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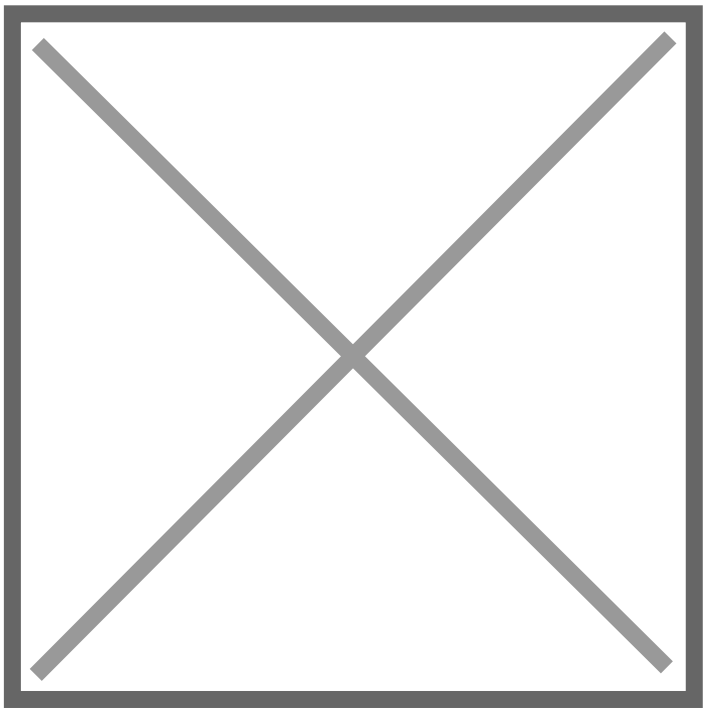
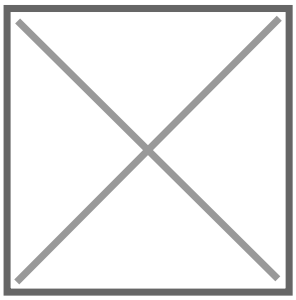
From feed grain to functional food: Brazil turns sorghum into gut-boosting health drink

03 November 2025 | News

In an exclusive conversation with AgroSpectrum, Professor Hercia Stampini Duarte Martino and her research team at the Federal University of ViÃ§osa (UFV) detailed their pioneering work on sorghum-based synbiotic beverages developed in collaboration with Embrapa and the University of Wisconsinâ??Madison. The innovation combines whole-grain sorghum with Lacticaseibacillus paracasei to deliver metabolic benefits linked to obesity reduction, improved lipid profiles, and enhanced gut microbiota balance.



