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Fringe heroines: situated struggles of women scientists in Brazilian agriculture

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ABSTRACT

Feminist scholarship regards the Western scientific revolution and twentieth-century agricultural modernization as patriarchal endeavors and technoscientific regimes as entangled in societal interests and politics. In this article, I engage with these perspectives by focusing on women scientists working in Brazil's leading agricultural sciences organization, Embrapa. My analysis draws on life history interviews with three women, juxtaposing their personal and career trajectories with the history of the organization, which is a symbol of the triumph of science over nature. Besides filling the gaps in a male-dominated history, these women's accounts reveal what I argue to be feminist struggles for more equitable and pluralistic agricultural sciences and practices. I refer to them as "fringe heroines" as they adopt research agendas that are at odds with the prevailing technoscientific paradigm and often find themselves subject to condescending attitudes and discrimination. These fringe heroines experienced a short-lived moment in the limelight during a period of progressive politics in Brazil. However, confronted by a less favorable context during the Bolsonaro era, they have taken a step back but have maintained their resolve to swim against the tide in their unyielding quest for justice and diversity with respect to agricultural knowledge production. The time is ripe for reflecting on the place of their situated struggles and knowledges in the past, present, and future of Brazilian agricultural sciences.

KEYWORDS Women scientists; feminist technoscience; ecofeminism; green revolution; Brazil

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Introduction

Feminist scholarship regards the Western scientific revolution and twentieth-century agricultural modernization as patriarchal endeavors (Merchant 1982; Shiva 1989) and technoscientific regimes as entangled in societal interests

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and politics (Åsberg and Lykke 2010). This article engages with these perspectives by focusing on Brazil and exploring the experiences of women scientists working inside the Brazilian Agricultural Research Corporation (Embrapa), a state-funded organization and the country's leading actor for agricultural sciences. The analysis emphasizes how these women's direct and indirect experiences with discrimination help to shape a feminist epistemology centered on practice and marginalized ways of knowing. This epistemology challenges and resists the top-down logic of scientific production that has prevailed since the dawn of Brazil's agricultural modernization.

The 1970s are usually seen as the turning point for Brazilian agriculture and the start of a science-driven modernization project (Alves, Contini, and Gasques 2008). According to some interpretations, modern agronomic science triumphed during this period in making soybeans successful in the low latitudes of the Cerrado (Brazil's savanna-like biome), eventually turning Brazil into a global agricultural power (Cremaq 2010; Pereira et al. 2012). Narratives about epic feats in the Cerrado echo other countries' narratives about green revolutions, with unprecedented gains in yields that presumably helped to avert famines (Cabral, Pandey, and Xu 2021). Such celebratory narratives single out the role of devoted male scientists, some of whom have been elevated to the status of "father" in a green revolution. Norman Borlaug (the global "father of the green revolution"), M. S. Swaminathan (the "father of the Indian wheat revolution"), and Yuan Longping (the "father of hybrid rice" in China) have achieved such status (Kesavan 2017; Schmalzer 2016; Sumberg, Keeney, and Dempsey 2012). If we look more closely at the agricultural histories of individual countries, other heroes come to the fore. These are overwhelmingly male scientists, with only occasional references to women (Cabral, Pandey, and Xu 2021).

The absence of women in the history of modern agricultural sciences is perhaps unsurprising given that, until recently, female enrollment in this field of study was relatively low (Goh et al. 2008). While this situation has changed, female role models in agricultural sciences remain scarce. I am cognizant of this gap and therefore deliberately frame this article in a way that emphasizes the role played by women. I do not seek to glorify female individuals but to provide an account of the experiences of three unnamed women navigating a technoscientific regime in which they are at a disadvantage. I ask: how do these women's personal lives and professional experiences shape their scientific attitude and practice?

Besides rendering female scientists more visible, the stories are significant because they reveal these women's experiences of striving for more equitable and pluralistic agricultural sciences and practices. These "fringe heroines" unassumingly adopt research agendas that are driven by a need for justice and plurality in agricultural sciences. They do this while experiencing condescending attitudes and sometimes direct discrimination. It is worth

emphasizing, however, that theirs is not only a quest for opportunities for women in science (or at least not primarily); it is also a quest for justice for social groups that have been marginalized and disadvantaged by agricultural sciences. While these women do not explicitly present themselves as feminists, their working practice and confrontation of the prevailing patriarchal regime within Embrapa is in line with feminist thinking and specifically the strand of feminist technoscience studies that emphasizes "situated knowledges" and rejects the separation between science and social practice. I argue that theirs are feminist struggles in that these women depart from their own experiences of subjugation to seek more inclusive knowledge production and interconnection with other dominated subjects (Warren 2000). It is worth clarifying, however, that I do not claim that these women's attitudes align with feminist thinking simply because they are women. Instead, I argue that their feminist stance is derived from experiences with discrimination and marginalization that are not exclusively gender based.

