering a consistent presence in the disputed food retail and food service scapes – guaranteeing programmed sales and leading production scale gains (Bloomberg, 2019). This scenario generated justifications for investors, even accounting for losses, with profits still far from achieved. Besides the operations, the perspective of valuation's growth in a promising near future was under constant reinforcement pressure, mobilizing narratives and devices to sustain

⁵ The first Beyond Meat product was, in fact, not the famous Beyond Burger, but a chicken strip, launched in 2012 and discontinued years later. According to a CNBC (Andrews, 2019) Report: "Beyond Meat's chicken came first, and it was a failure. Wall Street and investors don't care". The company's success was established with the burger launched in 2014. Impossible Foods' first product was the Burger pattie too, launched in 2016. Beyond Meat launched sausage in 2017, and Impossible Foods launched it in 2019. In addition, Beyond Meat launched meatballs in 2019 and nuggets and ground meat in 2021. Impossible Foods launched the Impossible Pork in 2020, meatballs and nuggets in 2021, and chicken chunks in a ready dish teriyaki in 2022.

Silicon Valley's foodtech startups' "world-changing" and "profit-making potential" aspects (Fairbairn et al., 2022, p. 652).

At the same time, in the Latin American context, plant-based meats enterprises trials were observed in Brazil, most of them becoming prototypes of unsuccessful startups: holding an audacious purpose, even replicating the Californian startups narrative and marketing aesthetics, but lacking enough food technology, delivering frustrating products far from the same animal-based meats consumption experience, disintegrated from innovation networks, without the support of financial investments and, mainly, operating backward to the well established Brazilian food industry flows. In that way, the initiatives of (proto-) plant-based meats in Brasil kept as vegan-prosumeristic, consumer-driven, low scale, handmade and nichified, short-survival, only randomly serving as convenient food options for daily consumption. These failures become more evident when we consider that meat substitutes are a broad, ancient, and traditional food category (which includes tofu, tempeh, and vegetarian proteic foods that may or may not have been submitted to industrial processing of isolation and texturizing). However, plant-based meats propose to be meat; a meat analogue product, equaling (or even surpassing) meat nutrition, flavor (in all its sensoriality), and the way of preparing and consuming the same animal-based meat under reference. Therefore, the novel plant-based meat category requires complex industrial processing, requiring broad financial, technological, scientific, and integrated investments to be implemented (Boukid et al., 2022; Zimberoff, 2021; Kustar & Patino-Echeverri, 2021).

Far different from the North Hemisphere – especially the U.S., Canada, Europe, and Asian Tigers – the economy in Latin America is considered peripheral, suffering more uncertainties, being more restricted, less fluid, less innovative, and less speculative, subject to unstable political governance and poor infrastructure. So, capital flows do not boost innovation in a similar compelling dynamic compared to the North (Viglioni, Brito & Calegario, 2020; Reis & Oliveira, 2021; Dellepiane & Wilkinson, 2018). Since 2015, Brazil has entered a recession, increasing interest rates, further reducing economic activity, and weakening investments in innovation and technology development (Andrade, 2020; Borges, 2021, Nonnenberg, 2021). According to International Monetary Fund [IMF] (2022), in a decade, Brazilian nominal GDP reduced from USD 2,46 trillion in 2012 to USD 1,83 trillion in 2022. Thus, Brazilian relevance in the global economy reduced from 3,27% to 1,76% in a decade. In addition, Brazil is undergoing a deindustrialization process (Flexor & Dias da Silva, 2021; Oreiro, Feijo, Punzo & Heringer, 2020). Moreover, the Brazilian food industry is low innovative, oriented to the domestic market, and little subjected to international

competitiveness. It lacks the support of policies to facilitate technology diffusion, so the food industry is the weakest link in the prosperous Brazilian agrifood sector – oriented to export commodities and minimally processed feed and food⁶ (Dellepiane & Wilkinson, 2018).

On the other hand, JBS and Marfrig, the two largest meat processors in the world, are Brazilian-founded and based companies. Brazil is the second largest meat producer country and the largest exporter (OECD/FAO, 2022). In the U.S. market, we saw an intersection of traditional beef producers and plant-based meat new enterprises (i.e., Tyson Foods). From this scenario, we inquired: what will be the role of Brazil if plant-based meats transform the global food market? Will Brazilian enterprises be limited to importing these products to market them at premium prices, meeting specific high-end demands of consumer niches? Latin America (Peres, 2012; 1983), which produces the majority of grains and meat in the world, will wait the deterioration of the current food production current and be limited to export legumes and import Californian high-branded patented meat analogs products? (Lazarin & Nique, 2020) Or will a novel assemblage emerge and integrate into such a transformation, being part of this meat innovation and food system sustainable transformation?

As markets are multi-level performances (Giesler & Fischer, 2017; Marsden et al., 2018), we cannot assume that previous inferred macro contextual problems operate as stable insurmountable barriers, and we were surprised by the market dynamics in such a way that during the conduction of the study Brazil became one of the world leaders in this novel food category, overcoming innovation barriers even before we properly map them. Future Farm startup, Incrível from JBS, Plant-Plus Foods from Marfrig and ADM, Burger King Brazil, and many other enterprises were not only founded but developed and structured to produce plant-based meat in Brazil, expanding portfolios to the point of deliver products around the world. The Not Company, a Chilean startup, was created focusing on plant-based milk and dairy solutions, expanded into plant-based meats, and became one of the leading plant-based analogues startups on the planet, but in a very different route if compared to the ventures we analyzed in Brazil, and we will detail this throughout the study.

So, our initial study project was to implement an ethnographic investigation within the Brazilian food market (Arnould & Wallendorf, 1994; Hess, 2001; Arnould & Price, 2006; Fuentes & Fuentes, 2017), tracking plant-based innovation to verify and highlight the viability to emerge an ecosystem for plant-based foodtech startups designed to overcome Brazilian food industry barriers (Dellepiane & Wilkinson, 2018). We turned to ethnography the

⁶ Along the text, we currently refer to food as nutrition for humans and to feed as nutrition for animals.

flourishment of the Brazilian plant-based industry, accessing the main actors performing it and how the respective organizations have been mobilizing market devices in such a challenging scenario. The COVID-19 pandemic posed to us a method adaptation, but we could access institutional meetings that assembled various actors (Akemu & Abdelnour, 2020). From this ethnographic study, we discovered that what we named a strategic mediation occurred, replicating adapted learnings from previous U.S. market happenings. The strategic mediation allowed the formation of a relatively cohesive assemblage that accelerated the formation and development of the plant-based industry in Brazil with fewer resources and in a more assertive way, reducing intraindustrial rework and making the most of the previous experiences in industrial and market practices already developed.

We briefly told now how it all started: at the end of 2017, Exame Magazine, a leading business publication in Brazil, published news informing that The Good Food Institute (GFI), an alternative-proteins focused organization, hired a director to implement and manage a branch of the U.S.-based Institute in Brazil (Barbosa, 2017). We assumed that the role of this Brazilian director was to stimulate importation of plant-based meats produced in the U.S., especially the growing Beyond Meat, or even resell patented formulas and processes. In the following year, 2018, the Brazilian Vegetarian Society (SVB) and Ibope (the most recognized research institute for market, opinion, and politics in Brazil) elaborated, conducted, and published a research indicating that around 30 million Brazilians were vegetarians⁷, which had a lot of media and market repercussion. At the end of 2018, we were acquainted with the ongoing development of a Brazilian foodtech startup that would replicate Beyond Meat's formula to manufacture plant-based meat analogs burgers in Brazil. We inferred that it would be a type of third-world subsidiary for the Californian startup, reselling or paying royalties to boost Beyond Meat's profits, but we were wrong.

From 2019 to 2022, this study investigates and follow-up the Brazilian plant-based meats industry's early formation, mapping multiple stakeholders interactions according to the ethnographic method and market assemblage theories as a heuristic platform (Marsden et al., 2018; Deleuze & Guattari, 1987; Delanda, 2006; Geels, 2018), capturing and explaining the market as an ongoing performance (Giesler & Fischer, 2017). The main objective was to verify if this novel food category can establish an industrial and market ecosystem, overcoming the intrinsic barriers of the Latin-America economy and Brazilian industrial environments (Dellepiane & Wilkinson, 2018; Dellepiane & Wilkinson, 2019; Fairbairn et al.,

⁷ It operated as a performative market device in the assemblage. In the attachments, we explain (and add criticism to) this market research.

2022; Boukid et al., 2021; IPCC, 2022). A secondary objective was to verify if this market formation would adopt a nichification course, mobilizing practices and market devices with the purpose of maximizing profitability by meeting the already existing demand of vegetarian segments; or if it would adopt a broader role, in the direction of mainstreaming plant-based meats, generating demand, becoming a competitive alternative to animal-based meats (Fuentes & Fuentes, 2017; Morris et al., 2021).

By following the Brazilian assemblage throughout its flourishing, we could capture and will describe how, despite the recognized inefficiencies and obstacles in innovation, economy, and industry, the plant-based meats products were quickly and efficiently developed, placing products in the food market, reaching capillarity in the local foodscape and being exported to several countries – to the point of coming to compete in the U.S. market, pressing prices down there; see figure 9. The presence and dominance of publicly traded companies (e.g., JBS, Marfrig, BRF, ADM, GPA), some of which are also listed in the U.S.'s stock exchanges, were central in the accelerated establishment of plant-based meats processing and trading market assemblage in Brazil. Throughout the ethnography, we demonstrated that, among several correlated factors, this accelerated establishment was remarkably incremented by market devices mobilized after the outstanding financial performance that Beyond Meat had in its IPO (Bloomberg, 2019; Fairbairn et al., 2022).

Through a thick description based on ethnographic data, this study presents the development of the plant-based meat industry in Brazil, initially understood as unlikely. We could access and explain unprecedented partnerships conducted within the ethnographed assemblage to structure the industry and the market, revealing strategic mediation of the Good Food Institute joint actors and leading a collaborative and shared understanding (Lusch & Watts, 2018) that oriented and framed practices and devices mobilization in such a way reducing intraindustry costs and assertively accelerating development (McNulty et al., 2020).

In accordance with the literature (Araujo & Kjellberg, 2009; Callon, Millo & Muniesa, 2007), we focused on institutional performances and device mobilizations, describing them but not analyzing them in isolation. No matter how strategic a mobilization was, we tried to contextualize it, bringing the implications to the assemblage, considering previous mobilizations as well as the actor's objectives and the frameworks guiding the movement into the analysis. Thus, we endeavored to map single actors' market performances and device mobilizations concerning the other actors, considering previous, concomitant, and sequential ongoings (Brunori et al., 2020).

We had followed the plant-based meats industrial market before its start in Brazil,

when we still wondered why we did not have products like this around here. We finished the study, four years afterward, in a scenario where dozens of industrial actors were already serving the domestic market with a consistent presence in the foodscape, as our ethnographic observations demonstrated. Furthermore, at the end of the ethnographic follow-up, at least three mapped actors were exporting their plant-based meats production to meet – further building, increasing and boosting – a wide global demand, as executives of the enterprises explained at several meetings that we attempted along the ethnography conduction.

The observed industrial development and whole assemblage dynamics allowed us to glimpse the potential of worldwide increasing accessibility to plant-based meats from the Brazilian agri-food industry and market, to the point of going beyond vegetarian niches in the future, mainstreaming plant-based proteins. Such a mainstreaming process of plant-based proteins (Beverland, 2014) can help achieve sustainable and healthy diets, collaborating to achieve the SDGs (see figure 1) and the Paris agreement. Further guaranteeing the food system sustainability, providing all humanity with health and well-being improvements, in line with the IPCC (2022) and Willett et al. (2019) indications.

This study deals with 9 [2; 3; 8; 9; 12; 13; 14; 15; 17], and indirectly with 4 [1; 6; 10; 16], of the 17 Sustainable Development Goals (SDGs), as illustrated bellow:



Figure 1. SDGs dealt with by plant-based meats food solution

Source: Elaborated by the Author (2022), adapted from United Nations [UN]. (2022). 17 goals to transform our world. Available at: <https://www.un.org/en/climatechange/17-goals-to-transform-our-world>

We considered the IPCC's Sixth Assessment Report analysis about synergies and trade-offs between sectoral and system mitigation options and the SDGs referring to plant-based protein and dietary change and SGD's correlation (IPCC, 2022). However, we remove here SDG 7, "affordable and clean energy," to understand that there is no direct correlation between plant-based meats and clean energy⁸, and we add the 8, 16, and 17 SDGs. We add the 8, "decent work and economic growth" because we understand that slaughterhouses work implies dangerous risks for workers, including physical and mental degradation that persist after the end of work, in a much more severe way than other food industries (Muller, 2018; Lazarin, 2018; FAIRR, 2022; Morais-da-Silva, Reis, Sanctorum & Molento, 2022). We include the 16 SDG for understanding that expanding compassion towards nonhuman animals implies in ethical, moral, and justice improvements for human society, recognizing the rights to existence, freedom, and self-determination for other than ourselves (Singer, 2015; Singer, 1987; Lazarin, 2018). And the 17 SDG inclusion resulted from the ethnographic research that we conducted for this study, in which it was possible to verify the acceleration of sustainable development from strategic collaborations between different actors, even with sometimes divergent interests.

⁸ Although it is possible to consider that by adopting plant-based meats more widely, the pressure on agricultural production intended for livestock animal feeding would be reduced, and from that reduction would be possible to increase land for biofuels production or dams for hydroelectric plants or even reforestation implementation to offset carbon from polluting energy sources... However, these are secondary associations with the development of the plant-based meats market, and we decide to stick to direct impacts only.

2 WHY EATING PROTEIN FROM PLANTS IS BETTER THAN EATING IT FROM ANIMALS? AND HOW TO CHANGE THE FOOD SYSTEM?

This chapter briefly presents and references frontier knowledge about food system sustainability, highlighting plant-based protein as a food solution (Topic 2.1). After that, perspectives towards food system transformation, focusing on investigations of market change, are presented to delimit our theoretical and methodological platform in the conduction of this study (Topic 2.2).

2.1 Plant-Based Proteins as a Major Solution to Guarantee Food System Sustainability

In 2021, 2022, and 2023 years, the Intergovernmental Panel on Climate Change (IPCC) launched its Sixth Assessment Report, the AR6 (IPCC, 2022), consolidating data that, in general, indicates an increasing aggravation of predictions about the planet's future climate and implications to natural and human systems. At the same time, the Report states that implementing solutions to reduce climate aggravation – climate change mitigation policies – and to deal with it – climate change adaptation policies – have been slow, if not incipient, in front of the predicted changes.

Therefore, developing strategies to reduce climate change aggravation and to adapt the human systems, especially in an attempt to guarantee food, water, and the basics for a dignified life to the growing human contingent in the climate change scenario, should receive more attention from various global actors (IPCC, 2022). The human population is estimated to grow until it reaches 9.73 billion people in 2064 (Vollset et al., 2020)⁹, in a scenario of demographic changes that will further increase the percentage of people subjected to poor states, raising food risks – adding economic and health problems. Reaching a contingent of 8.79 billion people in the year 2100 (Vollset et al., 2020) – in a way that, next, humanity should not reach the 10 billion people mark.

Recently, the IPCC (2022) significantly increased the recognition of climate and environmental impacts of large-scale industrial livestock as one of the main drivers of climate change:

⁹ Estimated a peak in a range between 8,84–10,9bn, reaching a contingent of 8,79bn people in the year 2100 (Vollset et al., 2020) – in a way that the human population probably will not reach the 10 billion people mark next. These estimatives does not consider SDGs achievement. In an alternative scenario with SDGs, Vollset et al. (2020) forecast a global human population of 6,29 billion (a range between 4,82 and 8,73bn) in 2100.

Enteric fermentation dominates agricultural CH₄ emissions with emissions being a function of both ruminant animal numbers and productivity (output per animal). In addition to enteric fermentation, both CH₄ and N₂O emissions from manure management [...] and deposition on pasture, make livestock the main agricultural emissions source [...] AR5 [the previous IPCC Report] has reported increases in populations of all major livestock categories between the 1970s and 2000s, including ruminants, with increasing numbers directly linked with increasing CH₄ emissions (IPCC, 2022, p. 34).

Although CH₄ has a shorter atmospheric lifetime than CO₂ (around 12 years, while CO₂ can remain for centuries), CH₄ has a warming force tens of times more significant, such that the IPCC (2022) estimates that a ton of CH₄ is equivalent to a range between 28 and 36 tons of CO₂, actually accounting its impact over 100 years.

IPCC (2022) indicates that not avoiding a climate collapse will imply drastic drops in agricultural productivity; what will happen if the levels of GHG emissions were not restricted to half of 2019 parameters until 2030. Not controlling the GHG emissions and carbon capture will lead to irreversible changes in the Earth's climate, and projections of prolonged droughts in the coming decades will generate water stress. That water stress would affect not only human and animal populations and local flora, but the entire global food system, destabilizing food production and availability across the planet and potentially collapsing even livestock activity and meat production (IPCC, 2022). In a scenario like this, without controlling the increase in global average temperature, tropical regions may gradually become less productive in agriculture, and temperate regions (sub-tropical, in regions such as Brazil Southern, Paraguay, Uruguay and Argentina half northern) may start to have a even leading role in productivity, despite of another instabilities and not considering sea level change. In addition to the threat to human food directly, socio-environmental impacts are projected, and Brazil, as well as other peripheral countries, can be significantly more affected. If surpassing a 1.5-degree warming in the Earth's atmosphere, projections indicate that the average income of Brazilians could be reduced by up to 83% until the end of the 21st century; in comparison, in the same scenario, the global average income may be reduced by up to 24% (IPCC, 2022).

One of the leading solutions listed by researchers and civil society actors in this context is the increase in the productivity of the food system through the reduction of livestock. The conversion of harvest into animal tissue is highly inefficient, imposing the most significant impact on the agrifood system (Poore & Nemecek, 2018; Kustar & Patino-Echeverri, 2021), with land use and GHG emissions, in addition to increased demand by nitrogen and phosphorus, which cause eutrophication and dead zones in lakes and coastal ecosystems (Willett et al., 2019)

Therefore, there is a search for evolution with increased productivity through animal genetics improvement, herd management practices, or novel feeding strategies, i.e., improvements in digestibility through biotechnology, enzymatic applications, and animal food sources. Embrapa researchers are conducting a study that has already concluded that pastures with legumes, especially beans, have the potential to increase livestock weight gain, significantly reducing methane emissions – in addition to increasing soil nitrogen fixation, a characteristic intrinsic to legumes (Rosso, 2022; Rodrigues et al., 2021)¹⁰.

Furthermore, there is an effort to develop technological material devices and biotech applications to reduce CH₄ emissions direct from animals' bodies, especially cattle. However, submitting animals to even more constraints with such applications comes against ethics and animal rights issue. Would subjecting them to the use of props and further subjugating their nature and existence be an acceptable practice? (Dawkins, 2021). In sum, although necessary and promising, the IPCC Report (2022) clarifies that processes to improve animal meat productivity and reduce its environmental footprints will not have a sufficient mitigating impact to reduce GHG emissions and ensure a sustainable food system to provide all humanity, being considered an incremental strategy; important but not enough (IPCC, 2022; Willett et al., 2019).

Thus, we conclude that increases in productivity and GHG reductions in livestock systems have an indirect and limited potential to reduce emissions and build a sustainable food system for all humanity, even more when accounting the feed supply chain with livestock activity. Thus, if there is no worldwide reconfiguration of food production (and consumption), sustainability in the food system to ensure food for all humanity will not be achieved, considering population growth and the climate change projections (Willett et al., 2019). Poore and Nemecek (2018) also concludes that improvements in the livestock production are not enough to guarantee a sustainable food system for all humanity, such as the IPCC AR6 (IPCC, 2022) and the EAT-Lancet Commission (Willett et al., 2019):

Though producers are a vital part of the solution, their ability to reduce environmental impacts is limited. These limits can mean that a product has higher impacts than another

¹⁰ Compared to a degraded pasture area. According to Rosso's (2022) findings, the efficient use of the leguminous BRS Mandarin intercropped with Marandu, and Basilisk grasses increased bovine weight gain and emitted less methane per kilo obtained. Thus, the daily GHG emission per kilogram of bovine weight gain was 614 grams in the intercropped pasture, while 2,022 grams were emitted in a degraded pasture. In addition, productivity was better when beans were intercropped in the pasture – the animals gained 478 grams per day, while in the degraded one, 302 grams per day of average annual weight gain. After discussing the results with a cattle breeder, questions that emerge are related to the application: is there a regrowth of beans like the general pasture? How to sow the beans in non-degraded pastures, high gripped grasses, at an advantageous cost to the producers?

nutritionally equivalent product, however it is produced. In particular, the impacts of animal products can markedly exceed those of vegetable substitutes [...] to such a degree that meat, aquaculture, eggs, and dairy use ~83% of the world's farmland and contribute 56 to 58% of food's different emissions, despite providing only 37% of our protein and 18% of our calories (Poore & Nemecek, 2018, p. 4).

Establishing scientific consensus, the AR6 Report (IPCC, 2022) states – with high confidence – that a broad shift towards sustainable healthy diets, which prioritize plant sources of protein and significantly reduce the amount of animal-origin product consumption, would provide great potential to reach the global targets for reducing GHG emissions. Furthermore, co-benefits to public health, the economy, and environmental improvements would result from such a dietary and productive food system reorientation. Such a high confidence about the potential for mitigating climate change and the co-benefits of adopting diets with greater prominence of plant-based proteins results from the IPCC's analysis of several studies and validation of their respective data, methods and results. “Shifting to sustainable healthy diets has large potential to achieve global GHG mitigation targets as well as public health and environmental benefits (high confidence)” (IPCC, 2022, p. 82).

The concept of sustainable healthy diets is quite ambiguous, being submitted to diverging views (FAO & WHO, 2019; Martini et al., 2021), making it a challenge to implement strategies and orient policies and decision-making (Willett et al., 2019). Furthermore, according to Martini et al. (2021), there are a poorly aligned depiction of sociocultural aspects and environmental impacts of sustainable healthy diets, while nutritional and health aspects shows more convergent definitions. FAO and WHO (2019) explicitly try to solve the ambiguity and inconsistencies in the definitions of sustainable health diets, providing a global guideline by the U.N. Thus, in 2019, FAO and WHO (2019) defined sustainable health diet patterns as reaching international nutrition recommendations, low environmental footprints (including GHG emissions), adaptability to local social, cultural, and economic contexts, affordable for all, and promoting well-being for the general population. The guideline suggests that sustainable healthy diets may incorporate small amounts of foods of animal origin, reducing mainly red meat. The definition and the guide, however, does not present a value for this “small amount” of red meat and animal-origin food.

Dealing with this consensus gap, the EAT-Lancet Commission joined 37 researchers to review, evaluate and ponderate scientific studies to establish consensual scientific targets to effective strategy design towards the food system sustainability concern. The Commission indicates that globally widespread plant-based diets – not necessarily strict vegetarian –

significantly reducing meat consumption and, as a result, limiting livestock production, are indispensable to achieve such a sustainable food system, guaranteeing at the same time nutrition and health for all humans and environmental stability in a context of climate change (Willett et al., 2019). Thus, the EAT-Lancet Commission indicates that sustainable and healthy diets must “have an appropriate caloric intake and consist of a diversity of plant-based foods, low amounts of animal source foods, unsaturated rather than saturated fats, and small amounts of refined grains, highly processed foods, and added sugars.” (Willett et al., 2019, p. 448).

Highlighting multiple co-benefits (Springmann et al., 2018; Willett et al., 2019) the EAT-Lancet Commission defines sustainable healthy diets as not-necessarily vegetarian or strict vegan, but prioritizing plant-based protein intake, limiting the consumption of animal-based proteins, as defined:

[...] protein sources primarily from plants, including soy foods, other legumes, and nuts, fish or alternative sources of omega-3 fatty acids several times per week with optional modest consumption of poultry and eggs, and low intakes of red meat, if any, especially processed meat (Willett et al., 2019, p. 459).

The globally adoption of sustainable healthy diets¹¹, by being plant-based protein centric, would transform the food system by:

[...] re-orient agricultural priorities from producing high quantities of food to producing healthy food. Production should focus on a diverse range of nutritious foods from biodiversity-enhancing food production systems rather than increased volume of a few crops, most of which are used for animal production (Willett et al., 2019, p. 449).

Globally, about half of all the harvest is turned into livestock feed. 77% of soybeans are earmarked for livestock feed, being operated as a resource for livestock production systems (Ritchie & Roser, 2021). Given the perspective of increasing global demand for meat, the share of feed crops in global crop production is forecasted to grow as the demand for feed increases with the further intensification of livestock production (OECD/FAO, 2022; IPCC, 2022). Thus, we can glimpse an inevitable trend towards an increase in the global harvest demand and more sumptuous pressure for agricultural frontier expansion, implying an increasing dispute between destining grains to feed humans or animals, imposing greater food insecurity on poor human populations. It is relevant to keep in mind that cereal grains (not including pulses, soy, nor nuts) currently deliver more than 40% of the global protein intake

¹¹ The reference diet modeled by the EAT-Lancet Commission is presented and explained in attachment 2.

for humanity, constituting an essential food, especially for the most vulnerable populations¹². Poore and Nemecek (2018) revealed that a global shift towards a dietary pattern that excludes animal-source food could reduce global land use by about 76% (see attachment 2).

Furthermore, excluding animal-based foods from the global food system would decrease GHG emissions by 6.5 Gt CO₂eq per year, reducing water acidification by 50%, eutrophication by 49%, and freshwater withdrawals by 19% (Poore & Nemecek, 2018; IPCC, 2022)¹³.

The EAT-Lancet Commission also proposes that a “great food transformation” to achieve a sustainable and healthy food system for all demands a food production reorientation related to a “necessary shift, which consists of increasing consumption of plant-based foods and substantially reducing consumption of animal source foods” (Willett et al., 2019, p. 448-449). Moving food from an animal meat-centric to a plant-based protein-centric orientation would optimize human health and assure a minimum functioning of environmental services, according to the estimated biophysical limits of the Earth. Such a dietary reorientation would allow agriculture improvements in the following decades, increasing their productivity and supply of healthy food, even in the face of a worsening climate, perpetuating the food system (Willett et al., 2019), providing nutrition for all humanity, reducing undernourishment and suffering especially for the poorest human populations (Springmann et al., 2018).

IPCC’s AR6 establish that studies (e.g., Ivanova et al., 2020; Poore & Nemecek, 2018; Springmann et al., 2018; Springmann et al., 2016C) deliberately increase the comprehension of the high mitigation potential of climate change by reducing animal-source foods and increasing plant-based protein foods consumption (IPCC, 2022). Furthermore, a reorientation towards plant-based centric proteins, by implying an agrifood reorientation with greater food productivity, would pose less pressure on land use, not only reducing deforestation but also enabling the restoration of degraded areas and the allocation of areas currently arable into natural forestry (Willett et al., 2019).

In a philosophical thesis about ethics of animal use as a resource, the social choice to feed pigs and then slaughter them to achieve meat or feed more poor people with grains, legumes, and rich plant-based foods directly is imminent: “By ceasing to rear and kill animals for food, we can make so much extra food available for humans that, properly distributed, it

¹² In such a way, the EAT-Lancet Commission considers that although the global consumption of food of animal origin has to be significantly reduced, with some populations, it should be increased to guarantee nutritional security, especially for children and young people in Africa and Asia (Willett et al., 2019).

¹³ Poore and Nemecek (2018) methodology and findings were reviewed and referred at the AR6 Report (IPCC, 2022), as well as Ivanova et al. (2020), Springmann et al. (2018), and Springmann et al. (2016) studies.

would eliminate starvation and malnutrition from this planet” (Singer, 2015, p. 33). Thus, beyond animal rights and environmental sustainability, there is an expanded conception that reducing protein production through animals' bodies and increasing it directly through plants leads to a change toward more productivity, economic gains, and human well-being (especially for the poorest people) with food security improvements (Springmann et al., 2016).

However, achieving these scientific targets are far from reality and market forecasts.

2.1.1 Meat Production and Consumption Data, Projections and Recommendations

According to the most recent OECD's data, the agricultural outlook from 2021 basis, the global per capita animal meat consumption (considering beef, veal, pork, poultry, and sheep) was around 34.12kg/year, or 93.47 g per day per person on the global average (OECD/FAO, 2022). A value that goes far beyond, even on a global average, the healthy and sustainable dietary recommendations for a sustainable food system proposed by the EAT-Lancet Commission (Willett et al., 2019)¹⁴.

Furthermore, per capita meat consumption varies enormously according to the planet's regions and each country, subject to individual income, domestic production, available foodscape structure, and food culture. In such a way, the global and macro views to evaluate or analyze improvements towards health and sustainable food consumption patterns must be constrained to due scientific consideration. Thus, food consumption levels should be interpreted with due caveats and meso-micro level circumspection. Therefore, it is necessary to understand food consumption in a contextualized, regionally reliable view coordinated along the production and market chains. After the due considerations have been made, consumers from North America, Oceania, Europe, and Latin America eat more meat daily than the global average, despite any loud social movements projecting vegetarianisms. Attachment 4 presents an OECD graphic detailing per capita meat consumption from OECD/FAO (2022), demonstrating the disparity between global average meat consumption and regional consumption. Springmann et al. (2018) alert that high-income countries have the preeminent potential to limit GHG emissions in a way that avoids a climate change rupture in the food system by significantly changing animal-based proteins with plant-based proteins in dietary patterns.

¹⁴ See attachments 2 and 3 for more details and ponderations.

According to OECD projections, the per capita global meat consumption is expected to reach 35.6 kg/year by 2031. Although not representing a drastic increase, it is also necessary to consider estimations of population growth, which should be the primary driver for an increase in meat demand, leading to increases in meat production. “Population growth is a major driver of increased meat demand, and its projected global increase of 11% will underpin an estimated growth of 15% in global meat consumption by 2031” (OECD/FAO, 2022, p. 192). Furthermore, we should consider that the human population is estimated to grow until the 2060s when it peaks at 9.8bn (Vollset et al., 2020), a 1,2bn people more than the 8,6bn estimate for 2030.

In addition, the current level of meat production already exceeds scientific targets, extrapolating the planet's biophysical limits and compelling the food system's sustainability unfeasible (Willett et al., 2019). In 2021, global meat production achieved 339 Mt, and the OECD estimates that in 10 years, it will reach an annual production of 377 Mt (not counting fish and other animals) (OECD/FAO, 2022). It represents an 11% increase in global meat production – poultry, pork, beef, and sheep meat is projected to grow 16%, 17%, 8%, and 16%, respectively, from 2021 to 2031.

Directly addressing issues related to Brazil, Brazilians, after Argentinians and the U.S. Americans, were the third largest consumers of beef in 2021, considering per capita estimative (OECD/FAO, 2022). The country is the second largest beef producer, the most environmentally impactful type of meat. Although Brazil accounts for the largest cattle herd on the planet, the country produces less beef than the U.S. Furthermore, concerning exports, “Brazil is the largest beef exporter (24%) ahead of the U.S. and Australia. Exports account for about a third of Brazil’s total beef production and hit record highs in 2021” (FAIRR, 2021, p. 85). The Brazilian Agriculture Minister (MAPA) estimates that the country will consolidate as the largest exporter of meat in the global food system, projecting increases of 24.6% in beef production, 28.2% in pork, and 28.6% in poultry throughout the 2020s (MAPA, 2020).

