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Beatriz Wardzinski Barbosa

MULHERES NA CIÊNCIA DO SOLO NO BRASIL:
UM RECORTE HISTÓRICO ACADÊMICO E PROFISSIONAL

Santa Maria, RS
2024

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Tese apresentada ao Programa de Pós-Graduação em Ciência do Solo, da Universidade Federal de Santa Maria (UFSM, RS), como requisito parcial para a obtenção do título de **Doutora em Ciência do Solo**. Defesa por videoconferência.

Orientador: Prof. Dr. Fabrício de Araújo Pedron

Santa Maria, RS
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Santa Maria, RS
2024

Para todas as cientistas do solo.

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À minha família, por me aninhar nos momentos bons, mas principalmente nos ruins.
Aos meus amigos, por serem meu refúgio seguro.
À minha psicóloga, por me ajudar a manter minha saúde mental nesta difícil jornada.
Ao meu orientador, por sempre me acolher nos momentos de adversidade.
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E por último, mas não menos importante, a mim mesma.
A adulta e a criança.
Você conseguiu.

Early in the nineteenth century, the word "scientist" didn't have masculine associations; in fact, it was coined to describe a woman. In 1834, the Cambridge don William Whewell wrote a complimentary article about Mary Somerville [...]. He called Somerville a scientist, in part because "man of science" seemed inappropriate for a woman, but more significantly because Somerville's work was interdisciplinary. She was no mere astronomer, physicist, or chemist, but a visionary thinker who articulated the connections among the various branches of inquiry. According to Somerville's biographer Kathryn Neeley, Whewell's coinage of the word "scientist" was not meant to be merely a gender-neutral term. Whewell wanted a word that actively celebrated "the peculiar illumination of the female mind": the ability to synthesize separate fields into a single discipline (BERGLAND, 2008, p. xv).

RESUMO

MULHERES NA CIÊNCIA DO SOLO NO BRASIL:
UM RECORTE HISTÓRICO ACADÊMICO E PROFISSIONAL

AUTORA: Beatriz Wardzinski Barbosa
ORIENTADOR: Fabrício de Araújo Pedron

As ciências agrárias e, especialmente, a ciência do solo têm historicamente apresentado uma composição de gênero fortemente desigual. Essa problemática é ainda exacerbada pela falta de estudos demográficos e de gênero, dificultando tanto a discussão quanto a formulação de ações estratégias para corrigir as inequidades. O principal objetivo desta pesquisa foi documentar e analisar um recorte histórico acadêmico e profissional das mulheres na ciência do solo no Brasil, com foco na sua presença, evolução e reconhecimento ao longo do tempo. Para alcançá-lo, dois objetivos específicos foram estabelecidos: i) realizar um panorama dos estudos de gênero nas ciências agrárias e na ciência do solo e identificar as principais tendências, lacunas e oportunidades de pesquisa; ii) realizar o primeiro levantamento demográfico da ciência do solo brasileira, com foco na composição de gênero ao longo do tempo em diferentes níveis acadêmicos e profissionais, assim como no reconhecimento entre pares. Nesta tese, dois estudos cobrem cada um dos objetivos. O Estudo I apresentou uma revisão bibliométrica e bibliográfica dos estudos de gênero publicados nas ciências agrárias e do solo, utilizando as bases de dados do Web of Science e Scopus (1975-2022). Parte da literatura foi sintetizada e discutida a partir do contexto histórico e contemporâneo. Foram identificadas a distribuição geográfica das publicações, principais periódicos, tendências e lacunas de pesquisa. O Estudo II abrangeu métricas de discentes e docentes de todos os programas brasileiros de pós-graduação (PPG's) (2004-2021); e de membros, representantes e prêmios da Sociedade Brasileira de Ciência do Solo (SBCS) (1947-2023). Os resultados do Estudo I revelaram que 50% das publicações (n = 50) foram realizadas após 2016. Foram encontradas poucas publicações de gênero na ciência do solo, com visibilidade limitada e concentração em periódicos específicos, como edições especiais ao tema. Há uma lacuna importante em análises de abrangência nacional, interseccionais e avaliações de políticas de equidade. Os resultados do Estudo II mostraram que, em 2021, a paridade de gênero nas matrículas no doutorado foi alcançada e as mulheres de 25 a 29 anos passaram a ser a maioria discente. A presença das mulheres na docência ainda é baixa (19% em 2021) e há maior representação na biologia do solo. O corpo docente mostra uma tendência ao envelhecimento, especialmente entre os homens, indicando potencial onda de aposentadorias nos próximos anos. A SBCS é composta principalmente de docentes homens e as mulheres representam apenas 30% das afiliações. Há um declínio acentuado no número geral de afiliados nos últimos 10 anos, principalmente entre estudantes. Na SBCS, mulheres são minoria nas posições representativas e menos reconhecidas por meio de prêmios. O cenário atual da ciência do solo brasileira reflete barreiras sistêmicas e culturais mais amplas, sublinhando a necessidade urgente da implementação de ações estratégias nos níveis individual, coletivo e institucional para a correção das inequidades. Ao

destacar o impacto positivo da equidade, diversidade e inclusão, esta tese visa contribuir para a evolução e inovação do conhecimento na ciência do solo, preenchendo uma lacuna importante na literatura existente.

Palavras-chave: Estudos de gênero. Demografia. Pós-graduação. SBCS. Disparidade.

ABSTRACT

WOMEN IN SOIL SCIENCE IN BRAZIL:
AN ACADEMIC AND PROFESSIONAL HISTORICAL SNAPSHOT

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ADVISOR: Fabrício de Araújo Pedron