My analysis draws on in-depth interviews with three women working in Brazil's renowned agricultural research organization, Embrapa. These interviews were conducted in Brazil in 2019 as part of a collaborative research project exploring the histories of the green revolution in countries of the Global South.[1] The three interviews focused on the life histories of the interviewees; they sought to generate an in-depth perspective on their professional careers while exploring how those careers were shaped by personal experiences and the broader context of agricultural sciences, Embrapa, and Brazilian agriculture. Life histories are a fitting method for this as they help to generate evidence on "how one person experiences and understands life, his or her own especially, over time. [Life histories enable] us to see and identify threads and links that connect one part of a person's life to another, that connect childhood to adulthood" (Atkinson 2002, 126). The method is particularly suitable for understanding female experiences in a field where they are under-represented. David Lewis (2008, 562) explains how the method can be useful for challenging "received wisdoms by generating nuanced accounts that subvert established knowledge."

For this article, I combined the life history material with insights about the history of Embrapa and Brazil's agricultural modernization that provide the backdrop for the three women's experiences. These insights were generated by the same research project and have been published elsewhere (Cabral 2021; Cabral, Pandey, and Xu 2021).

The article is structured as follows. In the next section, I briefly outline feminist perspectives that are relevant to a critique of modern agricultural sciences in general before describing the specific context of agricultural science in Brazil. After introducing the three women scientists, I develop my analysis of their life histories in two steps. First, I explore the formation of their ecological and social conscience. I then examine how they came to

confront power and champion justice and diversity in their field. I conclude by highlighting that these women's feminist epistemologies and practices can point the way toward more plural and inclusive agricultural sciences in Brazil. However, to embrace its fringes, Embrapa has to let go of its patriarchal past, something that is contingent on the social and political context in Brazil more broadly.

Subordinate standpoints, situated knowledges, and subaltern agency: insights from feminist scholarship and activism

Considering that the uneven opportunities for women in science have been an issue for many years, it is surprising that gender pay gaps and discrimination have yet to be addressed in any significant way (Blau 2013; Monosson 2008). Biographical research on women's experiences in science documents the obstacles and power relations still faced by women in a sphere that is overwhelmingly controlled by men (Hargittai 2015). However, the feminist critique of gendered science has gone beyond calls for women's inclusion, rights, equality of pay, and working conditions; it has questioned whether science has established an understanding of the world and of knowledge production that upholds and further entrenches patriarchy. Karen Warren (2000, 64, emphasis in original) defines patriarchy as

> the systematic domination of women by men through *institutions* (including policies, practices, offices, positions, roles), *behaviors*, and *ways of thinking* (conceptual frameworks), which assign higher value, privilege, and power to men (or to what historically is male-gender identified) than to that given to women (or to what historically is female-gender identified).

Ecofeminist perspectives have connected the domination of women through science to the domination of nature (Mies and Shiva 2014). Carolyn Merchant (1982) argues that the establishment of modern science by "founding fathers" such as Francis Bacon and René Descartes caused a shift toward seeing the Earth as a machine that could be controlled through a male-based scientific rationality. Ecofeminism has not only interrogated the patriarchal foundations of modern science but also explored its material relations with colonialism and capitalism, denouncing its logic of domination and its detrimental legacy.

Postcolonial perspectives from the Global South have given voice to ideas that rural and Indigenous women are the best guardians of nature due to their close proximity with it, in part deriving from gendered divisions of labor (Maathai 2019; Shiva 1989). In the field of agriculture specifically, Vandana Shiva (1991) exposes the logic of domination of modern agricultural science as realized in the Indian green revolution experiment. Her analysis of the impact of agricultural modernization on nature highlights that "[l]oss of

diversity is the price paid in the patriarchal model of progress which pushes inexorably towards monoculture, uniformity and homogeneity" (Shiva 2014, 164).

Ecofeminism has also pushed boundaries in the direction of plurality and subjectivity in the sciences. Cynthia Garrity-Bond (2018, 185) examines the feminist epistemologies based on Shiva and Brazilian theologian Ivone Gebara and argues that these foreground "diversity and difference as a solution to society's current ecological crises." Maria Mies (2014, 320) argues that a "subsistence perspective" calls for a new paradigm of science, technology, and knowledge that overcomes "the prevailing instrumentalist, reductionist science and technology – based on dualistic dichotomies which have constituted and maintain man's domination over nature, women and other people."

Authors such as Shiva (1991) and Andree Collard (1989) argue that women's experiences of oppression and disadvantage put them in a unique position to develop a more nuanced sense of reality, including understanding violence against nature. However, this view has been challenged for offering an essentialized female perspective (Gaard 2011; Grant 1987; Leach 2007). Sandra Harding's (1991) emphasis on the standpoint of the subordinate adds a distinctive take on the issue of women's experiences of oppression by putting the emphasis on positions of disadvantage rather than on female identity.

Feminist technoscience studies, or feminist science and technologies studies, have engaged specifically with "rethinking the hierarchies of knowledge production and patriarchal power structures" (Stine, Skewes, and Schwennesen 2018, 3). Building on Donna Haraway's (1988) concept of "situated and embodied knowledges"[2] and Harding's standpoint of the subordinate, feminist technoscience posits that knowledge production is never neutral but is always entangled with political positions, societal interests, and power dynamics (Åsberg and Lykke 2010). Feminist technoscience interrogates the gendered power relations that shape (and are shaped by) knowledge production and that produce social and environmental injustices, and it frames gender and basic categories such as "men," "women," and "nature" as socially constructed and politically charged, departing considerably from ecofeminist views of women and their connection to nature (Leach 2007; Stine, Skewes, and Schwennesen 2018). However, as argued by Haraway (1988, 593), ecofeminists' emphasis on women and nature as active subjects with agency rather than as "resources to be mapped and appropriated" remains a crucial contribution to feminist scholarship.