Regarding fish and seafood as an alternative, humans captured and produced 178 Mt of fish in 2021, with over 50% coming from natural ecosystems instead of aquaculture (OECD/FAO, 2022). Industrial fishing is responsible for biodiversity loss and endangers aquatic life, including mammals such as dolphins, whales, sea lions, and freshwater dolphins. Overfishing has depleted 60% of world fish stocks, with 30% overfished (Willett et al., 2019). Furthermore, seafood is a crucial protein source for more than 3 billion people, particularly the poor who rely on fishing for subsistence (Willett et al., 2019). Thus, the decline in fish

and seafood availability affects global food chains, and especially the poorest people who depend on fishing for subsistence, which is a growing concern.

Aquaculture is expected to surpass fishing capture by 2023, but it still emits more GHG emissions if compared to vegetable protein (Poore & Nemecek, 2018). Improvements in production practices and plant-based alternatives must be simultaneously considered to expand aquaculture sustainably. However, fish welfare and rights are concerns that it should not be deprecated. MFA claims that fish suffer painful practices during slaughter, suffering from a type of pain that is not heard, since they are animals without vocalization. In Brazil, it is common to slaughter fish by filleting, a technique in which the viscera are pulled out without stunning the animal (Coelho, Pedrazzani, Quintiliano, Bolfe & Molento, 2022).

Health concerns about fish eating consumption are also not consensus. Fish meat can contain mercury and be neurologically toxic, but it provides omega-3 fatty acids essential for neuro-development and heart disease prevention (Willett et al., 2019). While plant-based proteins also reduce cardiac risk and offer health benefits, the omega-3 fatty is not clear question yet – we will further explore this in topic 5.1, presenting a specific product, the Future Tuna.

In addition, as we will demonstrate throughout the ethnography, from legumes it becomes possible to produce foods that refer to taste and cooking preferences associated to meat, replacing it, while fish are associated with a specific flavor and aftertastes, being a limiting factor for its expansion in diets. The EAT-Lancet Commission suggests that aquaculture can help steer animal source proteins toward reduced environmental effects and enhanced health benefits but cannot solve the challenges of feeding 10 billion people healthy diets (Willett et al., 2019).

2.1.2 Pulses as a viable alternative to change unsustainable forecasts

OECD/FAO (2022) explains that the projections of meat production and consumption, based on the following a business-as-usual path, demonstrate that SDG 2, about zero hunger, will not be achieved by 2030 and GHG emissions from agriculture will continue to increase, worsening climate change. In addition, the agricultural frontier will inevitably be submitted to expansion, reducing forest areas and the natural Earth's carbon capture and sequestration. In the same direction as proposed by Godfray et al. (2018), Springmann et al. (2018), Eat-Lancet Commission (Willett et al., 2019), and IPCC's AR6 (IPCC, 2022).

Such livestock growth projections significantly threaten the possibility of respecting the main conclusion of the IPCC AR6: the need to peak GHG emissions in 2025 and, after

that, reduce emissions by 43% compared to 2019 levels until 2030 to keep the temperature rise at 1.5°C – a scenario of climate change already with relevant impacts to natural and human systems that will demand adaptation of humanity with human suffering. Furthermore, IPCC (2022) indicates that, in addition to reducing GHG emissions until 2030, it is imperative to sequester carbon from the atmosphere, a grand strategy that seems only factual through reforestation. Reforestation, in turn, demands land surface space, disputing it with agriculture, which ultimately leads to the solution of producing plant-based proteins, reducing the demand for animal feed and increasing protein productivity (Poore & Nemecek, 2018; Willet et al., 2019).

To achieve a sustainable and healthy reconfiguration of the food system, changes in the protein consumption worldwide are indispensable (Willet et al., 2019). In addition to vegetarianism and its variations, counting on new food consumption dynamics implemented by consumers (Lazarin, 2018), there is also other solutions to glimpse such a dietary change.

We already listed aquaculture as an alternative to delivering protein at a lower environmental footprint. There is also an even more disruptive proposal: cultivated meats. Cultivated meats are a solution to meat production in which certain animal tissue is produced through controlled cellular reproduction, generating increased productivity and less resource demand (Boukid, 2021) – we will briefly address this topic in the results chapter, discussing the GFI Brasil and its collaboration with JBS. There is also another proposition to protein production that is more averse to Western culture: structuring production and consumption of food from cultivating and processing insect bodies, which would deliver protein for consumers through an alternative production system with lower environmental impacts (Boukid, 2021).

In this study, we specifically address the plant-based solution, expanding it beyond consumers' implemented vegetarianisms. However, we do not neglect the potential of aquaculture alternatives and cellular reproduction technology, also due to the fact that we identified convergences between the actors of the assemblage that we ethnographed. Alternative protein solutions should be considered, and we reiterate they as convergent and complementary for a food system sustainable transformation.

Side by global meat consumption raising projections, OECD ponders the possibilities of food culture changes as vegetarianism growth, primarily emerging from high-income societies, as an alternative to reduce the forecasted numbers of livestock increasing over the 2020s (OECD/FAO, 2022). OECD also indicates a potential for a reversal and increase in

demand for pulses, above current projections according to hypothetical food regime changes (distinct from the business-as-usual path).

Pulses are a term to refer to the joint of vegetables rich in protein, seeds of legumes formed in pods, such as peas, beans, lentils, chickpeas, and soy (although some definitions distinguished soy, not by its nature, but by its distinct role in the current food system). Pulses provide high amino acids content (Hughes, Ryan, Mukherjea & Schasteen, 2011; Guillin et al., 2021; López-Moreno et al., 2022), and soy, in particular, after extruded and isolated, provides an amino acid profile similar to animal-origin foods, with a superior digestibility than red meat – see figure X .ADM ingredients/pdcca. capit.5.

However, despite their nutritional potential, pulses destined for human consumption form an agricultural category that has been declining in the last decades, especially in Western countries (OECD/FAO, 2022). For example, Brazilian daily cuisine is commonly recognized by beans (*Phaseolus vulgaris L.*) with rice for lunch, being the main daily meal, a joint that vegetable protein with all essential amino acids balance (Carvalho et al., 2012). Nevertheless, bean consumption has been falling year by year in the country, reducing the real protagonism of this vegetable within the protein supply in daily diets (IBRAFE, 2022; IBGE, 2020). In parallel, Brazilian's agricultural production of beans has fallen by half from the 1980s to the 2020s. For the 2022/2023 summer crop, it is estimated that beans will have the smallest farm area already mapped in the country (Conab, 2021; Ibrafe, 2022). According to the MAPA (2022), most of the agricultural areas reducing bean farming – a product that is entirely destined for human consumption – will be replaced by soybean crops – which work as a commodity in the globalized agrifood system – in an agricultural trend that should continue to growth throughout the 2020s as demand for animal feed increases around the world; reinforcing Brazilian's vocation of exporting commodities.

The EAT-Lancet Commission summarizes that the increase in pulse consumption is one of the leading changes to achieve a healthy and sustainable food system, reducing GHG emissions, allocating land surface for reforestation, and, at the same time, providing food for all humanity, reducing overall mortality and disease incidence (Willett et al., 2019; Springmann et al., 2016; 2018). Furthermore, there is a growing association between the increase in pulse consumption and the reduction of hunger in the world (IBRAFE, 2022; Springmann et al., 2016). In addition, the cultivation of pulses, including soybeans, naturally fixes nitrogen in the soil, operating as a regenerator of soil quality (Willett et al., 2019; IBRAFE, 2022).

Data about pulses are provided by OECD/FAO (2022), indicating a global average per capita consumption of 8kg/year in 2021 and forecasting an increase to 9,04kg/year per capita by 2031. Currently, Latin America's annual per capita consumption of pulses is 9,64kg; U.S. and Canada: 5,49kg; Europe: 3,40kg; Oceania: 1.71kg; Asia: 7,72kg¹⁵; Africa: 11,58kg; thus, varying significantly between regions and having greater relevance in protein intake among the poorest. On the other hand, OCDE projects that per capita consumption will increase in nearly all regions by the end of the decade – due to raising in environmental awareness, Europe is expected to have the most significant percentual increase. Such an increment depends upon consumer culture, industrial orientations towards meat substitutes using pulses as ingredients, and government policies (OECD/FAO, 2022). “Depending on the future dynamics of demand for such products [meat analogs], this could significantly change the future importance of pulses in the agricultural production mix.” (OECD/FAO 2022, p. 259)

Furthermore, OECD indicates that EU governments are increasingly supporting agricultural pulses chains development, providing more assistance to farmers and implementing strategies to increase pulses as a healthier and greener protein alternative. Such support is related to recognizing pulses as “a major ingredient in products such as meat substitutes” (OECD/FAO, 2022, p. 259).

According to the EAT-Lancet Commission's conclusions about the feasibility of the sustainable and healthy diet proposed, humanity should “learn new ways of preparing diets that are healthy and enjoyable” (Willett et al., 2019, p. 454). Moreover, the efforts of the plant-based meats industry have been collaborating with this need. The production of alternative proteins, and plant-based meats in particular, composes a potential that can emerge from different routes and even alter the demand for pulses and the agricultural reconfiguration, transforming the global food system towards a more sustainable logic. The potentiality of such a transformation originated from plant-based meats, linked to the already accelerating industrial ecosystem and the market of this segment, is booming studies improve pulses processing for plant-based meats production (Samard & Ryu, 2019; Webb et al., 2020; Ferawati et al., 2021).

¹⁵ OECD addresses soy in another topic, so we infer that pulses here do not include soy and soy-based products, which are quite prevalent in Asian food culture.

2.2 How does the Food System can change?

Although the conclusions to achieve health and environmental sustainability lead us to understand vegetarianism as the primary solution – or a definitive solution – it is necessary to make ponderations. Sociology commonly conceptualizes vegetarianism and its variations (e.g., veganism) as an eating practice (Twine, 2018; Hirth, 2021). Thus, comprehensions about vegetarianism generally focus on individual or niche dietary choices, identities, attitudes, consumer cultural manifests, and discourses. However, daily food practices towards plant-based protein constant intakes extrapolate identity aspects. Therefore, a deep understanding of plant-based diets demands a complex understanding of consumption practices but, simultaneously, the constitution of the foodscape by which these diets are inserted and constrained (Lazarin, 2018). Therefore, to envision an expansion of plant-based diets, it is necessary to understand the ongoing complex formatting of the food market, industries, and, ultimately, the global food system, guided by flows increasingly oriented to the financialization logic (Fairbairn, 2015; Fairbairn et al., 2022). Therefore, considering material devices and multiactors performance in framing foodscape is necessary, plus a redefinition of the concept of veganism, vegetarianism, flexitarianism, or plant-based diets as more broadly than anti-consumption practices (Dalmoro, Matos & Barcellos, 2020). In that way, vegetarianisms¹⁶ should be understood as food practices that entangles production as much as consumption instances (Hirth, 2021).

According to previous studies, given the current market structure, the adoption and maintenance of vegetarian diets involve not only an individual preference for meat and dairy-free foods but also implies individual performance of diverse non-conventional practices, including buying, cooking, and also consuming in alternative modes (Lazarin, 2018). For example, producing cheese at home instead of buying it, searching for different food services to eat, needing more nutritional and cooking lessons, and so on. Thus, challenging social establishment and adding much more barriers to daily life, sometimes making everyday life like a battle. These various demands discourage mainstream consumers from adopting sustainable eating standards and generate a wave of ex-vegetarians, frustrated consumers who return to regularly consuming products of animal origin (Lazarin, 2018).

Fuentes and Fuentes (2017, p. 530), studying plant-based milk marketing, define that “rather than encouraging entirely new modes of consuming food, meat and dairy substitutes

¹⁶ The "s" for vegetarian patterns variations: excluding meat, excluding dairy and meat, excluding eggs, dairy and meat, excluding all food of animal origin, reducing but not excluding totally food of animal origin, etc. Flexitarianism, reducetarianism, veganism, etc.

are often intended to become part of already-established practices of shopping, cooking and eating.” Therefore, plant-based analogs, both meat and dairy products, are at the core designed to reduce barriers to sustainable eating, fostering the consumption of healthy vegetable proteins without demanding major changes in consumers’ everyday practices.

Lecturing about sustainable food market construction, Dalmoro et al. (2021, p. 2) clarify that “consumers may not have enough power to change the food market structures, and other actors may need to support the adoption of more sustainable consumption practices [...].” In the same direction, FAO/WHO (2019, p. 22) highlights that achieving a sustainable food system will demand multi-actor interventions in supply and demand, “not least shifting social norms away from meat-based diets. There is no ‘silver bullet’ solution to create a sustainable food system. Instead, many changes across multiple food system sectors are needed”.

We recognize the food system as a global market (Ericksen, 2008; Pitt & Jones, 2016; Brunori et al., 2020), increasingly guided by financial flows (Fairbairn, 2015). From this understanding, we propose to add to the literature on market transformation (Dalmoro et al., 2021; Araujo, 2007), presenting the events of the plant-based Brazilian industry flourishing – emergence, rapid development, and establishment – to envision the sustainable solution of plant-based meats. Investigations toward market change can opt for diverse theoretical platforms and methodologies, and we present, discourse, and explain our approach toward assemblage and ethnography.

To understand the processes of change in the food system, Marsden et al. (2018) indicate that it is necessary to concurrently review the crisis of the current system and the anatomy of new systems and alternative assemblages – or alternative food networks (AFNs). In this study, we verify how the structure of the Brazilian food industry, recognized as stagnant in product innovation, incorporates an alternative anatomy, the startup *modus operandi*, which mobilizes foodtech innovation and venture capital, and intertwines with further actors, each with different objectives and capabilities, in an unprecedented way.

Proposed by Deleuze and Guattari (1987) and revisited by Delanda (2006), the assemblage theory is requisited in our study to highlight the performativity of periodic interactions between different actors and devices, which undertake “multilevel transformations that, when aggregated, can potentially reshape the food system” (Marsden et al., 2018, p. 6). The significance of assemblage scrutiny remains in accessing the dynamism of relationships – often unstable – that perform the food system through a set of heterogeneous elements, human and material (the latter capable of articulating and inducing

action). Brunori et al. (2020) propose that the food system should be investigated as an assemblage, considering its multiple actors that engage in different configurations according to their diverse objectives, capabilities, and agendas.

Emerging market studies (Dalmoro et al., 2021; Giesler & Fischer, 2017) express that market dynamics are multifaceted processes (Hagberg & Kjellberg, 2010), not fully controlled by companies, with an active role of consumers (Kjeldgaard, Askegaard, Rasmussen & Østergaard, 2017; Weijo et al., 2018), but not overestimating it (Thompson, Arnould & Giesler, 2013). Consumers alone do not have the capabilities to build new market structures to the point of instituting an effective change. The consumers' inability to implement perennial change in the food systems, even at micro and individual level, can be understood when considering the inherent complexity of this system. Unlike other markets, as described by Martin and Schouten (2014), food involves an exceptional materiality of daily consumption, demanding deliveries in continuous and intermittent flows that are not comparable to other markets – neither controllable by consumers (Van Bommel & Parizeau, 2020).

Brunori et al. (2020) explain that the food system complexity as consists of a vast continuum of activities, such as obtaining inputs, cultivating ingredients, producing food, transporting, industrializing, distributing, marketing, preparing, consuming, dispositioning, and managing. The continuum of activities occurs at different scales, being essential to analyze the interactions established between the meso (system/regime), micro (niches), and macro (landscape or contexts) levels, according to the propositions of multilevel perspective in socio-technical transitions. Geels (2018) explains that a system transformation occurs through the interaction of processes at the meso, micro), and macro levels. At the micro level, new practices and innovations – social and technological – emerge, then interact with at the meso level in assemblage, being influenced and constrained by the broader context, the macro level, such as demography, collective imagination, social values, geopolitics, trends. Geels (2018) emphasizes that, in addition to the socio-technical transitions undertaken by the various actors in the food system, there is a great deal of potential for radical micro-level innovations to trigger system change. Pereira, Drimie, Maciejewski, Tonissen and Biggs (2020) point out that innovations seen as disruptive can trigger transformations of dominant regimes and stable landscapes, mainstreaming alternative logic faster than previously inferred.

Therefore, Geels (2018) indicates that to glimpse a system transformation, after understanding the actors that perform the food system (taking into account their projects, interests, and lines of action), we should pay attention to radical innovations that tend to emerge in small niches. These innovations have transformative potential and arise “through

pioneering activities by entrepreneurs, startups, activists or outsiders” (Geels, 2018, p.5) – at figure 4, see Prosumers and Food-Tech Startups, with transformative potential presented.

In sum, a transformation in the food system occurs through multilevel interactions, as mentioned by Brunori et al. (2020), and can be understood through the following: niche innovations parallel to changes in the landscape – e.g.: cultural perspectives, macroeconomics, collective imagination – create pressures on the system, destabilizing the regime, then create windows of opportunity for new solutions developed in niches to spread and disrupt, and finally transform, the existing system, disrupting it (Geels, 2018).

Macro level (landscape) changes in the food system are constant and gradual, constantly feedbacked by practices from the diverse actors and devices that constitute it. In the case of latency of macro changes interacting with social or technical innovations capable of fitting in, anticipating, and accelerating a latent change, there is a possibility of disrupting the system, according to Geels (2018); and we glimpse plant-based meats in this disruption possibility, given that it adds to the gradual growing awareness of the problems of the current meat-centric configuration of the food system plus the growing interest in vegetarianisms in the West (Lazarin, 2018).

On the other hand, the breadth socio political economic complexity of the food system and the concentration and stabilization of dominant actors (Gladek, 2016; Wesz, 2016) that keep reinventing their practices incrementally, using financial (Fairbairn, 2015) and political structures (Wilkinson, 2016) to order assemblages according to their own interests (Brunori et al., 2020), implying that most social or technical innovations do not go beyond niches and remain limited to experimentation. Micro-level innovations, in addition to challenge the systemic *status quo*, needing to ally some interests of other actors, engaging then to perform a bottom-up process, “in contrast to corporate power, which tends to be top-down” (Pereira, 2020, p. 6).

In addition to interacting with the macro level to advance, an innovation needs to fit into a meso-level arrangement – an assemblage – with conducive governance (Pereira et al., 2020). This flattering fit demands reflexive and evolutionary governance and practices from diverse actors, being one of the prominent obstacles to achieving a food system sustainable transformation since there are established operations towards the maintenance of dominant interests. According to Pitt and Jones (2016), policymakers are key agents in the food system and in scaling (or limiting) processes of innovations, allowing innovations to reach more people, producers, and consumers, expanding and eventually changing mainstream dietary practices.

However, Pitt and Jones (2016, p. 2) highlight the prominent role of policy in restricting transformation, as “policy is one of the components of regimes that perpetuate unsustainable systems, with the transition process dependent on the choices of alternative regulatory policymakers”. In a way that policy is capable of restricting or allowing innovation development within local food market and impacting global food system. In Brazil, there are a major recognition of the restricting and unfeasible role of policy towards innovation in food market (Dellepiane & Wilkinson, 2018), which made the way in which the assemblage we followed developed and managed to overcome this barrier even more impressive – see Government and Producers Associations, in figure 3.

From this broad understanding, it becomes evident that innovation in food system do not can instaurate a transformation without engaging other actors and devices beyond those primarily proposing the novelty. In a multi-level dynamics, innovation should be integrated by diverse actors and devices in a favorable assemblage. Once developed, the new food products need to be integrated into assemblages in a way of scalling it into the continuous flow of activities that perform the food system (Van Bommel & Parizeau, 2020).

Innovation in plant-based meats has been taking place at an accelerated pace, finding support in the interests of various actors in the food system, globally and in Brazil, and also finding support at the macro level, with the growing understanding of the rights of non-human animals, the scientific recognition of environmental and climate benefits of plant-based proteins in comparison to animal meat and the increasing awareness of the juxtaposition of plant-based food and health – including reduced mortality and increasing in life expectancy (Dinu, Abbate, Gensini, Casini & Sofi, 2017).

The plant-based meats, as an innovative product to transform the food system, involve new ingredients, new technologies for the extrusion of proteins from grains, new formulations that guarantee texture and pleasant flavor allied with healthiness and affordable prices, and so on. However, plant-based meats also demand to restructure of agricultural production chains, industrial configuration, distribution integration, integration and changes in food service and food retail, public regulation, fair competitiveness with animal-based meats, alterations in food culture, and better nutritional understandings, development of new food aesthetics with the appreciation of whole grains and nuts as a source of protein, etc., food education, and so on.

We assume that, in order to integrate and be successful, the plant-based innovations need (in addition to providing optimized and efficient solutions for the food system) to demonstrate their potential in meeting the actors' interests. Such demonstration of meeting interests (as well as its superiority in efficient and optimized solutions) is submitted to a

shared understanding construction (Lusch & Watts, 2018; Dalmoro et al., 2021). Thus, plant-based meats innovations, ultimately, need to connote an increase in the profitability of the actors involved, operating within the current logic of financialization that guides the food system (Fairbairn, 2015; Fairbairn et al., 2022) – as illustrated in figure 3, presented at the end of chapter 4.

3 AN ETHNOGRAPHIC STUDY TO CAPTURE THE ASSEMBLAGE OF A NEW INDUSTRY RISING

This study ethnographed the initial formation of the Brazilian plant-based meats industry. The main objective was directed to verify the possibility of establishing a novel industry to produce and trade plant-based meats in (and from) Brazil, in order to collaborate with the structuring of a global solution for food system sustainability. To achieve a broad understanding, multiple actors and devices performing the Brazilian plant-based food industrial assemblage were observed and followed. The Brazilian food industry inherent problems, previously mapped (Dellepiane & Wilkinson, 2018; Dellepiane & Wilkinson, 2019), were considered but not further investigated.

Ethnography is not a new research approach in management studies. We conduct the ethnography following market-oriented propositions (Arnould & Wallendorf, 1994; Arnould & Price, 2006) and the literature on market-making phenomena (Araujo, 2009; Geiger, Kjelberg and Spencer, 2012; Fuentes & Fuentes, 2017). In Science and Technology Studies (STS), ethnography is also a leading method in the field (Hess, 2001; Lippert & Mewes, 2021) since the agency of multiple devices – not only human beings – can be captured to explain complex sociotechnical phenomenon (Callon et al., 2007).

Since we are following an industrial market establishment, another reason to choose ethnography as the research method, instead of interviews, was to avoid a reductionist company-centric understanding of the food market performance phenomenon. Presented as a “perspective [that] considers companies as actors capable of combining the resources needed to create markets and economic value by recognizing opportunities” (Dalmoro et al., 2021, p.1), this perspective does not fit in the broadened understanding of markets as social constructions.

Through ethnography, we captured not only sense-making narratives but ongoing relationships between diverse actors, attempting to market happenings, to shared mobilization of market devices, to unspoken external devices that framed the resources mobilizations and possibilities, and to marketing devices operationalizations of each ethnographed firm. Thus, applying ethnography, in addition to most of the data that emerge from the operation of each firm (and would possibly direct us to a company-centric reductionist understanding), we provide a thick ethnographic description of the Brazilian plant-based meats industry rising assemblage, extrapolating each single actor, and even a sum of single actors, presenting an assembly understanding.

This study is grounded in the theoretical framework of the distributive agency approach (Schatzki, 2001; Cochoy, 2009), which posits that the performance of practices that shape a market and consumer culture is distributed among various elements in an assemblage, including institutional, human, and material devices. For example, in the marketing of plant-based meats, factors such as food technology, packaging, store location, and positioning on shelves are all devices that contribute to the functioning of the market, not only towards consumer practices, but also towards the practices of managers, investors, and other actors. These devices are not simply the results of firm strategy, but are also key elements that guide human and institutional practices, contributing to the overall market-making process. Moreover, the operationalization of these material devices is dependent upon a range of institutional devices, flows, and instances, such as knowledge flows, market fairness and competitiveness, regulatory support for or against innovation, lobbying efforts, human development, and supply chain structuring. In other words, the successful functioning of the market is not solely reliant on the behavior of individual actors, but is rather shaped by a complex interplay between material and institutional devices, flows, and practices.

Mirroring the U.S. market, from where plant-based meats materialize as a viable food product with the boom of Beyond Meat and Impossible Foods enterprises, this study was conceived to cooperate with the hope of a mainstreaming of this food category around the world. As already told, this study was initially designed to map the barriers to innovation in the Brazilian food industry that disown the country as a mere granary, looking at how could be possible to foster an ecosystem enabling innovation and foodtechs startups to emerge and produce plant-based meats. At that time, 2018, some punctual initiatives in Brazil imported Beyond Meat products, being marketed at a quasi-gold priced in an extremely nichified way – diametrically opposed to Beyond Meat and Impossible Foods alleged missions of making animal meat replacement easier.

In this sense, to verify if Brazil could be a leading player in the emerging global plant-based meats market, we planned to conduct an ethnography with actors that should be involved in this new market (e.g., GFI Brazil, Embrapa, and vegan foods companies and eventual startup idealizers interested in plant-based meats technology). What a surprise when, in 2019 first semester, Fazenda Futuro was launched, debuting the production of plant-based meats in Brazil; and shortly after, the InCrível, a JBS plant-based meat burger that quickly expanded to become an entire line, and also Rebel Whopper in Burger King, the BK's standout sandwich offered with a plant-based burger, produced by an unprecedented partnership joint Marfrig and ADM in Brazil.

Given this unexpected and quick industrial flourishing, the study's main objective changed, moving away from the focus on understanding the innovation barriers and proposing solutions to an innovative ecosystem emergence. The study accompanied the arrival of international actors (more precisely, U.S.'s actors) and mobilization of traditional and new Brazilian actors (food industrial and startups) in movements that – beyond making it possible to produce meat analogues through plant-based ingredients, using extrusion technologies and new food additives in Brazil – is currently performing a novel assemblage capable of surpass the previously inferred as unsurmountable barriers to innovation, in a successful mode that quickly institute the production of the novel food category, not only in reaching the national market but both affecting the global food market constituency, as we will describe and explain in chapter 5 detailing the results of the ethnography.

Then, the main objective of this study is to describe the Brazilian plant-based industrial assemblage in its fluorescence stage. For this, we map the main actors, their interrelationships, and their performances in the constitution of the assemblage, including the production and mobilization of market devices. Thus, we present the results of these multiple performances to meet a secondary objective of understanding how Brazilian food industry barriers to innovation were overcome by this unique assemblage, pointing out the potential to transform the global food system from emerging developments in the peripheral Latin America. In addition, another secondary objective, previously designed¹⁷, was to verify how market and marketing devices have been constructed and mobilized by the actors of the Brazilian plant-based meat assemblage, if the major orientation were toward a plant-based mainstreaming or towards a nichification market orientation, that would limit to meet the existing demand of vegetarian niches, using the plant-based meats disruption more as an advertising narrative than a future food solution. We could quickly address and answer this ultimate objective from the foodscape observations and managers' discourses (and organizational practices) that we accessed along the ethnography.

So, even with the arise of plant-based meats production technology in Brazil, an ethnographic study together with the main actors in the performance of this novel food industry continued to be relevant, maybe even more than before. We could apprehend difficulties and novel strategies, not only to access and implement innovation within the food industry but about the operation of market devices and assembling partnerships to implement

¹⁷ Derived from Beverland (2014) and Fuentes and Fuentes (2017) marketing research questions.

the industry itself, to gain competitiveness for expansion, and glimpse the possibility of mainstreaming the meat analogs products in the domestic market and around the world.

Our ethnographic data collection took place between 2019 and 2022¹⁸, comprising two main strands with different research tools: 1. monitoring of institutional meetings assembling actors that performed the Brazilian plant-based meat market; 2. observations of the plant-based meats products market devices, especially marketing mix at foodscape.

We conducted an ethnographic accompaniment of business and scientific meetings that were focused on the plant-based meats Brazilian market, accessing major players of this industry in a context of discussing the industry constituency, describing their strategies, difficulties, and market perspectives, in the meantime of building a shared understanding – which, in turn, comes to framing subsequent market devices operations and movements; which we were able to access through market and foodscape observations. All the ethnographed meetings assembled more than one representative actor in the Brazilian plant-based meats industrial assemblage constituency, e.g., foodtech startups executives, traditional food companies marketing and innovation directors, NGO professionals, government representatives, and agrifood scientists.

Considering the COVID-19 pandemic, which arrived in Brazil in March 2020, a significant part of the ethnography was digitally mediated (Miller & Horst, 2021)¹⁹. What at first seemed like a derail to the ethnography had a remarkably fruitful impact on the study conduction since the pandemic situation increased the frequency of access to many actors such as startups, companies, and public and non-profit institutions. The access to digitally mediated encounters that already occurred at a lower frequency and in a more closed way – previously not amenable to ethnographic observation – ensures a thick description of the field (Akemu & Abdelnour, 2020). The recurrent lockdowns in Brazil and the home-office

¹⁸ In the subsequent chapter, we explain the extended version of the ethnography, which started earlier, imposing directions and expanded understandings of the investigated phenomenon.

¹⁹ The digital mediated ethnography significantly differs from netnography, which is another type of research. In netnography studies, a virtual phenomenon is under scrutiny, and so virtual dynamics are the protagonist. Netnography is a particular research method of online community or metaverse, counting on its own scripts (Kozinets, 2022; Belk, 2017). In a virtual mediated ethnography, the method used in this study, a real mundane and, in our case, a material phenomenon, is accessed by digital mediation, which does not change the content in analysis nor the essential ontology in research (Kozinets, 2022). According to professor Marlon Dalmoro's explanations, in a netnography study, a researcher can conduct a digital interview to understand a virtual vegan community, for example; on the other hand, in a digital mediated ethnography, a researcher can conduct a digital interview to understand market practices, such as vegan consumers' food shopping in during the pandemics time. The first method is intrinsically online, including the phenomenon under scrutiny, the second (conducted in this study), is an ethnography that makes use of digital mediation to guarantee or enhance data access and improve field entrance.

establishment phenomena (at least for management positions) caused such a frisson towards the use of the Zoom platform and digital meetings, providing a fertile ground for events that gathered multiple actors in the food industry. This frisson was even further in the plant-based meat market, considering its novelty and the high interest in experience exchange between the almost-all-beginners actors. In addition, we perceived an aspiration for creating a shared narrative for the emerging plant-based meats Brazilian industrial market, in order to broaden the sense of what each actor had been conducting. Thus, the digital mediation imposed by the COVID-19 pandemic – beyond boosting the participation of multiple actors in online meetings – facilitated our presence in such meetings. In 2019, we were aware of meetings joining actors of the plant-based meats industry, but that took place in São Paulo City, Brasília, and Curitiba²⁰, and we could not participate. As of 2020, business and scientific meetings have become openly transmitted or accessible upon payment, prior registration, or invitation. The ethnographed meetings – that brought together more than one relevant actor in our investigated assemblage and were conducted centered on the plant-based meat industry theme – were field noted, recorded, partially transcript, and analyzed. This data, which emerged from meetings that repeatedly assembled representative performers of the Brazilian plant-based industry, consolidates the major hermeneutical portion of the ethnography.