Agricultural and soil sciences have historically displayed a significantly unequal gender composition. This issue is further exacerbated by a lack of demographic and gender studies, hindering both the discussion and the formulation of strategic actions to correct inequities. The main objective of this research was to document and analyze an academic and professional historical snapshot of women in soil science in Brazil, with the aim of understanding the presence, evolution, and recognition of women in this scientific field over time. To achieve this, two specific objectives were established: i) to conduct an overview of gender studies in agricultural sciences and soil science, identifying the main trends, gaps, and research opportunities; ii) to conduct the first demographic survey of Brazilian soil science, focusing on the gender composition over time at different academic and professional levels, as well as peer recognition. In this thesis, two studies cover each of the objectives. Study I presented a bibliometric and bibliographic review of gender studies published in agricultural and soil sciences, using the Web of Science and Scopus databases (1975-2022). Part of the literature was synthesized and discussed from both historical and contemporary contexts. The geographic distribution of publications, main journals, trends, and research gaps were identified. Study II covered metrics of students and faculty from all Brazilian graduate programs (2004-2021); and members, representatives, and awards of the Brazilian Soil Science Society (SBCS) (1947-2023). The results of Study I revealed that 50% of the publications (n = 50) were conducted after 2016. Few gender publications in soil science were found, with limited visibility and concentration in specific journals, such as special issues on the theme. There is a significant gap in research with national scope, intersectional analyses, and evaluations of equity policies. The results of Study II showed that, in 2021, gender parity in doctoral enrollments was achieved, and women aged 25 to 29 became the majority of students. The presence of women in faculty is still low (19% in 2021) and there is greater representation in soil biology. The faculty shows a trend towards aging, especially among men, indicating a potential wave of retirements in the coming years. The SBCS is mainly composed of men professors, and women represent only 30% of affiliations. There has been a sharp decline in the overall number of affiliates over the past 10 years, especially among students. In the SBCS, women are a minority in representative positions and less recognized through awards. The current scenario of Brazilian soil science reflects broader systemic and cultural barriers, underlining the urgent need for the implementation of strategic actions at individual, collective, and institutional levels to correct inequities. By highlighting the positive impact of equity, diversity, and inclusion, this thesis aims to contribute to the evolution and innovation of knowledge in soil science, filling a significant gap in the existing literature.

Keywords: Gender studies. Demographics. Graduate degree. SBCS. Disparity.

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LISTA DE SIGLAS

AS	Agricultural sciences (ciências agrárias)
ASA	Agronomy Society of America
BIPOC	Blacks, Indigenous and People of Color
C	Commission
C1.1	Comission 1.1 – Soil genesis and morphology
C1.2	Comission 1.2 – Soil survey and classification
C1.3	Comission 1.3 – Pedometrics
C1.4	Comission 1.4 – Paleopedology
C2.1	Comission 2.1 – Soil biology
C2.2	Comission 2.2 – Soil physics
C2.3	Comission 2.3 – Soil mineralogy
C2.4	Comission 2.4 – Soil chemistry
C3.1	Comission 3.1 – Soil fertility and plant nutrition
C3.2	Comission 3.2 – Correctives and fertilizers
C3.3	Comission 3.3 – Soil and water management and conservation
C3.4	Comission 3.4 – Land use planning
C3.5	Comission 3.5 – Pollution, soil remediation and recovery of degraded areas
C4.1	Comission 4.1 – Soil education and public soil perception
C4.2	Comission 4.2 – Soils and food security
C4.3	Comission 4.3 – History, epistemology and sociology of science.
CAPES	Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (Coordination for the Improvement of Higher Education Personnel)
CNPq	Conselho Nacional de Desenvolvimento Científico e Tecnológico (National Council for Scientific and Technological Development)
CNR	National Research Council
D	Division
D1	Division 1 – Soil in space and time
D2	Division 2 – Soil processes and properties
D3	Division 3 – Soil use and management
D4	Division 4 – Soils, environment and society
DOI	Digital Object Identifier

FAPESP	Fundação de Amparo à Pesquisa do Estado de São Paulo (The São Paulo Research Foundation)
IUSS	International Union of Soil Sciences
JIF	Journal Impact Factor
LGBTQIAP+	Lesbian, Gay, Bisexual, Transgender, Queer, Intersex, Asexual, Pansexual, and more
LGI	Land Grant Institution
MSc	Master's degree (mestrado)
OA	Open Access
PhD	Doctoral degree (doutorado)
PQ	Research productivity grant
RBCS	Revista Brasileira de Ciência do Solo
RN	Regional Nucleus (Núcleo Regional)
SBCS	Sociedade Brasileira de Ciência do Solo (Brazilian Soil Science Society)
SIPe	Italian Society of Pedology
SISS	Italian Society of Soil Science
SJR	SCImago Journal Rank
SN	State Nucleus (Núcleo Estadual)
SNI	National System of Researchers
SS	Soil science (ciência do solo)
SSSA	Soil Science Society of America
STEM	Ciência, tecnologia, engenharia e matemática (Science, technology, engineering, and mathematics)
UDESC	Universidade Estadual de Santa Catarina
UFC	Universidade Federal do Ceará
UFERSA	Universidade Federal Rural da Região do Semi-Árido
UFLA	Universidade Federal de Lavras
UFPB	Universidade Federal da Paraíba
UFPEL	Universidade Federal de Pelotas
UFPI	Universidade Federal do Piauí
UFPR	Universidade Federal do Paraná
UFRB	Universidade Federal do Recôncavo da Bahia
UFRGS	Universidade Federal do Rio Grande do Sul

UFRPE	Universidade Federal Rural de Pernambuco
UFRRJ	Universidade Federal Rural do Rio de Janeiro
UFSM	Universidade Federal de Santa Maria
UFV	Universidade Federal de Viçosa
UK	United Kingdom
UNESP	Universidade Estadual de São Paulo
US	United States
USDA-ARS	United States Department of Agriculture - Agricultural Research Service
USP	Universidade de São Paulo
WCSS	World Congress of Soil Science
WoS	Web of Science

SUMÁRIO

1 INTRODUÇÃO GERAL

Os cursos das ciências agrárias sempre tiveram uma composição de gênero fortemente desigual e que historicamente desfavoreceu as mulheres (BAVEYE et al., 2006; McINTOSH; SIMMONS, 2008; BREVIK et al., 2018; SACHS, 2018). A ciência do solo, em especial, é uma das disciplinas menos diversas das ciências naturais e da terra (CARTER et al., 2021), uma situação que é ainda agravada pela escassez de estudos que abordam o gênero como categoria de análise neste campo. A literatura existente indica que, globalmente, poucas pesquisas têm focado em mapear as tendências demográficas dentro da ciência do solo, principalmente aquelas que incluem análises quantitativas e discussões aprofundadas focadas na disparidade de gênero.

Um levantamento global da distribuição de gênero dentro da ciência do solo revelou uma baixíssima presença de mulheres em sociedades profissionais, como oradoras principais em conferências internacionais e nos conselhos editoriais de revistas de alto impacto (DAWSON; BREVIK; REYES-SÁNCHEZ, 2021). Pesquisas realizadas nos Estados Unidos (VAUGHAN et al., 2019) e na Itália (ADAMO et al., 2022), evidenciaram que as cientistas do solo são minoria particularmente em posições de alto nível hierárquico e de liderança, além de receberem pouco reconhecimento acadêmico. No contexto italiano, evidenciou-se a igualdade de produção científica entre gêneros em todos os níveis de carreira, sugerindo que a baixa presença de mulheres em cargos de alto nível não se deve a uma falta de produtividade acadêmica, mas sim a uma segregação vertical (ADAMO et al., 2022).