Feminist engagements with social movements for food justice provide an example of how the views of disempowered women can be championed, even where the struggles of those women are not framed as feminist (Conway 2018). A feminist food agenda has emerged without antagonizing

non-feminist factions within the broader food movement; instead, the feminist commitment to empowering disadvantaged women has meant engaging with other non-feminist struggles, including those for the inclusion of peasant women in gendered modes of production.

This dialogic stance is discussed by Janet Conway (2018) in relation to how the World March of Women, a feminist movement, has interacted with La Vía Campesina, a transnational peasant movement for food sovereignty (van der Ploeg 2014). Conway illustrates how the March has sought to build a global feminist identity through open-ended dialogue grounded in collective action among women who are marginalized due to different aspects of their social identity. Conway's analysis draws attention to the March's efforts to empower the "subaltern agency" of the primary subjects of a feminist politics of food sovereignty, which include rural, peasant, and Indigenous women. Feminist agroecology has also been a space for the convergence of multiple identities united by common experiences of disadvantage and a felt need for collectivizing the struggle to resist and oppose dominant forces (Hillenkamp 2020; Siliprandi 2015).

To sum up, feminist perspectives, particularly ecofeminism, have not only drawn attention to the obstacles and discrimination facing women in science but also questioned the foundations of science as patriarchal and oppressive toward women and nature. Feminist science and technologies studies have, in addition, drawn attention to the hierarchies of knowledge associated with patriarchal logics of domination and brought to the fore situated knowledges and subordinate standpoints. In the domain of food activism, feminist stances have promoted subaltern agency and marginal ways of knowing.

Before introducing the three women scientists – our fringe heroines – I describe the organization in which they work, including its origins narrative and prevailing technoscientific paradigm.

Embrapa and its prevailing technoscientific paradigm

The origins of Brazil's modern agricultural sciences are usually traced back to the 1970s and linked to the creation of Embrapa by the then-military regime, which ruled from 1964 to 1985 (Alves, Contini, and Gasques 2008). The founding of Embrapa in 1973 was part of a wider state project of agricultural modernization to address food shortages, increase productivity, and strengthen connections between agriculture and industry (Mengel 2015). Embrapa was established based on an extensive network of research institutes and experimentation stations that were already in place across Brazil, some of them with roots dating back to the nineteenth century. However, the modernization project of the military government necessitated a different approach, one that directed science toward the goal of establishing a competitive agribusiness sector (Wilkinson and Sorj 1992).

With United States (US) agriculture as its model, Embrapa reorganized existing research structures into product-focused research centers and created a postgraduate training program to mold young recruits according to the needs and development vision of the organization. During Embrapa's early years, recruitment was conducted by headhunting at top Brazilian agronomy universities. Many of the newly recruited scientists (predominantly men) were sent abroad for training, mainly to a handful of US universities that included the Universities of California Davis, Florida, Mississippi, Purdue, and Wisconsin (Mengel 2015). This postgraduate training program continued into the 1990s, and only toward the end of that decade did Embrapa start hiring scientists with doctoral degrees completed in Brazil.

With its world-class scientific cadre, Embrapa quickly became the leading source of scientific and technological innovation for Brazilian agriculture. Over the years, it established itself as a global model for tropical agriculture. Its early success is associated with the incorporation of the Cerrado into modern agriculture and the production of grains, notably soybeans, at scale and in low latitudes. The so-called "Cerrado revolution," which started in the late 1970s, marked the beginning of Brazil's own green revolution experiment (Cabral, Pandey, and Xu 2021). Reflecting on Brazil's main scientific achievements, Pedro Arraes Pereira et al. (2012) highlight the package of technologies that would eventually turn the Cerrado into a world-leading source of grain and beef, including improvements in soil fertility, biological nitrogen fixation, new plant varieties and hybrids, a zero-tillage practice, and integrated crop and livestock systems. Biological nitrogen fixation played a particularly important part in Brazil's soybean success, and much of the groundbreaking research in the area is attributed to a female scientist, Johanna Döbereiner (1997).

The institutionalized history of Embrapa, rehearsed at the time of its 40th anniversary (Cabral 2021), highlights the triumph of science over nature through the conquering of the "barren" Cerrado and the tropicalization of temperate crops. It emphasizes individual high-yield crops (rather than complex farming systems), the power of science to control nature, and a system of innovation governed by a diffusionist logic whereby scientists (the experts) generate technologies for farmers (seemingly passive knowledge takers) to use. This history portrays the prevailing technoscientific paradigm as a top-down, expert-driven model of knowledge production that sees science as superior to experiential knowledge and as offering apolitical or value-free solutions that can help farmers to transition, in a linear fashion, to a more technologically and economically advanced condition (Dosi 1982; Mormina and Istratii 2021). In such a paradigm, nature (the barren or unproductive Cerrado) is seen as something with no value until it is domesticated (Warren 2000) or as a machine whose mechanics can be controlled

(made productive) through science (Merchant 1982) and its mainly masculine heroic figures (Cabral 2021).