Beyond the meetings with key market constitution actors, the ethnographic fieldwork for this study also encompasses market and foodscape observations. The focus of these observations were directed to market devices mobilizations and to plant-based meat products marketing mix operationalization, including product, packages, pricing, placement, and promotional elements at food service and food retail in addition to advertisements (Callon et al., 2007; Fuentes & Fuentes, 2017). Beyond observing the status of the devices, the objective was to follow their evolution over time and track their direction to an industrial growth process, relating then to the strategies narrated in meetings and the assemblage and market construction. The elements captured in observation include launches, re-launches, product formulation, product formats, packages, presence and allocation in food retail and food service, prices (of the products themselves and their traditional analogs of animal origin), multimedia advertising, branding, etc. Each foodscape observation was photographed, filmed, and ethnographically field noted, in order to discern the marketing mix operationalization and envision the progress of the market formatted by the nascent industry. These data about

²⁰ For example, the event “*Corrida pelos Hambúrgueres Plant-Based*” (running for plant-based burgers), by AGN Consultancy, occurred in 2019 at São Paulo City, face-to-face and without live streaming, could not be accessed by the researcher. In contrast, another event in sequence, the “*Corrida pelos Hambúrgueres Plant-Based 2*”, which took place in 2020 and was conducted online, is part of the study corpus.

market and marketing devices were submitted to posteriori analysis, also unraveling the assemblage's actors' endeavors towards a mainstreaming (instead of maintenance of nichification) process.

Furthermore, the market observations made it possible to compare market practices to narrated strategies and objectives presented by the actors in the meetings, conveying a deep understanding of the industrial-market construction and the development of plant-based meat products innovation towards a global mainstreaming process. This because, beyond foodscape in situ and online observations, wherein we accessed marketing devices, we digitally conducted observations in the financial market to capture market devices and market positioning mobilizations to truly understand the assemblage.

Taking into account that the food system operates on a global scale and is subject to the process of financialization (Fairbairn, 2015), a process that was perceived as one of the most relevant in the configuration of the scrutinized assemblage, we monitored news from the financial market concerning the industries and startups of plant-based meats through Bloomberg (Torres, 2021). In addition, we also use data from Using Crunch Base's to access financial information and investments in startups (Dalle, Den Besten & Menon, 2017). We accessed brands, firms and holding groups websites to capture historical facts and previous market mobilizations concerning each actor in the assemblage. (ADD) Therefore, we also accessed reports from the actors themselves and considered them when referring to plant-based initiatives, which happened mainly in shareholder and sustainability reports (Reis & Molento, 2020), e.g., JBS's and GFI's reports (JBS, 2019; JBS, 2020; JBS, 2021; Bryant & Krelling, 2021). We also follow reports published by the FAIRR, a collaborative investor network focused on animal farming (and that significantly influenced the Brazilian assemblage performance, as we will detail foremost); FAIRR's reports presents market data, scientific data on the impacts of livestock activity, and perspectives on the organizations, governance, and capital flows on meat and its alternatives (FAIRR, 2019; FAIRR, 2020; FAIRR, 2022).

By observing market and marketing devices and financial market movements, we were able to deepen the understanding of facts and junctures referred by the various participants during the ethnographed meetings, as well as to better understand the performative dynamics of this industry in the U.S., which allows a more reliable explanation of the Brazilian assemblage dynamics. Furthermore, it is necessary to reiterate that these various reports, news, and financial data are taken into account as performative market devices since they frame the practice horizons, forcing the scrutinized assemblage (Finch & Geiger, 2010; Slater,

2011; Geiger et al., 2012). In the following chapter we present and detail data collection incursions and the respective results.

4 RESULTS SYNTESIS

The ethnographic fieldwork took place from 2019 to 2022, starting with a participant observation conducted on 2019 May 13th, on the occasion of the launch of the first plant-based meat product produced in Brazil: Futuro Burger from the Future Farm startup. The event took place at Lanchonete da Cidade, Sao Paulo City. The Futuro Burger launch marked the beginning of the marketing mix devices at foodscape observations (including the first self-experience consuming a plant-based meat product, see figure 2) – see video 1. The end of fieldwork occurred on 2022 October 16th, in a visit to a specific store of the Carrefour supermarket, in Sao Paulo City to observe an unprecedented point-of-sale strategy operated in partnership with Verdali's startup, wherein seven different types of plant-based meat started to be commercialized in fractions at the butcher sector, alongside meat cuts of animal origin – see figure 3.



Video 1. Futuro Burger Launch, at the night of May 13th 2019 at Lanchonete da Cidade, Jardins, São Paulo City
Note: The video is available at: youtu.be/6bolSw0ycyU
Source: The Author (2019).



Figure 2. Future Burger sandwich by Lanchonete da Cidade
Source: The Author (2019).

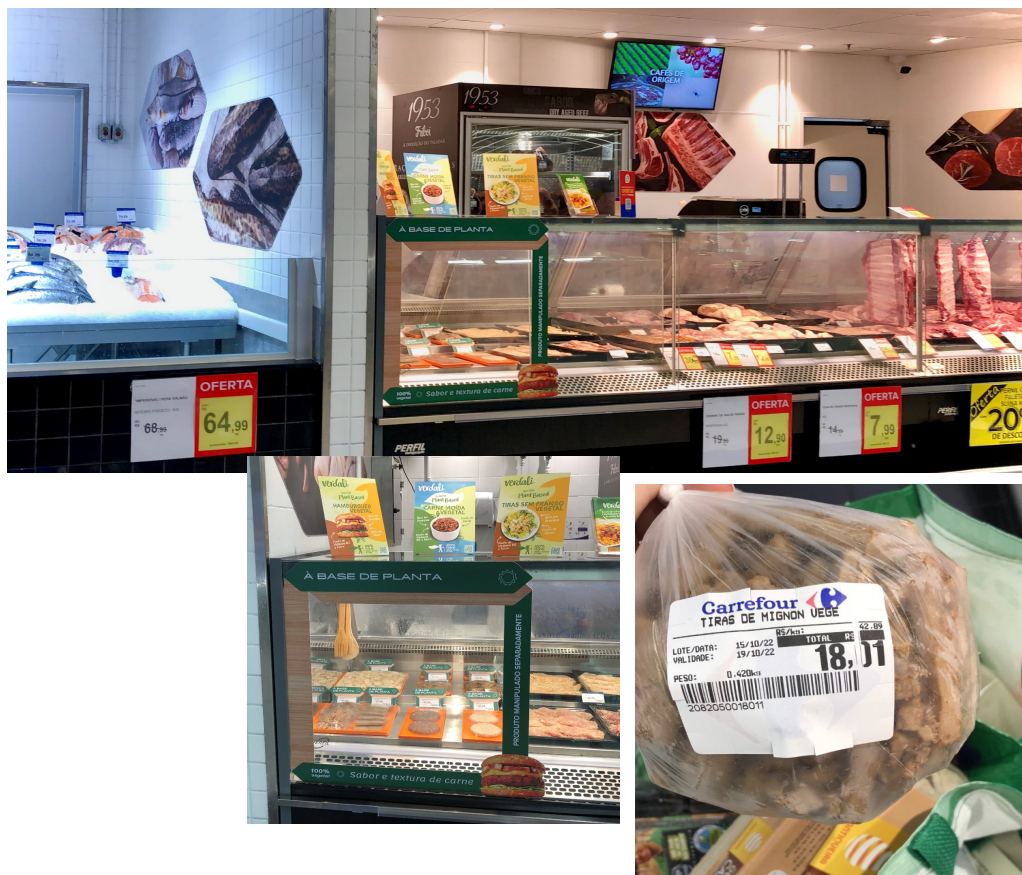


Figure 3. The Butcher section in Carrefour Brasil store offering fractionated plant-based meats, 7 different Verdali's products

Note: We became aware of the Verdali-Carrefour's product placement novel strategy by AGN Consultancy; and knowing that it would initially be implemented in just two stores in São Paulo, we previously contacted Carrefour Pamplona store via telephone to ask about the Verdali's availability in the butcher sector and were informed that chicken strips was the only product available in that store, and that the complete mix was at the moment only available in the Santo Amaro's Carrefour store, so from that point on we requested the visit of the sociologist to the store in Santo Amaro to carry out the observation given our unavailability to go to the city of São Paulo at the time, being present by video call and whatsapp conversation during the observation, guiding it.
Source: Photographed by sociologist Msc Monique Roecker Lazarin as requested by the author (2022).

Along the 42 months of fieldwork, we conducted 111 field incursions, compiling a first personal meeting with the GFI Brasil director, 16 participations in institutional meetings that assembled multiple actors – as detailed in Table 1 –, and 94 foodscape observations in food service, food retail, and advertising platforms – detailed in Table 2.

Along the research conduction, it was possible to access 52 different professionals from 40 different organizations that participated in the meetings, plus 9 organizations accessed without a professional or manager mediation through the observation of devices or market movements²¹, dozens of different products from 17 plant-based meat brands, at 10 different food retails, 9 different food services, in addition to varied advertising multimedia platforms – as presented in tables 1 and 2.

We observed 13 Brazilian plant-based meat product lines through foodscape observations: 1. Future Farm, 2. Seara Gourmet and Incrível (that appears as a product within the Gourmet line but evolves as an entire plant-based meat line), 3. Plant-Plus Foods (Marfrig and ADM Brasil joint venture) and Revolution (a Marfrig's brand), 4. Verdali, 5. Carnevale (a R&S Blumos enterprise), 6. The New (formerly The New Butchers), in addition to brands that started to offer one or more plant-based products, 7. Not Co, 8. Superbom, 9. Sadia Veg&Tal (a BRF brand including plant-based meat products), 10. Frimesa (a cooperative that launched a plant-based meat burger), 11. Vida Veg, 12. Urban Farmcy, 13. Amazonika Mundi (formerly Sotile). We do not exclude Not Co as a foreign enterprise, including it within the Brazilian assemblage scrutiny (although it is a Chilean-founded startup), because Not Co produces and trades plant-based meat products in Brazil²². Besides these 13 enterprises (accounting for more than 14 brands, since some enterprises implemented more than one brand), we also observed and established inferences with four more plant-based meat brands: Beyond Meat, Impossible Foods, Ozo (a JBS plant-based meat in the U.S.), and Viverra (one of the leading plant-based meat enterprise in Europe, acquired by JBS in 2022).

Before the launch of the first plant-based meat product in Brazil in 2019, we had already been monitoring this market, so in a more extended version, we must clarify that observations of the Brazilian plant-based meats proto-market started in the year 2016. In addition to verifying movements in the international market and capturing the arrival of the GFI in Brazil, which had direct implications for the industrial formation that we scrutinized, we conducted observations of the previous (or proto) plant-based meat products in Brazil. We conducted a photo collection of vegan products which set out to be meat analogs, including

²¹ Mainly players in the financial market, such as Bradesco BBI, FAIRR, and Exame Magazine.

²² And starts to serves most countries in the American continent.

food retail observations of a preliminary version of extruded soy meat analog from Superbom – see pictures and further details in attachment 2 – and a personal meeting with the trade director of a vegan family-owned food industry²³, that produced and traded plant-based products intending to simulate animal meat. In this meeting, we could understand the desire to replicate what was being produced in the United States, producing animal-meat-like experiences, as well as the barriers to the small company's development, with obstacles in getting ingredients, which they imported from China, in a high-cost inputs counter-flow, the difficulty of entering the local distribution channels, in addition to a perceived level of rejection towards the products by the vegan public, who was the target and indeed those who bought the product at the time. Finally, when prepared, the products did not deliver the same experience as an analog of animal origin, being vegan protein delicious options but not meat analogs as one could expect, so it could be inferred that the company certainly deals with technological limitations as well.

Within the methodological conduct of ethnographing the initial formation of the plant-based meats Brazilian industry assemblage, the first access to institutional actors ensued in October 2019 in a personal meeting with the director of the Good Food Institute (GFI) Brazil. The meeting was held in São Paulo City, in a vegan coworking coffee in the Higienópolis neighborhood indicated by the director's secretary. In this conversation, the director explained the initial dynamics of the industry and market formation, revealing the concatenation that brought the most advanced plant-based meat technology to Brazilian enterprises, specifically for the Future Farm startup²⁴ and for ADM - Marfrig joint venture²⁵. Furthermore, the GFI director reinforced the importance of ingredient industries, and the specific machinery they demand²⁶, for an industrial formation to emerge and establish. In addition, the GFI's director elucidated aspects related to competitive dynamics, precautions towards the emergence of a new food category, and aspects of public regulation and mainstream consumption, demonstrating know-how obtained by his Institute along the previous ongoing of this novel market in the U.S. The outcomes of this first personal meeting with GFI Brazil were discussed with professor Dr. Walter Nique and directed the following stages of the research.

²³ Considering that it was a small and nichified business and due to the meeting being conducted several years ago (2016), we decided to not cite the firm's name nor include it in the assemblage analysis. Also, for the reason that, somehow, we criticize its products and strategy. Furthermore, the aforementioned supply-chain and marketing strategies are no longer currently conducted at the time this study was written (2022).

²⁴ That hits the market in May 2019.

²⁵ That hits the market through Burger King Brasil fast-food chain in September 2019.

²⁶ Extrusion machinery globally provided by the century-old company Wenger (acquired by Marel).

The most important outcome of the personal meeting with the GFI Brazil director was not the explanation about the plant-based food implementation in Brazil nor the imminent risks the early products and the category establishment could face. The most important outcome of this first meeting was the access to future meetings that would occur. After the conversation, we established some direct contacts via Instagram messages, and this recurrent contact permits us to be aware of events that gathered diverse key actors in the plant-based emerging market – a strategy conducted in line with the ethnographic methodological propositions applied to contemporaneous business (Akemu & Abdelnour, 2020). By a fortunate coincidence, which became more esteemed over time, our first direct contact, more than random, was established with the leading player in this novel industry. The GFI Brazil was revealed, with the progress of the ethnography and the development of the market itself, as a central player with the ability to join different – and even competitor – actors. Actors who had the resources and skills to mobilize market-making devices and who collectively shared a narrative to modeling the market, feedbacking the construction and the mobilization of devices, practices, and meanings.

The initial meeting with GFI was the only event conducted with a single market actor; after that, we endeavored to partake in events that brought together two or more actors uttering about the Brazilian plant-based meat industry, per our theoretical understanding. In a marketing study about food-market change, Kjeldgaard et al. (2017, p.4) explain that “actors have a shared interest in the maintenance of the field. Therefore, the unit of analysis is not so much the actions of individual actors. Rather, the analysis examines the dynamics of collective strategic action that reproduces predominant field logics.” Therefore, in addition to the concatenation of facts that allowed us to implement this strategy, we chose to accompany meetings that brought together more actors.

None of the ethnographed meetings, excluding the first one, was organized, nor had intrusive participation of the researchers. Therefore, we adopt an unobtrusive observation (Holbrook, 1997). A passive role in participating in meetings didn’t require the researchers to intrude in the research context. That is, although accompanied all alive, we do not interact directly with the participants²⁷ in the meetings; we just accompany and take notes of their elucidations and each other interactions. We established some direct contact with GFI, AGN, Labea-UFPR, and FISA – all hosts of the meetings, so the contacts were referred to access the

²⁷ In the eleventh meeting, a MAPA and Anvisa collaborative two-day workshop about regulation development for plant-based meat and milk analogues products, which addressed the construction of a regulatory framework for the plant-based industry in Brazil, bringing together government actors and agrifood associations, we wrote some comments and replies in the Q&A session, but without interfering with the meeting’s agenda.

meetings. We established direct contact with the GFI Brasil, with its general director, as already mentioned, and with the Wenger director via e-mail to improve understanding of some of the company's partnerships that were not clear in the meetings accessed.

In table 1, we present a synthesis, briefly describing the meetings and the accessed participants, the actors, and their informant professionals²⁸. There were 17 meeting events, in which there was the participation of 40 distinct actors (organizations), represented by 52 distinct informants (spokespersons professionals representing their respective organizations); informants some of whom recurrently repeated participation in the ethnographed events²⁹. Informants that, in some moments, even entered into subtle confrontations due to their positions as competitors disputing the construction of what we observe as a shared understanding, or shared meaning, of the nascent market, according to their divergent objectives, supposed to guide a narrative with agency capacity to the point of guiding the next market ongoings.

Most of the time, however, the elicited participant actors' objectives converged during the meetings, and the establishment of fair play, and even more than that, an open collaboration posture, was repeatedly alleged and reported as an unprent practice within the dynamic established until then within the Brazilian food industry.

Beyond the 17 reported meetings, another 5 additional meetings with the mapped actors were accompanied but not excluded of the ethnographic data set for not focusing on the specific topic of plant-based meats (e.g, prioritizing cultured meat, plant-based dairy, innovations in food chain and food service, and promotion of vegetarian diets in a nichified perspective), only tangencing the questions under scrutiny. Partial transcription and analysis of the meetings generated 211 single-spaced pages of content, in addition to handwritten field notes not digitized.

In the meetings the participants exchanged experiences and narrated their trajectories and perspectives regarding plant-based meat products – nutrition, flavor, standard, technology, ingredients, R&D –, prices, competitive dynamics – compared to similar products of animal origin and other plant-based meat competitors sometimes presented at the same meeting –, logistics, exportation, industry, supply chain, marketing, packaging, consumption, market formation and regulation in Brazil and the world.

Although the meetings elicited the fundamental majority of the ethnographic data, in situ observations that mapped and apprehended the marketing mix devices in foodscape (more

²⁸ In this study, we count and refer to organizations as actors and the participant professionals as informants.

²⁹ Thus, increasing the depth of the collected elucidations and our understanding of the ongoing dynamics.

specifically food service, food retail, and advertising media scapes) were conducted and field noted. We found explanations for some questions that emerged in the observations in the meetings and vice versa.

Table 1. List of the ethnographed meetings during the fieldwork with Brazilian plant-based meats industrial and market actors

Ethnographed Meetings	Participant Actors (and their informant professionals)	Date
<i>First meeting: a personal meeting with the director of the Good Food Institute Brasil</i>	GFI Brazil (General Director).	2019 October
<i>Second meeting: "The running for plant-based burgers in Brazil 2" market status and covid-19 perspectives, an AGN event</i>	AGN (Founder); Fazenda Futuro (Marketing Director); JBS-Seara (Marketing and Trade Director); Superbom (Innovation Director).	2020 May
<i>Third meeting: a talk with Fazenda Futuro startup at the FoodTech Movement</i>	Fazenda Futuro (Commercial Director); FTM (Contributor).	2020 July
<i>Fourth meeting: understanding plant-based proteins alternatives and opportunities in the Food Ingredients South America</i>	GFI Brazil (General Director); Marfrig (Operations Director); R&S Blumos (Co-Founder and Technology Director); JBS-Seara (Marketing and Trade Director); Fazenda Futuro (CEO); FISA (Contributor).	2020 August
<i>Fifth meeting: an open talk about plant-based alternatives market in Brazil in the XII Open Innovation Week</i>	NotCo (Director); Verdali (CEO); BRF (Innovation Director); Superbom (Innovation Director); The New Butchers (Co-founder); Nestlé (Innovation Manager); AGN (Founder); 100 Open Startups (Communication Director); Mantiqueira (Innovation Manager); NoMoo (CEO).	2020 September
<i>Sixth meeting: "Foodtech's Invasion into the Growing Plant-Based Market", Inovabra Habitat, a Bradesco webinar</i>	AGN (Founder); Verdali (CEO); Superbom (Innovation Director); Unilever (Marketing Manager); Mr. Veggy (Co-founder).	2020 October
<i>Seventh meeting: "The new carnivores", a presentation about innovation, technology and sustainable alternatives in the Food Design Week</i>	GFI Brazil (General Director); Planta Group (Investor).	2020 November
<i>Eighth meeting: "TecnoCame - Plant-Based, the food revolution is increasingly on the Brazilian consumer's table"</i>	GFI Brazil (General Director); Unilever (Marketing Manager); Superbom (Marketing Director) SVB (Manager of Certifications).	2020 November
<i>Ninth meeting: a Globo Rural Magazine webinar to present a GFI novel research on meat consumption and plant-based alternatives in Brazil</i>	JBS-Seara (Marketing and Trade Director); GFI Brazil (Corporate Engagement Manager; Corporate Engagement Coordinator); GPA (Commercial Development Manager); Globo Rural Magazine (Editor-in-chief).	2020 December
<i>Tenth meeting: a Globo Rural Magazine webinar about the future of meat and Brazilian livestock challenges</i>	Embrapa (Analyst); UFPR (Animal Husbandry Professor); Rabobank (Analyst); GFI Brasil (General Director); Globo Rural Magazine (Editor-in-chief; Contributing Journalist).	2020 December
<i>Eleventh meeting: a MAPA and Anvisa collaborative two-days workshop about regulation development for plant-based meat and milk analogues products</i>	Abia (Regulatory and Scientific Director); Abir (Technical Director); GFI Brazil (General Director; Brazilian Public Policy Director; Corporate Engagement Manager); Ital (General Director); Mapa (Vegetable Products Inspection Director); Anvisa (Food Manager); Embrapa (R&D Director).	2020 December
<i>Twelfth meeting: a dialogued expository class about meat analogues meats technologies at the Animal Welfare Laboratory of the Federal University of Paraná</i>	JBS-Seara (R&D Director) UFPR (Animal Husbandry Professor; Researchers; Students).	2020 December
<i>Thirteenth meeting: Inovabra Habitat, a Bradesco webinar about innovation in plant-based food</i>	AGN (Founder); Planta Group (Investor); Mr. Veggy (Founder); Sebrae (General Analyst).	2021 March
<i>Fourteenth meeting: a meeting about the future of plant-based in South America at the Food Ingredients Global Conference</i>	Unilever (Marketing Manager); 100 Foods (CEO); GL Foods (CEO); FI Global (Contributor).	2021 April
<i>Fifteenth meeting: Artificial intelligence applied for plant-based food formulation in South America, a presentation at the Food Ingredients Global Conference</i>	NotCo (R&D Manager); RedFox (CEO); FI Global (Contributor).	2021 April
<i>Sixteenth meeting: an AGN meeting about ingredients for plant-based products, looking at the present and future in Brazil</i>	AGN (Founder); R&S Blumos (Co-Founder and Technology Director); ADM (Technical Director for Latin America); Döhler (Marketing Director).	2021 April
<i>Seventeenth meeting: "insights on extrusion technology, markets, ingredients and product innovation for plant-based meat alternatives"</i>	Wenger (Director; Processes and Technology Manager); R&S Blumos (Co-Founder and Technology Director); BRF (R&D Manager), Planta Group (Investor), GFI Brazil (General Director).	2021 November

The foodscape observations comprised 94 ethnographed field trips; 43 in food retail, 23 in food service, and 28 observations of plant-based meats in advertising multimedia platforms. Table 2 presents a brief description of the foodscape observational data collection. Among the observations, in addition to the classic food retail (e.g., supermarkets) and food service (e.g., restaurants), there were observations conducted from home and in urban streets, in cases of observing advertising and food delivery apps, in addition to a specific observation in an agricultural show (R&S Blumos and IBRAFE at Show Rural Coopavel).

Table 2. List of foodscape observations of Brazilian plant-based meats marketing devices

	Observed Foodscape	Brands Observed	Freq.	Date Range
food service	<i>Lanchonete da Cidade (cafeteria chain)</i>	Sandwich options with Future Farm plant-based meats	1	2019
	<i>Burger King (fast food chain)</i>	Rebel Whopper sandwich (Plant-Plus Foods)	5	2019 - 2022
	<i>Bob's (fast food chain)</i>	Tentador Zero Beef (Bob's, Future Farm)	2	2019 - 2021
	<i>iFood (delivery app)</i>	Sandwich options with Future Farm; BK's Rebel Whopper (Plant-Plus Foods); Bob's Tentador Zero (Future Farm); Sadia Veg&Tal, Incrível, and Future Farm packaged products	9	2019 - 2022
	<i>UberEats (delivery app)</i>	Tentador Zero Beef (Bob's, Future Farm)	1	2019
	<i>Big Pão (bakery)</i>	Sandwich options with Future Farm plant-based meats	2	2020 - 2021
	<i>Subway (fast food chain)</i>	Sandwich options with Incrível plant-based meats	1	2022
	<i>Outback (fast food chain)</i>	Barbecue dish with Incrível plant-based meat; sandwich option Plant-Plus Foods	1	2022
	<i>Amazon (U.S.)**</i>	Future Farm; Beyond Meat*; Impossible Foods*	1	2022
	food retail	<i>St Marche (supermarket)</i>	Future Farm	1
<i>Pão de Açúcar (supermarket)</i>		Future Farm	3	2019 - 2020
<i>Zaffari (supermarket)</i>		Future Farm, Seara Gourmet; Incrível; Urban Farmcy	3	2019 - 2022
<i>SuperMuffato (supermarket)</i>		Future Farm; Seara Gourmet; Incrível; Superbom; Not Co; Sadia Veg&Tal; Frimesa; Vida Veg	11	2019 - 2022
<i>Beal Festival (supermarket)</i>		Future Farm; Seara Gourmet; Incrível; Sadia Veg&Tal; Frimesa; Verdali	8	2019 - 2022
<i>Muffatão (supermarket)</i>		Incrível Seara; Sadia Veg&Tal; Frimesa	5	2019 - 2022
<i>Angeloni (supermarket)</i>		Future Farm; Incrível	4	2019 - 2021
<i>Koch Express (supermarket)</i>		Future Farm; Incrível	2	2019 - 2021
<i>Mercado Maria Luíza (grocery store)</i>		Future Farm; Frimesa; Verdali	2	2020 - 2021
<i>Carrefour (supermarket)</i>		Future Farm; Verdali	4	2020 - 2022
media	<i>TV Globo</i>	Institutional Market Campaign (GFI mediation); BK's Rebel Whooper (Plant-Plus Foods); Seara Gourmet (Incrível Burger)	5	2020 - 2022
	<i>OOH Sao Paulo Streets</i>	Future Farm; BK's Rebel Whooper (Plant-Plus Foods)	3	2019
	<i>OOH Shopping Pátio Higienópolis</i>	BK's Rebel Whooper (Plant-Plus Foods)	1	2019
	<i>Azul Airlines Magazine</i>	Future Farm	1	2019
	<i>Exame Magazine Website</i>	Plant-Plus Foods	1	2019
	<i>Instagram</i>	Incrível; Future Farm; Plant-Plus Foods; The New; Verdali; Superbom; Amazonia Mundi; Frimesa; Vida Veg; Not Co; Sadia Veg&Tal; Beyond Meat*; Impossible Foods*; Ozo*; Vivera*	15	2019 - 2022
	<i>TV Band</i>	Incrível	1	2021
	<i>Show Rural Coopavel</i>	Camevale from R&S Blumos, IBRAFE stand	1	2022

Note: *Beyond Meat, Impossible Foods, Ozo and Vivera are U.S. and European plant-based meats brands, but were observed due to its influence on the Brazilian assemblage. **Amazon were accessed from a random location in Florida – United States, allowing a comparison of the availability and prices between Future Farm and their competitors. **Source:** Elaborated by the author (2022).

Food delivery apps, even when offering packaged, not-ready-to-eat products, were included and accounted as food service, together with restaurants, bakeries, etc. On the other

hand, a specific observation of a supermarket app, the Super Muffato App, was accounted for within the Super Muffato liniment in food retail. Finally, one international observation of plant-based meats offerings in the Amazon's platform in the U.S. was conducted and included within the food service observations scope (although we were not able to buy the offerings and consume them).

The foodscape observations data comprised 237 photographs (including print-screens), 32 videos, and 25 single-spaced pages of field notes. Excluding digitally mediated observations, they were conducted in loco (at food service, food retail stores, shopping malls, and streets) in São Paulo, Paraná, Santa Catarina, and Rio Grande do Sul states, the four southernmost states of Brazil. Thus, uniting the entire Southern states to the major state in the country, in a way that we could conduct foodscape observations in the southernmost capital of the country (Porto Alegre), in coastal cities in the state of Santa Catarina (Balneário Camboriú and Florianópolis), in an inner city and in a boarder and multicultural town in Paraná (Cascavel and Foz do Iguaçu), and in the largest city in the Southern hemisphere (São Paulo).

Focusing on the plant-based meat products marketing devices, we captured the products' availability, packages, respective positions on the shelf or menu, prices, and point-of-sale promotions and advertising. Advertising included diverse formats, such as out-of-home (OOH) panels on streets and shopping malls, social media posts, digital influencers' promotional content on Instagram, product placement in television programs, newspapers and magazines advertisements, banners on websites, supermarket promotional flyers, sound advertising at supermarkets stores, and traditional television advertisements.

Considering the theoretical platform and the ethnography we conducted, we elaborated a scheme, presented in figure 4, identifying the groups of relevant actors for the constitution of the industrial assemblage concerning the plant-based meats in Brazil. Through ethnography, we could directly access and apprehend the interrelationships, the conduct of market practices, and the mobilization of performative devices by the respective groups of actors – explained in figure 4. At the end of the next chapter, after presenting the ethnographic results, figure 24 illustrates actors' brands and the interrelationships identified along the assemblage's ongoing flourishing. The groups of consumers, prosumers and activist entrepreneurs, rural producers, and trading and food logistics were not ethnographed, thus not directly accessed by the study, only indirectly referred through the participants' elucidations, secondary data, and studies previously conducted.