Por outro lado, os estudos também apontam um futuro potencial de mudança na composição de gênero e identidade da ciência do solo. Adamo et al. (2022) identificaram um aumento no número de mulheres entrando e trabalhando na ciência do solo italiana. De maneira similar, Vaughan et al. (2019) relataram um aumento nas matrículas de mulheres em programas estadunidenses de mestrado e doutorado em ciência do solo e uma baixa presença de mulheres em disciplinas específicas, como física e fertilidade do solo, indicando interesses temáticos diferentes dos homens (BREVIK, 2019; VAUGHAN et al., 2019). Ademais, alguns países como México, Peru e Holanda relataram uma maioria emergente de mulheres entre a nova geração de cientistas do solo (DAWSON; BREVIK; REYES-SÁNCHEZ, 2021). No entanto, estes resultados sinalizam um potencial de mudança na representatividade

de gênero a longo prazo e desde que haja suportes estratégicos para que as mulheres consigam avançar em suas carreiras e atinjam posições de liderança e com poder de decisão. Além disso, é essencial considerar certos fatores que podem criar uma falsa impressão de avanço na equidade de gênero. Na Bulgária, por exemplo, o aumento de mulheres na ciência do solo decorreu, em grande parte, pela migração de homens para áreas profissionais mais lucrativas (DAWSON; BREVIK; REYES-SÁNCHEZ, 2021).

A justificativa para este estudo, portanto, se apoia na atual ausência de informações e análises demográficas dentro da ciência do solo brasileira, sendo este o primeiro passo para uma compreensão mais precisa e realista sobre a presença, a evolução e o reconhecimento das cientistas do solo no Brasil. Esse entendimento é fundamental para o desenvolvimento de estratégias eficazes que possam corrigir inequidades e promover justiça social, diversidade, inclusão e inovação dentro da comunidade científica.

Neste contexto, a hipótese geral deste trabalho postula que, apesar dos avanços na presença de mulheres discentes em programas de pós-graduação, a trajetória histórica acadêmica e profissional das mulheres na ciência do solo no Brasil é marcada por uma disparidade de gênero persistente, refletindo não apenas uma presença e reconhecimento desiguais, mas também uma escassez de estudos de gênero que abordem essas questões. Com isso, o objetivo geral desta tese é analisar um recorte histórico acadêmico e profissional das mulheres na ciência do solo no Brasil, buscando compreender como tem sido a presença, evolução e reconhecimento das mulheres ao longo do tempo neste campo científico.

Para endereçar os pressupostos trazidos na hipótese geral, as seguintes perguntas foram levantadas: “Qual é o estado da arte dos estudos de gênero nas ciências agrárias e do solo e quais são as principais lacunas, tendências e oportunidades de pesquisa?” e “Qual tem sido, nos últimos anos, a presença das mulheres em diferentes níveis acadêmicos, profissionais e no reconhecimento por pares na ciência do solo no Brasil?”. A partir destes questionamentos, foram delimitados os seguintes pressupostos para as hipóteses específicas:

1. Nos campos das ciências agrárias e, particularmente, na ciência do solo, os estudos de gênero são notavelmente escassos. Existem lacunas significativas tanto em estudos demográficos quanto na análise de dados

interseccionais. No entanto, essas mesmas áreas apresentam tendências emergentes e oferecem oportunidades para pesquisas futuras.

2. Embora a presença das mulheres discentes nos programas brasileiros de pós-graduação em solos esteja aumentando, essa tendência não se traduz em uma representação proporcional na docência, em cargos de liderança ou no reconhecimento acadêmico. Isso reflete a existência de barreiras sistêmicas e culturais e a necessidade de implementação de ações estratégicas para corrigir essas disparidades.

Nesta tese, dois estudos cobrem as hipóteses específicas mencionadas acima. Os estudos foram escritos em inglês com a intenção de serem publicados em periódicos científicos e, apesar da possibilidade de haver sobreposição de conteúdo, cada um deve ser lido de forma independente.

O Estudo I, localizado dentro da sessão de revisão da literatura desta tese, apresenta uma revisão bibliométrica e bibliográfica dos estudos de gênero nas ciências agrárias e do solo publicados na base de dados do Web of Science e Scopus, no período de 1975 até 2022. Parte da literatura existente foi sintetizada e discutida a partir do contexto histórico e contemporâneo. Foram identificadas a distribuição geográfica das publicações, principais periódicos, tendências, lacunas e oportunidades de pesquisa.

O Estudo II apresenta um recorte histórico da composição de gênero na ciência do solo no Brasil. A análise abrange métricas referentes a discentes de mestrado e doutorado (matrículas, titulações, desistências/desligamentos, faixa etária e estudantes migratórios) e de docentes (nível ou posição acadêmica, faixa etária e disciplinas) de todos os programas brasileiros de pós-graduação em solos de 2004 a 2021; e da Sociedade Brasileira de Ciência do Solo (SBCS) (membros, atividade e formação acadêmica dos membros, divisões e comissões, posições administrativas e prêmios) de 1947 a 2023.

As considerações finais finalizam a tese reforçando a importância da equidade, diversidade e inclusão na geração do conhecimento científico. Para uma melhor fluidez de leitura, as referências bibliográficas foram compiladas em uma lista única ao final deste trabalho.

2 ABORDAGENS TEÓRICO-METODOLÓGICAS

2.1 EPISTEMOLOGIA DA CIÊNCIA E PARADIGMAS CIENTÍFICOS

A epistemologia, como ramo filosófico, é o estudo do conhecimento. Ela ocupa-se em analisar criticamente os princípios, hipóteses e resultados das diversas ciências, visando uma reconstrução racional do processo pelo qual o conhecimento científico é obtido e compreendido. Essa reconstituição abarca as dimensões lógicas, linguísticas, sociológicas, interdisciplinares, políticas, filosóficas e históricas da ciência. Para isso, é fundamental reconhecer que o conhecimento científico não é absoluto, mas transitório e sujeito a mudanças, e que os diversos contextos ideológicos, religiosos, econômicos, políticos e históricos influenciam na sua formação (TESSER, 1995).