Embrapa's scientific practice and technological outputs are more varied than is suggested by its success narrative, though its own methodological diversity and plurality of knowledge have been overlooked by the organization's leadership. The broadening of Embrapa's scientific methods and technological production has become more noticeable since the early 2000s and can be linked to the diversification of its scientific cadre and the changing political context.

When the organization was first created, it mainly recruited agronomists; however, over the years, it has become a workplace for scientists with a more diverse range of disciplinary backgrounds and perspectives on agronomy, a field that is increasingly heterogeneous and contested (Sumberg and Thompson 2012). While in 1980 only 12.4 percent of Embrapa's researchers were women (Goh et al. 2008), by 2018 women represented over a third of its researchers with doctoral and postdoctoral training.

Several factors contributed to this diversification of profiles and ways of thinking about agricultural science and its role in society. One was the introduction in the mid-1980s of the open recruitment mechanism for public sector staff. This meant that Embrapa's leadership no longer had as much direct control over the profile of new recruits; their selection was now based on exam scores. Another factor was the gradual hiring of researchers with higher qualifications than in the past and, for those who studied in Brazil after the end of the dictatorship in 1985, exposure to debates questioning conventional science and the legacy of the green revolution, including the "alternative agriculture" movement within the discipline of agronomy (FAEAB and AERJ 1984). Diversification was also aided by the retirement of the first generation of Embrapa scientists who had lived through the organization's heyday and benefited from its generous training program. Many of these pioneers shared intense gratitude and allegiance to Embrapa, but these have faded in recent years.[3] Self-criticism and interrogation of the organization's history and legacy have become more commonplace.

As for the political context, between 2003 and 2015, Embrapa developed research projects with a focus on social inclusion and participatory methodologies for technological innovation. This was a time when Brazil was governed by a coalition led by the left-wing Workers' Party (Partido dos Trabalhadores, PT), which developed a set of programs to support family farmers that were geared toward distributive justice in the agricultural sector (Grisa and Schneider 2015). The social function of publicly funded research was being debated at this time. Embrapa's establishment of a research program focused on family farming (known as Macro-Programa 6 or MP6) and, thereafter, the creation of portfolios centered on agroecological production systems and social innovation are examples of novel

developments inside an organization that has traditionally produced technology targeting capital-intensive, market-oriented farmers. Under the umbrella of these initiatives, more marginal social groups became the target of Embrapa's applied research. Some of this work questioned conventional scientific methods and adopted participatory methodologies that embraced alternative ways of knowing and enabled an understanding of agrobiodiversity in its ecological, social, and cultural dimensions (Bustamante, Barbieri, and Santilli 2017; Dias, Eidt, and Udry 2016; Eidt and Udry 2019; Machado, Nass, and Machado 2011).

Yet, despite increasing diversity, Embrapa's technoscientific paradigm remained unaltered. Experimental and socially motivated research projects have remained niche areas, often portrayed as part of the organization's corporate social responsibility, as reported in its annual social accounts (*Balanço Social*). Furthermore, the scientific credentials of researchers involved in those projects have often been questioned inside the organization, which is still largely dominated by mainstream agronomy (Navarro 2013).

While the sustainable development agenda has, in recent years, pushed Embrapa's leadership to think harder about the environmental impacts of modern agriculture, it has not led to any significant shift in its approach to knowledge generation. In fact, sustainable or green technologies that are showcased by the organization continue to have a strong emphasis on individual crops and productive intensification geared toward the consolidation of competitive value chains:

> In an environment of strong competition, the reduction of production costs and the intensification of technology in production processes, through increased efficiency of agricultural machinery, human and natural resources, are essential requisites for accessing markets. (Embrapa 2018b, 78)[4]

Furthermore, the approach adopted by Embrapa in 2018 to classify the stage of maturity of technologies (known as "technology readiness level"/"manufacturing readiness level," or "TRL/MRL," and based on a methodology developed by the US National Aeronautics and Space Administration (NASA)), reaffirmed a top-down, standardizing, and market-oriented logic for technology production (Embrapa 2018a). Experiences with participatory methodologies, social innovation, and agroecology do not fit easily within this universalistic technoscientific rationality; they do not count as science in the orthodox canon.

Three fringe heroines at Embrapa

Having given an overview of Embrapa and its prevailing rationality, I now introduce the three female researchers working in the organization whose life histories and professional experiences are the basis for my analysis. My

encounters with these women were, to some extent, accidental. They happened while I was conducting research in Brazil on the history of the green revolution and interviewing researchers (both male and female) working at Embrapa. I soon realized that male expertise and heroes proliferated in Embrapa's account of the green revolution, and, except for Döbereiner, women were seldom mentioned as having played any significant part in the story. While I was interested in Embrapa's male-centric epic narratives and how they intersected with the dominant agricultural epistemology within the organization, I wondered why women remained absent from these accounts. I sought to include more female voices among my respondents and came to interview these three women and others working in different units of Embrapa across the country.