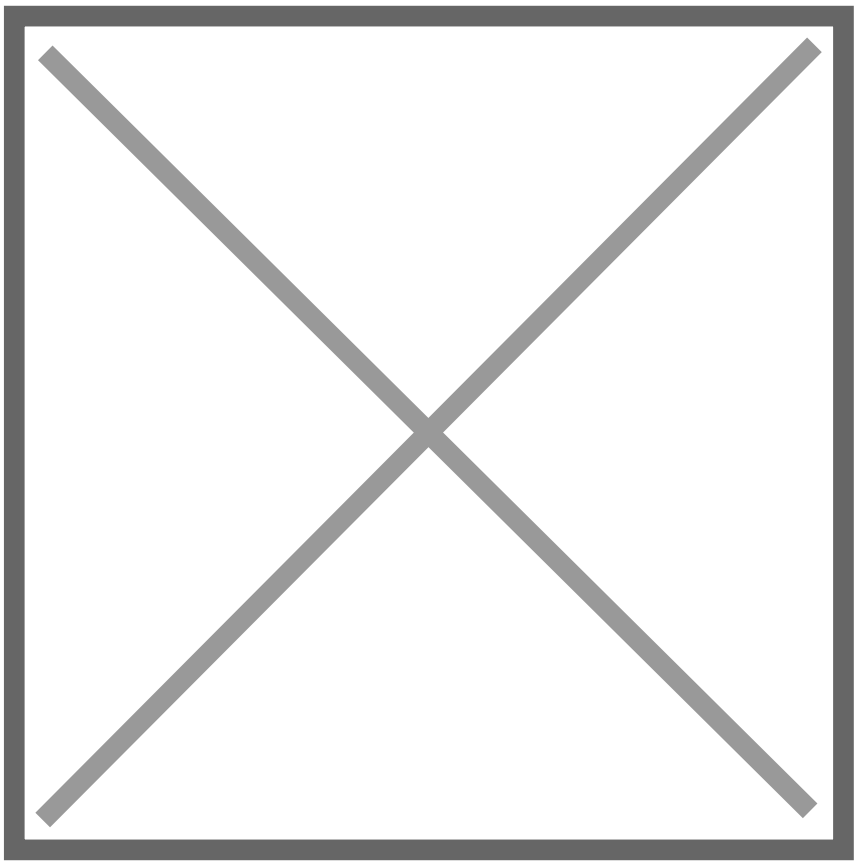


In an exclusive conversation with AgroSpectrum, Professor Hercia Stampini Duarte Martino and her research team at the Federal University of ViÃ§osa (UFV) detailed their pioneering work on sorghum-based synbiotic beverages developed in collaboration with Embrapa and the University of Wisconsinâ??Madison. The innovation combines whole-grain sorghum with Lacticaseibacillus paracasei to deliver metabolic benefits linked to obesity reduction, improved lipid profiles, and enhanced gut microbiota balance.

The researchers emphasized strong translational potential for Brazil, noting the productâ??s alignment with public-health priorities and suitability for vegan and lactose-intolerant consumers. They highlighted commercialization opportunities within the fast-growing global plant-based market, while underscoring the need for broader consumer education and regulatory validation. Looking ahead, the team is advancing larger clinical studies, new probiotic strains, and metagenomic analyses to scale functional sorghum innovation from lab to marketplace.

Innovation & Rationale

Your team developed extruded whole-grain sorghum beverages with and without Lacticaseibacillus paracasei. What motivated Embrapa to explore non-dairy, plant-based synbiotic products, and how do they address current public health challenges related to obesity and metabolic health in Brazil ?

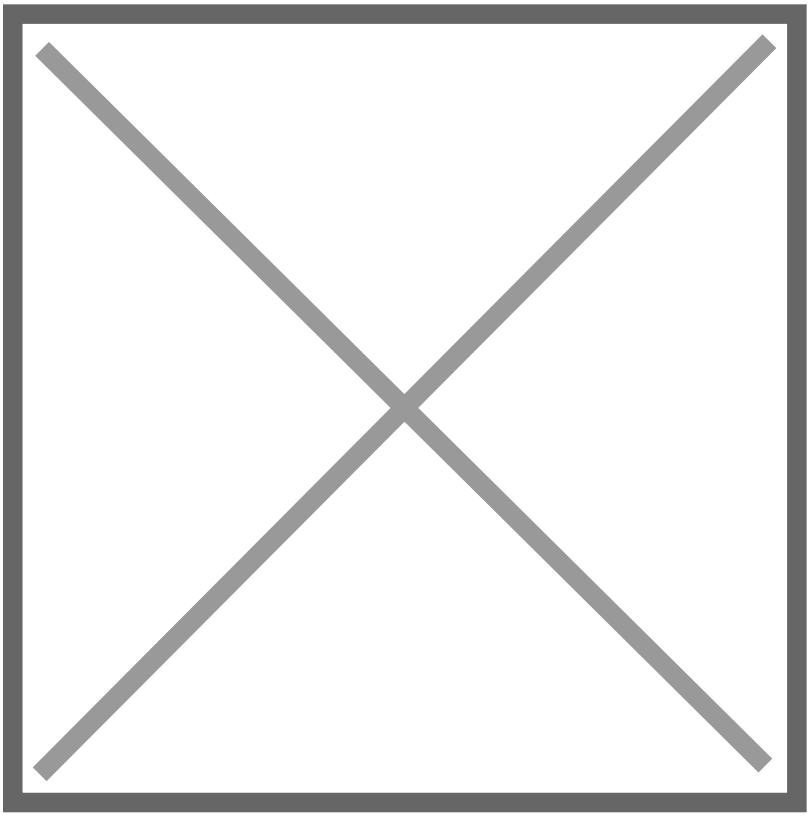


The motivation was to addressÂ two strategic demands: first, toÂ expand food alternativesÂ for vegan and lactose-intolerant consumers seeking functional plant-based options; and second, to develop solutions utilizingÂ Brazilian-adapted cropsÂ like

sorghum, with relevant nutritional potential. The whole-grain sorghum provides dietary fibers, resistant starch, and phenolic compounds that modulate gut microbiota and aid in glycemic control. By combining it with the probioticÂ*Lacticaseibacillus paracasei*, we created a synbiotic product with a combined effect onÂ satiety, insulin sensitivity, and low-grade inflammation. This innovation is aligned with obesity management policies, offering an accessible, sustainable, and culturally appropriate dietary intervention for the Brazilian population.