No livro *A Estrutura das Revoluções Científicas*, Kuhn (2006) argumenta que a ciência opera dentro de paradigmas estabelecidos, que são conjuntos de práticas, normas e conhecimentos aceitos por uma comunidade científica, moldando a maneira como os(as) cientistas veem o mundo e abordam problemas. Kuhn enfatiza que, embora os paradigmas sejam fáceis de identificar através de ilustrações em manuais, conferências e exercícios de laboratório, a identificação de regras comuns é mais complexa. Ele propõe que os paradigmas funcionam mais como “famílias naturais”, com semelhanças que se superpõem e se entrecruzam, em vez de atenderem a um conjunto rígido de regras. Esta abordagem ressalta a importância da prática e da imersão na tradição científica para o aprendizado e a condução da ciência.

Kuhn (2006) também discute como os(as) cientistas são treinados(as) e moldados(as) pelos paradigmas, aprendendo por meio da aplicação de conceitos em problemas concretos, em vez de apenas teorias abstratas. Essa educação científica implica que os(as) cientistas podem operar efetivamente dentro de um paradigma sem necessariamente compreender ou concordar com todas as suas regras ou fundamentos explícitos. Kuhn (2006) também argumenta que a ciência não progride de forma linear e cumulativa, mas sim através de “revoluções científicas”, nas quais um paradigma existente é substituído por um novo, em um processo que ele chamou de “mudança de paradigma”. Essas mudanças ocorrem quando o paradigma existente se torna incapaz de explicar fenômenos novos ou

contraditórios, levando a uma crise e eventualmente à adoção de um novo paradigma que pode abordar essas lacunas.

Nesse sentido, a noção de Kuhn (2006) de que a ciência opera dentro de paradigmas que definem não apenas o conhecimento aceito, mas também as formas como os problemas são abordados e resolvidos, ressalta a importância do contexto em que a ciência é praticada. Isso implica que a ciência do solo, como qualquer outro campo, não é apenas um conjunto de conhecimentos objetivos, mas também uma prática moldada por uma tradição específica, valores e normas. Neste contexto, a crescente entrada de mulheres na ciência do solo não é apenas uma questão de diversidade, mas também de epistemologia. Essa mudança traz novas perspectivas e abordagens que podem desafiar ou enriquecer os paradigmas existentes, podendo resultar em uma reestruturação do campo da ciência do solo.

Especificamente no contexto desta tese, as mulheres, ao ingressarem e contribuírem para um campo historicamente dominado por homens, podem desencadear uma mudança de paradigma ao introduzir novas ideias e abordagens, especialmente no que diz respeito à transição de um paradigma com foco agronômico para um ambiental e interdisciplinar. A reflexão sobre essas mudanças paradigmáticas, como Kuhn (2006) sugere, é uma tarefa epistemológica essencial. Assim, esta tese não está apenas documentando uma mudança na composição demográfica do campo, mas também investigando como essas mudanças afetam o próprio conhecimento produzido. Desta maneira, a abordagem epistemológica permite compreender melhor as bases sobre as quais a ciência do solo está construída e como ela pode evoluir para abordar desafios futuros de maneira mais eficaz.

Além disso, a ênfase de Kuhn (2006) na prática científica e na educação dentro dos paradigmas estabelecidos permite o entendimento de como as tradições científicas são transmitidas e como novos membros da comunidade científica são socializados em determinadas formas de pensar e resolver problemas. Isso é particularmente importante quando consideramos o papel das mulheres na ciência do solo. Suas experiências e desafios enfrentados, além da diferença de perspectiva e interesses, podem levar à identificação de “anomalias” dentro do paradigma existente, incentivando uma reavaliação e potencial revisão dos pressupostos científicos e relacionais da disciplina.

2.2 CIÊNCIA COMO “SABERES LOCALIZADOS”

O conceito de saberes localizados de Haraway (1988) desafia a visão da ciência positivista, que se diz objetiva e universal. Ela argumenta que o conhecimento é sempre situado e reflete as perspectivas de quem o produz, insistindo na ideia de que a verdade e o conhecimento são inerentemente parciais. Deste modo, a negação de valores, preconceitos e política seria irreal e indesejável para a ciência. A objetividade feminista aceita que o conhecimento e a verdade científica são parciais, situados, subjetivos, relacionais e imbuídos de poder, reconhecendo que qualquer pretensão de neutralidade é condicionada pelas experiências e crenças do(a) cientista. Portanto, o conceito de saberes localizados insiste no significado legítimo da objetividade, com uma versão “corporificada” da verdade, a qual fuja do cinismo que encobre a objetividade científica descorporificada. Ademais, Haraway (1988) argumenta que diferentes localizações sociais e culturais influenciam o que é visto e conhecido, enfatizando a importância das condições específicas de onde e como o conhecimento é gerado. Assim, ela promove uma visão da ciência que reconhece e valoriza a diversidade de perspectivas e experiências, argumentando que isso leva a um conhecimento mais enriquecedor e responsável.

Ao integrar o conceito de saberes localizados como um princípio central, esta tese adota uma postura que reconhece e valoriza as experiências vividas das mulheres cientistas, moldadas por seus contextos e identidades únicas. Essa perspectiva propicia uma análise mais ampla e contextualizada dos dados e fenômenos estudados, desafiando a noção tradicional de objetividade na pesquisa científica. Além disso, promove a reflexão sobre como as estruturas de poder e os contextos sociais moldam o conhecimento científico, argumentando a favor de uma ciência que seja reflexiva e consciente dos vieses que podem influenciar a pesquisa. Em termos práticos, a adoção dessa perspectiva significa que esta tese, além de documentar a presença das mulheres na ciência do solo no Brasil, também investigará como isso pode transformar as práticas científicas tradicionais. Ao invés de uma visão unidimensional da ciência do solo, uma abordagem mais abrangente e contextualizada poderá levar a avanços significativos na maneira como entendemos, interagimos e valorizamos o solo e a sua complexidade.

2.3 INTERDISCIPLINARIDADE, INTERSECCIONALIDADE, DIVERSIDADE E INCLUSÃO

A interdisciplinaridade se refere à integração e colaboração entre diferentes disciplinas ou áreas do conhecimento. Ela envolve a combinação de métodos, teorias e abordagens de dois ou mais campos para criar novos conhecimentos e soluções, além de desenvolver novas teorias, metodologias e formas de pensamento, contribuindo para a inovação e o avanço do conhecimento. Este conceito se baseia na ideia de que os desafios reais do mundo frequentemente não se encaixam nas fronteiras rígidas das disciplinas tradicionais. No contexto da pesquisa e da educação, a interdisciplinaridade promove flexibilidade e a capacidade de ver problemas sob diferentes ângulos. Isso é especialmente relevante em áreas que exigem uma combinação de conhecimentos das ciências naturais e sociais, onde as questões são complexas e interconectadas (DERRICK; FALK-KRZESINSKI; ROBERTS, 2012).