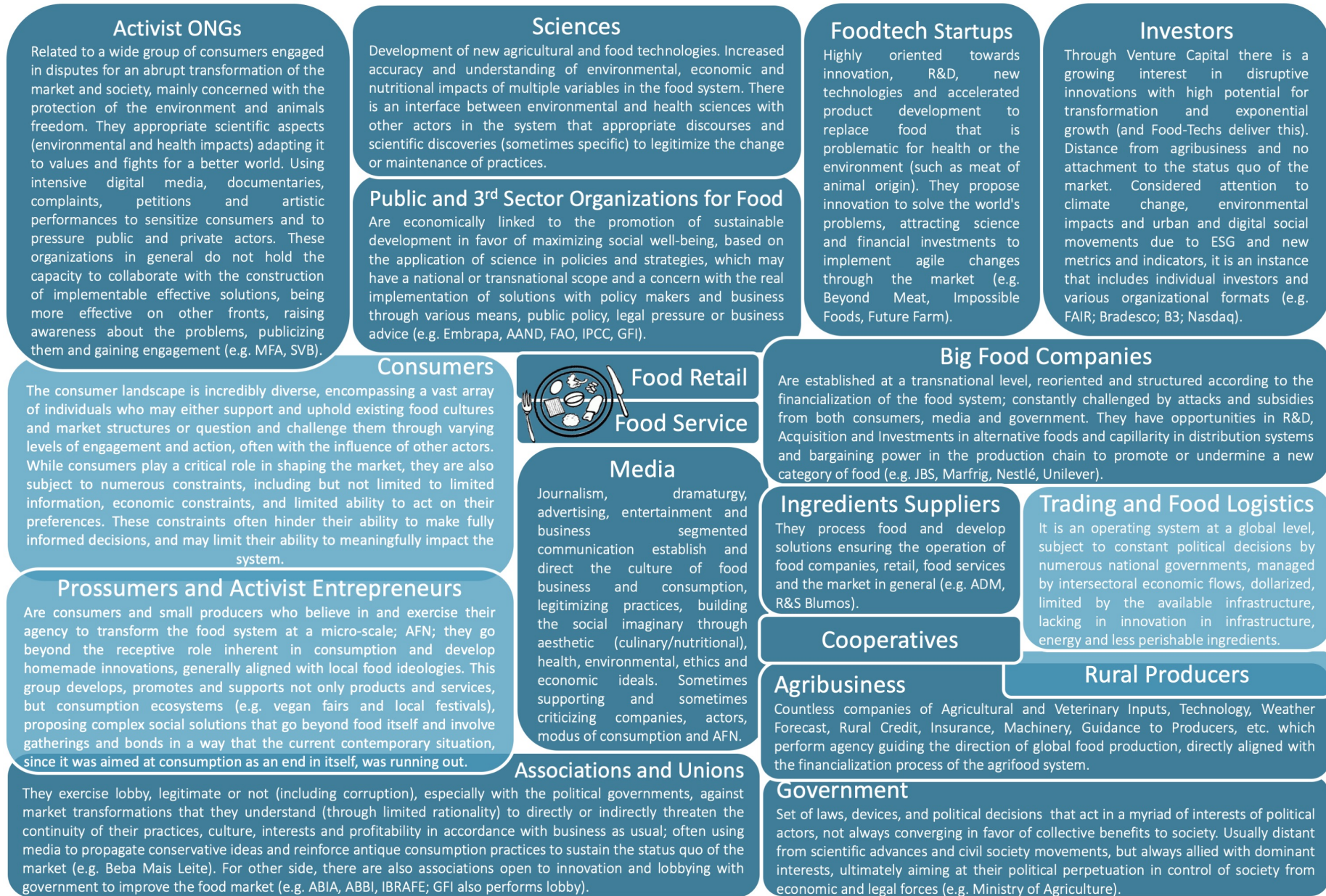


Figure 4. Groups of actors that perform the nascent Brazilian plant-based meats industrial assemblage (2019-2022)

Note: The lighter colors shows groups that were not directly ethnographed through our methodological data collection: consumers; prosumers and activist entrepreneurs; rural producers; trading and food logistics. Nonetheless, these groups were sensed by the ethnographed actors' narratives and elucidations and market data from Bloomberg, in addition to previous studies from marketing and consumer research. **Source:** Elaborated by the author (2022).

5 MEETING THE ASSEMBLAGE: A THICK DESCRIPTION OF THE ETHNOGRAPHIC FOLLOWING OF ACTORS AND DEVICES THAT PERFORMED THE BRAZILIAN PLANT-BASED MEATS INDUSTRIAL FLOURISHMENT

Several actors and devices overlapped performances in the Brazilian plant-based meat market assemblage constituency. They managed market practices that, in the last instance, determine consumption patterns and the market directions, including an ongoing structuring of a novel supply chain, challenged of reconciling stakeholders' multiple interests, including some of who are initially averse and resistant to change, especially towards vegetarianisms. Along this chapter, we present in detail the most important actors ethnographed and what they did in the assemblage, considering their histories, missions, and alleged interests, their elucidations made through their respective informants (their employees, most of all in director or manager positions), their market movements and consequent impacts towards the assemblage, and explaining their mobilizations of – and being mobilized by – market devices. Along with the market actors' presentation, we indicate and detail market devices, describing how they have been operationalized by actors and how they influenced the actors too, understanding devices as actants in the assemblage but being resulted from the actors' strategic elaboration and mobilization.

We start presenting, in topics 5.1, 5.2, and 5.3, the three first cases of enterprises in the nascente Brazilian plant-based meats industry: Fazenda Futuro – Future Farm, a Brazilian foodtech startup –, Incrível – a plant-based meats brand of JBS Brazil, that arises within the structure of Seara –, and Plant-Plus Foods – a joint-venture of Marfrig and ADM.

Along with the thick description of these 3 cases, we constantly refer to other actors and devices in the assemblage, duly detailed in the subsequent topic, 5.4. Hence, we describe other actors and their practices in the assemblage constitution: GFI, MAPA, GPA, AGN Consultancy, R&S Blumos, Superbom, BRF, The Not Co, Verdali, Unilever, Marel, SVB, FISA, MAPA, IBRAFE, Bradesco, FAIRR, ABIA, ABBI, Carrefour, Burger King Brasil, Embrapa, Ibope, Döhler, FISA... In total, there were 49 organizations directly accessed by the ethnography (as referred to in tables 1 and 2 and illustrated in figure XX), in such a way that it became disconcerting to describe in detail all of them.

5.1 Future Farm

"We are a solution to stop a full environmental collapse that stems from our eating habits [...] we won't be able to avoid such a collapse by telling to meatlovers to change flank steak, picanha (culotte) or sausage for a sprout salad. No, it's not going to work [...] We propose to replicate, through technology, the same consumption experience that a meatlover wants and is used to have, so that he can once, twice, three times a week replace animal protein by our protein made from plants." (Future Farm's commercial director, at the third meeting, adopting a world-changing ambition to describe the startup).

As proposed by Fairbairn et al. (2022, p. 5), world-changing ambition side-by-side profit-making potential are two elements mobilized by foodtechs to conquer investors' attention and raise capital in Silicon Valley, on a broader strategy of "performing disruption to conjuring capital". We could apprehend these two elements in all the ethnographed meetings in which Future Farm participates. Moreover, we confirm the performance of these propositions with investors, and other related stakeholders, in the ongoing market happenings, happenings to be described below.

Future Farm (*in Brazilian/Portuguese: Fazenda Futuro*)³⁰ is a Brazilian foodtech startup that debuted in 2019. Future Farm presents itself – for the Brazilian market assemblage – as a pioneer, and is indeed recognized as the first mover (Robinson, Kalyanaram & Urban, 1994) in the Brazilian market, as it was the first enterprise to produce and commercialize plant-based meat analogues that replicate the process of Beyond Meat and Impossible Foods Californian foodtechs in Brazil.

The startup's founders had previous experience³¹ in the food and beverage market, which gave them the understanding that meat is the largest category of the food market, and at the same time, a still stagnant and undisrupted category, and day-by-day more pressured by the growing understanding of its inefficiencies and unsustainability. From understanding that a great change in the meat market is inevitable, the startup was conceived in 2017 – the same year that the GFI started operating in Brazil. Before starting to design the startup, the two

³⁰ We chose to use the brand name in English because it was developed and is used by the company in all the other countries out of Brazil. Even in Latin America Spanish-speaking countries, Future Farm is branded in English; the same for Arabic countries. Unlike other brands, such as Incrível, which does not have an English brand version (which would mean "Incredible"), so we use the original Portuguese name. In turn, Plant-Plus Foods, by ADM-Marfrig, was launched with a English brand name in the Brazilian market.

³¹ The Future Farm founders previously founded, in 2007, the "Sucos do Bem" enterprise, producing an innovative beverage at the time, placing natural juices without additives in boxes, combining healthiness, flavor, and convenience (Ferreira, Ferreira & Mayer, 2012). A robust storytelling marketing scheme promoted "do Bem", a strategy still described as a novelty in marketing communications at the time, which gained brand recognition throughout Brazil. In less than a decade of operation (and before the beginning of Future Farm structuring), the "Sucos do Bem" was acquired by ABInBev at an undisclosed valuation (Bloomberg, 2016).

founding partners traveled worldwide to observe and understand how plant-based meats were performing with consumers in different markets (Belk, Wallendorf & Sherry, 1989).

After conducting this marketing-research odyssey, the Future Farm founders inferred that all the plant-based meat products marketed around the world constrain consumers to make a trade-off: choosing between price or product quality. So the consumers had to pay dearly for a tasty meat analogue nice branded product, or they had to eat a cheaper but “awful”³² product, promoted as an alternative to meat but with a far different experience than a meat eater would expect. From that inroad marketing inferences, the foodtech was designed to fill such gap, being formulated oriented to the idea of gradually scaling its production and inserting itself in diverse profitable international markets, producing at the lowest cost in Brazil and exporting, reaching the global food market as an affordable and competitive alternative – as we were told by the Future Farm’s commercial director, at the third meeting.

In addition to understanding consumer behavior towards the marketing mix of plant-based products in different countries, the startup founders also made trips to meet plant-based industries in U.S. and Germany – from where they acquired their industrial machinery. In 2018, Future Farm founders were to California to meet Beyond Meat’s production plant. These technical incursions were mediated by the GFI, both Brazilian and U.S. headquarters. These incursions allowed for maximizing investment and reducing intra-industry rework, accelerating general development, as proposed by the TEA literature (McNulty et al., 2020; Mahmud, Moni, High & Carbajales-Dale, 2021).

Even if Future Farm is recognized as the first mover in the Brazilian assemblage, when we think about the global food market, placing the startup as a global actor, it is remarkable that Future Farm waited for the development of technology by other enterprises to launch a product already developed at an advanced level, at the 2019 year – while in the U.S. market, similar enterprises have been in operation since 2015. As a result, Fazenda Futuro was able to reduce costs and risks and grow at an accelerated pace with fewer challenges that a disruptive business initially faces, even more with the support of GFI’s TEA (McNulty et al., 2020).

From an initial investment of less than USD 10 million, the foodtech factory was built in the Brazilian state of Rio de Janeiro and started its operation manufacturing only one first product, a disc of ground TVP reddish colored and fatty succulent that reminds – to the point

³² In Portuguese: *horroroso* (awful, horrible, abhorrent), an adjective used by the Future Farm’s commercial director, when narrating the trade-offs faced by consumers choosing meat substitutes according to the odyssey of its founders (Belk et al., 1989), at the third meeting.

of confusing – an animal-based burger. This first Future Farm product, marketed as “Futuro Burger 1.0”, is composed of a mix of non-transgenic soy, peas, beetroot, and coconut fat, providing an optimized nutritional profile and the typical hamburger flavor and texture. When cooked, the Future Burger replicates the processes that a similar product of animal origin would go through, a process recognized as the Maillard reaction (Naik, Wang & Selomulya, 2022; Yasir, Sutton, Newberry, Andrews & Gerrard, 2007).

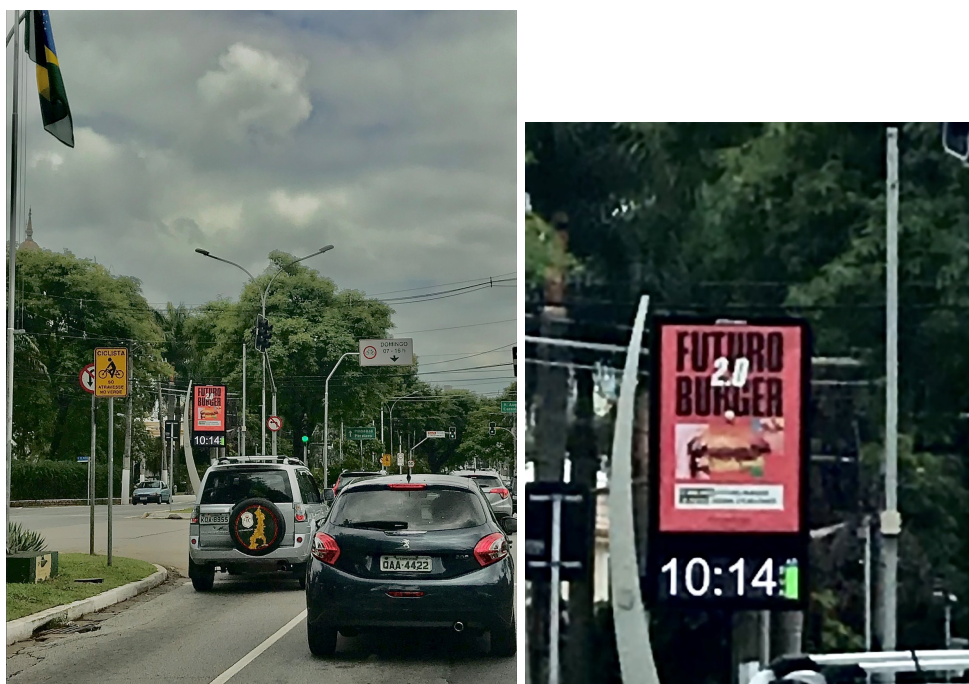


Figure 5. Future Burger 2.0, an improved version six months after the first release being, promoted at OOH advertising – Brazil Avenue, Jardins, São Paulo, November 16th 2019
Source: The Author (2019).

A few months after the first Futuro Burger launch, a second version, “Futuro Burger 2.0” takes place, replacing the former product with improvements received from consumers and resellers, in a clear analogy to tech enterprises, after launching a minimum viable product (Moogk, 2012; Morris et al., 2021; McNulty et al., 2020). The culture of innovation was adopted by Future Farm more than a marketing aesthetic or a language of advertising communication, as we initially supposed, by adding to it some criticism. The Brazilian foodtech, in fact, implements the startup *modus operandi*, extrapolating branding and packaging, inborning it within product development dynamics and trade operations – as we could access at the third, fourth, ninth, tenth and, seventeenth meetings.

During the first year of operation, the startup positioned its products in more than six thousand sales points in Brazil, achieving presence in around 80% of medium and large foodretail stores. An outstanding achievement, given the complexity of the refrigerated chain,

the challenges of logistics in Brazil, and the product's intrinsic novelty that, by being an innovation, would have to face diverse resistance from resellers (Fliaster & Kolloch, 2017).

Food distribution into the Brazilian foodscape is a complex operation, especially for small companies disintegrated to the established fluxes (Dellapiane & Wilkinson, 2018; Van Bommel & Parizeau, 2020). Future Farm was designed to take into account the challenges of entry into this market, starting independently, without the command of a large food company, and not counting with the endorsement of a large meat processor. Thus, the importance of building new partnerships and integrating in the most flexible strategic way possible has been estimated and worked on since before the operations started. According to Future Farm's commercial director (at the third meeting), the teams were aware of logistics and distribution challenges. Even though it is a new, independent company, with most employees having no prior experience in the meat chain, the rapid growth and integration conquered by the startup would be the result of its readiness to adapt. Future Farm managed to conquer spaces, as its commercial director affirmed, not having an arrogant attitude of delivering an only closed solution for the entire market, flexibilizing and adapting their times, orders, and even packages according to the true listening of emerging demands from each partner. Thus, the startup established and maintains conversations with its partners and clients, adapting solutions for each channel to the maximum, as much as possible, according to their factory and operational limits. Such listening posture and quick adaptability in a certain way positively surprised the novel partners, facilitating a rapid expansion and reducing the expected resistances from refrigerated logistics, retail, and food service and other stakeholders. A major explanation for the quick achievement of a large presence and good performance of Future Farm in Brazilian food retail was the collaboration established with the GPA group³³.

Counting on GFI Brasil mediation, the collaboration with GPA also boosted the formulation of new products, as the demand for plant-based meat was quickly verified. This interaction between Future Farm and GPA resulted in a rapid expansion of the plant-based meats wide category portfolio, for both Future Farm and Incrível (JBS), leading implications for other industrial actors, such as R&S Blumos, Verdali, and Marel-Wenger.

³³ GPA is the “Companhia Brasileira de Distribuição” (in English means Brazilian Trade Company), formerly Grupo Pão de Açúcar. GPA is the second biggest retail business in Latin America, selling food and general merchandise through hundreds of supermarkets (Pão de Açúcar and Extra), hypermarkets, and home appliance stores in Brazil, Colombia, Uruguay, and Argentina. It is a publicly-traded company controlled by the Casino Group (a French conglomerate retail, which holds 41% of the shares) (GPA, 2022).

Less than 6 months since the beginning of Futuro Burger sales at GPA supermarkets, the novel plant-based category accounted for more than 1 third of frozen hamburgers sales in the largest Brazilian foodretail chain (also counting the launch of JBS, the Incrível Burger Seara Gourmet) – as the editor of Globo Rural Magazine stressed out at the ninth and the tenth meetings.

Thus, among other reasons, with the determinations of GPA from the retailing of Futuro Burger, and after “future’s ground beef” and “future’s meatballs”, the Brazilian industry was quickly encouraged to formulate and deliver more plant-based meat products suited to the daily culinary culture of Brazilians – as the startup’s commercial director informed in the third meeting, and the GPA commercial development manager expressed at the ninth meeting.

After three years in operation, Future Farm holds eight different meat products in a bigger than 8 SKU portfolio containing: 1. burger (including at least three different presentations, the two discs currently branded as Future Burger 2030, after the Future Burger 1.0 and 2.0 versions; the four discs for the wholesale channel, and the mini burgers box), 2. ground meat (branded as Future Beef in America and Europe, and as Future Mince in Oceania and Asia), 3. meatballs, 4. sausage, 5. smoked burger version (which was implemented after the modification for the 2.0's version release, which reduced the smoky flavor, and received feedback from consumers who missed the strong flavor of the first version), 6. chicken chunks (branded as Future Chick'n in the U.K.), 7. tuna (branded as Future TVNA in Europe and Oceania), and 8. kibbeh (the latest release in the Brazilian market, which came with the mini burger version as being two products for parties, branded as "*Futuro Party*", release that explored the Annita Brazilian superstar image, shortly after her entry as an alleged investor in the startup and be positioned as a poster girl for the *Fazenda Futuro* brand in Brazil).



Video 2. Future Farm’s second launched product promoted at GPA’s supermarket, sound advertising

Note: “Future Grounded Meat, your favorite recipes now with an innovation fine touch”, in portuguese: “*Carne moída do Futuro, suas receitas favoritas agora com um toque inovador*”. This sentence, reproduced in the video, ends a sound ad aired inside a Pão de Açúcar Supermarket store, in the Moema neighborhood, upscale region of the city of São Paulo, on October 11, 2019. The advertisement invites consumers to go to the frozen section, next to the frozen packaged meats, to get to know the grounded meat “of the future” (as the Portuguese name denotes), a new product to make the recipes you love using only vegetables. The video captures only the end of the ad's audio. We tried to contact GPA's marketing department to request the complete audio advertisement, but we didn't get a response.

The video is available at: youtube.com/shorts/e9fP_UG2VkJQ

Source: The Author (2019).



Figure 6. Products of Future Farm retailed at Pão de Açúcar supermarket: Future Burger, Grounded Meat launch, and display of Future Burger 2.0

Source: The Author (2019).

We could understand that this portfolio expansion resulted from food innovation in the Brazilian assemblage as a whole (and relying on knowledge flows from global plant-based meat actors, too), not being a result of a secluded in-house R&D. In addition to expertise from technical partners providing ingredients and machinery, and beyond GFI mediation and GPA collaboration, Future Farm featured another Brazilian foodtech startup to introduce its first product that replicates the texture of unminced, non-sausage, entire meat cuts, indicating greater purity and healthiness. In addition, the processing of long-fiber plant-based meats occurs through a process that maintains the original hydration of the ingredients, reducing the additives, and generating a cleaner label for the final product – as informed by Verdali, R&S Blumos, GPA, ADM, JBS and AGN professionals at the ninth, twelfth, sixteenth and seventeenth meetings.

At the end of 2020, Future Farm launched a chicken breast plant-based meat analogue product. Unlike processed meat products, such as burgers, ground beef, or sausage, that are produced using vegetable protein ingredients that have a ground texture, producing a chicken breast analogue demands a long fiber extruded maintained integral. Hence, a plant-based meat product can refer to the sensorial characteristics of less processed, whole meat cuts.

Future Farm's chicken strips product was outsourced to be produced by Verdali, a Brazilian plant-based meat foodtech startup idealized in 2014. Verdali started production and commercial operations in 2020, with a factory in the interior of the state of Santa Catarina, in the small town of Videira. The startup detained a focus on producing plant-based meat in larger cuts by exploring wet extrusion technology. From the first half of 2020, the foodtech started delivering plant-based meat products with proprietary long fibers, with chicken breast analogs at the forefront but advancing, two years later, to the highly valued in Brazilian cuisine fillet steak (*filé mignon*) – as illustrated in figure 3.

The wet extrusion process, which produces high-moisture meat analogs (HMMA), is not a new technology; it was developed in the last century (Cheftel, 1992). However, it is still little available in the Brazilian agri-food industry – as explained by the R&S Blumos technical director at the fourth meeting. This scarcity availability is due to the fact that TVP products have commonly been elaborated with the dry extrusion systems, single screw machinery, which are also applied for the production of breakfast cereals (Carvalho et al., 2012) and, even more widely, in the production of animal feed – as explained by Wenger's processes and technology manager at the seventeenth meeting. In addition, given being wet, maintaining the original moisture from the legumes, the ingredients and all the HMMA products need to be kept refrigerated; different from dry TVP, high-moisture vegetable proteins are not shelf-stable, bringing more costs and complexity to the chain, reducing one of the leading plant-based meat productive advantages in relation to animal-based meat products – as explained by the R&S Blumos technical director at the fourth meeting.

Future Farm's choice to outsource the product's complete production to Verdali is even more assertive and strategic when we consider the complexity of receiving and storing refrigerated ingredients, which would require the development of new processes and grander factory investments. This assertiveness of outsourcing the production of long fiber products is quickly recognized by various actors in the assemblage – as we could access at the sixteenth and seventeenth meetings. Therefore, throughout 2021 and 2022, both Verdali and R&S Blumos, which have their own brands of plant-based meat products, also become producers for Fazenda Futuro and BRF's Veg&Tal brands – and possibly also other brands that maintain confidentiality agreements.

Given the installation of extrusion technology, still little utilized in the Brazilian industry, it becomes possible to go beyond products based on ground meat and sausages, which result from dry extrusion systems. The emergence of industrial actors focused on wet extrusion, such as Verdali and R&S Blumos, in addition to a strategic mediation that brought

them together, facilitated the portfolio expansion of the novel plant-based meat category, impacting Fazenda Futuro, Incrível, and the entire assemblage – according to details presented by Verdali’s CEO at the fifth and sixth meetings; see Verdali’s plant-based meats being offered at Carrefour Brasil butcher in figure 3, in the previous chapter.

By referring to more whole and fibrous meat cuts, the products begin to expand to replace not only the processed and indulgent meat options. Thus, plant-based meats fit the demands of Brazilian consumers, as indicated by the GFI and GPA to the producers, a point reiterated in the meetings we ethnographed. In addition, HMMA products have a greater aesthetic appeal to healthiness as they result in cleaner label products with fewer ingredients composition since there is no need for additional ingredients to reload moisture. However, participants point out that this benefit is largely aesthetic (arising from consumer naivety) than a nutritional fact, since the additives used in plant-based meat products also deliver nutritional value, bringing greater nutritional density to the food – as explained in the fourth and twelfth meetings³⁴.

We observed, for the first time, the Verdali’s branded chicken strips product on August 28, 2020, at the Maria Luiza grocery store, in the homonymous neighborhood, in the interior city of Cascavel Paraná. The plant-based chicken product branded as *Fazenda Futuro* was observed for the first time on November 30, 2020 at the SuperMuffato supermarket, in the same city. In 2021, Future Farm also expanded its portfolio toward healthiness appeal including a tuna omega 3 fortified product.

Parallel to expanding availability and convenience at food retail, Future Farm also managed to implement effective channel strategies for foodservice, expanding at the same time the demand for its products and the possibility for the consumer to have a first experience with the product. Even the launch of the first product took place in the foodservice, as shown in figure 2 and video 1.

In September 2019, shortly after the launch of Rebel Whooper, BK’s plant-based meat sandwich, produced by the ADM-Marfrig joint venture (detailed in the 5.3 topic), the Brazilian fast-food chain Bob’s also launched a sandwich using meat supplied by Future Farm. Named “*Tentador Zero Beef*” (in English: Tempting Zero Beef), Bob’s sandwich led the foodtech’s burger to reach more than 1000 points throughout Brazil. Bob’s is a Brazilian fast-food chain founded in 1952, the third largest in the country, held by the Brazilian Fast Food Corporation. This supply demonstrated the productive, organizational, and growth

³⁴ We will continue the discussion about HMMA and wet extrusion technology in subsequent topics; the main exponents of it in the scrutinized assemblage are Verdali, R&S Blumos, and Wenger/Marel.

capacity of the recently launched startup, which was expanding its installed capacity – in a feed backed dynamics counting on venture capital.



Figure 7. Bob’s plant-based meat sandwich sold-out at iFood delivery app, for the south region of São Paulo City during its launch period

Note 1: iFood is the leading food delivery app in Brazil, being part of the Brazilian current food consumption culture. **Note 2:** The Bob’s product was often sold out for several hours and days on the platform, the screenshot is from September 23, 2019. **Source:** iFood (2019), image captured through screenshot by the author.

In 2021, Bob’s chain expanded its plant-based menu to two options, launching the “*Tentador Zero Frango*” (“tempting zero chicken”), also developed and produced by Future Farm. In the second half of 2022, Bob’s changed its plant-based meat supplier, utilizing the meats provided by Incrível, from JBS, in its menu, and even reinforcing it to the public through co-branding advertising.

The rapid advance of Future Farm into the Brazilian foodscape, added to the digital and mediatic frisson, in addition to the novelty of the product and its pioneering to the Brazilian market, initially consolidates the Future Farm brand, even without large investments in mass communication – even more notable point when compared to its main competitor,

Incrível Seara, that enters into the market counting with the strength of a traditional food brand and a lot of advertising investments, as we detail in the next topic.

Future Farm's commercial director, at the third meeting, affirmed that just after the first months of launch, the brand becomes the reference for the plant-based meats category in Brazil, titling the category. "*Carne do Futuro*" (meaning future meat or meat from the future), "*Comida do Futuro*" (future food, or food from the future), "*Hambúrguer do Futuro*" (future burger, or burger from the future) quick entered into the Brazilian popular culinary vocabulary. We must consider that, in 2019, the newly released food category did not have its own reference nomenclature – a market device that GFI would strategically mediate.

In 2019, a consensus had not yet been established on the use of the term "carne vegetal" (in English: vegetable meat), which was proposed in 2020 by GFI Brasil after conducting market research (GFI Brasil, 2021) with consumers and finding a preference for the term; instead of "carne vegana" (vegan meat) or "carne feita de plantas" (which would be a more literal translation of plant-based meat, meaning meat made from plants), given that strangeness towards plant-based meats or its literal translation "*carne à base de plantas*", was already inferred. After the proposal by the GFI in 2020, the adoption of the expression "vegetable meat", in addition to 100% vegetal, is noted to refer to plant-based meats in the Brazilian market – according explained in the eighth, ninth, tenth, and eleventh meetings.

As we previously detailed, according to the commercial director, the true listening of the demands from retail and foodservice and subsequent adaptation as far as possible in the products and packages were determinants to the successful implementation of channel distribution strategies. Furthermore, the novelty of the product and the strength of the brand that was built certainly operated as facilitators. Co-branding was a marketing strategy frequently explored by foodservice actors, as illustrated in figure 8 (Grossman, 1997).



Figure 8. Photographs showing the promotion of Future Burger and its inclusion in the menu at a conventional neighborhood bakery

Note: The first picture, taken at July 2020, shows a display on the wall, produced by the bakery itself, promoting the “no-ox” novelty. The second picture, from May 2021, shows the integration of the option, highlighting the brand Futuro, on the menu; also note that a vegetarian version “*X-Vegetariano*” remains on bakery’s menu. **Source:** Photographed by the author (2020, on the left, display; 2021, on the right, menu) at Big Pão Bakery, a traditional bakery at Tropical neighborhood, Cascavel City, Paraná State.

The startup's work with foodservice actors was remarkably successful, as we could verify from foodscape observations – see in figure 8 communication devices spontaneously implemented by a local foodservice actor, reinforcing the brand and the product, allowing us to infer a great and valued channel relationship and the bakery's interest in increasing product sales not only just after the launch, but keeping it up over the years.

However, we consider that, in most of the conducted observations, the entire product mix of Future Farm's portfolio was not available in food retail. A frequent irregularity in the availability of products was noted; the future burger followed by ground beef and meatballs were more recurrent available. On repeated visits to supermarkets (Beal Festival, SuperMuffato, and Zaffari), only sometimes sausage, chicken, and tuna were found. This observed irregularity may be related to the startup's willingness to make its integration more flexible according to the refrigerated chain and retailers' disposition and decisions. On the other hand, this inference seems weaker when we recurrently observed that Incrível's bigger portfolio was also not found in its totality, even being a Seara line, belonging to JBS, with a grandly structured distribution network. For example, the Incrível sausage, a Seara product, was observed only once in foodretail – at SuperMuffato Gourmet, Rua Paraná, Cascavel Paraná State, in May 2020.

Nevertheless, we can infer that the inherent flexibility of startup is worked on as a strong point by Future Farm to grow inside food chains and foodscape, using its flexibility and adaptability capability to overcome challenges of logistics and placement. And this is not just to serve the domestic Brazilian market.

Beyond the Brazilian consumers, the startup starts to export, already in its first months, considering the prospect of increasing business revenues and the startup's valuation when structuring itself as an exporter in Brazil. Still in 2019 the expansion out of Brazilian borders started, first for Uruguay, Chile, and Mexico. In 2020, beyond Latin America, Future Farm started and succeeded in establishing trade operations in Europe and in the United Arab Emirates, in addition to entering the Australian market and going to the U.S. For this rapid expansion, the foodtech implemented a strategy they referred to as: "hacking Brazilian meat distribution logistics" – as presented at the fourth meeting.

Since its ideation, along its seed stage (Nigam et al., 2020), Future Farm intended to export its products, reaching the global market by producing cheaper and optimized quality plant-based meats in order to achieve international competitiveness. Future Farm planned to "hack" the logistics of Brazilian meat to take its product to wherever Brazilian meat was. Given that Brazil, as the leading meat exporter in the world (OCDE/FAO, 2022), has a grand structured refrigerated chain, the startup could adapt and infiltrate it, "catching a ride", way in which the arrival of products to the European and Arab markets actually happened – as narrated by the commercial director at the third meeting³⁵. As presented in chapter two, the global meat supply (excluding fish) has Brazil as a protagonist. While the U.S. is the largest producer in the world, Brazil is the largest meat exporter, accounting for more than 20% of global trade. In relation to Brazil "is expected to record by far the largest increase in world meat exports" according to 2031 forecasts (OECD/FAO, 2022, p. 201).

Therefore, Future Farm manages to get closer to other actors and integrate into chains, reducing additional developments. By dribbling encumbrance with a new structure, the startup optimizes its costs and reduces route establishment time. Furthermore, among the aforementioned flexibility and product adaptations to facilitate and enhance entry into distribution channels, the startup adapts its packages for each international market.

The premise of adapting, as far as possible, the products to enhance consumers' and stakeholders' experiences along distribution channels is applied to other countries. The startup

³⁵ The Future Farm's commercial director pointed out that he was personally in Amsterdam, Netherlands at the time of his participation in the event, working with european stakeholders that eagerly began to receive the Brazilian plant-based meats together with deliveries of Brazilian animal-based meats.

applies the brand and the other marketing devices as touch points able to create a relationship, taking even more care to guide the relationships with foreign stakeholders.

According to the commercial director narrated that the entire packages are in Arabic in Future Farm's products available at supermarkets in Dubai, with the exception of the Future Farm brand, which is in English. In Sweden, the package is entirely in Swedish, the same in Mexico, the package is entirely in Spanish... Thus, product packages are fully adapted to each country's language and food culture, including variations within the same language, such as: "Future Beef" and "Future Mince" to name the same product, the ground meat, the first used in U.S. and Canada, while the second in U.K. and Australia.