Nutritional & Functional Insights

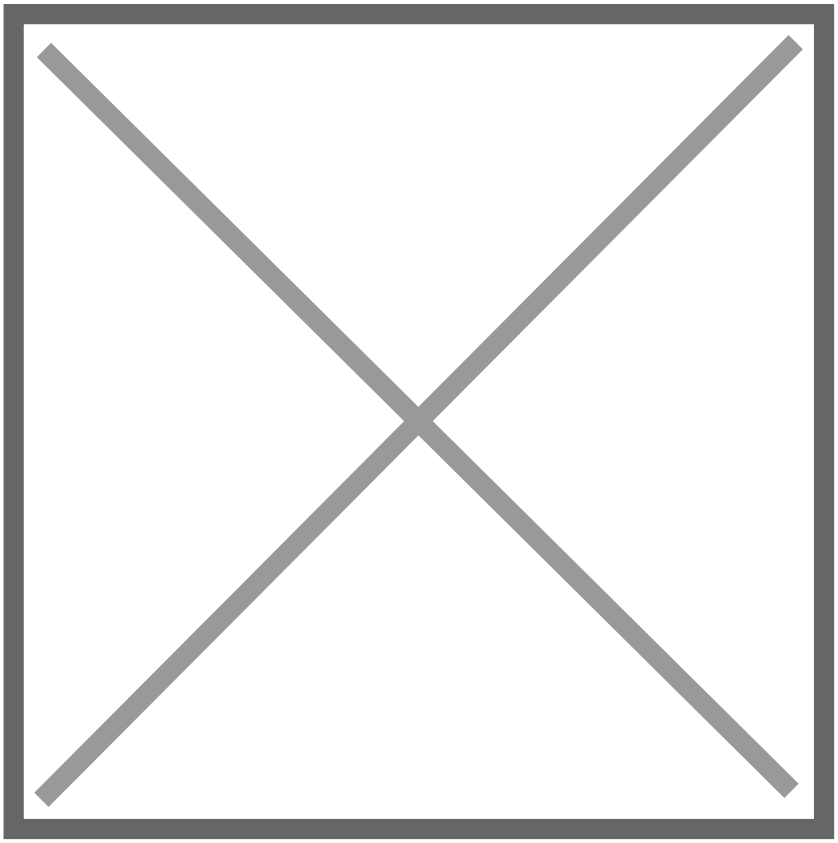
The study highlights high levels of resistant starch, phenolic compounds, and antioxidants in the BRS 305 sorghum beverage. How do these bioactive compounds mechanistically contribute to improvements in visceral fat, lipid profiles, and overall cardiovascular risk markers, such as Castelli index I ?



These components act via complementary mechanisms.Â Resistant StarchÂ reaches the colon, where it is fermented intoÂ Short-Chain Fatty Acids (SCFAs)Â like butyrate and propionate. These metabolites improve insulin sensitivity, stimulate satiety hormones, reduce inflammation, andÂ decrease visceral fat accumulation.Â Phenolic compounds and antioxidantsÂ protect against oxidative stress and the oxidation of LDL-cholesterol, a key factor in atherogenesis. This combination of actions favors the reduction of total cholesterol and LDL-c and can contribute to increased HDL functionality, resulting in a better total cholesterol/HDL-cholesterol ratio (Castelli Index I), a direct indicator of lower cardiovascular risk.