A teoria da interseccionalidade, desenvolvida por Crenshaw (1991), argumenta que as opressões, como raça, gênero, classe, sexualidade e outras identidades, não atuam de forma isolada, mas se entrelaçam e moldam experiências únicas de discriminação e privilégio. Por exemplo, a experiência de uma mulher negra e lésbica pode diferir significativamente da de uma mulher branca heterossexual, não apenas por causa do sexismo, mas também do racismo e da homofobia. Assim, a interseccionalidade permite uma análise mais aprofundada das experiências das mulheres na ciência do solo, considerando como diferentes identidades impactam a sua presença, evolução e reconhecimento. Isso ajuda a compreender as barreiras enfrentadas pelas mulheres em geral e como essas barreiras podem variar para mulheres de diferentes origens e identidades.

Nesse contexto, o conceito de diversidade refere-se à diferença. Dessa, maneira, é uma característica que se manifesta em grupos, não em um único indivíduo. Por exemplo, na força de trabalho científico, diversos indivíduos com características e experiências de vida distintas compõem um conjunto diverso, mas um(a) único(a) cientista não representa a diversidade por si só (GIBBS, 2014). Porém, a diversidade deve ir além da representação numérica e do simples reconhecimento da pluralidade. Ela envolve a apreciação e o uso dessas diferenças para enriquecer um ambiente ou contexto. Em outras palavras, é necessário que

haja inclusão, implicando em um esforço ativo para garantir que pessoas com diferentes gêneros, sexualidades, raças, contextos sociais, habilidades, ideologias políticas, entre outras identidades interseccionais, sintam-se bem-vindas e sejam capazes de participar plenamente em um determinado ambiente ou contexto. Isso envolve a remoção de barreiras que possam impedir a presença total de qualquer grupo e a criação de ambientes onde as diversidades e as singularidades de cada indivíduo são aceitas, valorizadas e vistas como positivas. O propósito é assegurar a inclusão de todos(as) os(as) cientistas com base em suas competências profissionais, sem exclusão devido a características pessoais (REYES-SÁNCHEZ; IRAZOQUE, 2022).

Na ciência do solo, a inclusão da diversidade beneficia a resolução de problemas complexos, como a segurança alimentar, a crise climática global e a mitigação do aquecimento global. Uma perspectiva interdisciplinar, enriquecida por múltiplos pontos de vista, é essencial para gerar soluções criativas e inovadoras. A diversidade de experiências e conhecimentos contribui para análises mais precisas e abrangentes, levando a uma tomada de decisão mais eficaz e a resultados que são mais inclusivos e representativos. Além disso, esse tipo de abordagem melhora a formação dos(as) cientistas do solo e aumenta o impacto do campo além do ambiente acadêmico, aplicando-o de maneira mais efetiva no mundo real (RÉYES-SÁNCHEZ; IRAZOQUE, 2022).

2.4 TEORIA CRÍTICA FEMINISTA, PATRIARCADO E RELAÇÕES DE PODER

A diferenciação entre teoria feminista e movimento feminista é essencial para compreender o feminismo não apenas como um movimento social e político, mas também como um campo teórico e metodológico (McAFEE et al., 2023). O movimento feminista é um conjunto de esforços sociais, políticos e econômicos que visam alcançar a equidade de gênero e os direitos das mulheres. Esse movimento engloba uma diversidade de campanhas e atividades, incluindo marchas, protestos, advocacia legal e sensibilização pública, com o objetivo de desafiar e transformar as estruturas sociais e legais que perpetuam a inequidade de gênero. Ele é caracterizado por sua natureza dinâmica e diversificada, adaptando-se e evoluindo ao longo do tempo e em diferentes contextos culturais.

Por outro lado, a teoria feminista é um campo acadêmico que estuda questões de gênero, poder e desigualdade. Ela se dedica à análise crítica das maneiras pelas quais o gênero influencia e é influenciado por sistemas sociais, culturais, políticos e econômicos. A teoria feminista não se limita à discussão sobre os direitos das mulheres; mas também aborda temas como interseccionalidade, relações de poder, identidade de gênero e representação (McAFEE et al., 2023). Deste modo, compreender o feminismo como um campo teórico e metodológico ajuda a entender como os ideais feministas podem ser aplicados para a análise e solução de problemas reais na ciência do solo.

A teoria crítica feminista, surgida no meio acadêmico nos Estados Unidos no início dos anos 70 e desenvolvida paralelamente aos movimentos ativistas feministas, é um campo de estudos essencialmente interdisciplinar. Assim, há uma recusa em classificá-la com uma única definição ou um único campo de estudo. Essa vertente teórica traz novas perspectivas para o debate sobre gênero, destacando as restrições enfrentadas pelas mulheres e identificando mecanismos de mudança (FRASER, 1989). Nesse contexto, o conceito de patriarcado, central nos estudos feministas, refere-se a um sistema social e cultural em que os homens detêm a predominância de poder – especialmente de liderança, propriedade e autoridade – em diferentes esferas, como política, econômica e familiar, resultando na opressão e subordinação das mulheres (WALBY, 1989).

Porém, assim como qualquer campo teórico acadêmico, a maneira como cada corrente teórica feminista aborda o patriarcado e suas manifestações de poder pode diferir significativamente. Por exemplo, o feminismo interseccional estuda como diferentes identidades e sistemas de opressão – com ênfase em diferenças de gênero, raça e classe – se sobrepõem e interagem. Essa abordagem reconhece que as experiências de opressão e dominação não são uniformes e podem variar significativamente de acordo com essas intersecções (CRENSHAW, 1991). Já o feminismo pós-estruturalista se concentra na análise das estruturas sociais e institucionais que mantêm o patriarcado e questiona as próprias categorias de gênero e poder, com enfoque nas construções discursivas e representacionais do patriarcado (BUTLER, 1990).