Given the recognition of brand as a performative marketing device, Future Farm managed to provide the best consumption experience. Thus, delivering a standard package, in Portuguese or in English, randomly pasted with a "white stick on the top with the legal words in Arabic", in the words of the startup's commercial director, would restrict the ideal consumption experience and the brand's relationship with its new audiences.

Thus, bureaucratic informative white stickers over the brand are indicated as an undesirable market device, since the appreciation of package and brand applications plays an important role in the marketing mix of novel plant-based products. A role above what is commonly expected from daily meat product, given the novelty of the product and the category itself, doubts about it, and eventually a higher price to which it is still subject.

Here, we are referring to packages concerning labels, information, consumer persuasion, and branding applications, without discussing the inner materiality of packaging. Discussions about package materials, formats, and alternatives emerged in the fifth and eighth meetings when Superbom's directors explained the costs of packing plant-based meat burgers. They explained that initially, there was a requirement to import materials from Israel: a plastic film to preserve the product and allow visibility for the consumers simultaneously, and a round tray to keep the disk products (that could break or even crumble) intact format. Over the months and years, the development of less expensive packaging and suppliers has taken place, and fears regarding the integrity of the products have also been reduced. Another consideration emerges as we understand how Future Farm managed to take advantage of the Brazilian meat chain vocation and adapt to the weaknesses of the same agrifood industry, inserting itself in the meat flows and simultaneously working to be enjoyable. The structuring for exporting was even more favored due to devaluation, a phenomenon to which Brazilian currency is subjected, as well as most of the Latin American

currencies. Between 2019 and 2021, the BRL/USD³⁶ exchange rate devaluated in around 40%³⁷, in a movement that had started since the beginning of the 2010s decade, alongside fiscal, economic and industrial deterioration implanted in Brazil (Borges, 2021; Nonnenberg, 2021; Flexor & Dias, 2021; Oreiro et al., 2020). If, on the one hand, this implies high costs for an industry that demands ingredients, machinery and process provides from globalized production chains, on the other hand, it stimulates Brazilian exports, implying in maximized profits to international trading.

Thus, by positioning itself as export-oriented, Future Farm catches venture capital investors' interest, increasing its valuation rapidly. At the end of 2019, just months after it started operations, the Brazilian foodtech was valued at US\$ 100 million. In addition, by arriving in the U.S. market and offering competitiveness, in 2020 the startup gained traction in venture capital scape among Brazilian investors and even being noticed and financed by European and U.S. investors.

Before detailing the startup financing dynamics, we must consider market ongoingings and mobilized devices that performed such financing dynamics. We understand that financial market and venture capital performances are culturally and mediatized mediated, and this has even greater relevance in the smaller Brazilian financial market (Chague, Giovannetti & Silva, 2020), which cannot be neglected. In 2019, Beyond Meat's IPO surprised the financial market globally, being widely noticed and mediatized as a success case (Bloomberg, 2019), reverberating to the point of generating performative devices that were able to lead changes in market construction dynamics in Brazil.

In its IPO, BYND³⁸ stocks were initially offered in a range between USD 19 and 21 (for 9.625 million common shares offered) in a publicly reported plan to raise about USD 185 million for financing operations expansion, emphasizing sales and marketing operations. The Californian foodtech's IPO became a historic case in the financial market as its stock price tripled. Bloomberg (2019) highlighted that "the maker of vegan beef and sausage products" had the best debut session in all the U.S. listings since the 2008 crisis³⁹, reaching 163% growth and touching \$3.83 billion market value at the close of IPO trading⁴⁰.

³⁶ BRL: Brazilian Real, currency, also expressed as R\$ in Portuguese in a parallelism with USD and US\$.

³⁷ This referred currency devaluation phenomenon cools down in Brazil in the year 2022, with the global effects of Covid-19, Trump-Biden's U.S.'s monetary expansion, Russian war; however, the dollar brazilian real exchange rate remained, most of the time, along 2022, above 5.

³⁸ Acronym for Beyond Meat in Nasdaq.

³⁹ The best performance among IPOs that raised at least \$200 million.

⁴⁰ Since that moment, BYND stocks have been evaluated, priced, and performed as disruptive technologies (similar to tech enterprises and cryptocurrencies), starting to reduce their value from 2021 onwards due to

This notoriety of Beyond Meat in the financial market along 2019 came to influence investment decisions in Brazil, drawing the attention of investors and institutions to the case and to whole plant-based meats solution (Fairbairn et al., 2022; Chague et al., 2020), as repeatedly detailed and explained along the ethnographed meetings, mainly by the director of AGN Consultancy.

The AGN Consultancy (in Portuguese: *AGN Consultoria*) is a business consultancy 2017 founded, working to facilitate ventures and business implementation in the plant-based food market in Brazil, partnering with various other actors that we accompanied. More details about AGN role within the scrutinized assemblage constitution are presented at the 5.4 topic. The AGN director spells out the relationship between Beyond Meat IPO and a change in funding raising dynamics for plant-based foods ventures in Latin America. According to the AGN's director, in 2017 and 2018, raising funds for startups in Brazil was exceptionally complicated, particularly for foodtechs focused on novel ingredients, which, in the director's words, was "a difficulty pilgrimage". Ag Techs, startups focused on agriculture solutions, captured the vast majority of the scarce financial resources available to the whole sector, followed by startups focused on food logistics, foodretail, and foodservice digital solutions. Innovative projects related to novel ingredients and novel industrialization processes, especially the healthy and plant-based ones, had little adherence, in line with what was previously indicated by Dellapiane & Wilkinson (2018).

However, the AGN Consultancy's director stated that after Beyond Meat's IPO, there was a rapid change in the flow of investments toward plant-based ventures. According to the director, "money began to pour in for plant-based foodtechs", impacting the success of well-presented Latin American startups such as Fazenda Futuro and NotCo, which succeeded in implementing robust funding rounds capitations. In addition, "big companies began to look at this market in a very different way" – AGN Consultancy director at the fifth meeting. In the next topic, we also detail a Bradesco BBI financial report that recommended investments in plant-based meats for large Brazilian meat processors: JBS, Marfrig and BRF. As it was prepared and published by one of the leading institutions in the Brazilian financial market, it became a highly performative market device, pressuring meat companies' investment and operations decisions and performing the assemblage, as it increased interest and facilitated the capital flow to Future Farm, by validating and indicating as profitable the new food category suggested by the novel startup.

interest rates increases by the Fed, in addition to recurrent problems in manufacturing and supply (Afanasieva, 2022) – read more details at attachment 1.

Using Crunch Base's data (Dalle et al., 2017), we accessed that the first funding round of Future Farm were conducted at July, 2019, an Early Stage founding Series A⁴¹, were 2 investors, Monashees and Go4it Capital applied USD 8.5 million in the startup, which was in operation for two months and used the resources to expand the manufacturing plant. In September 2020, the startup was previously valued in USD 111 million, a series B funding raising occurred. The BTG Pactual, Turim MFO, Enfini Investiments in addition to the two institutions that had already invested in the first round: Monashees and Go4it.

In November 2021, the startup receive a valuation of BRL 1.9 billion, and implemented 2 consecutives and districts investment rounds. Future Farm raised USD 58 million in the U.S. on November 1st, from the company's new headquarters in California. This founding raising were projected at structuring the distribution operation, being mediatized as a perspective of increasing Future Farm products presence at the U.S. and European foodscapes (Forbes, 2021). Two days later, on November 3th, the startup conducted a series C of funding round, raising BRL 300 million de Range Capital, BTG Pactual, XP Inc, Caravela Capital, Turim MFO, Enfini Investents, Go4it Capital and Monashees, to enlarge its operations in Brazil, specially towards exports product manufacturing.

Consequently, Future Farm was structured through venture capital, inserting itself in a quite different logic from the until then plant-based meats enterprises implemented in Brazil. These previous enterprises had been structured to vegetarian niches and were little integrated into the determinants flows of the current food system configuration (Gladek, 2016; Fairbairn, 2015; Brunori et al., 2020). Product sales, as well as vegetarian consumer demand, are obviously an essential part supporting the firm's start. However, Future Farm does not stand there to drive its development, positioning itself as an enterprise aligned with the development of investor value, entered the financial market delivering high-value speculative propositions. Thus, in a far different way from prosumeristic or family-owned small food industries, which we previously observed trying to perform proto-plant-based meat analogs solutions until then, before 2019 in Brazil.

At the end of 2021, Future Farm hired a specific CEO for the operation in the U.S., which now has a company headquarters, in the largest consumer market in the world for both animal and plant-based meats (OECD/FAO, 2021; FAIRR, 2021). Produced in Brazil,

⁴¹ A startup founding process consists of several stages, begins from the seed stage, the first level of raising capital, in which a concept or idea is founded. In the case of Future Farm, this first stage founding comes from its founders. Early Stage founding series A and series B are financial rounds associated with the early-stage structuring and growth. Series C is a round commonly towarded to financing expansion (Nigam, Benetti & Johan., 2020).

optimizing operating costs and taking advantage of logistics chains, its products are estimated to keep to a quarter lower costs in comparison to similar products manufactured in the U.S. – as presented at the sixteenth meeting. Thus, besides being another option in the food market, increasing plant-based meats convenience in the foodscape, Future Farm puts pressure on the world's largest and leading plant-based meats market to lower its prices, as we could observe through online marketplace offers.

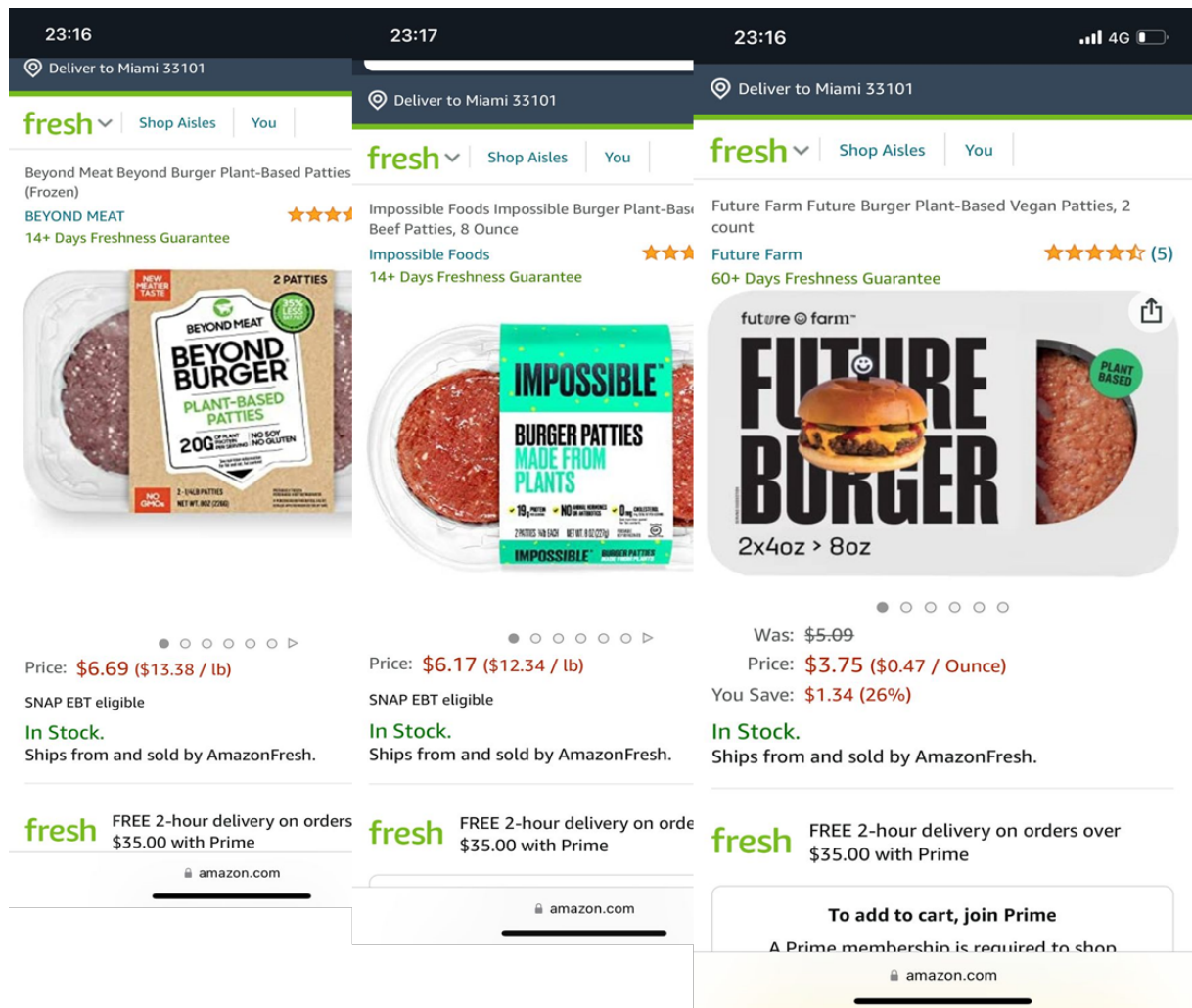


Figure 9. Future Farm Burger competing in the U.S. foodscape.

Note: Amazon Fresh offers for Miami, Florida, in August 31st 2022. The 3 products are quite similar, offering 2 units of 4 ounces each. The 3 packages are also quite similar; the burgers are placed at plastics, 2-disc molds, covered by clear plastic film and co-wrapped in paper. However, Beyond, a pea-protein based, contains 20 grams of protein per unit. Impossible, a soy-based, contains 19 grams of protein per unit. Future, based in a mix of 3 seeds: Soy, Pea and Chickpea, contains 16 grams of protein per unit. **Source:** Amazon (2022), image captured by the author.



Figure 10. Beyond Burger being offered at a discount, at the Whole Foods Market store at Amazon, to direct compete with Future Burger prices

Note 1: Whole Foods Market do not retail Future Farm (nor Impossible Foods) products. Amazon offers for Miami, Florida, in August 31th 2022. **Note 2:** Different from the Amazon Fresh offers, showed in the previous picture, the Whole Foods Market did not include free-tax delivery; but the consumer can opt to go to a store or buy directly from the Whole Foods site, where there was the same offer. **Note 3:** Online sales channels are still currently exceptionally relevant for the novel plant-based meats category, in a disproportionate way compared to animal-based meats, not only in Brazil but in the Middle East and the U.S. too, as proposed at the second, third, and fifth meetings. **Source:** Amazon (2022), image captured by the author.

Therefore, we can comprehend the transformative potential of Future Farm, pushing prices down in the largest and leading plant-based meats market in the world, the U.S. Considering the global food system, the startup offerings represent the potential of the Brazilian industrial assemblage, providing plant-based meats at lower prices. Even with inherent barriers to Latin American startups, along its first three years of operations, Future Farm is currently enhancing competitiveness in the U.S. American market, in fact, performing as plant-based meats *mainstreamer* actor.

More food, less tech: a challenge for plant-based foodtech startups that has received due attention from Future Farm

The pressure to lower products prices, reflection of increased competitiveness in which the Future Farm is a part of the impacts affecting Beyond Meat performance, imposing a cost cutting, with layoffs of employees and operation's reduction (Freitas, 2022). The Californian plant-based company, once a startup, has been forced to fit into a real food market logic, that requires not only a profitable operation (Cotei, Farhat, 2017) but also a uninterrupted delivering, integrating into logistics and material intensive food industry. A high volume industry, dealing with constant flux in quick time frames, subject to perishability inherent to food – and meat, although made from plants, even more subject to rotting. Thus, food delivering is complex in a unique form, never existing in a static or stationary state (Van Bommel & Parizeau, 2020), demanding from its actors the performance of particular practices, integrated into the logistics chain of these products for daily consumption, a reality far beyond booming growth, disruptive innovation, marketing brainstorm and future promises (Cotei, Farhat, 2017; Nigam et al., 2020; Pereira et al., 2020).

By taking advantage of all this established knowledge, counting on the mediation of partners, especially GFI, Future Farm structured by learning from the mistakes made by other startups, especially in the U.S. market. Thus, the Brazilian enterprise reduces investments outlay, reworks, and had good (and bad) practices to consider, relying on benchmarking. Thus, besides being able to count on the innovation in product already developed, it directs efforts to integrate with already established chains and create good relationships with foodservice, food retail and the system of exports and importers around the planet, adapting as much as possible to the demands of each of these stakeholders.

Therefore, the Future Farm emerges integrating into a novel and at the same time other established assemblages, to the point of proposes a hub to deliver plant-based meats for all the world, in a view resulting of the shared understanding and market narrative mediated by GFI in Brazil, engaging Embrapa, IBRAFE, ingredients industrial actors, Globo Rural, JBS and Marfrig.

5.2 Incrível – JBS

"When did a new category of food emerged? I think it's been so long... When was the last time a new category of food appeared in the world? When we talk about food category, we have meat technology, dairy technology, cereal and bakery technologies... Today plant-based is a food category, with its own legs and learning to walk. So, plant-based is something that doesn't die anymore, it's not a product flavor, it's a food category." (JBS's R&D director, at the twelfth meeting, proposing that plant-based meats performs a bigger and perennial phenomenon, instead of a niche trend).

The largest meat processor on the planet, JBS is commonly rated by vegan movements as one of the biggest animal killers in the world. The company was founded in 1953 in the Brazilian Midwest, in Goiás State, starting an operation of slaughtering five heads of livestock per day. From there, a long history of acquisitions begins in Brazil and Argentina until the 2000s and worldwide afterward. The company reaches 21 plants of meat processing in Brazil and Argentina, to the point of acquiring 100% of Swift-Armour capital, Argentina's biggest beef producer and exporter, in the year 2005. In 2007, JBS acquired Swift in the U.S., and was listed on the Sao Paulo stock exchange⁴². From there, JBS expands its operations by acquiring: Tasman Group (Australia), Smithfield Beef (the beef division of Smithfield in the U.S.), Bertin (in Brazil), acquiring interest control of Pilgrim's Pride Corporation (entering the poultry industry in the U.S.), Toledo Group (Belgium), Tatiara Meats (Australia). In 2013, JBS acquired Seara in Brazil, expanding its poultry and pork operations, so the company became the largest poultry processor in the world.

Seara is a slaughterhouse that has grown to become one of the world's largest meat and frozen foods brands. It was founded in 1956 in Santa Catarina State, Southern Brazil. The initial operation of a poultry and pork meat processor expands towards integrating the animal farm, also relying on investments in research to improve animal management techniques and increase productivity and meat quality. In 1982, Seara became the first Brazilian company to export chicken meat to Europe. After being acquired by Ceval Alimentos, Seara started an acquisition process to expand its operations to Paraná, São Paulo, and Mato Grosso do Sul states. In 1997, the multinational company Bunge acquired Seara. In 2000, Seara became the largest pork exporter in Brazil, delivering its products to 27 countries. In 2001, Seara implemented a plant oriented to thermoprocessing, producing chicken-based products. In 2005, Seara was acquired by Cargill; subsequently, Marfrig acquired Seara, and finally, in 2013, JBS acquired Seara.

⁴² Publicly traded as JBSS3 (B3 Brazil), JBSAY (OTC U.S.), and JBSAYN (BMV Mexico).

After acquiring Seara, JBS acquired Tyson Foods' poultry operations in Brasil and Mexico. In Uruguay, JBS acquired Zenda, a leather processor. In Australia and New Zealand, JBS acquired Primo Smallgoods Group. In Europe, JBS acquired Moy Park. In the U.S. JBS acquired Cargill's pork business, and through Pilgrim's, acquired GNP Company. JBS acquired Plumrose (U.S.), Tulip (Europe), Marba (Brazil), in addition to holding shares and segments of other companies around the world.

In 2019, JBS launched a plant-based burger in Brazil, within the Seara organization, a product that overcame executive forecasts and surprised all projected expectations – as expressed in the second, fourth, ninth, and twelfth meetings. The first JBS plant-based meat product quickly evolves into an entirely independent line, something unprecedented in Seara's organizational structure – as expressed in the second meeting. Named *Incrível*, which literally translated to English means incredible, denoting according to Brazilian understanding: fantastic, unbelievable (maybe: impossible?), the product evolved to become a plant-based line within Seara, the Seara *Incrível*, fastly presenting the most extensive portfolio among all the brands in the novel category in the Brazilian foodscape, including HMMA products. In 2022, *Incrível* became an independent brand and business, leaving Seara to be structured by its own structure, directly submitted to JBS global, by the side with two other plant-based meats JBS's brands: Ozo and Vivera.

Therefore, after 2019, the largest animal meat processor in the world started to develop, produce and distribute plant-based meats in thousands of foodscapes around Brazil, investing massively in marketing communication in this category. Simultaneously, JBS-USA founded a new enterprise that implemented a startup *modus operandi*. In the same year of *Incrível* launch in Brazil, in 2019, an independently organizational structure enterprise, entitled Planterra Foods was launched. From 2020 to 2022, this venture produced (eventually outsourcing) and distributed plant-based meats products under the Ozo brand in the U.S. market – as presented by the JBS marketing and trade director at the second and fourth meetings.

The reasons that led the largest meat processor company in the world to build up these two plant-based enterprises were captured along our ethnography and extrapolated from those initially alleged by Seara's directors. More important than the sales performance and verified demand for the product, noticed in its first months in the Brazilian food retail, is understanding how this launch of *Incrível* was accelerated by JBS to not so fall behind Future Farm and Marfrig in its native country. This acceleration delivered an initial product that was markedly artificial and poorly nutritive, as one can suppose by a plant-based product.

Incrível's first product was then proposed as indulgent – as justified by the commercial director at the second and fourth meetings. The artificiality in ingredients, additives, aromas, and colorings is due to the non-availability of the “biomolécula i”⁴³; a heavily promoted component included in Incrível's products at the end of 2019. The additive of natural ingredient origin, produced by biotechnological fermentation of fungi, increased Incrível's products with high palatability, providing a juiciness sensoriality, according to the umami flavor potentialities – as explained by the R&D director at the eleventh meeting.

Before detailing the ongoing market happenings, devices, and mobilizations that allow us to make such inferences, we describe the devices that led JBS to be a global leader in the plant-based meats market. The company decided to work toward keeping its protagonism in the global meat market (be it meat animal, plant, or cell-based) (Fairbairn et al. 2022). We accessed the FAIRR reports suggesting and raking companies investing in plant-based meats, in addition to other ESG's financial market devices (e.g., IATP, BBAF), implying governance transitions and financial mediatization (Freitas, 2022). JBS highlights its new plant-based meat products in reports to shareholders and also in news channels, reinforcing a change in its positioning as a global food company, recognizing the novel plant-based meats as an expanded movement in its very beginning of leading a transformation in the meat industry, and reiterating its adherence with a future vision.

FAIRR, Farm Animal Investment Risk and Return, is a collaborative investor network focused on dealing with ESG issues related to animal farming publicly traded companies, including meat processors and food retail chains. Founded in 2015, FAIRR deals with animal abuse concerns, antibiotics resistance crises and ESG in general. One of FAIRR's jobs is to clarify and strengthen the relationship between plant-based proteins and environmental sustainability with investors and governance of agrifood global companies, a relationship that comes year after year being more associated by companies, as indicated in their reports (FAIRR, 2020).

Thinking about Brazil specifically, a local device that performed the Incrível launch (as well as other plant-based meat enterprises launches) was an investor advisory report, elaborated and published by Bradesco BBI in May 2019. The report indicated that JBS, Marfrig, and BRF companies would have significant increases in profitability if investing in plant-based meats. Bradesco BBI is a leading financial firm, considered the best team of financial analysts in the Brazilian market⁴³, providing “recommended portfolios in the

⁴³ “Bradesco BBI's research team is made up of more than 30 equity and fixed income analysts who cover over 200 Brazilian and American Latin stocks and monitor various unlisted companies. Our analysis and research are

Brazilian market so that investors who follow our award-winning analysts' recommendations can make the best investments in the market and ensure superior returns" (Bradesco, 2022). Bradesco BBI recommendations perform the Brazilian financial market in such a way that has direct and indirect implications for Brazilian corporate management and decision-making (Chague et al., 2020; Contel, 2020). On several occasions, movements of appreciation or depreciation of JBS shares were directly related to Bradesco BBI reports, as expressed by journalists (Romani, 2021)⁴⁴. Right after the outstanding Beyond Meat IPO, which significantly influenced the venture and financial attitudes towards foodtech startups (as detailed by the AGN's director at the fifth meeting) and alongside the launch of the Future Farm operations (occurred at the event in which we participated in 2019 May), the Bradesco BBI team published an investment report forecasting a potential to improve JBS's financial performance directly through profitability increment if the company start investing in this novel meat category. The Bradesco BBI's Report spread to its clients a forecast that for each 5% of JBS's revenue invested in plant-based meats production, the firm would reach an increase of around 13% in EBITDA (Cormier, Demaria & Magnan, 2017; Chen, Xie & Zhang, 2017; Hinze & Sump, 2019).

Even before the BYND IPO event, the leading performance of Tyson Foods (a global company that is positioned as the second largest meat processor in the world, just behind JBS) as one of the main initial investors in Beyond Meat, in addition to a series of biotechnology venture investments in the alternative meats conduct by Tyson, is an element that should not be neglected, given performativity of benchmarks -- a fact expressed by the AGN Consultancy's director at the fifth meeting. Within the livestock and meat processing industries, benchmarks (e.g., BBFAW) are market devices conducting performative processes, with the potential to drive change in intrafirm decisions, such as the JBS movements in the alternative protein industry, and from multiple stakeholders, such as Bradesco and financial groups (McLaren & Appleyard, 2019; Chen et al., 2017)⁴⁵. Then, soon after the Bradesco BBI Report, in June 2019, JBS announced to its investors and the general

distributed to clients in the US, Europe, and Asia, as well as Brazil, [we] develop insightful forecasts and models for all key events and variables to help investors make vital decisions" (Bradesco, 2022).

⁴⁴ On the other hand, the Batista Brothers, which control part of JBS, have long been associated with corruption and attempts to manipulate financial markets, including allegations relating to the hiring of Bradesco BBI (Bautzer, Parra-Bernal, 2017). This, however, is not enough to inhibit the performance of Bradesco BBI's recommendations with investors and stakeholders in the Brazilian financial market.

⁴⁵ In April 2019, just before the BYND IPO, Tyson Foods disposed of its stake in the foodtech startup but at the same time highlighted to investors and media its internal investments in plant-based meats (Bloomberg, 2019), and announced, just one month later, in May 2019, its own plant-based meats brand, Raised & Rooted (Bloomberg, 2019) went on to compete with Beyond Meat at the U.S. market (Bloomberg, 2019).

financial market the acceleration of its innovation pipeline towards plant-based meats (JBS, 2019), quickly launching the Incrível Burger, the first JBS's plant-based meat analog, in August 2019.

Furthermore, the company changed its market positioning statement, rephrasing and broadening it from “the largest meat producer in the world” to “the global leader in the production of protein-based foods” (Srivastava, Shervani & Fahey, 1999; Blankson et al., 2013). The choice of “protein-based” expression instead of a generic “food”, “delicious food” or “frozen food” demonstrates the crescent recognition that plant-based proteins can be part of the core business, not disorienting it (Srivastava et al., 1999). The choice of “protein-based foods” also demonstrates a surpassing of an old association of animal meat as the synonym and definer of protein. On the other hand, the replacement of the term “meat” demonstrates that plant-based meats are not commonly understood as meat, indicating the direct association between meat and animal tissues (Boler & Woerner, 2017), in such a way that keeping “meat” to include plant-based meat in the market positioning would, in the current culture, be confusing or it would have little capacity to indicate, especially to the financial market, what the company has been trying to emphasize: its expansion towards plant-based meats (Fairbairn et al., 2022).

In 2018 Ibope, the leading Brazilian research institute, published a market research indicating that around 8% of the Brazilian population, a contingent of 30 million people, were vegetarian. This market research was hired by SVB, and we do not know about interventions in the research design, but we address some criticism to it in attachment 6. Initially mobilized by SVB and varied Brazilian media (e.g.: Exame, Folha de S. Paulo, Globo Rural), the IBOPE's research served as an instrument constantly mobilized by AGN Consultancy and GFI Brasil to operate as an investment justification in the plant-based industry -- as repeatedly ratified by JBS and Marfrig executives and ABIA's technical director at the second, third, fourth, eighth, tenth, eleventh and twelfth meetings. Thus the renewed Institute's research operated as a performative market device, first arousing interest from executives and later justifying their investment decisions (Finch & Geiger, 2010; Zwick & Cayla; 2011).

During the meetings we were able to capture different arguments and subtle disputes towards the market narrative construction and the shared understanding stabilization; while Future Farm (and other startups) executives mobilized climate and environmental questions, food system issues, and SDGs goals to explain their performance and the startups' mission, Seara executives mainly mobilize consumer-behavior data, focusing in the local market demand (instead a global approach), emphasizing the Ibope's 2018 research to justify the

Incrível's mission. The same market narrative perspective is applied to social media advertising content. While Future Farm (as well as other startups such as Not Co, The New, and Verdali) highlighted the environmental, social, and ethical benefits of their products, in Incrível and Plant-Plus Foods (ADM-Marfrig joint venture) advertising content we did not observe these comparative superiorities over the analogs of animal origin were – according to Instagram observations.

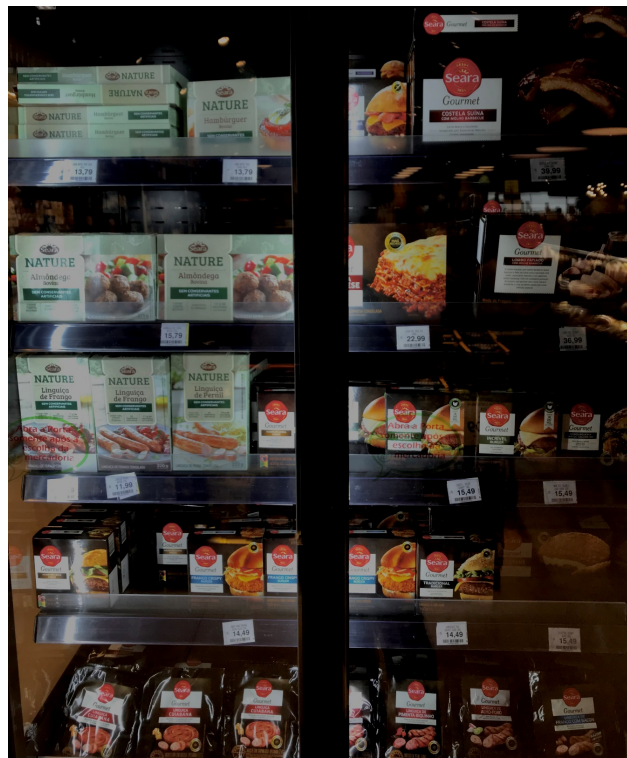


Figure 11. Incrível Burger positioned side by side similar animal meat products of Seara Gourmet and Seara Nature lines at a premium gondola at the Pão de Açúcar Supermarket
Source: Photographed by the author (2019).

The Incrível burger, a product in the Seara Gourmet line, was launched in August 2019⁴⁶, just three months after the launch of the Futuro Burger. Made with non-GMO soy, beet, onion, garlic, gluten, caramel coloring IX... delivering, in addition to 28 grams of protein, 40% of the daily sodium recommendation according to Mercosur parameters (980mg each disk). Thus, JBS's plant-based burger presented a significantly more ultra-processed ingredients profile than Future Burger.