The three women on whose experiences I focus in this article have various levels of seniority within the organization and contrasting profiles in terms of academic training and work foci. They have had unique professional careers but share common stories of struggling for recognition in a male-dominated working environment and a determination to pursue their research interests and agendas, often working in fringe areas that are not recognized as legitimate science. I refer to these three women by the pseudonyms Isaura, Gabriela, and Eunice. I introduce them following the chronological order in which they joined Embrapa.

Isaura

Isaura is an agronomist with specializations in biometeorology, soil science, vegetal biology, and agroecology. She joined Embrapa soon after its creation. She was then a newly trained agronomist with already quite specialized expertise obtained through internships in leading research institutes. Once at Embrapa, she enrolled in the postgraduate training program abroad and pursued a Master's degree in the US. She had studied French at school, but Embrapa insisted that she learn English and study in the US. Her early trajectory is somewhat similar to that of many Embrapa pioneers who joined the organization in that early period, except that she faced significant hurdles as a woman scientist and young mother.

Upon returning to Embrapa, she collaborated on various international research projects, mainly with European partners, and diversified her expertise and interests. She then started gradually diverging from the typical career pathway of that first generation, many of whom went back to the US for a PhD and postdoctoral training. In the late 1980s, she enrolled for a PhD in biology in Brazil. The territorial focus of her work led her to specialize in native vegetation and complex agroforestry systems. She became increasingly interested in the combination of ecological and social dimensions of agroforestry systems and eventually undertook a postdoctoral degree in

agroecology in Europe. At Embrapa, besides coordinating and leading research projects, she has held several senior management positions. She has also been an active participant in a network focused on agroecology and social innovation, with connections to social movements outside of the organization.

Gabriela

Gabriela is an agronomist and ecologist whose work focuses on genetic resource conservation and ethnoscience. She joined Embrapa in the late 1980s through the competitive public recruitment mechanism (*concurso público*) with a Bachelor's degree in agronomy from a Brazilian university and professional experience within the private sector as an agribusiness planning consultant. At Embrapa, she grew increasingly aware of the environmental impact of input-intensive agriculture and self-critical of her previous experience in the private sector, becoming interested in themes related to environmental conservation. These motivated her to undertake a postgraduate degree in ecology, also at a Brazilian university. Since then, her work has combined ecological and social dimensions, focusing on the role of Indigenous people in the conservation of genetic material, as well as their food security status and well-being. Her work has a well-defined territorial and social focus.

Eunice

Eunice is a social scientist whose work focuses on family farming systems, socio-environmental dynamics, and agrobiodiversity. She joined Embrapa in the early 1990s, also through the public recruitment mechanism. When she started, she already had a Master's degree in rural sociology, obtained in Brazil, and work experience in education and training. She later completed her studies in Europe with a PhD in the same field and a postdoctoral position. Like Gabriela, Eunice is from a generation of Embrapa researchers who joined the organization at a time when debates about the environmental and social impacts of agricultural modernization were becoming widespread. With her background in education and sociology, she was well placed to work on the social dimensions of agricultural activity, including labor conditions, social inclusion, public policies to support disadvantaged social groups, and the links between social inclusion and environmental conservation and diversity. She soon established her research niche, working with female fruit gatherers (*extrativistas*) in the north and northeast of Brazil, in areas where poverty and lack of access to land are particularly problematic. Similar to Gabriela, Eunice's work has a distinct social and geographic focus.

The formation of an ecological and social conscience

Having introduced the professional profiles of the three fringe heroines, I now analyze the formation of their ecological and social conscience and the foundations of what I argue is their feminist epistemology. These women's life histories illustrate how their personal experiences intersected with the changing political context, helping them to develop a self-critical sense of their place in a patriarchal organization (Embrapa) and society and become determined to challenge the status quo. The subsequent section explores how these women question the technoscientific paradigm from their situated spheres of practice, seeing the local as the nexus of authority with which to confront power. Their emphasis on practical experience and field contact echo Haraway's call for situated knowledges. Their own experiences of disadvantage and deliberate efforts to work with marginalized social groups make them see science in ways that align with Harding's standpoint epistemology.

The coming of age of women scientists

Magdolna Hargittai (2015, 313) asks: "[W]hy have women been interested in science despite often considerable difficulties and barriers?" She goes on to explain that it is because "they could not live their lives confined to the restricted role unjustly assigned to them, which implied exclusion from these most exciting activities."

Isaura, Gabriela, and Eunice all described the challenges that they have faced throughout their careers, particularly in the early stages. Gaining acceptance in a male-dominated world and combining work with family responsibilities (including their lack of availability to travel abroad or flexibility to relocate to remote locations) were recurrent themes in interviews with these three women and others working at Embrapa. However, they also emphasized their aspirations and determination as young graduates. Upon its creation, Embrapa quickly became a focal point for agricultural research in Brazil. For newly trained agronomists, it was regarded as one of the most desirable places to work in the country; Gabriela explained that "the dream of every young agronomist was to work for Embrapa." For Eunice, its allure was more personal and unique. As a young graduate working for a local government department, she would accompany her colleagues on field trips. On these journeys, she would often drive past a large plaque bearing the word "Embrapa," which pointed in the direction of a complex that hosted one of Embrapa's thematic units. She was fascinated by this plaque – "I thought at the time that that plaque meant something to me" – and she pictured Embrapa scientists as "demigod-like figures." She dreamed of one day joining the organization.