O feminismo pós-estruturalista foi inspirado em grande parte pelos trabalhos de Foucault (FOUCAULT, 1977, 1979, 1980), o qual compreende o poder como um sistema dinâmico e fluido de relações de força, que surge de cada interação e

contexto social, infiltrando-se em toda a sociedade. Essa visão indica que o poder não se concentra exclusivamente em uma entidade ou grupo específico, não é algo que os indivíduos possuem, mas se manifesta de diferentes formas, estando incorporado em discursos, instituições e práticas cotidianas. Foucault (1977) identifica a ciência e a escola como duas das instituições nas quais o poder se manifesta concretamente – seja através de práticas ou de exercícios – e argumenta que, por meio do ensino, essas formas de poder são naturalizadas. Dessa maneira, a conexão intrínseca entre poder e saber tem efeitos no que conhecemos, as formas pela qual conhecemos e até mesmo no sujeito que conhece (FOUCAULT, 1980). Essa abordagem é útil para analisar como o poder opera em diferentes níveis, desde o pessoal até o estrutural, e como ele está entrelaçado com a produção de conhecimento e identidades de gênero. Isso se reflete, por exemplo, no ingresso em programas de pós-graduação, nas oportunidades de crescimento profissional, nas grades curriculares e nas prioridades das linhas de pesquisa.

2.5 GÊNERO, IGUALDADE E EQUIDADE

O conceito de gênero, conforme articulado por Butler (1990), estabelece uma distinção crítica entre sexo e gênero. Para Butler, enquanto o sexo tem sido tradicionalmente percebido como uma categoria biológica fixa, definida por atributos fisiológicos que classificam os indivíduos como masculinos ou femininos, essa visão é redutiva. Butler argumenta que até mesmo o sexo é influenciado por contextos sociais e culturais, desafiando a ideia de que seja uma premissa puramente biológica. Segundo Butler (1990), o gênero emerge como uma “performance” — um conjunto de comportamentos, atitudes e expressões que são aprendidos, repetidos e reforçados pelas normas sociais. Essa performance de gênero, influenciada pelas expectativas da sociedade, não está diretamente ligada ao sexo biológico, sublinhando a fluidez do gênero e sua variação conforme o contexto cultural e individual.

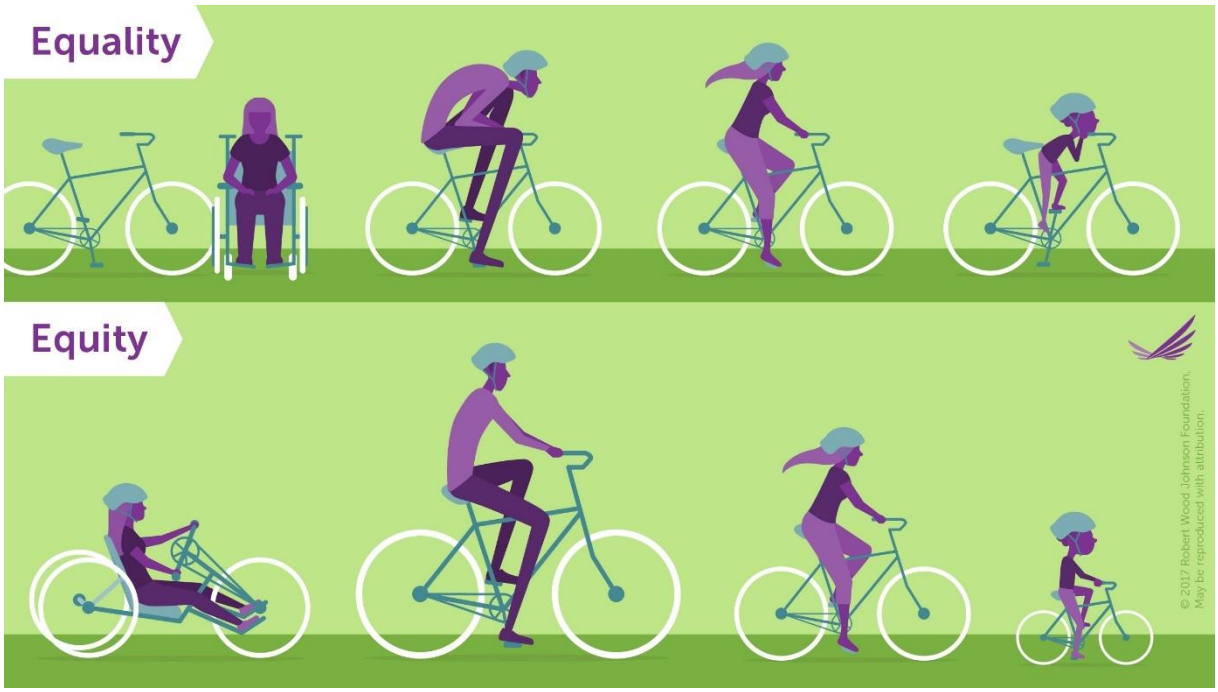
Butler (1990) explica que, ao longo do tempo, o gênero estabelece parâmetros que se transformam em estereótipos, determinando normas de comportamento desejáveis para cada gênero. Isso inclui, por exemplo, a noção de que as mulheres são naturalmente mais adequadas para papéis domésticos, os espaços que cada indivíduo deve ocupar e até mesmo as áreas de conhecimento

consideradas mais apropriadas para cada um. Dessa forma, o conceito de gênero proposto por Butler (1990) busca contestar o determinismo biológico associado à ideia de sexo, isto é, a concepção de biologia como destino. Essa perspectiva leva à naturalização das desigualdades entre homens e mulheres e, ao naturalizar o poder, acaba por ocultar os mecanismos através dos quais ele opera, bem como limita a possibilidade de contestação e transformação da estrutura social.

Compreender o gênero como uma construção social, e não como um resultado direto do sexo biológico, possibilita uma análise mais crítica de como as normas de gênero influenciam a presença, a evolução e o reconhecimento das mulheres na ciência do solo. Destaca-se, assim, que os obstáculos e desafios enfrentados por mulheres nesse campo são frequentemente o resultado de construções sociais e culturais, e não de limitações inerentes ao seu sexo biológico.

A integração desses conceitos nesta tese é fundamental para guiar a visão de um novo paradigma voltado à igualdade e à equidade de gênero, dois termos que, apesar de frequentemente utilizados como sinônimos, possuem distinções importantes (Figura 2.1).

Figura 2.1 – Diferença entre igualdade (*equality)* e equidade (*equity*)



Fonte: (RWJF, 2017).

A igualdade de gênero implica o conceito de que todos os seres humanos, de quaisquer identidades de gênero, são livres para desenvolver suas habilidades pessoais e fazer escolhas sem as limitações impostas por estereótipos, papéis de gênero rígidos e preconceitos. Significa que os diferentes comportamentos, aspirações e necessidades de todas as pessoas são considerados, valorizados e favorecidos igualmente, e que seus direitos, responsabilidades e oportunidades não dependerão de sua identidade de gênero. Por outro lado, equidade de gênero significa justiça no tratamento para todos os seres humanos, de quaisquer identidades de gênero, de acordo com suas respectivas necessidades. Isso pode incluir tratamento igual ou tratamento que é diferente, mas que é considerado equivalente em termos de direitos, benefícios, obrigações e oportunidades (adaptado de INTERNATIONAL LABOUR ORGANIZATION, 2007).