⁴⁶ Based on our market ethnographic observations. JBS (2020) states that the Incrível Burger launch occurred in May 2019, side by side Future Burger launch, and, at the twelfth meeting, the launch was told as a March 2019 happening, which would place it as the first product on the Brazilian market. However, we only observed the distribution and commercialization of this product in the São Paulo State foodscape from August onwards.

The Incrível Burger was positioned next to a mushroom hamburger, described as the vegetarian version within the Seara Gourmet line. In addition, Seara had the “Nature” line, which did not include any plant-based meat products, which intrigued us at the beginning of the ethnography, as the line value proposition appeared to link nature and healthiness to meats of animal origin while positioning plant-based meats as indulgent-sausage-artificial products. At the fourth meeting (that occurred one year after the first foodscape observation of Incrível), the JBS Marketing and Trade Director explained the initial market positioning of Incrível Burger within the Seara Gourmet line, instead of Seara Nature, as being a choice to highlight the deliciousness of the product instead of focusing on its healthiness.



Figure 12. Promotional display of Incrível Burger at packaged meat products section, next to Seara Nature line at Beal Festival Supermarket

Note: “biomolécula i” yet not available in this first product version. “Incrível Burger: seems like meat, but is not”. Beal Festival is a supermarket chain in Cascavel, Paraná State. **Source:** Photographed by the author (2019)

The first JBS plant-based meat product promised an indulgent and incredible consumption experience, in line with its line value proposition, Seara Gourmet – as explained at the fourth meeting. The Incrível product fastly gained popularity in the market, not only with consumers but with several other actors, as we were able to capture in the meetings. In addition, the launch of a meat analog product by the largest animal meat processor on the planet achieved repercussions in financial and food industrial markets (Bloomberg, 2019;

FAIRR, 2022; FISA, 2020). Furthermore, the Incrível Burger Seara Gourmet was supported by an intensive distribution within the Brazilian food retail and with high-frequency advertising in mass media, in ways that Future Burger, as a product of a constrained budget startup, could not do – see figure 15 and its note.



Figure 13. Futuro and Incrível burgers competing on price at Zaffari Supermarket
Note: “biomolécula” is yet not available in Incrível Burger first version. Zaffari is a supermarket chain in Porto Alegre, Rio Grande do Sul. **Source:** Photographed by the author (2019).

Quickly⁴⁷ achieving an extensive presence in the Brazilian foodscape due to the capillarity of JBS meat logistics (Van Bommel & Parizeau, 2020), well-established sales channels with the traditional Seara brand, implementing a bold pricing strategy (Calantone et al., 2014), and expanding the portfolio in several ways, Incrível becoming the broadest plant-based meats line in Brazil (JBS, 2021). Therefore, in 2020 Incrível accounted for more than half of Brazil's plant-based meat sales volume – as affirmed at the ninth meeting.

⁴⁷ “Speed is associated with developing better capabilities as measured by faster learning, effective use of resources, and greater ability to launch cutting-edge products than competitors” (Calantone, Randhawa & Voorhees, 2014, p. 98).



Video 3. Incrível Seara products available at SuperMuffato

Note: The video is available at: youtube.com/shorts/BNIh6eR3Wvo

Source: Filmed by the author (2020) at SuperMuffato, a supermarket chain in Cascavel Paraná in September, 2021.

As JBS was not the first company to launch a plant-based burger in the Brazilian market but sought to become the leader (and even observed trials of presenting itself as the first company to launch this category), the company implemented a pricing strategy that relied on breakeven margin. Thus, JBS pressured competitiveness (Calantone et al., 2014), quickly advancing over the first mover market position, the Future Farm. Thus, Seara's marketing strategy pressured prices in the newly formed plant-based meats segment, mainly within Brazilian retail, to become a fast-mover and try to surpass the brand repeatedly associated as the first mover (Calantone et al., 2014). Considering the production costs, mainly due to ingredients imports and the Brazilian currency exchange rate, the option for pea protein, a grain that Brazil has no vocation for producing, and the unstructured supply chain, the Incrível burger, and the products from the Incrível Seara line throughout 2020 were put on the market "close to breakeven, because what we really want is to offer a solution to the consumer while we don't bring a better option" – according to the marketing and trade director, at the fourth meeting.

At the Sixth meeting, this pricing strategy implemented by JBS was criticized by other actors, two minor competitors. Mediated by AGN Consultancy, Superbom innovation director, and Verdali CEO, discussed the pricing pressure introduced by JBS plant-based marketing, which instead of making the novel category mainstream in the long term, could stifle innovation by suppressing minor enterprises and ultimately limiting the industrial flourishing and repressing the plant-based meats market. But what settled along the industrial assemblage over the months and years was the formation of supply chains that gradually optimize production costs, involving efforts to increase the production of pulses alternatives to transgenic soy, mobilizing actors such as GFI, Embrapa, MAPA, Ibrafe, and Globo Rural. In addition, the development of ingredient manufacturing processes by Wenger, R&S Blumos, Verdali, ABBI, ABIA and ADM and GFI mediation, concurrently with global technological development in the plant-based endeavor, favors the interchangeability of vegetable protein ingredients (REFER).

This understanding regarding pulses is gradually being developed and included in the performative market narrative. Market research devices were constructed and mobilized by GFI, which conducted surveys with consumers, demonstrating a low rejection of soy protein alongside a low willingness to pay more for products based on peas (GFI, 2020). A rejection of soy as the main ingredient seems to be inferred by JBS and other actors (see Figure X, The New's advertisement) in the formulation of new products – as presented at the ninth, tenth, and eleventh meetings and reiterated by Embrapa and Globo Rural participants. Ahead, we will resume, as far as possible, the discussion on ingredients supply chain structuring and the variability in pulses applications in plant-based meat production.

Returning to Incrível history: the great demand surpassing management projections of the Incrível Burger product, the Seara Gourmet line, was presented as the main justification for the Incrível line launch – at the second, fourth and twelfth meetings. The same reference to the astonishing sales performance and the Instituto Brasileiro de Opinião Pública e Estatística [IBOPE] (2018) market research were used in JBS's investor communication devices: “an analysis of consumer demand for vegetable proteins led to Seara launching the Incredible Seara range” (JBS, 2020). However, we could access that the development of an entire range of plant-based products has been studied since early 2018 inside JBS, including a market odyssey conduction by JBS executives that followed the plant-based meats in Europe and U.S. mapping innovations and unraveling them.

In December 2019, Incrível was expanded and launched as a product line, offering beef and chicken burgers, nuggets, kibbeh, and oriental meat (a ready dish mixing pieces of

plant-based meat and legumes). In addition to being produced with pea protein (Incrível Burger product within the Seara Gourmet line continues as soy-based), the Incrível Seara products became more healthiness and cleaner labeled (compared to Incrível Burger Seara Gourmet); no more artificial IV caramel coloring, sodium reduced, and counting with a fermented natural flavor enhancer additive, a innovative ingredient branded as “*Biomolécula i*”. The Seara Gourmet line continued with the Incrível Burger, in a fattier version now nutritionally improved, removing the caramel IX coloring and adding the “*Biomolécula i*”, also, it was renamed as Gran Incrível Burger, in reference to its greater thickness. In 2022, with the departure of Incrível from the Seara scope, the Seara Gourmet plant-based burger was renamed as “100% Vegetal Burger”, and its package ascribes that the formulation is still the same.



Figure 14. Seara Gourmet Incrível Gran Burger, package highlighted its exclusive “biomolécula i”
Note: the advertising stamp affirms: “The only one with biomolécula i, meat texture, meat flavor, 100% vegetal”. **Source:** Photographed by the Autor (2021), at Angeloni Supermarket, a supermarket chain in Santa Catarina State.

The product reformulation at the end of 2019 in the Incrível Seara line launch brought healthiness to the plant-based meat products and was justified by the marketing and trade director as a strategy derived from tracking consumer feedback, similar to what Future Farm did by reducing the smoked flavor and improving its Futuro Burger 2.0. JBS’s plant-based products start to be produced on the edge of indulgence in order to be as healthy as possible within this indulgence. The emergence of the covid-19 pandemic after March 2020 also

pressed for this reformulation towards healthiness, given an immediate change in consumer behavior – as expressed by GPA commercial director at the ninth meeting, AGN director at the second and thirteen meetings, and the JBS R&D director at the twelfth meeting. In the U.S., JBS's Ozo plant-based products, since its market launch, in 2020, have opted for more healthy-oriented market positioning, containing less fat and less sodium in the products made with natural fermented additives – according to the JBS marketing and trade director at the fourth meeting.

However, the Incrível Burger reformulation and the plant-based meats portfolio expansion with greater healthiness were only conducted by JBS after the fermented additive availability. The “Biomolécula i” is an additive ingredient produced by biotechnological fermentation processes, keeping naturalness. It enhances flavor perception by stimulating the gustatory and olfactory receptors, increasing salivation, making the eating experience more intense and juicier – as described by the R&D director at the twelfth meeting. Thus, it was possible to deliver a meat-like palatable experience using natural ingredients, allowing a clean label that connotes healthiness. The “biomolecula i” is repeatedly presented as an innovation by Incrível Lab – at the second and fourth meetings; and JBS investment reports (JBS, 2020; JBS, 2021).

The “Incrível Lab” is a name to refer to Incrível's independent organizational structure, which applies and demonstrates what we refer to as a *startup modus operandi* within the big food company. It is semi-independent management, marketing, and R&D operations dedicated exclusively to the Incrível, something unprecedented that had not happened to any other Seara line – as explained by the trade and marketing director at the fourth meeting and by the R&D director at the twelfth meeting. According to JBS 2020 Investment Report:

The Incredible Lab was created with a focus on developing plant-based protein products for the Incredible Seara range, but its activities will be extended to innovations related to other lines. The Incredible Lab's biggest find was the “Biomolecula i”, which combines natural aromatic molecules with fermentation of existing natural ingredients to guarantee similarity to animal protein (JBS, 2020).

However, in the “Technically Food” book (Zimberoff, 2021), it was published that JBS hired foodtech biotech startup MycoTechnology⁴⁸. MycoTechnology is a food ingredient

⁴⁸ MycoTechnology has nondisclosure agreements (NDAs) for its clientes; however, the Mycotechnology production for JBS was published in a book (Zimberoff, 2021), so we decided to present it here. The partnership was not presented at the ethnographed meetings. We do not know whether or not there is a breach of confidentiality agreements in disclosing this information.

producer⁴⁹ that utilizes mushrooms, more specifically mycelium, to solve challenges in the food and beverage industry:

Mycotechnology began delivering its protein blend to JBS, the world's largest processor of fresh beef and pork with annual sales of more than \$50 billion. JBS owns many smaller companies, including Planterra Foods, based in Boulder, Colorado. Planterra, which doesn't mention its relationship with JBS on its website, launched a line of plant-based burgers and ground "beef" called Ozo in the summer of 2020 (Zimberoff, 2021, p. 80).

Thus, we inferred a correlation between the Incrível Lab's innovative "biomolecule i" and "myco's clear iq", the fermented flavor enhancer produced by the U.S. startup:

Another mycelium-based ingredient made by the Denver company [MycoTechnology] was a powder called Clear iq – a by-product of the fermentation process. The company says that "clear iq", used in tiny amounts, alters eighteen of the twenty-five receptors on our tongue that sense the bitterness, or harsh flavor, in foods (Zimberoff, 2021, p. 64).

We were unable to provide further details on this collaboration between MycoTechnology and JBS for Incrível and Ozo products. However, in 2021, Planterra, the JBS's plant-based independent startup that held Ozo brand, made public this partnership, assuming collaboration with Mycotechnology for R&D, but not indicating a direct supply of ingredients.

With these inferences, we can capture how the technology developed in Silicon Valley has been guiding the plant-based meats category development in Brazil. After all, as the CEO of MycoTechnology claimed, in the plant-based meats novel market "there's a lot of copycat innovation – not a lot of real innovation" (Zimberoff, 2021, p. 75). After all, innovation is an inherent part of the plant-based meats narrative that attracts investors.

Therefore, we infer that JBS accelerated its pipeline pressured and mobilized by the market devices and ongoing of the first half of 2019. This pipeline acceleration, highlighted to investors and the market in general, reflected in reports and news (Mendes, 2021; Alerigi, 2019; FAIRR, 2019; JBS, 2019), was implemented with the early launch of the company's first plant-based product to compete with Fazenda Futuro and not fall behind Marfrig, which also introduce plant-based meats in the Brazilian market in 2019, as we describe in the next topic. Only after the end of 2019 JBS started to produce with fermentation technology and, in

⁴⁹ "Although you may not have heard of MycoTechnology, it has twenty-seven awarded patents and forty-seven pending, which has helped raise more than \$85 million in funding [...] each of its twenty-four fermentation tanks was in a constant state of brewing or being cleaned to brew again. The opposite of a craft beer operation, this seemed more industrial: two-dozen hulking steel tanks all churning out a single ingredient. Manufacturing plants like this are a hidden part of our food supply" (Zimberoff, 2021, p. 66).

fact, deliver plant-based products with an acceptable level of intrinsic quality. With the launch of the Incrível line, removing the numerous unhealthy additives, we began to infer a solution that puts the products on a similar level to those of the Californian startup Impossible Foods.

Another partnership, this one not subject to confidentiality – on the contrary, repeatedly advertised – was a collaboration with a startup that produces vegan dairy products. This partnership accelerated the development and production of a new product for the Incrível line, *escondidinho* [a type of lasagna made with cassava and ground beef, very popular in Brazilian cuisine], launched in 2020. This partnership is instilled in Incrível Lab, being presented as an innovative solution without precedents in JBS and Seara history, enabling a quick and efficient expansion of the Incrível line portfolio (Sun & Lee, 2013). Instead of industrial confidentiality, this collaboration in the form of a joint venture with a small vegan startup was repeatedly presented at meetings and highlighted by JBS investor reports (JBS, 2021a):

In 2020, Seara and NoMoo, a Brazilian foodtech pioneer in the manufacture of fermented cashew nut cheeses and yogurts, teamed up to bring an unprecedented product to the market: the Incrível Escondidinho (shredded, sun-dried meat), with meat and plant-based cheese flavor. NoMoo cheese is the result of a careful R&D process that allowed the Rio startup to be the only industry in Brazil with the capacity to ferment plant-based milk with the same technology used for the manufacture of conventional dairy products, maintaining the characteristics of grating, slicing and melting, just like the animal-based version. The collaboration between Seara and food startups like NoMoo originated at Incrível Lab, a research and innovation center focused on plant-based meats development, a Seara's laboratory anticipates global trends and keeps up with the most advanced foodtech companies in the world (JBS, 2021, p. x)

NoMoo is a Brazilian plant-based dairy foodtech startup founded in 2016. In the fifth meeting, the NoMoo CEO explained that the startup's focus is to provide the benefits of dairy foods, eliminating its negative aspects on consumer health and animal milk production. The startup had developed plant-based alternatives, including fermented cheeses, mayonnaise, cream cheese, and butter. From the joint venture with Seara, NoMoo expanded into the Brazilian foodscape and gained traction, starting to export its dairy analogs. Thus, JBS demonstrates flexibility and innovation also in industrial and organizational processes, highlighting the startup *modus operandi* adoption, evidencing a growing interest of large corporations in the innovation processes of startups, as well as an openness to strategic partnerships toward acceleration in development and production – as explained by the 100 Open Startups communication director at the fifth meeting.

The development of new products within the Inkrível line also relied on the strategic mediation of GFI, which throughout 2020 participated in the launch of new products in the portfolio: fish bait and shredded shank – as presented at the eighth meeting. In addition, GPA acted as a strategic partner for developing new products, structuring the distribution channel, providing real-time consumer feedback, and implementing retail strategies, such as the double display on shelves. Google was also a partner at the beginning of the business, helping to strengthen the designed strategies with data – according to the trade and marketing director at the ninth meeting.



Figure 15. Inkrível fish tit-bits product-placement endorsed by the Masterchef’s Brazil Jacan
Note: Among the robust advertising strategies conducted by Seara for Inkrível is endorsement of culinary chefs recognized in Brazilian culture. Chef Jacan, pictured above, is popularly known and esteemed for his participation in *Masterchef Brasil*, a popular television show broadcasted on Band TV. In addition, the Seara Gourmet line sponsored the television show *Mestre do Sabor*, a similar culinary program on TV Globo, in which there was placed references to the quality of the Inkrível Burger. We also observed insertions of Inkrível Burger Seara Gourmet in the content of the reality show *Big Brother Brasil*, broadcasted on TV Globo, in its 2021 edition, recognized as the most popular edition in history. On Instagram, influencers of Brazilian popular culture, such as actress and presenter Maisa and musician Alok, endorsed and produced content for Inkrível, which was broadcast not only on the brand’s Instagram profile but on the respective social media and lives on YouTube by the artists themselves. **Source:** photographed by the author (2020), during the Band TV broadcast.

For Easter 2020, Seara launched a temporary product, a plant-based shredded codfish, branded as a “special edition”. The “Inkrível Bacalhau” was available at a lower price than animal-based options, being quickly sold out. The outstanding performance at the points of sale where it was made available (particularly GPA stores), led Seara to consider implementing it as a continuous product available throughout the year – according to the trade and marketing director at the ninth meeting – but this was not confirmed – according to our conducted foodscape observations and online documentary research at Inkrível’s website. During Christmas time, the shredded codfish special edition product was again delivered to

the market. We can therefore perceive that when working with special products traditionally more expensive, such as shredded codfish – and, in a similar market case of another startup, The New's Salmon – it is possible to reach a better competitive price for consumers, delivering a cheaper food solution, which is immediately absorbed by the consumer market.⁵⁰

In addition to a beef and chicken hamburger, meatballs, kibbeh, nuggets, sausage, and ready-to-eat oriental vegetables with meat cubes (discontinued in 2022) and escondidinho, similar to lasagna (NoMoo co-branded) and special editions of shredded codfish, the line offered fish tit-bits (see figure 15), shredded ham and arrives from 2021 to larger cuts, HMMA: meat strips, beef steak, chicken fillet, chicken breast cubes, and adding ground beef. Thus, Incrível expanded its portfolio including everyday and special meats, considering the non-indulgent aesthetic daily food demands, as requested by GPA, according to its consumers' demands towards the novel plant-based meats category – as explained at the ninth and twelfth meetings.

The director of R&D at JBS, at the twelfth meeting, explained that all this portfolio expansion, involving not only new product development but ingredients suppliers arrangements, occurs in a “crazy rhythm” (in Portuguese: hallucinated rhythm), according to her words. Such accelerated dynamics were established not only at JBS but also in other industries and actors of this new chain – as explained by the director at the twelfth meeting. Thus, operating broadly as a food category, Incrível, in its first year on the market, had products from each category of Seara: hamburgers, special meats, sausage, and ready meals, in addition to pure meat cuts – as explained by the director at the twelfth meeting. JBS reports to investors points out that it became Brazil's first major company to offer a complete range of plant-based protein products, further diversifying its protein offerings to consumers (JBS, 2020).

Regarding the double display on shelves, JBS's Incrível is oriented to implement a broad strategy, unlike some plant-based startups, which try to position their products in the meat section or remain in vegetable or vegetarian-special coolers. In the double display strategy, sale channel representatives are oriented to positioning, as long as possible, respecting each store's particular design, the Incrível products alongside traditional meat products, and simultaneously on the vegan shelf, if there are any. Thus, operates as a

⁵⁰ AGN Consultancy published a news reference about Nestlé producing a plant-based version of the problematic foie-gras, branded as voie-gras, it is available in Switzerland and Spain at cheaper than the cruel animal-based option (Afanasieva, 2022).

mainstreaming marketing device to reach both vegetarian and non-vegetarian consumers (Fuentes & Fuentes, 2017).

However, it is noteworthy to clarify that the shelf positioning strategies are shared with each retailer, which implements, manages and handles product availability and positioning. In no foodscape observations, we did find all the more-than-10 Incrível products available. Sausage, for example, was just observed once (see figure 16). The long cuts, HMMA tech products, were not observed in supermarkets in the Brazilian Southern, having a more intense distribution in Sao Paulo State. So, even with a large portfolio, according to our three years long observations, JBS's plant-based meat products available at Paraná, Santa Catarina, and Rio Grande do Sul states are generally limited to beef and chicken burgers, nuggets, and escondidinho. The other products are, until 2022, submitted to a verified distribution irregularity (it is not known, however, if it is a question related to JBS production, sales strategy, or retailers' preference to stock and made available all the entire Incrível's line).



Figure 16. “Incrível Salsicha” at SuperMuffato Supermarket

Source: The author (2020). Photographed at SuperMuffato, a supermarket chain in Cascavel Paraná, May 2020.

Regarding food service, in early 2020, the Incrível Seara line began supplying soy meat to the fast-food chain Subway in Brazil, which SVB had pressured to include vegan options in its menu. In 2022, Subway’s sandwich turned to a chicken breast option, exploring

the HMMA texture, and reinforcing the Incrível supply by co-branding marketing applications. Also in 2022, Incrível replaced Future Farm supplying the burgers used by the Brazilian fast-food chain Bob's. In Outback Steak House Brasil, a dish was launched in the second half of 2022, and Incrível's brand was referred in a co-branded – as illustrated in the following figure:

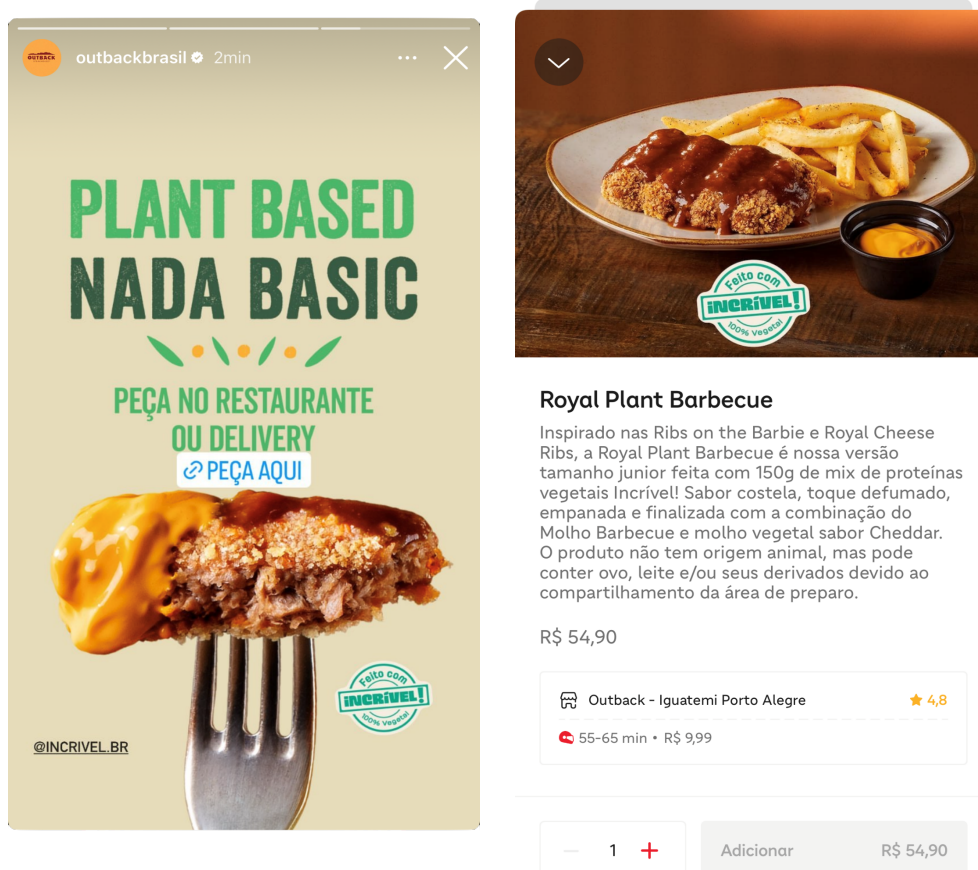


Figure 17. Incrível's product composing an Outback's Brasil dish
Source: Outback at Instagram (2022) and Outack at iFood (2022), print screens by the author

In 2021 and 2022, JBS conducted market movements toward their plant-based business worldwide. In 2021, Vivera, a Netherlands-based enterprise, was acquired for 341 million euros (JBS, 2021). Vivera had the third largest market share in Europe, being, until then, the biggest independent plant-based company in the continent.

In 2019, Vivera was already part of the Brazilian assemblage as it produced products imported by BRF, branded as Sadia Veg&Tal. – as explained by the BRF innovation director at the fifth meeting. The two products, nuggets and burgers, formed the simple portfolio marketed as Sadia Veg&Tal by BRF, implemented through the importation of European plant-based meats (in addition to locally produced vegetable pies with dairy products of animal origin). The costly implementation was conducted to respond as quickly as possible to

the rising of the novel category within the Brazilian foodscape and the pressures of the financial market (e.g., Bradesco BBI report).

After the Vivera acquisition by JBS, Incrível leaves Seara's organizational structure and brand. It conducts a rebranding, adopting a visual identity close to the aesthetics used by the Vivera brand. From that moment on, incredible leaves Seara, even being removed from the brand's website⁵¹, forming a new business unit for JBS, directly submitted to JBS global.



Figure 18. Incrível's rebranding as it ceases to be part of Seara's domain
Source: Incrível Instagram profile, print sream by the author (2022).

JBS presents the acquisition of Vivera as another effort to increase the company's innovation and market position in plant-based meats and alternative proteins. Furthermore, reinforces that Vivera “owns technological know-how that will ratchet up our operations in the plant-based segment” (JBS, 2021).

In 2021, JBS committed to being net zero by 2040, agreeing to be monitored by the Science Based Targets Initiative. On the contrary, in 2022, the IATP found that the company's

⁵¹ As we could access at Seara's website: <https://www.seara.com.br/produtos>

operation had a 51% increase in GHG emissions in 5 years. In addition to the finding, the IATP actively mobilizes investors to rethink their investments in JBS, as the media also reiterated (Freitas, 2022).

In 2022, the JBS fund for the Amazon (in Portuguese: "JBS Fundo Pela Amazônia") resolved to be applied in funding research projects that use ingredients from the Amazon rainforest for plant-based meats solutions (protein, additives, fats, texturizers, etc.). Mediated by GFI, this application of JBS resources corroborates with a MAPA's public notice, making resources available to researchers and startups with the same purpose (both are presented in attachments). Thus, we can comprehend the growing search instituted by some actors (JBS, GFI, MAPA, Embrapa, Globo Rural and FISA) for new ingredients exploring the potential of Brazilian biodiversity. The Seara trade and marketing director alleged that the food industry worldwide does not use even 20% of the vegetables available for human food, so there would be a lot of new good sources of protein to be discovered and explored. According to the director, JBS has been working globally to negotiate and develop supply chains for plant-based ingredients to make them cheaper, given the fact that the products in 2020 were commercialized at a margin next to break-even, due to the cost of importing ingredients, quoting the Canadian peas – at the fourth meeting. Freitas (2022) published a notice about a disputed “run for peas” instilled by Beyond Meat and its similar startups emerging around the world. OECD/FAO (2022) projects growth in pulses agricultural production due to plant-based meats industries' demand.

In 2022, in a move allegedly strategic for the company, JBS enters the fish market, expanding its offer of animal proteins with less environmental impact – as we explain in chapter two (2.1) (JBS, 2022). In 2021, in addition to its plant-based businesses, JBS increased its investments in alternative protein ventures, acquiring and raising investments in Biotech Foods, a biotechnology startup focused on cultured meat, with plants in Brazilian Santa Catarina State and in Spain. Thus, JBS reiterates its position on becoming a leading global actor in protein in a broader sense, contemplating the traditional produced through livestock, the plant-based and the rising technology of cultured meat (JBS, 2021)⁵². We are not aware of Biotech Foods developing and delivering ingredients and novel solutions to improve plant-based meat production, but there were indications and perspectives about cultured and plant-based mixed meat products and even using both technologies as ingredients in animal-origin meat (meat extenders) – as proposed by GFI's corporate

⁵² It is worth noting that this process of JBS entering the segment of cultured meat has the collaboration of the GFI in the U.S., Europe and Brazil.

engagement coordinator at the ninth and eleventh meetings. These propositions are other nothing-new innovations, since hybrid meat products using TVP or isolated soy protein to increase protein in meat processed foods (such as sausage, nuggets, burgers, mortadella, etc.) is a well-established industrial practice, in which plant-based, especially soy, proteins are applied as meat extenders – as explained by Wenger director and processes and technology manager at the seventeenth meeting.

According to Fairbairn et al. (2022), the movement conducted by JBS towards plant-based and cultured meats is not an isolated market movement, nor an unusual one, when we consider the maintenance of the leading status of this actor in the global food system:

global leaders in conventional meat production Tyson Foods and Cargill have made major investments in cultured meat forerunner Memphis Meats, part of a larger trend of dominant agri-food firms moving to secure their market position by pursuing acquisitions and joint ventures with alternative protein companies (Fairbairn et al., 2022, p. 14).

In October 2022, JBS announced the closure of Planterra, the startup founded by the company to produce and distribute the Ozo brand of plant-based meats in the U.S. (JBS, 2022), claiming to the investor increase focus on Vivera and Incrível business.

Thereby, in 2022, JBS had its products being traded in almost every country in the world through brands such as Seara, Swift, Friboi, Rigamonti, Maturatta, Cabaña Las Lilas, Pilgrim's, Rezende, Gold Kist Farms, Bare Chicken, Pierce, 1855, Big Chicken, etc., and Incredible and Vivera. Throughout its global operation, the company directly employs more than 250 thousand people around the world, a portion significantly in animal processing factories – in a wide history that, we cannot neglect, includes several human deaths, dozens in Brazilian slaughterhouses, where workers were ground to death (Mapa de Conflitos, 2015; Mergulhão, 2021). In addition to accidental human deaths, thousands of JBS's employees were subjected physical and mental suffering due to repetitive movements in a freezing environment, causing muscular and neurological injuries (Reis, Tirloni, Ramos & Moro, 2017; Tirloni et al., 2017) and incalculable psychological damage due to the constant animal slaughter, in an intermittent massacre scenario (Muller, 2018); in addition, JBS is related to unfair legal disputes dealing with labor abuses and widespread multilevel corruption in Brazilian politics and economics (Silvestre, Viana & Monteiro, 2020). In this sense, there is a prevision that better working conditions be instituted in Brazil according to a wider transition from the current animal-based meats to plant-based production (Morais-da-Silva et al., 2022).

5.3 The Marfrig-ADM Joint Venture

“In Marfrig we are absolutely sure that the demand for protein in the coming years and decades will continue to increase, so we are very convinced, both in the animal protein segment and in the plant-based segment. These two proteins will complete each other in the coming decades, in the sense of the task of nurturing the population [...]” (Marfrig operations director at the fourth meeting).

Currently branded as Plant Plus Foods, two of the largest food companies in the world, ADM and Marfrig, implemented a joint venture to produce plant-based meats, that allowed the introduction of massive meat analogues options in food service reference chains such as Burger King Brasil, Outback and Subway in Latin America and exporting to European clients.