Probiotic Synergy

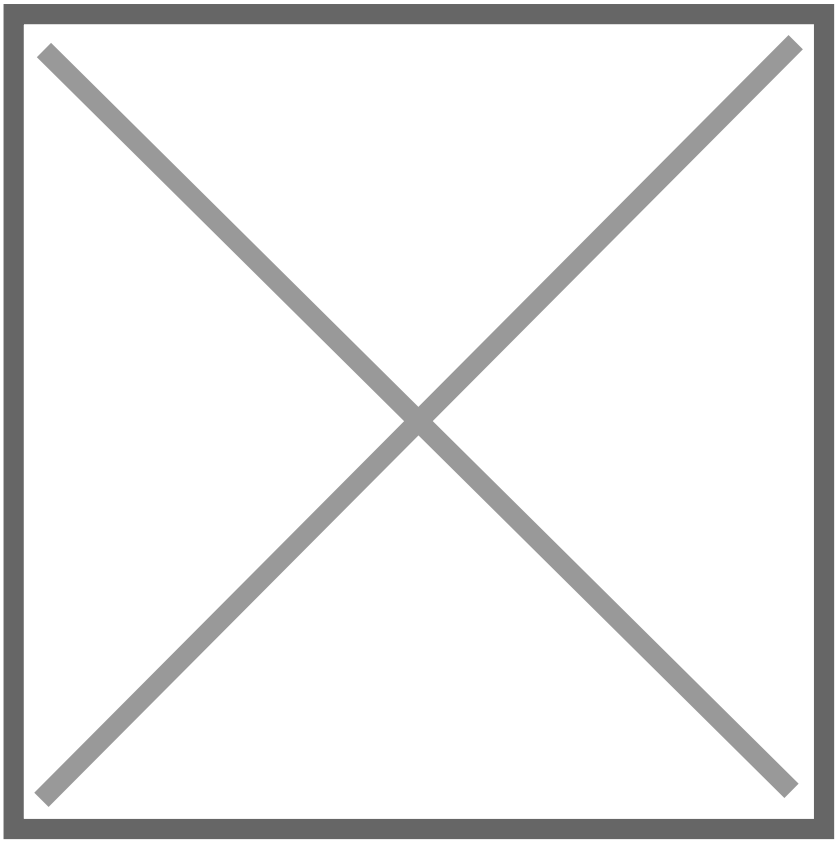
Could you elaborate on the interplay between the probiotic and the sorghum matrix, particularly how sorghum nutrients enhance probiotic viability and short-chain fatty acid production?



Sorghum provides dietary fibers, resistant starch, and micronutrients that function asÂ prebiotic substratesÂ forÂ *Lacticaseibacillus paracasei*Â and the resident microbiota. This nutritional environment favors the viability ofÂ probiotic during storage and passage through the gastrointestinal tract. The fermentation of these fibersÂ intensifies the production of SCFAs, which potentiate the beneficial intestinal and metabolic effects. The result is a true synbiotic relationship: the sorghum protects and feeds the probiotic, and the probiotic maximizes the beneficial conversion of fermentable compounds naturally presents in the grain matrix.

Clinical & Public Health Implications

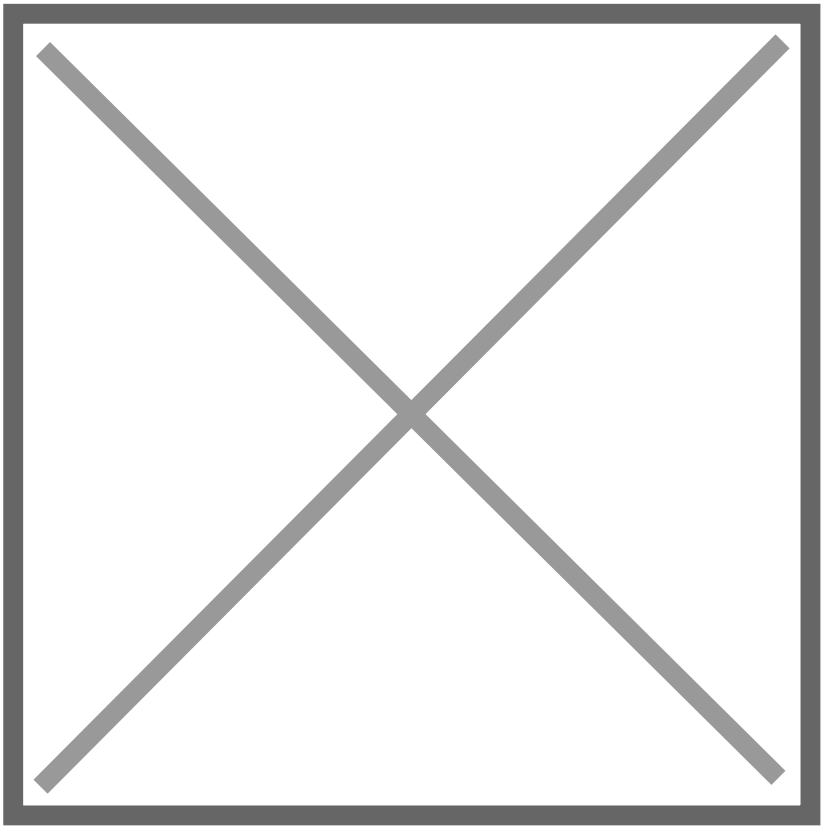
Given that this was a pilot study with 30 overweight and obese adults, how do you envision scaling these findings to broader populations? What role could sorghum-based synbiotic beverages play in national dietary guidelines or obesity prevention programs?