Assim, o conceito de equidade de gênero norteará esta tese. Embora a igualdade e a equidade de gênero sejam fundamentais para o avanço dos direitos e oportunidades das mulheres, optar por “equidade” em detrimento de “igualdade” enfatiza a necessidade de estratégias, recursos, oportunidades e suporte diferenciados para superar barreiras específicas e assegurar a inclusão plena das mulheres na ciência do solo.

3 REVISÃO DA LITERATURA

3.1 BREVE HISTÓRIA DA EDUCAÇÃO FORMAL DAS MULHERES NO BRASIL

Ao tratarmos da história das mulheres na ciência, é comum tratarmos da história de mulheres não brasileiras, especialmente das europeias. O motivo por trás disso, além da predominância de uma versão hegemônica ocidental e norte hemisférica do feminismo, talvez seja o fato de que o Brasil tenha um histórico educacional fraco e tardio – e quanto à situação educacional feminina, esse histórico acaba sendo ainda mais conturbado. Portanto, os estudos e a documentação no Brasil sobre as mulheres na educação e na ciência são muito escassos.

Durante o Brasil-colônia (1500-1822), as mulheres eram classificadas como *imbecilitus sexus* (sexo imbecil) e não havia escolas para meninas, nem mesmo em Portugal (RIBEIRO, 2000). A educação das mulheres, independentemente de sua origem ou status, limitava-se principalmente aos cuidados domésticos e familiares. A maioria das portuguesas era analfabeta, inclusive as mulheres da Corte, que tinham permissão apenas para ler livros de rezas. Nesse período, o domínio e as decisões eram exclusivamente do homem, em uma estrutura familiar patriarcal. Ribeiro (2000) ressalta que a palavra “família”, de origem latina, significa “escravos domésticos de um mesmo senhor”, implicando obediência ao patriarca.

A primeira reivindicação pela educação das mulheres no Brasil partiu dos indígenas, que consideravam injusta a restrição das mulheres ao ensino. Eles solicitaram a inclusão das mulheres indígenas na escola, mas a rainha de Portugal rejeitou o pedido devido às “consequências nefastas” que o acesso das mulheres indígenas pudesse representar à cultura da época (RIBEIRO, 2000). Até 1561, há o registro de uma única mulher que sabia ler e escrever: Catarina Paraguassu (ou Madalena Caramuru).

Apesar disso, as mulheres tiveram um importante papel no início da economia agropecuária no Brasil. Durante períodos de ameaça ao domínio português, as mulheres precisaram ocupar posições reservadas exclusivamente aos homens, inclusive na esfera pública. As únicas duas capitanias que tiveram sucesso foram administradas por mulheres, sendo uma delas responsável por trazer as primeiras mudas de arroz e laranja para o Brasil, além de presentear os indígenas do Rio

Grande do Sul com o gado bovino, que eles posteriormente reproduziram em larga escala (RIBEIRO, 2000).

Os conventos foram os primeiros locais de ensino para mulheres no Brasil, com o primeiro sendo fundado em 1678. O ensino superior chegou ainda mais tardiamente, já que Portugal cerceava a evolução educacional na sua colônia. Por volta da época da independência do Brasil, a Espanha já havia criado quase trinta universidades em suas colônias, mas Portugal limitou as suas à Metrópole (TEIXEIRA, 1999). Em 1808, a Família Real mudou-se para o Brasil com sua corte. No mesmo ano foram criadas as primeiras instituições de ensino superior brasileiras, centradas em apenas um curso para a formação de profissionais liberais (DURHAM, 2005). Foi somente em 1879 que, com a Reforma Leôncio de Carvalho, as mulheres alcançaram o direito de cursar o ensino superior. As universidades modernas como conhecemos hoje, abrangendo ciências básicas, pesquisa e formação profissional, surgiram apenas na década de 1930 (DURHAM, 2005).

Porém, mesmo em meio a um contexto de desafios educacionais e limitações impostas às mulheres, figuras notáveis e pioneiras conseguiram transcender as barreiras da época e redefiniram o papel das mulheres na educação e política no Brasil. Bertha Lutz (1894–1976), cientista, diplomata e política brasileira, dedicou sua vida a desafiar as barreiras institucionais e culturais à participação das mulheres na vida pública e política do país (MARQUES, 2020). Ela foi uma figura central na inclusão da igualdade de gênero na Carta da ONU, como integrante da delegação brasileira na Conferência de fundação das Nações Unidas. Foi a segunda mulher a fazer parte do serviço público brasileiro, assumindo inicialmente o cargo de secretária no Museu Nacional em 1919, e, vinte anos depois, tornando-se a chefe do setor de botânica. Em 1936, Lutz se tornou a segunda mulher a assumir um mandato como deputada federal no país, posicionando-se na vanguarda da luta pelos direitos das mulheres. Além de suas contribuições individuais, Bertha Lutz fundou e liderou a Federação Brasileira pelo Progresso Feminino, uma organização dedicada à defesa do sufrágio e dos direitos das mulheres no Brasil (MARQUES, 2020).

Antonieta de Barros (1901–1952), professora, jornalista, política e filósofa brasileira, defendia a educação como direito fundamental, meio de transformação e emancipação social (SANTOS, 2022). Ela argumentava pela necessidade de uma educação inclusiva e acessível a todos, destacando a importância do direito ao voto

e da participação ativa das mulheres na política para a conquista de uma verdadeira democracia. Sua trajetória é marcada pela superação de preconceitos de gênero, raça e classe, culminando em sua eleição histórica em 1934, sendo a primeira mulher negra a se tornar deputada estadual no Brasil. Antonieta de Barros criticava a marginalização e o silenciamento impostos pela sociedade patriarcal e racista, utilizando sua voz para reivindicar igualdade e justiça. A criação, por ela, do projeto de lei que instituiu o Dia do Professor como feriado nacional em 1948 e a inclusão de seu nome no *Livro dos Heróis e Heroínas da Pátria* são testemunhos de seu importante legado (SANTOS, 2022; BRASIL, 2023).