The three women successfully joined the prestigious organization, gaining experience working alongside other highly qualified researchers and becoming involved in pressing agricultural development themes, a coming-of-age process that turned their aspirations for self-betterment into ambitions to transform and improve the world around them. They reflected on their past experiences and the history of Brazilian agriculture and came to interrogate their understanding of the profession and the organization of which they so desired to be part. Though remaining proud to work at Embrapa, the three women expressed critical views on the history of their organization and its impact on Brazilian agriculture, environment, and society. Gabriela talked passionately about her moment of realization of the predicament of Indigenous people in Brazil and the history of her country, which she had never thought to question before. She reflected on her first field visit to an Indigenous community as a moment of revelation and interrogation of self:

> It was a great learning experience. It made me think about the history I had learnt at school when I was young, how that history lied, created distorted realities and false heroes. Often the real heroes are not the ones celebrated on paper but other, anonymous heroes. I started reflecting, questioning my organization, questioning the research options made by the organization where I worked, and contrasting these with the real needs, dreams, and demands of that part of society.

Environmental ethic

The three women conveyed a strong environmental conscience. They started their life history accounts with childhood memories that placed them in nature: the vegetable garden where Isaura used to play, the river that provided the setting for Eunice's family picnics, the waterfalls (*cachoeiras*), and woods (*mato*) where Gabriela would lose track of time and cause great concern to her family. Gabriela and Isaura engaged with the environment academically through their studies. Eunice arrived at it through her work encounters with the struggles of family farmers and specific social groups (such as *extrativistas*) whose identity and livelihoods are entangled with their ecological setting.

Besides their personal experiences, these women referenced the awakening to the environmental question in Brazil, beginning in the 1980s, as the backdrop for their lives. The alternative agriculture movement within the agronomy discipline developed in the mid-1980s, at the time that Gabriela and Eunice were undertaking their studies. For Isaura, this exposure came later, through work, and became particularly strong as agroecology emerged as a distinctive critique of the green revolution paradigm in the late 1990s (Niederle et al. 2019). In 1992, Brazil hosted the Earth Summit, which was a milestone and turning point for sustainable development in the country and across the world. Eunice's engagement with the

environmental question consolidated as she realized its connection with agrarian social justice, another subject with which she is intellectually engaged, having received postgraduate training in sociology from Marxist scholars who had been in exile and returned to Brazil at the end of the military dictatorship. For her, agroecology has, since the mid-2000s, become a key platform for articulation between environmental and social research agendas, working in a transversal and interdisciplinary manner.

Drive for social justice

The three women's drive for social justice developed through different formative life experiences. Gabriela recalled her "thirst for action" as a student in the late 1980s (in the aftermath of the military regime) and her aspiration to contribute to a better world for agricultural laborers in particular. However, her most transformative experience with injustice came later, through interactions with Indigenous people. Eunice's own personal background and the hardships that she faced as a young woman (working from a very young age to make ends meet) bolstered her felt sense of unfairness and discrimination. Her account of her life history emphasized class divides and inequities in Brazil, which she experienced first hand in multiple ways: "[Y]ou can read Brazilian society through my own personal history." For Isaura, the sense of discrimination is based on gender rather than class. The daughter of a chemistry professor, she was part of the generation of Embrapa pioneers recruited in the mid-1970s, when female agronomists were uncommon and often treated with contempt. She recalled the difficulty of combining work with her family responsibilities and her sense of duty to succeed as a woman scientist as a way of challenging a patriarchal system:

> Fifteen days after giving birth to my second child, I was informed [by Embrapa] that I had been selected to take a four-month English training course in an isolated part of Brazil. This would prepare me to later that year enroll in a postgraduate degree in the United States. There was no flexibility because of the short timeframe to spend US funds for training. When I received the news, I was still breastfeeding and thought I could not do it. That night, I mulled over it and tried to imagine what they would think of me if I refused to go and whether they would think it had been my decision. I woke up determined to go and with a clear plan of who would look after my children. My eldest was not even two years old. "Heartless mother," some people would say. "Go for it," others would say. And so I did.

Confronting power through diversity and difference

In portraying their personal experiences as members of the Indigenous and settler populations living with the colonial legacy in the Brazilian state of Mato Grosso, Tchella Maso et al. (2022, 157) note that

> [e]ach of us comes from our own specific personal perspective (class, race, ethnic group, gender, education, and other material and identity aspects) to denounce elements of a harsh reality and leave open the possibility of the construction of alternatives.

Rooted in their lived experiences of discrimination based on class, gender, and ethnicity and a deep environmental and social conscience, the three Embrapa women direct their work toward vulnerable social groups and territories that they are committed to supporting in spite of the obstacles that they face. This commitment encourages them to swim against the tide and push for change from within. Eunice confessed:

> I love this institution [Embrapa]. I am a committed Embrapiana. I say committed! But I know exactly what Embrapa is. I know exactly who Embrapa primarily works for, and I will never align with that. Embrapa's mission is to target different social groups. I will die saying this, fighting for this. My *own* [her emphasis] groups are family farming producers. I have that very clear.