The pilot study demonstrated safety and positive outcomes in overweight and obese individuals, although the sample size was limited. We are currently analyzing data from a subsequent study conducted with a larger number of individuals with overweight and obesity in order to validate the pilot findings. The next steps will likely involve larger, multicenter clinical trials that include more diverse population groups and long-term follow-up with robust clinical and metabolic endpoints. If the benefits are confirmed, sorghum-based synbiotic beverages could be incorporated into national healthy eating guidelines and implemented in schools, primary healthcare settings within the Brazilian Unified Health System (SUS), and obesity prevention initiatives, given that this technology is accessible, affordable, and readily scalable throughout Brazil.

Market & Consumer Adoption

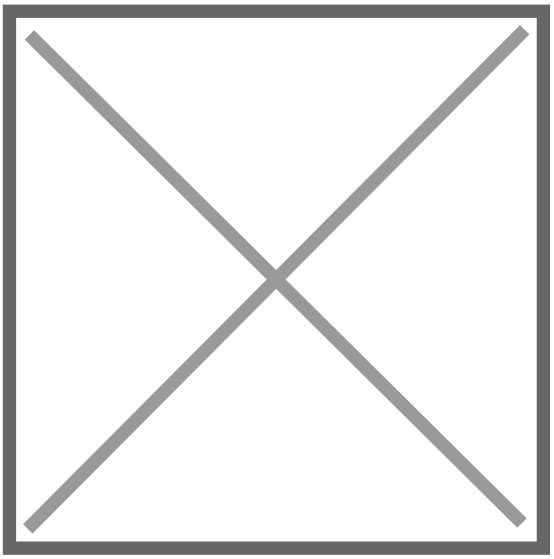
Plant-based, non-dairy probiotics are gaining traction globally. From Embrapaâ??s perspective, what are the key opportunities and challenges for commercializing these sorghum beverages in Brazil and internationally, especially for vegan and lactose-intolerant populations?



OpportunitiesÂ are clear: the continuous growth of theÂ plant-based market, driven by vegans, lactose-intolerant individuals, and health-conscious consumers. Sorghum adds nutritional value and sustainability.Â ChallengesÂ include ensuring sensory acceptance (taste/texture), achieving probiotic stability in non-dairy matrices, navigating functional claim regulations, and needing educational campaigns, as sorghum is still unfamiliar to many Brazilian consumers. Robust scientific proof and sustainability certifications can facilitate access to the international functional food market.

Future Research & Technological Horizons

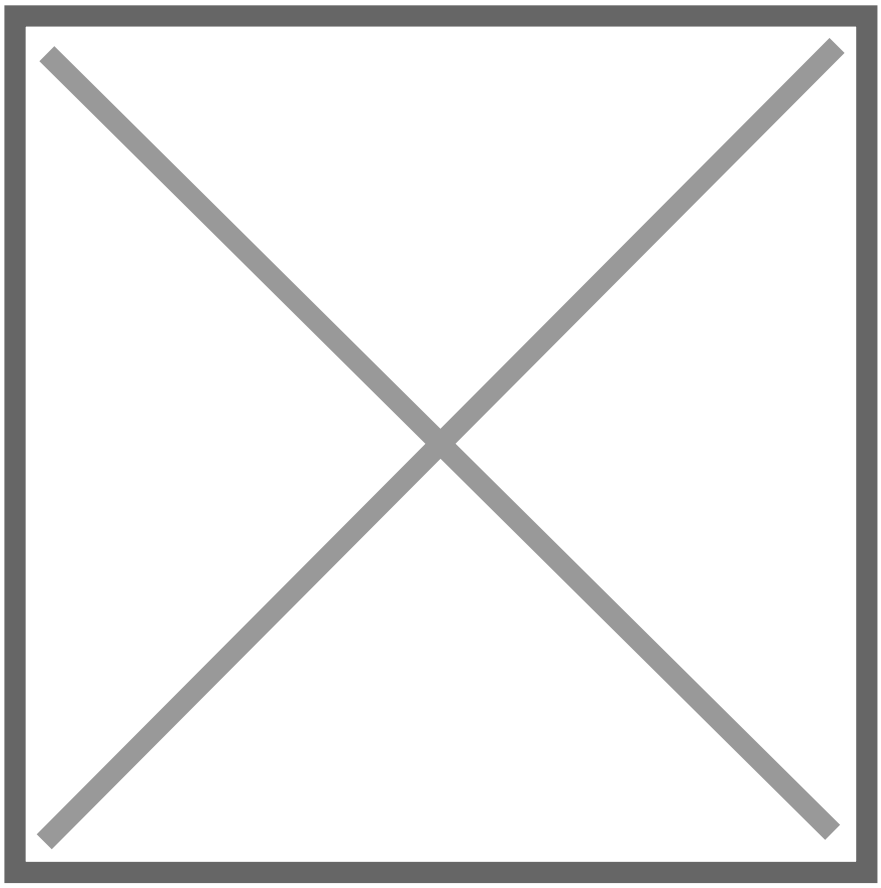
Looking ahead, what are the next steps for Embrapa in optimizing sorghum-based functional foods? Are there plans to explore longer-term interventions, other probiotic strains, or potential impacts on gut microbiota diversity and metabolic health outcomes?