Referred as an unprecedented joint venture, highly considered in the financial market, and promoted among the investing public, above all by Marfrig – see figure 21. The operations made it possible not only to meet a demand from the food market but also to improve Marfrig's positioning in sustainability rankings and highlight it among investors.

Operations started in the second semester of 2019; Marfrig and ADM formalized the joint venture as a new brand in May 2020. Plant Plus Foods is headquartered in the city of Chicago, in the U.S. Despite being headquartered in the North American country, we understand that this joint venture is structured in Brazil and emerges to meet Burger King Brasil's demand along with Marfrig's interest in responding to the financial market from its operations in the South American country. Therefore, we include it as one of the main actors in the flourishing Brazilian plant-based meats industrial assemblage.

Marfrig held 70% of the venture, produces and distributes Plant Plus Foods' products from its plants operating segregated production lines in Mato Grosso State and Ohio State – as explained by the operations director at the fourth meeting. ADM holds 30% of the joint-venture, supplies the ingredients from its plants in Mato Grosso do Sul Estate and North Dakota State (Money Times, 2019).

In 2022, Plant Plus Foods holds an 8 SKU portfolio, including hamburgers, with three flavor variations (traditional, ribs, and rump cap), and Tuscany sausage, ground beef, kibbeh, meatballs, and pulled chicken. In all products, soy is the major ingredient. In its first years, the ADM-Marfrig enterprise expanded through the acquisition of Sol Cuisine, a Canadian plant-based meats industry that counts with intensive channel distribution in the U.S. and Mexico markets too, thus expanding the plant-based production, distribution, and commercial

operations. We must mention that, according to a notice from BeefPoint (2022), despite outgrowth, the ADM-Marfrig joint venture still does not generate net cash profitability.

Thus, in 2019, in addition to JBS, Cargill, and Tyson Foods, ADM and Marfrig also entered the plant-based meats sector. As we will describe below, ADM has historically been part of the vegetable protein production chain, being a protagonist both on a global scale and in the Brazilian market. However, what is new now is the establishment of a partnership in the form of a joint venture that generates a new venture (far different from the JBS - NoMoo collaboration, which remained as a co-branding initiative).



Video 4. Rebel Whooper advertisement, broadcasted at TV Globo

Note: The advertisement replicates the advertising of the Impossible Whopper, a partnership between BK and Impossible Foods in U.S., as presented in attachment X. At the attachments, other advertising pieces of plant-based Burger King are presented. Note: In 2022, BK launched an advertising video following the previous motto, the "Even more Confusing Times", to advertise their plant-based chicken nuggets "that got no chicken, but taste like chicken, confusing", in European countries. This campaign was not broadcasted in Brazil, since that until August 2020, the plant-based nuggets were not available in BK Brazil. The BK Brazil has only two alternative-to-meat products on their menu: the "Veggie Burger", with a disc made of mushrooms and cheese, and the plant-based meat Whooper, the "*Whooper de Plantas*", formerly called "*Rebel Whooper*", made of plant-based meat produced by ADM-Marfrig. Even with the nomenclature change, the fact of keeping the Veggie Burger on the menu shows that BK understands the potential of the product beyond the vegetarian public. However, opting for naming "*Whooper de Plantas*" instead of "*Whooper Vegetal*", as the category mediated by the GFI has been structured for labeling, although it is a strategy to keep the fast-food chain as globalized as possible, may demonstrate a BK detachment from the strategic mediation carried out by the GFI in the Brazilian assemblage. The video is available at: youtu.be/mY8NrVI6Ldo

Source: Burger King Brasil (2019). Broadcasted on September and October 2019 and on the internet.

Although Burger King Brasil did not participate in any meeting that we ethnographed, it is essential to emphasize its performative role within the Brazilian and global assemblages

of the new category of plant-based meats. The fast-food chain implemented the Impossible Whopper in the U.S., investing in mass advertising and pricing offerings, allowing wide first experimentation, guaranteeing an experience quite similar to that of traditional meat options – a concern reiterated by the GFI director in our first meeting, considering the potentially destructive effect toward the novel market in cases of massively delivering not really good products, tasting bad, diverging from the promise of the category. After the implementation of the venture with the startup Impossible Whopper in the U.S., BK replicates the procedure in other countries, and in Brazil, it starts in the second half of 2019 after the supply agreement with Marfrig and ADM. In Chile and Argentina, the supply of plant-based meats to BK is from NotCo, and not from Marfrig.

Although the main focus of Plant Plus Foods, as well as a large part of Marfrig's production, is foodservice, we once observed a branded product in Brazilian food retail in a supermarket in the city of Florianópolis, Santa Catarina State, in 2021, illustrated in the following picture.



Figure 19. Plant Plus Foods' Ground Beef available at a Supermarket

Note: Package at a black box, on the right, on the top shelf, next to Future Burger. Vegetable pie from Sadia Veg&Tal, containing animal-based dairy ingredients and low protein profile, also demonstrated at the figure.

Source: photographed by the author (2021).

5.3.1 Archer Daniels Midland (ADM)

Archer Daniels Midland, or ADM, is one of the largest companies in the world⁵³, and the largest in animal feeding (cattle, poultry, swine and aquaculture). Alongside Bunge, Cargill and Louis-Dreyfus, ADM forms the top 4 multinationals that concentrates around 75%⁵⁴ of the soybean trading and processing activities around the globe; quartet of companies referred as the ABCD⁵⁵. In our ethnographic field, ADM is a relevant actor by processing soybeans and providing ingredients to plant-based meat manufacturers, side with Döhler, R&S Blumos, Verdali, etc. But this is only a small business in the ADM conglomerate. The Company started in 1902 as a cooperative initiative to crush linseed in Minnesota, U.S., and since then, it has been transforming grains resulting from agricultural crops into products for food and beverage, animal feed, and industrial biosolutions. ADM has centers of nutritional innovation, which are responsible for solutions of improved absorption nutrients, providing animal feeds with optimized amino acid profiles. Specifically, in relation to food, the Company is recognized as the inventor of TVP in the 1960s, a product still widely used in the food industry and in cooking practices, including in Brazilian cuisine, where it is recognized as soy ground meat.

The technology director of R&S Blumos pronounced its admiration for ADM, due to its historical importance in the industrial development of plant-based meats. According to the R&S Blumos director, “ADM and Wenger were the companies that created TVP; when we are talking about TVP, we are talking about a trademark of ADM” – at the fifteenth meeting.

The extrusion technology, is, in fact, the industrial precursor of plant-based meats. Thus, ADM besides being a relevant player in the current plant-based market, historically constructed the basis that allowed the current existence of this food category. However, we should explain that before TVP, long before the 1960's, in the Eastern world, tofu and other fermented legume protein were already used as plant-based meat analogs; between 206 BC and 220 AD, in China, “the Han dynasty developed a standard meat analog tofu” (Ishaq, Irfan, Sameen & Khalid, 2022, p. 974). Such meat analogs, based on bioprocessing, does not deliver meat texture.

Globally, ADM processes food and feed from soybeans, sunflower, canola, linseed, peas, lupins, and beans, all of which are protein-rich grains. To supply the current Brazilian and Latin American industrial food market, ADM offers three products lines of plant-based

⁵³ Publicly-traded, listed in NYSE, under the ticker symbol ADM.

⁵⁴ Throughout the 2010s (Wesz Jr, 2016).

⁵⁵ Acronym, referring to the initials of ADM, Bunge, Cargill, Dreyfus companies (Wesz Jr, 2016).

protein ingredients through its brand Purely Nature: sundry soy protein concentrates⁵⁶, sundry soy protein isolates⁵⁷, and a TVP portfolio of soy, pea, wheat, and bean proteins.

ADM uses a PDCAAS (protein digestibility-corrected amino acid score) (Hughes et al., 2011) scheme in their plant-based meats ingredients marketing material – a B2B informative and advertising booklet –, highlighting the superiority of soy protein over other protein sources:

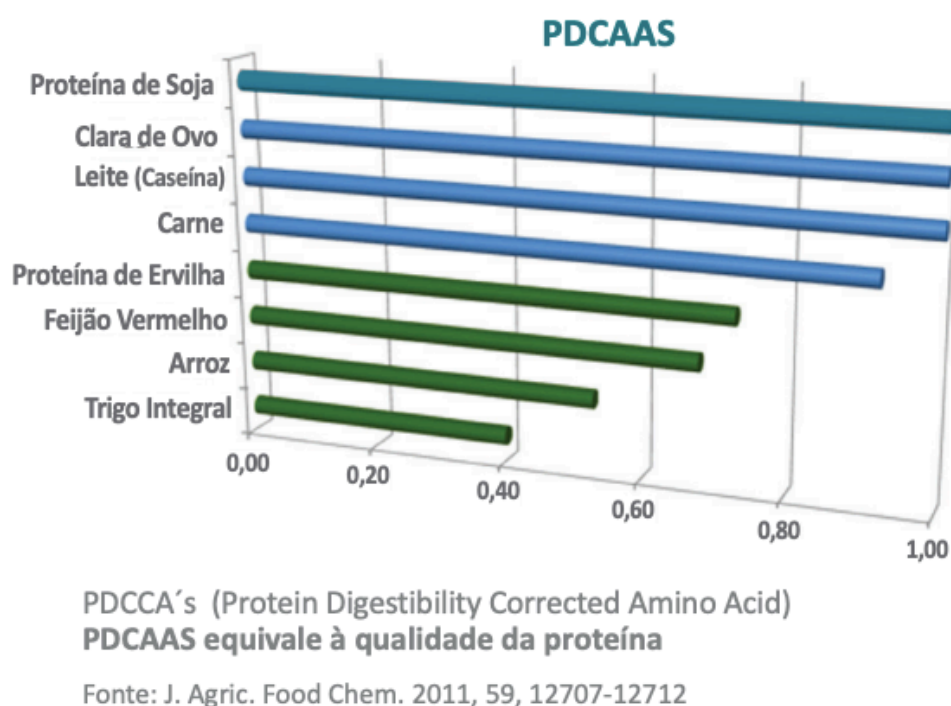


Figure 20. PDCAAS of Soy Protein scoring the maximum, 1, in an ADM Brasil marketing folder, targeting industrial clients

Note 1: In Brazilian Portuguese, the figure presents, from top to down, soy protein, egg white (albumin), milk (casein), meat (from animal origin, unspecified), pea protein, red bean, rice and whole wheat. **Note 2:** Recent studies indicate that pea proteins can score over 1 in PDCAAS, being below 0.9 in the case of the whole pea, and above 0.9 when isolate pea protein is considered; when supplemented with methionine, pea protein reaches 1, equaling to casein (Guillin et al., 2021). **Note 3:** Although PDCAAS is a widespread and highly validated measure to assess protein quality (Hughes et al., 2011), since 2013 an alternative method, the Digestible Indispensable Amino Acid Score (DIAAS) was proposed and recommended by the FAO as a better nutritional measure (Guillin et al., 2021).

Source: ADM Brasil (2022), referring Hughes et al. (2011).

A good solution provided by plant-based meats is their resolution of antinutrients and reduced digestibility of in natura vegetable proteins (specifically all kinds of seeds). Because

⁵⁶ Branded ARCON® SFP 200, with minimum protein levels of 69%, amino acid profile superior to Brazilian legislation, and 20% fiber content – providing texture and palatability; ARCON® EB and ARCON®MM, from the same product line, are animal-based concentrates.

⁵⁷ Branded Profam, with minimum protein levels of 90%.

vegetable protein in natura contains molecules that act as antinutrients (e.g., phytate acid) which, after industrial thermo processing (or home cooking), are generally broken, not affecting digestion and nutrition (López-Moreno et al., 2022; Sarwar Gilani, Xu Xiao, Cockell, 2012).

Phytates are natural components of seeds, preserving the seed's capability of life generation. They are a varied set of organic substances derived from phytic acids, serving as a protective barrier in seeds' barks. This barrier awaits the ideal conditions to dissolve, and the seed can start germinating. In the human digestive tract, however, the phytates act as an antinutrient, reducing zinc absorption and even, in some cases making digestion difficult in general. Nonetheless, the R&S Blumos technical director explains that simple processing, like heating, breaks the big phytates molecules, significantly reducing the anti-nutrition characteristic of seeds source protein⁵⁸ (López-Moreno et al., 2022). On the other hand, phytates have chemopreventive/anticarcinogenic properties; phytic acid's role against colon cancer is confirmed (Reddy, 1999).

A mainstream problem, which generates a rejection of plant-based meats, is a common sense (albeit erroneous) association of soy crops with Amazon deforestation. ADM was one of the first actors to sign and promote the Amazon Soy Moratorium (ASM) initiative in 2006, a private conservation policy designed to guarantee that the soybeans traded were not cultivated in areas of the Brazilian Amazon deforested after the Moratorium⁵⁹.

In addition to acting as an ingredient supplier for the plant-based meats industry, ADM offers technical support, optimizing the ingredient application and adjustments, providing consultancy, and adapting solutions so that the final product reaches the nutritional profile, flavor and texture desired. ADM can also provides support for its customers' products to reach the global market.

Our ability to replicate traditional meat products and expertise in extrusion is renowned throughout the industry [...] When hydrated, textured protein delivers a fibrous meat-like texture with outstanding moisture retention and excellent mouthfeel, making them perfect for meat and meat alternative applications (ADM, 2022).

⁵⁸ Vegan NGOs (e.g., MFA, SVB) also propose to consumers homemade techniques like soaking beans for a few hours to reduce anti-nutritional factors. It is also commonly recommended to eat or drink high vitamin C foods together with beans eating; according to López-Moreno et al. (2022, p.4), "vitamin C has been shown to counteract the inhibitory effects of phytates on mineral absorption".

⁵⁹ The high rates of compliance and traceability permits to ASM being recognized as one of the most effective conservation initiative and a mark that "set the stage for supply-chain governance of other commodities" (Heilmayr, Rausch, Munger & Gibbs, 2020). The ASM is responsible for the improvement of the image of Brazilian soy in global market. Heilmayr et al. (2020) estimates that the ASM prevent between 9,000 and 18,000 km² of deforestation in the Amazon rainforest over its first decade (2006–2016).

As explained by the ADM technical director at the sixteenth meeting, in 2018, less than a year before the start of the plant-based meats establishment and propulsion in Brazil, ADM opened the largest soybeans ingredients⁶⁰ factory in Latin America. The ADM soy ingredients factory is located in Campo Grande City, the capital of the Brazilian State of Mato Grosso do Sul, with a production capacity of 50 thousand tons/year and a variability of over 75 different types of plant-based protein⁶¹. With the new extrusion technologies installed at the Mato Grosso do Sul's factory, ADM made possible the joint venture with Marfrig to take place. In 2020, ADM inaugurated a pea protein-focused operation factory in the state of North Dakota in the USA, which became part of Plant Plus Foods operations. In 2022, ADM opened its first Innovation Center in Latin America, at São Paulo State. Focused on human nutrition (instead of animal feeding), this Innovation Center has a pilot plant to simulate all processes and technologies in plant-based meat manufacturing (Food Innovation, 2022).

5.3.2 *Marfrig*

Marfrig is the largest hamburger producer in the world, manufacturing more than 200,000 tons of it in 2019. Counting with one of the largest installed capacities for meat processing in the world, Marfrig has production plants in Brazil, Argentina, Uruguay, Chile, and the U.S. It has more than 30 thousand workers in its 31 units, delivering products to more than 100 countries. Founded in 2000, Marfrig going public in 2007⁶².

Being second biggest food company in Brazil, Marfrig owns meat brands such as: Montana, Bassi, Viva (a neutral carbon meat brand), Pampeano, Campo del Tesoro, Quickfoods, and, Revolution, Plant Plus Foods and Sol Cuisine, three plant based meats brands. In addition to its focus on delivering meat to food service at a global scale.

In addition, from March 2022, Marfrig held more than 33% of BRF's shares and managed to determine BRF's administrative board. Marfrig, through its subsidiary National Beef, is one of the largest meat processors in the U.S.

Even with a more recent history, Marfrig acquires several slaughterhouses throughout South America and, similar to JBS, holds cases of workers deaths with accidents in slaughterhouses in addition to incalculable physical and psychological injuries to its current

⁶⁰ Oriented to the production of soy-based protein ingredients, soy oil is not considered here.

⁶¹ With the traceability of inputs, in accordance with ASM; GMO, non-GMO (conventional) and organic options; and halal and kosher certified.

⁶² Traded as MRFG3 at B3, the Sao Paulo Stock Exchange.

and retired workers (Muller, 2018; Reis et al., 2017; Tirloni, Reis, Ramos & Moro, 2017; Mergulhão, 2021). Issues related to deforestation concerns Marfrig; FAIRR (2021) indicated that the company has around 30,000 direct and a range between 60,000-90,000 indirect suppliers across the Amazon and Cerrado biomes, highlighting the complexity of these supply chains and the importance of implementing effective policies and technologies for monitoring and controlling it. However, Marfrig highlights that it is the “only company ranked as low risk by the FAIRR global ranking”, according its reports and website (BeefPoint, 2022), thus reiterating the importance and appreciation of this actor for the company and the financial market.

Its website also stands out, with a disproportionate relevance regarding its operations proportions, the plant-based business:

Another front in which Marfrig stands out is in the production and commercialization of items based on vegetable protein, from Brazil. It is the first company in the country to operate in this niche on a commercial scale for food service. In this activity, it maintains an exclusive agreement with the North American Archer Daniels Midland Company (ADM), which even gave rise to PlantPlus Foods!, created in 2020. Result of a joint venture between the two companies, PlantPlus! produces and sells plant-based foods through retail channels and food service chains in South and North America (BeefPoint, 2022).

Similar to JBS's addressed recommendations, the Bradesco BBI Report in 2019 projected an increase of 13% in EBITDA for each 5% of Marfrig's revenues directed to plant-based meats production (Cormier et al., 2017; Chen et al., 2017; Hinze & Sump, 2019). In addition to putting pressure on the three companies (JBS, Marfrig, and BRF) that a few months later, in fact, put plant-based meat products on the market, this report increased the interest of countless investors, in addition to increasing the general awareness on the subject among Brazilian investors, also operating as a complementary device to the news-flow derived from Beyond Meat IPO. Just after announcing the joint venture formalization, the Marfrig stocks valued more than 5% (compared to Ibovespa's rising of 1.3%) (Romani, 2021).

Even after the formalization and creation of the new brand, Plant Plus Foods, Marfrig maintains its Revolution brand in the portfolio, as a strategy to reiterate its investments in the plant-based segment.

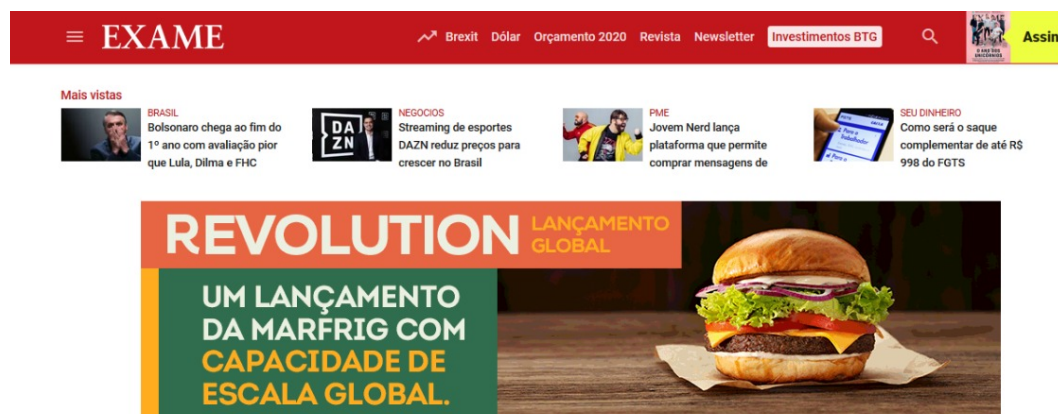


Figure 21. Marfrig's plant-based burger line launch advertisement at Exame Business

Note: It is no coincidence that the novel product launch advertisement was positioned in a media that reaches an investor profile. The advertisement is not targeted to consumers, but to investors, as we discuss more in the next figure's note (Srivastava et al., 1999; Srinivasan, Pauwels, Silva-Risso & Hanssens, 2009). **Source:** Captured by the author (2019).

At the fourth meeting, the operations director explained that Marfrig has two separate production lines to avoid contaminating plant-based products with residues of animal products. JBS, on the other hand, in 2020, interspersed production, sanitizing the machinery and treating it as an allergenic to avoid contamination, but not having a production line completely dedicated to plant-based products. From this, the director also indicated the previous significant investments to expand the factory's production capacity, according to the highly effective and projected demand for the novel product category. At the beginning of 2020, the plant-based meats produced by Marfrig in Brazil (at that moment, only burgers) were already exported to Europe, with a demand alleged as unforeseen, according to the director's words.

Anyway, we could apprehend that Marfrig has a more conformist stance in relation to the development of plant-based meats, praising the level of technology already available in the industry and turning its speech towards meeting the demands of current consumers without declaring actions in favor of innovation that would allow the mainstreaming of plant-based meats. Along the fourth meeting, such posture receives a strong counterpoint from other players, especially the Future Farm startup CEO⁶³.

However, we cannot confuse the inferences arising from a specific discourse by a director with the market practices implemented by Marfrig that, in fact, shaped the Brazilian plant-based meats market in its emergence, pressuring competitiveness, demonstrating new business models, and expanding in an unprecedented way the offer of plant-based meats, with quick and intensive distribution in the food service for all the country, especially Burger King,

⁶³ Marfrig's Marketing Director was among the confirmed guests at the second meeting, in May 2020, "the running for plant-based burgers in Brazil 2", promoted by AGN Consultancy, but did not attend.

which implements the mainstream process by offering these meats at a similar price to the similar products of animal origin.



Figure 22. Marfrig brand highlighted at a BK's store promotional display

Note: Evidencing the co-branding with Marfrig, which was very interested in demonstrating its performance in this novel product, especially to the investor public. Advertising and brand application is also a market device that goes beyond the attraction of consumer audiences, operating with investors, even at points of sale. Close to this BK's restaurant, we cross 2 OOH promoting the Rebel Whopper in Berrini Avenue, which, together with Faria Lima Avenue, composes the main axis of financial location in Brazil (Grossman, 1997; Srivastava et al., 1999).

Source: Photographed by the author (2019).

5.4 The Good Food Institute Brazil

“People don't resist change, they resist being changed” (GFI Brasil director at seventeenth meeting (referring professor Peter Senge).

The GFI Brazil director at several events repeatedly spoke the above phrase. This phrase synthesizes the GFI stance towards organizational actors and market devices, rather than relying on consumer behavior and culture changes to transform the food system.

Along the ethnography conduction, we identified that the actor with the greatest potential for mobilizing the assemblage was, and continues to be, the GFI. The Good Food Institute Brazil is the Latin American branch of the Good Food Institute. A nonprofit organization founded in the U.S. in 2016 by MFA⁶⁴.

Focused on developing plant-based and cultured protein alternatives, the Institute is worldwide fully financed through philanthropic funds, not receiving money from companies, industries, or governments, precisely to guarantee to the Institute an exemption role in the food market – as stated by the corporate engagement coordinator at the eleventh meeting.

The GFI co-founder, less than a year after the institute's foundation in the U.S., highlighted the importance of establishing a headquarter in Brazil when evaluating the national market offerings for alternative proteins: “They're [Brazilians] selling canned, plant-based meat that reminds me of the plant-based meat I was eating in the 1980s, and it's the equivalent of \$6 a can” (Quartz, 2017), alluding that low-quality products are sold at high prices, in a market with latent demand and many industrial development problems – see figure 23.

In 2017, GFI hired a representative in Brazil that became the GFI Brazil director (and our first field informant). Initially, we infer that this representative had the mission of making Brazilian trade companies import (from the U.S.) plant-based meat products to supply the vegetarian market. However, along with the development of the ethnography and the market

⁶⁴ Although it emerged from the MFA, a 1999-founded activist organization for the purpose of liberating animals and ending animal farming, the GFI adopts a distinct stance. GFI works to reconcile and unite interests to accelerate alternative (non-animal) protein innovation, arguing about constructing a more broadly sustainable food system. From this conciliatory posture, the GFI's approach to the coexistence between diverse sources of protein and raise awareness and engagement toward the need to increase protein production directly from plant-based sources to meet the growing global food demand without reducing the profits of industries and rural producers and governments, even emphasizing the centrality of these actors to build plant-based solutions. While the MFA denounces and exposes animal suffering in very blunt and shocking ways and acts to sensitize consumers to reject animal-origin meat, the GFI works with the production chain and food companies, implementing less combative activities and adopting neoliberal discourses, winning the trust of the most diverse actors in the meat chain and food system. This link between GFI and MFA, strategically, is never presented by the GFI and was discovered in our documentary research about the Institute's origins, which, it is worth noting, is an independent organization.

itself, we could see that it went much further than that, with a truly transformative purpose and effective multi-front work.



Figure 23. Example of canned vegetable protein product with no evolution for decades marketed in Brazil at a premium price (above USD 10 per kilo)
Source: Superbom (2019).

GFI strategically works internationally to accelerate alternatives to animal protein (meat, dairy products, and even eggs), highlighting plant-based, fermented and cultured meat innovations. Based in the U.S., the GFI has five more headquarters in Europe, India, Israel, Asia-Pacific, and Brazil. The Institute supports innovators, investors, and companies interested in producing alternative protein food products. In addition to corporate engagement efforts, the GFI also works in science and technology and public policy. The Institute has research grants to food-tech projects and develops partnerships with research institutions⁶⁵ toward modeling open-access techno-economic analyzes (TEA); which ultimately generates applications for GFI provides scientific-based technical consultancy in product formulation and optimized industrial process (Mahmud et al., 2021) and accelerate plant-based industry innovation and development.

In Brazil, the Institute partners with Embrapa for the development of pulses and beans agriculture and searches for novel vegetable sources of proteins. GFI has been subsidizing the “Biomass” (biomes) project, a large study of the Brazilian flora applied to plant-based food alternatives, promoting research at universities, research institutions, and private companies. Such initiatives arise due to the urgent demand of the Brazilian plant-based meats industry for

⁶⁵ In Brazil, the GFI established a partnership with the Federal University of Paraná to study cultivated meat technologies and professional education to boost this new industry (cultured meat), through a postgraduate discipline in the course format, “introduction to cellular animal husbandry”; at least two editions were completed. The twelfth meeting was a related part of this project.

national and cheaper ingredients – as reiterated at the fourth, ninth, tenth, eleventh, sixteenth, and seventeenth meetings. In addition, as previously mentioned in JBS's topic, through mediation by GFI, JBS's Amazon Fund was earmarked for research into developing ingredients and solutions for plant-based protein – more details are presented in the attachments.

Simultaneously, GFI has a work front for public policies, approaching governmental instances (legislative, executive, and judicial instances) to facilitate the construction of a business and market environment favorable to innovation and plant-based products, weakening the strong and complex meat and dairy lobbies, in several countries around the world. For this, the Institute mobilizes the learning it developed in the U.S., dealing with a strong lobby against plant-based meats and dairy innovations. In Brazil, the Institute works directly with MAPA, Anvisa, and MTCI, actively promoting innovation and solutions for the plant-based market development and, at the same time, confronting any resistance in the agricultural lobby, with conciliatory and pró-Brazilian developmental stances, and also implementing required legal supports.

This political and institutional work conducted by GFI in Brazil has been done as a mirror of the solutions already developed for what the plant-based market has already suffered in the U.S. throughout the 2010s. In the U.S., GFI has managed through advocacy, lobbying, and legal strategies to face label censorship of plant-based products. Label censorship is one among another market conservative (against innovation) initiatives. These initiatives try, usurping and imposing legal and regulatory instruments, to limit food culture, food labeling, and food marketing, not in favor of consumers, but according to the interests of established and dominant actors, who oppose or resist at several levels to changes in the food system configuration.

The MAPA minister, by an irony of fate, was in the past, in 2018, when acting as a Federal Congresswoman, the promoter of a label censorship law in Brazil. Tereza Cristina (DEM-MS) proposed a bill drafted by the Brazilian Association of Milk Producers prohibiting the use of the name "milk" and related ones in non-animal origin products (Souza, 2018). This bill drafted threatens not only the marketing of new plant-based products about also already enshrined in Brazilian food culture, such as coconut milk. However, under her command, MAPA started not only to positively mediate the plant-based meats segment but also to invest, such as the regulatory projects adopting a pro-innovation perspective and the allocation of funding notice, in 2022, for plant-based ingredients development. Recently, despite the economic situation and the precariousness of investment by the current Brazilian

federal government in innovation, science, and technology, the Globo Rural portal released a public notice for funding from MAPA and MCTI from the Brazilian federal government to researchers with ideas for solutions for plant-based meat ingredients (illustrated at the attachment 7) (Finep, 2022). These activities conducted by MAPA and the positive posture that was previously expected resulted from the strategic work of the GFI.

Without overestimating this work front, given the importance of GFI's work with food companies and startups, we need to clarify that GFI's work with MAPA, Embrapa, and associations such as Abbi, is of foremost importance for strengthening the novel assemblage establishment, as proposed by Marsden et al. (2018, p. 1305):

assemblages become potentially transformatory will partly depend upon the continued adjustments and actions of the dominant regulatory structures and the degree to which alternative assemblages can become more embedded and institutionalised without losing their inherent integrity and autonomy.

This work front is recognized as so functional that it was already being implemented by GFI, with successes and failures, in the U.S. and other countries, in Europe and Asia. Thus, the Institute counted on an instrumented know-how that has been applied in Brazil to ensure the greatest possible development of the plant-based sector (both meat and milk analogs). Partnerships with associations, such as ABBI, are also a strategy to connect with diverse actors and boost bio innovation.

The media sector is another work front of the GFI. The Institute works with the Brazilian media sector, both mainstream (e.g., Rede Globo, the most-watched television channel in the country) and segmented media (e.g., Globo Rural Magazine). Therefore, GFI has, since 2017, strategically modeled the image of plant-based meats to the diverse actors in the foodscape, including consumers but extrapolating them. The following video, an advertorial (Golan & Viatchaninova, 2014), is part of a broad institutional campaign produced and broadcasted on the main Brazilian television station, the widely mainstream campaign “Agro: the Brazilian wealth industry”, started in 2016 as “Agro is Everything”. This campaign is studied and recognized as cultural propaganda operating to favor the agribusiness image among Brazilians (Santos, Silva & Maciel, 2019; Stefanello & Medeiros, 2021).

In addition to the intense frequency of repetitions, the “plant-based meat is agro” advertorial brings a speech to engage several actors interested in Brazilian’s agriculture productivity, arousing interest and simultaneously deconstructing resistance, resulted from the direct work of GFI Brasil with Brazilian media (Bryant & Krelling, 2021).



Video 5. “Plant-based meat expands market for agricultural producers”

Note: "Plant-based meat expands market for agricultural producer", the 49-second video was massively broadcasted in the advertising breaks of the country's largest TV channel for 3 weeks in March 2021, with the advertising call "Carne Vegetal é Agro" (plant-based meat is agri).

The video is available at: youtu.be/R004V-5NCpo

Source: TV Globo, 2021, campaign “*Agro: a indústria riqueza do Brasil*” (agro, the Brazilian wealth industry, adapted by the author (English subtitles added).