Gabriela talked about her trajectory at Embrapa as a journey between heaven and hell. Heaven is the place of aspirations and of developing the transformational work that you believe in, and hell is when those aspirations are frustrated and blocked by institutionalized ignorance and prejudice. In relation to Embrapa's work with Indigenous people, she explained:

> There were serious misunderstandings about the reality of Indigenous people, and how they live is often regarded as wild and lazy. So, we started taking colleagues from other areas to come along and visit seed fairs [managed by Indigenous people]. We wanted them to see the wealth and diversity of local seeds, and we wanted them to learn about other ways of knowing and gain awareness about other worldviews. They would return from those visits as more committed researchers and that makes a huge difference for the work you do.

For Gabriela, commitment is derived from experiential knowledge obtained by engaging with people's everyday realities. In her work with Indigenous people, ethnoscience provides the methodological tools to support this engagement. Similarly, Eunice emphasized the role played by the experience of working with social groups in shaping research cultures and creating a mindset that enables researchers to interrogate the purpose and relevance of technical solutions for society.

These ways of thinking are perceived to be the exception inside Embrapa. In Eunice's view, agricultural sciences in Brazil are still largely unconcerned with people and see farmers as final users and not as points of departure. In her ethnoscience work, Gabriela faces resistance from colleagues at Embrapa and a predominant culture that separates science from the mundane sphere of on-the-ground realities. Contact with farmers and other agricultural social groups is often regarded as the job of "extension technicians" (whose professional status inside Embrapa is inferior to that of

scientists), whose role it is to pass on the knowledge developed by scientists in a linear fashion.

For Gabriela, this prejudice against ethnoscience has meant a constant need to prove it wrong and show that "standard" scientific outputs (such as journal articles, conference presentations, and textbooks) can be generated from these experiences. Eunice faces similar discrimination in her sociological research on agricultural systems, often confronting dismissive comments from colleagues:

> It's not easy for you [as a social scientist] to get established in an institution where 90 percent of your colleagues are from the natural sciences. The work of a sociologist is sometimes seen as the work of a journalist. "What exactly do you do?" [colleagues ask me]. It is important that you publish and that you engage with other [reputed scholarly] spaces.

The resolve to confront discrimination and swim against the tide is derived from a professional and personal dedication to particular social groups and/or territories. The women's epistemological stance is one that values the standpoint of the subordinate. This commitment to marginalized social groups is also instrumental in occupying a niche and establishing a position of respect inside Embrapa. Eunice explained: "It is important that you make clear what you are here [at Embrapa] for. I understood that quite early on." *Extrativistas* in the north and northeast of Brazil are not only her source of motivation but also her area of expertise and one that colleagues have come to recognize and respect. Gabriela and Isaura, too, have well-defined social groups that they have sought to empower and mobilize into action–research initiatives. Though operating on the fringes, these women are using their positions in the organization to build an agricultural science that is situated in peoples' struggles and subaltern standpoints. These are not only women's struggles but also the struggles of Indigenous and other social groups in conditions of marginalization.

These women's direct engagement with agrobiodiversity and the context-specific circumstances of their target groups have equipped them with a mindset that values, in the words of Gabriela, "local logics of knowing" and with tools that enable them to pragmatically engage with diversity and complexity and reject prescriptive blueprints. Gabriela's epistemology echoes Haraway's situated knowledges perspective. She reflected on this in relation to Indigenous agriculture, expressing self-awareness of the limits of her own standpoint and authority to prescribe:

> Indigenous agriculture is a controversial theme. There are places where Indigenous people practice agriculture based on their own traditional practices, and there are places where they have adopted green revolution technologies and combined these with traditional systems. In some areas of Mato Grosso, monocropping has long been adopted by some Indigenous people and is

> working for what they seek to achieve. So that idea – that we can tell what is best for them in terms of territorial development – is quite problematic.

So how much space have Isaura, Gabriela, and Eunice had inside Embrapa? For these women and other researchers (both male and female) with a similar intellectual stance and a commitment to ecological and social justice, institutional spaces for exchange within the organization were more readily available when Brazil was governed by the PT-led coalition. The MP6 research program, in place between the mid-2000s and mid-2010s, was key to mobilizing resources toward research projects with a focus on family farming systems. Though accommodating highly diverse research approaches, MP6 projects were aligned in their attention toward relatively marginalized social groups. Furthermore, the shared understanding of the social function of state-funded research (hence the justification for working with those disadvantaged groups) resonated with these three women's worldviews. This short-lived chapter in Embrapa's 50-year history was the most prolific for these three women. Their fields of expertise and approaches to science were valued and rewarded. This favorable context emboldened their actions, leading them to coordinate experimental research projects, publish findings from this work, take on leadership positions within the organization, and engage directly with policy debates inside and outside Embrapa.