Research will advance on several fronts:Â longer and multi-center clinical studiesÂ to assess sustained effects on weight control, lipids, and insulin. We will also exploreÂ new probiotic strainsÂ and technologies like microencapsulation to maximize bioactive compounds and probiotic viability. The metagenomic and metabolomic analysesÂ will deepen the understanding of how the beverage modulates theÂ gut microbiota diversity and function, including the role of theÂ mycobiota, and its direct relation to the observed metabolic effects.

Sustainability & Crop Valorization

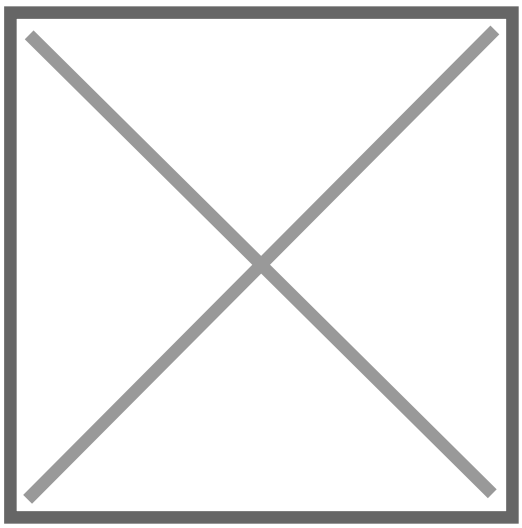
Sorghum is underutilized in Brazil for human consumption. How does this research contribute to crop valorization, climate-resilient agriculture, and the development of functional foods that are both nutritionally and environmentally sustainable?



By developing a high-value product for human consumption, we areÂ valorizing sorghumÂ and creating a new market beyond animal feed, which is crucial forÂ national food security. Sorghum is aÂ drought-resistantÂ and water-efficient crop, strengthening agricultural systems resilient to climate change. The use of whole-grain maximizes the uptake of dietary fibers and micronutrients whileÂ reducing the environmental footprintÂ compared to animal-based inputs. This approach aligns with United Nations Sustainable Development Goals (SDGs): SDG 2 â?? Zero Hunger, SDG 3 â?? Good Health and Well-being, SDG 8 â?? Decent Work and Economic Growth, SDG 12 â?? Responsible Consumption and Production, SDG 13 â?? Climate Action and SDG 15 â?? Life on Land; linking environmental sustainability, public health, and economic development.

Translational Potential

Beyond clinical markers, do you see potential for these beverages in sports nutrition, elderly care, or other specialized dietary applications? How might Embrapa collaborate with the private sector to accelerate innovation in plant-based functional foods?



The product has potential inÂ sports nutrition, offering gradual-release energy and recovery support via SCFAs, as well as inÂ elderly care, aiding intestinal health and reducing chronic inflammation. It is also applicable in specific clinical diets requiring prebiotics and probiotics. To accelerate innovation in plant-based functional foods, Embrapa seeks private sector partnerships for technology licensing, industrial scale-up, functional certification, and sensory acceptance studies. Collaboration through Research and Development (R&D) consortia and technology transfer agreements is essential to ensure that scientific advances are effectively translated into accessible, commercially viable consumer products.

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