Together with the industries, in addition to working with the startup Fazenda Futuro and with JBS, GFI worked together mediating technical knowledge for R&S Blumos, the ingredients company that now supplies HMMA protein ingredients in Brazil, as well as with Verdali – as presented at the fourth meeting. Another venture mediated by GFI, in partnership with Embrapa, was the development of Sotile, a startup now branded as Amazonika Mundi, which uses cashew fiber for meat texture, a waste by-product that was sometimes discarded in the cashew industry in Northeast Brazil, producing burgers and other vegetarian products – as explained at the seventh meeting.

As repeatedly presented along this study, GFI plays a central role in our ethnography and, as we conclude, in the initial Brazilian plant-based industrial assemblage, for its ability to

attach different actors. Without a central physical office in Brazil, but with a cohesive, tight, and proactive team, working on several fronts with the expertise to replicate what worked in the U.S. and much scientific knowledge to act, the strategic performance of the GFI after its arrival in Brazil, at the beginning of the year 2017, was a turning point for the start and establishment of the plant-based meats industry.

The Institute acted directly with startups projects and food companies through corporate engagement, not only arousing interest but, mainly, mediating the construction of TEA-fundamented implementable solutions – that accelerate the whole industry and market development (McNulty et al., 2020). The Institute intermediated the knowledge and technological flows between North American startups and the Brazilian startup Future Farm. It also works by boosting connections between suppliers, joining investors and startup projects, and providing frontier-scientific-based resolutions to technical barriers, in the machinery, process, and ingredients formulation for plant-based meat products.

In this way, the GFI makes it possible to accelerate the development of the plant-based meat industry globally, optimizing processes, reducing entry barriers, and improving economic profitability and competitiveness, while reducing duplicate efforts among companies in the plant-based industry. This strategic mediation was fundamental to the Brazilian plant-based meats rising, since knowledge transfer, technology flows and financial availability are recognized as intrinsically truncated and inefficient and scarce (Dellapiane & Wilkinson, 2018; Dellepiane & Wilkinson, 2019; Fairbairn et al., 2022; McNulty et al., 2020).

MFA-GFI- FAIRR nexus: A multi-level, multi front transformative work

Along the ethnography, we comprehended that GFI and MFA had a unique formation and also understood the essential role of FAIRR collaborating in the same transformative purpose, resulting in a global strategic performance in several dedicated work fronts, which would not be effective if conducted by a single institution, with a single purpose. GFI conducts an activity that integrates with business and the food market in a very different way from the front mobilized by the activist NGO that founded it. In Brazil, for example, SVB has tried to implement a broad program for business support to grow the implementation of vegan options; however, it does not seem to have had traction. By critically mobilizing consumers against food companies' practices, an organization or institute hampers its integration into the core of these companies.

While MFA, as well as other activist NGOs, works with consumers and at the base of the food companies' activities (e.g., in slaughterhouses, in trucks that transport animals, in

front of supermarket stores, etc.), GFI works together with managers and directors, politicians, policymakers and researchers to implement alternative protein solutions in a different level of work, mobilizing distinct market devices. One more level up, distant from consumption and factory activities and, less but also, from management strategies, FAIRR works directly with investors and the governance of major food companies, pushing through the ESG the adoption of plant-based solutions; thus generating interest and demand to the GFI's work and mediation.

A multilevel transformative dynamic has been implemented by GFI and FAIRR within the food market constituency, throughout their assertive movements at a global level, not only impacting but actually performing the Brazilian assemblage. This collaborative dynamic plays a central role in the phenomenon we study. The relationship between the MFA and GFI is not propagated, nor even alleged by any of the participants we followed, in any of the meetings. But, if we go back in time a little, we can comprehend that a strategic activism work to change the animal factory industry began with the MFA culminated in the structuring of GFI and GFI Brasil, influencing the formation of FAIRR and enabling the implementation of FAIRR propositions. Thus, the most prominent performative actor in the conjuncture of our scrutinized assemblage emerges from consumer activism. When we started the study, we claimed that consumers would not have agentic capacities to implement a perennial transformation in the food market, but at the end of the ethnography we came to the ultimate conclusion that it is from the activism of consumers, formatting an NGO for the protection of animals, that evolves into institutions that come to mediate transformative flows between companies in order to build the Brazilian assemblage of plant-based meats, extrapolating the direct demand directed to the food companies, but formatting the aforementioned non-profit institutions.

5.5 The Assemblage illustrated in a figure

From figure 4, that presents a scheme about the groups of actors to be investigated in a meso-level analysis to comprehend the nascent Brazilian plant-based meats industrial assemblage (2019-2022), presented at the end of chapter 4, we developed the following figure with the brands of each one of the actors accessed along the ethnography and we added traits for each of their assembling partnerships, including devices mobilizations, as we could map.

6 CONCLUSIONS

This study was conducted assuming the complex multi-level nature of the food market and food industry and their current ongoing dynamics. Therefore, the novel assemblage was mapped and followed for 42 months – but in an expanded form, between 2016 and 2022 years. We directly accessed 40 organizations and 52 professionals, along with 17 institutional meetings focused on the Brazilian plant-based meat novel market concerns. In addition, 94 foodscape observations, allowed us to capture the launch and marketing of 13 different novel plant-based meats product lines: Future Farm, Incrível (JBS, Seara, including Seara Gourmet), Plant-Plus Foods (ADM, Marfrig, including Revolution), NotCo, Verdali, Carnevale (R&S Blumos), The New (formerly The New Butchers), Superbom, Sadia Veg&Tal (BRF), Frimesa, Vida Veg, Urban Farmcy, Amazonika Mundi (formerly Sotile). We also accompanied four international plant-based meat brands: Beyond Meat, Impossible Foods, Ozo (a brand from the extinct Planterra venture from JBS), and Vivera (formerly an independent plant-based meats brand in Europe, currently owned by JBS).

The study revealed that the plant-based meat industry in Brazil was structured through a dynamic that surpassed innovation barriers within the food industry, supported by shareholder investors and venture capital, and facilitated by the strategic mediation of a third-sector Institute. This dynamic allowed Brazilian plant-based meat ventures to arise, overcome Brazilian food industry innovation barriers, and position themselves as showcases to investor publics. The research suggests that the plant-based meat industry's emergence in Brazil was driven more by investors and financial market demand than consumer and foodscape demand.

Therefore, it was possible to achieve our objective in this study describing the assemblage formation and the process underlying it. We could present the early formation and quick flourishing of a new industrial assemblage that positioned plant-based meats in the Brazilian foodscape and started to export. This assemblage was structured through a dynamic hitherto unheard in Brazil, surpassing innovation barriers instilled within the food industry, being supported by shareholder investors and venture capital and counting with the strategic mediation of a third-sector Institute to facilitate the flows, reducing entry barriers, engaging big animal-processor companies and startups, connecting them to the innovations developed in the U.S. during the 2010s.

We were also able to reveal an up-scale process in the financial market and companies' governance, mediated by actors and devices (FAIRR, Bradesco BBI, IBOPE, BBFAW, Bloomberg and Exame news-flow, etc.), linking animal factory with ESG risks, accelerating

the plant-based meat investments and positioning them as showcases to investor publics (as Marfrig and JBS performed). From that, understanding dynamics in the global financial market from 2019 to 2022, we demonstrate how the logic of food system financialization allowed Brazilian plant-based meat ventures to arise and overcome Brazilian food industry innovation barriers. We could reveal how this financialization logic and (primarily financial) market devices were determinants to the launch, flourishing, and ongoing establishment of the three most prominent representatives of the novel food category in Brazil: Future Farm, JBS, and Marfrig-ADM.

In addition, regarding a limitation, we were not able to stress how the financialization logic performed and market devices were operated in less prominent cases that are part of the assemblage, such as the (erratic) initial implementation of BRF plant-based meat line, Sadia Veg&Tal, importing European Vivera's products, and other ventures, such as R&S Blumos, Verdali, and even Not Co (the most valuable non-U.S. plant-based startup in the world). But we were able to reveal along the thick description of the three biggest plant-based meat enterprises in Brazil, complementing with GFI, FAIRR, Bradesco, GPA, MAPA, and several other actors and market devices mobilizations how the performative dynamics established the assemblage.

From the conduction of this ethnographic study, we conclude that Brazilian industrial plant-based meats assemblage flourishing in 2019, 2020, and 2021 years occurred due to the availability of financial resources from market actors eager for innovation and ESG solutions; in a low-interest rate scenario both in the U.S. and in Brazil. If the plant-based meat projects from Future Farm, JBS, and ADM-Marfrig had not been structured at that time, after 2021 and throughout 2022, with rising interest rates, they would not have flourished in the way we described, at least not as intense and accelerated as observed, remaining as not-implement projects for longer, and not performing the expansions in portfolio, production capacity and presence in food channels in a bold way (and surprising way, according to the words of diverse directors that we followed) as we could observe. Thus, we infer that the plant-based meats Brazilian industrial assemblage flourishing occurred driven by investors and financial market demand, more than consumers and foodscape demand.

The financialization logic and primarily financial market devices were determinants to the launch, flourishing, and ongoing establishment of the three most prominent representatives of the novel food category in Brazil: Future Farm, JBS, and Marfrig-ADM.

Thus, we state two propositions, P1: the emergence of the Brazilian plant-based food industry as a unique assemblage has the potential to transform the global food system, but in

order for plant-based meat innovations to be successful, they need to demonstrate their potential in meeting and reconcile the interests of actors involved in the food system and increase their profitability and/or position of power, operating within the current logic of financialization that guides the food system.

P2: Given the current economic context of high interest rates and reduced availability of resources for innovation (year of 2022), alternative modes of financing for plant-based meat enterprises and alternative protein actors, such as tokenization, could provide a solution to overcome barriers to innovation and ensure resources.

This suggests that future research should investigate the potential of tokenization as an alternative financing mechanism for startups in the plant-based food industry in Latin America and the implications of this for the global food system and sustainable innovations, in light of cryptoeconomics and decentralized modes of finance based on Bitcoin or Ethereum blockchain.

Side by the financial market demand, the facilitation of technology flows was a determinant factor in the assemblage constitution. We conclude that intra-industry and intra-sectoral collaboration was decisive in optimally implementing the plant-based meat industry in Brazil. We could capture that the immediately preceding ongoing in the U.S. plant-based meats market served as know-how for an optimized implementation of industrial, distributional, retail, food service, and political solutions, given the performance of actors who previously (or simultaneously) performed this same market in the U.S. (Burger King, GFI, FAIRR, Carrefour, JBS).

The Brazilian industrial plant-based meats assemblage was accelerated by the implementation of new organizational arrangements, that speed up and guarantee flexibility to processes, such as the joint venture between ADM and Marfrig to deliver the meats demanded by Burger King Brasil; the JBS USA implementation of a plant-based startup, Planterra; an unprecedented collaboration between JBS and a small plant-based startup, NoMoo, to expand the plant-based meats portfolio. Thus, we revealed how big food companies adopted a startup *modus operandi* to speed up their process and optimize them to produce and deliver plant-based meat products. Thus, to implement the novel food category, industrial actors extrapolated the traditional doings of the conventional Brazilian food industry, surpassing a series of obstacles and deficiencies toward a new way of producing meat.

On the other hand, even as an independent startup, Future Farm managed to insert itself into the well-established flows of the Brazilian food industry, counting on GFI, and GPA collaborations, and “hacking” the refrigerated Brazilian meat chain, quickly becoming

an exporter and strengthening its cash with dollars, allowing expanding productive capacity as it gains attention and raises investments from venture capital.

The ability to reconcile interests and join ambitions was also a crucial element in the industry emergence and market configuration. The GFI stance and the placement of persuasive strategies within the construction of the market narrative, industrial shared understanding, and ultimately guiding mobilization of practices and devices toward a mainstreaming of the novel category (instead of remaining as a niche solution).

A third proposition arises from the underlying work of GFI and FAIRR. P3: the flourishing of the Brazilian plant-based meat industry was a multilevel process that substantially relied on the strategic actuation of international institutions focused on alternative proteins development, capable of mobilizing devices and actors to shape the respective assemblage in the way it was implemented.

Among the limitations, we were not able to stress pricing contingencies related to ingredients supply chains and macroeconomics and complex subsidies instilled along animal-origin meat chains, thus affecting a deep understanding toward our secondary objective. Regarding our secondary objective, to verify the implementation of mainstreaming or nichification marketing and operations management, we conclude that the marketing devices have been positioned to allude to mainstreaming plant-based meats, especially from the observations made at food service and food retail.

However, a mainstreaming process of plant-based meat products demands a gain in competitiveness and a gain in scale, but these gains will not be established from an increase in demand on the part of consumers and from the foodscape, but rather with an increase in aggregate installed productive capacity that demands the structuring of productive chains of ingredient industries, including not only pulses but also the various additives for the manufacturing of these products, as well as the machinery required in the technological processes of extrusion (provided by Wenger, Marel).

Increasing consumer demand and increasing production of plant-based meats does not directly lead to an increase in profitability since it is being constrained by supply chains, as we inferred from the experiences of JBS, Marfrig, and R&S Blumos. We were not able to properly ethnograph and describe the efforts being implemented toward plant-based meat supply chain development (GFI, GPA, MAPA, JBS, ADM, ABBI, ABIA, IBRAFE, R&S Blumos). Therefore, it is necessary to offer these products competitiveness, guaranteeing them the same benefits that the state offers to their analogues of animal origin, not only in the industry that manually invoices the final product or in the establishment that sells it to the

consumer, but throughout the grains production chains and its industrial processing as ingredients supplying the plant-based meats manufacturers. In order to encourage it, at least by making it as viable as the animal chains.

OECD proposed that governments in Europe would promote pulses production chains; we noticed a similar need in Brazil, not only in the instance of producing the grains but of industrializing them through the processes destined to the production of ingredients for plant-based meats. But in this instance, we come up against the process of deindustrialization in Brazil, and we are constrained by the economic reality of 2022, both Brazilian and global.

As much as the food companies and startups manufacturing and branding plant-based meats, ingredients producers, intermediary industries, demand investments. In Marfrig's case, the ingredients as provided by ADM, that are expanding its operations and innovation efforts. ADM in a research Innovation Center in the state of São Paulo and in a factory in Mato Grosso do Sul are indicative of the increase in this production capacity, but more is needed, and we were able to capture that MAPA, as well as other Brazilian government institutions, are aware of this need.

However, the moment is not so favorable, and neither is the economic structure and conjuncture of Brazil. IBRAFE is working to develop a bean-based solution, partnering with R&S Blumos. We were able to verify demand, establishment of the search for naturalness in ingredients and technology in processes. More important than finding new technological processes or new ingredients is structuring a supply chain to guarantee industrial establishment. Discussing prices and supply chain structuring is a limitation. These points are essential when we glimpse that plant-based meats could lead to a global food productivity leap, implying in the deflation of food, above all, improving the finances of the poorest (given that food compromises up to 70% of the income of the poorest) and reduction of constraints leading to increasing human well-being around the world.

Future studies should investigate the impacts of this food category on consumers, especially those identified as vegetarians and vegans. Is there a possibility of weakening this consumer culture to the point of considering post-vegetarianism? By delivering food that proposes the same consumption experience, would the food industry be deconstructing these consumers' rejection of animal products? Regarding the new plant-based meat ventures and novel organizational configurations, future studies should investigate if: could startups take advantage of new forms of collective and decentralized financing based on crypto-economics, to somehow circumvent macroeconomic cycles and unfavorable circumstances in the financial market?

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ATTACHMENT 1 - Beyond Meat Stock Performance Compared to BTC and ETH Performances

Beyond Meat Inc

\$24.40 ↓ 62.39% -40.47 YTD

After Hours: **\$24.22** (↓ 0.74%) -0.18

Closed: Aug 31, 6:48:53 PM UTC-4 · USD · NASDAQ · Disclaimer

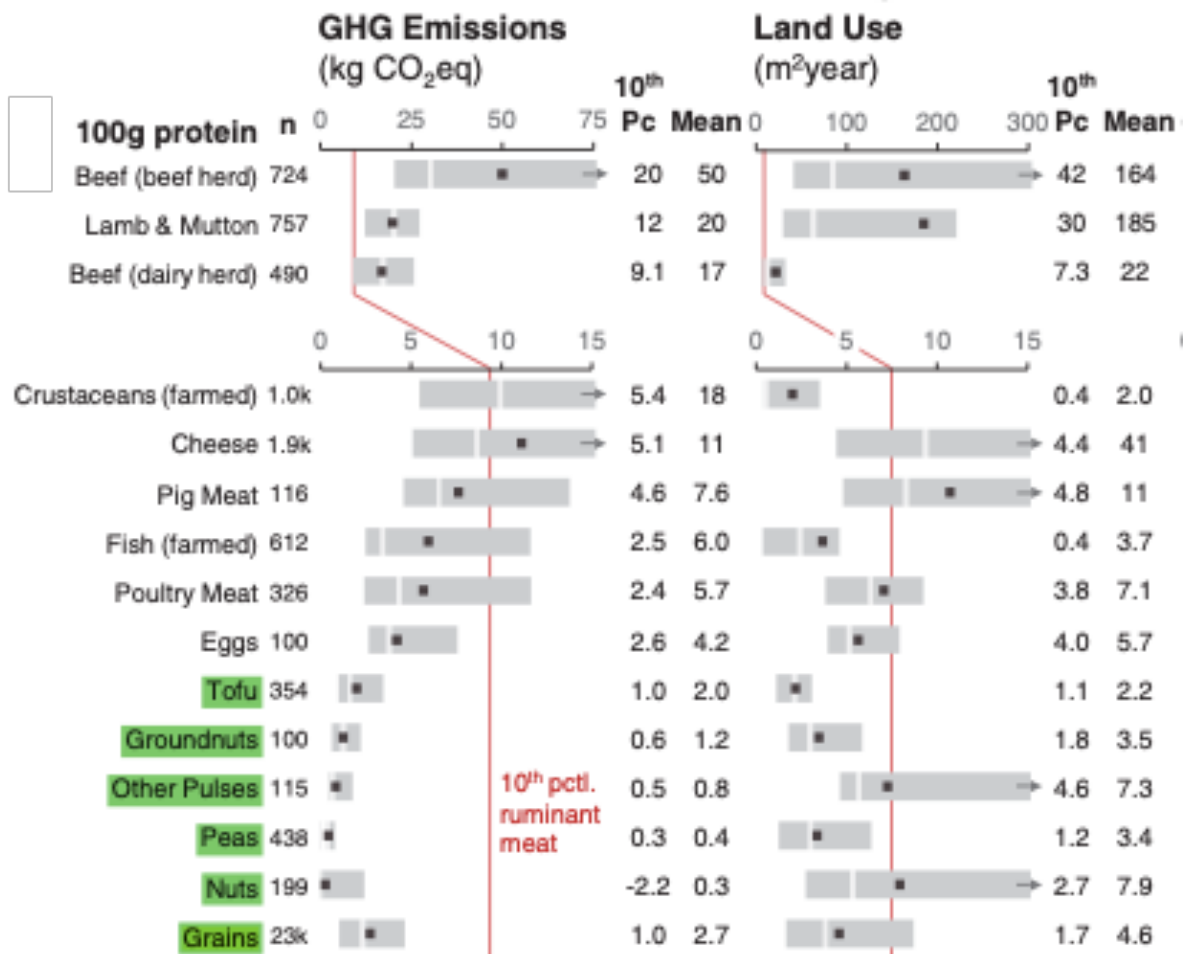
1D 5D 1M 6M YTD 1Y 5Y MAX



 Beyond Meat Inc	\$24.40	-\$40.47	↓ 62.39%	
 Bitcoin (BTC / USD)	19,990.30	-27,743.10	↓ 58.12%	×
 Ether (ETH / USD)	1,546.25	-2,221.29	↓ 58.96%	×

Note: According to Singer (2022): “Beyond Meat might represent one of the greatest falls from grace for the high-flying IPOs minted during the bull market of recent years, but it isn’t alone. Poshmark Inc. popped by 142% in its debut session and is now trading at one-quarter of its January 2021 IPO price. Snap Inc. surged by 44% on its first day in 2017, pushing the stock above its current levels five years later due to a new profit warning from the firm.” Both firms used to be compared to Beyond Meat are digital tech solutions: Pushmark is a social commerce marketplace joint consumers to trade secondhand fashion, home goods, and electronics, Snap Inc. is the Snapchat owner, the globally famous mobile camera application that allow users to send and receive videos and photos, with easy edits, filters, drawings, etc. **Source:** Google Finance, 2022.

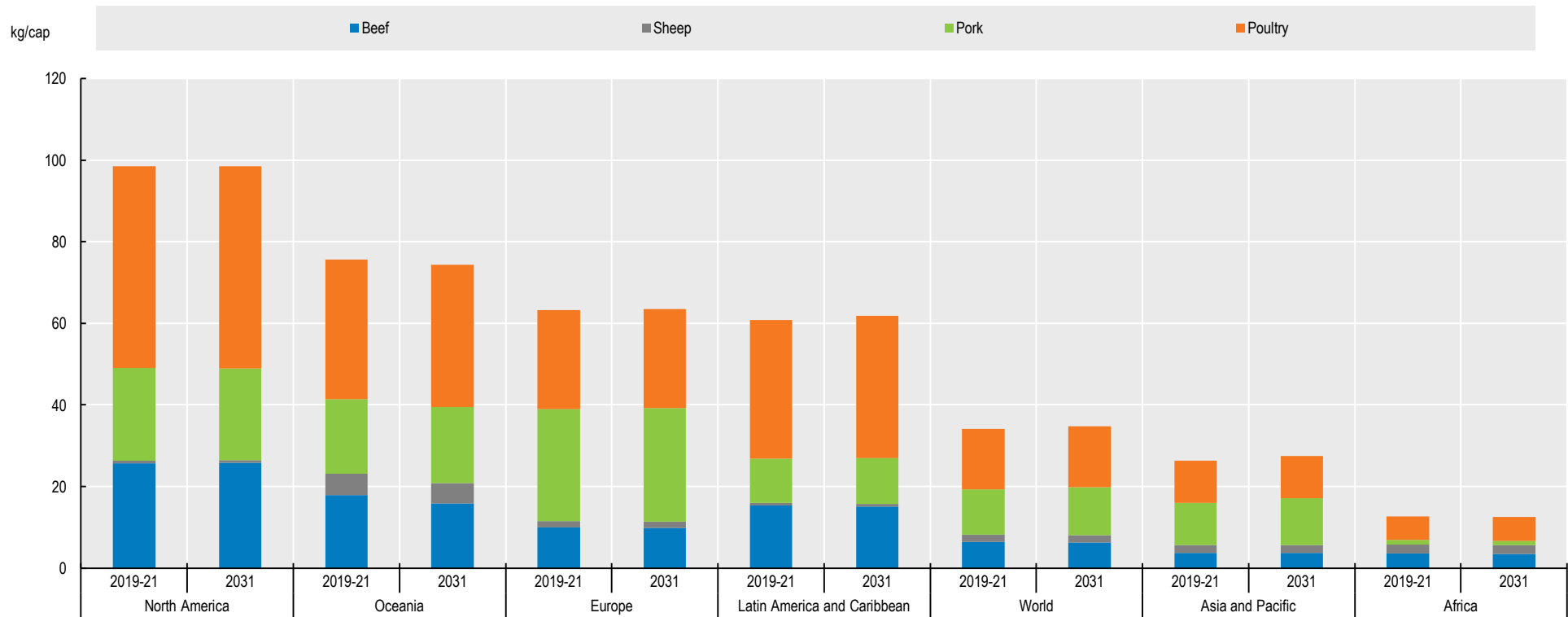
ATTACHMENT 2 - Estimated Global Variation in GHG Emissions and Land use in Protein-Rich Foods



Source: Adapted from Poore and Nemecek (2018).

cattle are consumed. (Willett et al., 2019, p. 451). **Note:** “Because intake of red meat is not essential and appears to be linearly related to total mortality and risks of other health outcomes in populations that have consumed it for many years, optimal intake might be 0 g/day, especially if replaced by plant sources of protein.” (Willett et al., 2019, p. 445) Poultry and fish has health benefits, but not above those identified by the consumption of plant-based proteins. Moreover, as the production systems of these animals also affect biodiversity, ecosystems and grain flows, moderation is recommended: “the optimum consumption of poultry is 0 g/day to about 58 g/day and have used a midpoint of 29 g/day for the reference diet (Willett et al., 2019, p. 445) and “28 g/day of fish can provide essential omega-3 fatty acids and is associated with reduced risk of cardiovascular disease [...] We also suggest a range of 0–100 g/day because high intakes are associated with excellent health. Plant sources of α -linolenic acid can provide an alternative to omega-3 fatty acids, but the quantity required is not clear.” (Willett et al., 2019, p. 457). “As an alternative to red meat, for the reference diet we use an intake of 50g/day of nuts, which can include peanuts and treenuts. These and other plant protein sources are generally exchangeable, although a mix is desirable nutritionally.” (Willett et al., 2019, p. 457) [...] Soybeans are associated with cancer risk reduction and beans in general are associated with lower risks of coronary heart disease. “Given these association, we included 50 g dry weight per day of beans, lentils, and peas, and 25 g/day of soybeans in the reference diet.” (Willett et al., 2019, p. 457). **Source:** Willett et al. (2019).

ATTACHMENT 4 - Meat Consumption per capita: Continued Rise of Poultry, Pigmeat and fall of Beef



Note: Per capita consumption is expressed in retail weight (OECD/FAO, 2022). **Note 2:** It is even in this sense, demonstrated by the graphic, that even with the importance of reducing consumption at a global level, the availability and consumption of meat for populations in Africa to optimize nutrition, especially for children, should be increased (Willett et al., 2019). **Source:** OECD/FAO (2022), “OECD-FAO Agricultural Outlook”, OECD Agriculture statistics (database), <http://dx.doi.org/10.1787/agr-outl-data-en>.

ATTACHMENT 5 - Superbom Vegetarian Chicken retailed at a Supermarket in São Paulo, 2018



Note: The Superbom food industry since the 20th century has been producing and selling vegetarian meat analogues products in Brazil. This product, which simulates pieces of chicken breast, contained ingredients derived from eggs and milk. The portfolio also included a hamburger that declared the flavor of beef and nuggets, breaded with whole grains. **Source:** Photographed by the author (2018). Master Supermercados, Shopping Frei Caneca, São Paulo City, June 16th 2018.

ATTACHMENT 6 - IBOPE Survey about Vegetarianism in Brazil, a Research Commissioned by SVB

**P.01D) Gostaria que você desse sua opinião para cada uma das frases abaixo que eu vou ler.
O quanto você concorda ou discorda: Sou vegetariano.**

	TOTAL	SEXO		IDADE					ESCOLARIDADE			
		MAS	FEM	16 A 24	25 A 34	35 A 44	45 A 54	55 E MAIS	ATE 4ª SÉRIE DO FUND.	5ª A 8ª SÉRIE DO FUND.	ENS. MÉDIO	SUPERIOR
BASE	2002	958	1044	356	423	420	356	447	450	430	783	339
Discorda totalmente	66%	65%	68%	74%	75%	64%	62%	58%	58%	63%	69%	75%
Discorda parcialmente	15%	16%	14%	12%	10%	15%	17%	18%	16%	14%	16%	12%
Não concorda nem discorda	5%	5%	5%	5%	4%	6%	4%	3%	4%	4%	5%	4%
Concorda parcialmente	6%	7%	6%	4%	5%	6%	7%	9%	9%	7%	6%	4%
Concorda totalmente	8%	9%	7%	5%	6%	8%	9%	11%	13%	11%	4%	5%

Note: The research, which reported that 8% of the Brazilian population, a contingent of 30 million people, were vegetarians, as repeatedly observed in the events we followed, had influence in the decision-making (or at least in the justification) of investments in plant-based meats, thus operating as a market device, initially mobilized by SVB and various media outlets (Exame, Folha de S. Paulo, Globo Rural), but mainly mobilized by AGN Consultoria, GFI Brasil to the point of serving as a justification according to JBS executives for investments in the plant-based industry and according to the technical director of ABIA. PUBLIC OPINION SURVEY ON VEGETARIANISM. Conducted in 2018, with 2002 interviews in 142 Brazilian municipalities. Survey estimates consumers that agree with the statement "I'm a vegetarian". Source: Ibope (2018). P.01D) The following sentences are presented for your opinion. How much do you agree or disagree: I am a vegetarian. Higher prevalence of complete agreement: lower education (up to 4th grade elementary school, 13% completely agree that they are vegetarian, compared to 5% with higher education), this inflated the data of 8% of Brazilians or 30 million people... more men than women, more in municipalities with up to 50,000 inhabitants, more among those earning up to 1 minimum wage, more in social classes D/E... being vegetarian is the same as eating fruits and vegetables... if I eat vegetables, I am a vegetarian. Logical reasoning by inclusion of foods, not by exclusion. The research clearly takes advantage of a shallow methodology and the misunderstanding of part of the population (or an alternative understanding) to inflate the numbers of consumers in the category in which SVB operates, so that the Society can use an authoritative instrument from Ibope to pressure other actors, especially companies, to implement pro-vegetarianism practices. This research was indeed important for the decision-making of companies. Thus, regardless of the instrument's plausibility, it is relevant in the assemblage, resulting from a strategic partnership between SVB and Ibope, being massively disseminated and exerting performativity, acting as a legitimate actant of the plant-based assemblage that emerged. The results can be visualized and scrutinized at: <https://www.svb.org.br/images/Documentos/JOB_0416_VEGETARIANISMO.pdf>.

ATTACHMENT 7 - Globo Rural Publicize MAPA's Funding Call For Brazilian Foodtechs Toweded Plant-Based Meat Ingredients Development



Note: The Globo Rural published edital refers to a MAPA's initiative, from the Brazilian federal government, which was mediated by GFI Brasil. **Source:** Instagram Globo Rural. August 29 2022. Print-screen capture by the author.

ATTACHMENT 8 - JBS Allocates Resources from Their Amazon Fund to GFI, to Funding Researches to Ingredients and Protein Sources Derived the Amazon Biome



Source: Instagram The Good Food Institute Brasil. September 1st 2022. Print-screen capture by the author.

**ATTACHMENT 9 - Video Advertisement for Impossible Whopper by Burger King
launch in U.S., in 2018, the most Classic BK's Sandwich with Plant-Based Burger
Produced by Impossible Foods startup**



Note: The video is available at: youtu.be/3aTtf2A_LI

Source: Burger King, 2018. Produced by David Madri Advertising Agency.

**ATTACHMENT 10 - Plant-Based Whopper by Burger King, a World-Wide Campaign
“Confusing Times” in 2021, a Cannes Awarded Advertisement**



https://www.youtube.com/watch?v=kCMsm019sro&t=9s&ab_channel=EIPublicista

Note 1: Both the Rebel and the Impossible Whoppers were rebranded as Vegetal and Plant-based respectively. A similar renaming occurred at Bob's, in which the the “Tentador Zero Beef” came to be called “Tentador Veggie Carne” from 2021. **Note 2:** The same vídeo was adapted and broadcasted in several countries beyond Brasil, such as U.S., Germany, Chile (were the NotCo startup provide the meat), Costa Rica and Portugal.

Source: Burger King, 2021, Produced by David Madri Advertising Agency, exhibited in Brasil in Instagram Burger King and TV.