In the period since, the political circumstances in Brazil and the institutional environment of Embrapa have been less favorable. The redistributive side of agricultural policy was significantly eroded by the government of President Jair Bolsonaro, who held office from 2019 to 2022 (Sabourin 2018; Sauer 2020). In this hostile climate, the portfolio for social innovation has become one of the few spaces of articulation for Embrapa researchers whose focus is on social groups (rather than crops) and who are critical of the prevalent technoscientific logic. However, they still face the difficulty of fitting their work within the new TRL/MRL system of technological innovation. Isaura expressed frustration with the organization's attitude toward socially focused research:

> The new planning system is formulated as if the research were entirely focused on a technological output. There is no space for research with a social focus. There is a group of researchers who are open to talking to others in the socio-economic field, but they bundle together sociology, anthropology, and economics as if they were all the same.

With dwindling institutional support inside the organization, the three women described how they are gradually turning toward informal networks and epistemic communities outside Embrapa. Agroecology has emerged as "the place of anchorage," as Eunice put it, for those who do not adhere to the prevailing logic. They often rely on personal resources to continue to

engage with this space, paying from their own pocket to attend conferences, conduct field visits, and support more junior colleagues. As Isaura confided, agroecology at Embrapa is currently sustained by what she called a "*piracema* foundation" – an analogy with river ecosystems and, specifically, the phenomenon that sees fish swimming upstream against the current for survival and reproduction.[5]

After a short stint of success, the three women have withdrawn to the sidelines, a place that they know well from first-hand experience. Being back at the fringes bolsters their militant attitude but inevitably reduces their scope for impact.

Conclusion

Brazil has risen to the status of a global agricultural power. This is often attributed to the triumph of science over nature and technologies that have contributed to raising crop yields and market competitiveness. The dominant narrative of Brazil's agricultural success emphasizes the role of Embrapa in the conversion of the Cerrado biome. As with other green revolutions (Shiva 1989, 1991), this is a story shaped by a patriarchal epistemology that is ill suited to understanding diversity and subaltern ways of knowing. Yet, Embrapa is a more diverse organization than its institutionalized history and success narrative would suggest. The life histories of the three women portrayed in this article – our fringe heroines – are illustrative of the gradual diversification of Embrapa's scientific cadre in terms of gender composition, academic background, and attitudes toward agricultural science and epistemology.

Subjective experiences and the political, social, and institutional contexts for agricultural sciences in Brazil have inevitably influenced these women's careers. However, their position of disadvantage in a patriarchal technoscientific regime matters in shaping their worldviews and their intense desire for justice. I have argued that they embody a feminist epistemology that weaves together the condition of nature and of marginalized social groups. As scientists, they strive for approaches that combine plurality and subjectivity with a sense of justice toward nature and society. Justice is pursued by engaging with peoples' experiences and situated knowledges and by focusing on marginalized groups and therefore favoring the standpoint of those in positions of disadvantage. The fact that these fringe heroines are women matters less than their own experiences of discrimination and their contact with others who are marginalized by the technoscientific regime more broadly. In this article, I have not explored whether the approach of these women to agricultural science is different because they are women; instead, I have argued that their choices are informed by experiences of injustice directed toward themselves or others whom they have encountered

through their professional and personal lives. It is their own subordinate standpoint in a patriarchal system and their efforts to mobilize the perspectives of the groups with which they work that mark their feminist epistemology that confronts the totalizing forces of the hegemonic regime at Embrapa.

Political context matters in creating opportunities for feminist viewpoints in science, as science is deeply entangled with politics and visions of society (Åsberg and Lykke 2010; Jasanoff and Kim 2015). These women's scope for action and impact is conditioned by the environment in which they work. They have experienced moments of opening as well as closure throughout their careers. Inside Embrapa, their protagonism was at its strongest during a period of progressive politics in Brazil. The recent period has, by contrast, been one of retreat to the sidelines as they have struggled to fit their normative stances and epistemologies within the prevailing technoscientific regime of their organization and within the agricultural politics of their country more broadly.

Embrapa's half-century anniversary in 2023 should be an opportunity for self-reflection. The organization's future relevance to Brazil's agriculture, environment, and society should not be defined by nostalgic and partial memories of a development experience and scientific approach that are no longer tenable. As feminist scholars argue, diversity and difference are the only ways forward to deal with the current ecological crisis. It is time that Embrapa accepted a more plural stance toward science, came to terms with the situated knowledges generated from its fringes, and gave these and their unsung champions the recognition and space that they merit.

Notes

1. The interviews took place in the cities of Aracaju, Belém, and Brasília. These are not necessarily the locations in which the three women work but the places where it was feasible for them to meet me during my stay in Brazil.
2. As Haraway (1988, 583) puts it, "only partial perspective promises objective vision … Feminist objectivity is about limited location and situated knowledge, not about transcendence and splitting of subject and object. It allows us to become answerable for what we learn how to see."
3. Elsewhere, I provide a detailed analysis of organizational identity within Embrapa (Cabral 2021).
4. All translations are by the author.
5. *Piracema* is the Tupi word for "swimming upstream," used to describe the time of year when fish swim against river currents to lay their eggs and reproduce. Tupi is an extinct aboriginal language previously spoken in parts of Brazil.

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