Em 1951, os cursos de pós-graduação no Brasil surgem a partir da criação da Campanha Nacional de Aperfeiçoamento de pessoal de nível superior (atual CAPES) e, em 1965, a pós-graduação é regulamentada pelo Conselho Federal de Educação (BRASIL, 1965). A partir da década de 1970, em meio ao regime ditatorial, o Brasil vivenciou um aumento significativo na educação, com mais pessoas completando o ensino fundamental, médio e, em menor proporção, o ensino superior (GUEDES, 2008). Esse período de expansão educacional coincidiu com mudanças sociais, como a abertura política, a liberalização sexual e a ascensão do movimento feminista. As mulheres também começaram a ingressar no mercado de trabalho, especialmente nas classes sociais mais altas, onde tradicionalmente eram associadas ao ambiente doméstico.

Essas transformações desempenharam um papel fundamental no avanço da educação e na posição das mulheres no sistema educacional brasileiro. A tradição da universidade como um espaço dos homens foi rompida e as mulheres passaram a ser, com muita rapidez, de minoria (25% em 1970) à maioria (53% em 2000) da população com nível superior no Brasil (GUEDES, 2008). Atualmente, as mulheres representam 62% da população com algum nível de educação secundária (UNDP, 2019). Dados do Censo da Educação Superior (INEP, 2020) confirmam que o universo acadêmico registra maior número de matrículas de mulheres em todos os tipos de graduação presencial (bacharelado, licenciatura e tecnólogo), com tendência de crescimento ao longo do tempo.

O avanço na educação e qualificação das mulheres no Brasil é uma conquista significativa e uma mudança histórica nas relações de gênero. No entanto, apesar dessas melhorias, a equidade ainda é um desafio. O Brasil ocupa a 95ª posição entre 162 países no *Gender Inequality Index*, índice que mede as desigualdades de

gênero na saúde reprodutiva, empoderamento e situação econômica (UNDP, 2019). Em um retrato geral, embora as mulheres representem 66% das matrículas nos cursos de licenciatura no país, apenas 47% das posições docentes são ocupadas por elas (INEP, 2020).

Apesar da redução das disparidades de gênero na carreira acadêmica, o campo científico ainda apresenta uma predominância de homens em certas áreas do conhecimento e nos níveis mais elevados de bolsas de produtividade do CNPq (BARROS; MOURÃO, 2020; REICHERT et al., 2022). No cenário geral, 48% das pessoas com doutorado atuando em pesquisa e ensino são mulheres. No entanto, esse percentual cai para 41% nas ciências agrárias e 33% na agronomia. Além disso, apenas 26% das bolsas de produtividade em ciências agrárias e 23% em agronomia são concedidas a mulheres (BARROS; MOURÃO, 2020). Uma porcentagem ainda menor é encontrada nos níveis mais altos de bolsa e nenhuma mulher recebe bolsa na categoria mais elevada (REICHERT et al., 2022). Inclusive, as mulheres estão mais envolvidas na formação de recursos humanos (orientando estudantes), publicando mais em periódicos não-JCR e são mais velhas nos níveis mais baixos ou sem bolsa (REICHERT et al., 2022).

Esses estudos mostram que, apesar dos avanços, as inequidades de gênero no espaço acadêmico brasileiro continuam, manifestando-se em barreiras que limitam as oportunidades de sucesso e avanço profissional das mulheres. Embora haja um investimento significativo das mulheres em educação, os homens predominam nas posições de maior prestígio, como na docência universitária. Isso pode indicar que a decisão das mulheres de prolongar seus estudos está vinculada à limitação de oportunidades profissionais. Essa tendência se repete nos cursos de mestrado e doutorado, onde a presença das mulheres supera a dos homens (CAPES, 2022; GOUVÊA; FIÚZA, 2023), apontando para uma discrepância entre a educação avançada das mulheres e sua absorção pelo mercado de trabalho ou progressão na carreira, reforçando a persistência da disparidade de gênero no contexto acadêmico brasileiro.

3.2 SCARCITY OF GENDER STUDIES IN AGRICULTURAL AND SOIL SCIENCES: A WORLDWIDE ASSESSMENT OF CURRENT STATUS AND FUTURE DIRECTIONS

Highlights:

- Gender disparity is a longstanding issue in agricultural and soil sciences.
- We provide a bibliometric and bibliographic review on gender studies in these fields.
- Gender studies in soil science are less recognized and cited.
- Gender studies in agricultural sciences exhibit more publications and citations.
- Global national data and intersectional research are needed in gender research.

Abstract: The field of agricultural sciences, and especially soil science, have always presented a strongly unequal academic and professional gender composition. Current demographics demonstrate that they have never been at the forefront of gender and diversity issues within the earth and natural sciences. This paper is the first to conduct a bibliometric and bibliographic review on gender studies within the fields of agricultural sciences (AS) and soil science (SS). We synthesize and discuss the existing literature, providing a historical and contemporary context, and identify geographical distribution of publications, key journals, trends and research gaps. The data for this research was obtained through the Web of Science and Scopus databases. We found 78 publications in the AS group and 22 in the SS group. Overall, the number of publications increased considerably since 2016: 50% were published in the last 7 years, the other half are spread over a period of 40 years (1975 to 2015). The most frequent language was English and the United States was the country with the highest number of publications and sum of citations. In the SS group, the average of citations per publication is low and they do not seem to achieve recognition and significant interest from the scientific community. In the AS group, comparatively, the average number of citations per publication is higher, especially until 2008. After that year, there is a sharp decline in the average, which can be explained by an increase in the number of publications. Despite the growth in gender studies especially in the agricultural sciences, they are still scarce when compared to other fields of geosciences. Therefore, in addition to raising awareness among students, faculty and staff of academic institutions, it is recommended that more

detailed and in-depth studies be carried out around the world so as to have a picture as close as possible to reality about the gender disparity in agricultural and soil science as a whole, in order to maximize the efficiency of decision-making and equity policies.

Keywords: women; bibliometric review; bibliographic review; disparity; scientometrics.

3.2.1 Introduction

In the last decades, there has been in many countries a remarkable increase in the literacy rate of women across all educational levels, especially in higher education, surpassing men in terms of enrollment and earned degrees (UNESCO, 2017). This advancement reflects significant progress in terms of gender equity. However, gender disparities in science persist, varying in magnitude depending on the country and field of knowledge (HUANG et al., 2020). One field that demonstrates significant gender gaps is science, technology, engineering, and mathematics (STEM). Girls tend to lose interest in STEM as they grow older, leading to lower participation rates. In higher education, women represent just 35% of STEM students, and they face higher dropout rates in STEM disciplines throughout their higher education, career transition, and professional trajectories (UNESCO, 2017). Soil science, as an example, is among the least diverse disciplines within the earth and natural sciences. It has lagged behind in addressing gender and diversity issues in graduate programs, and has one of the lowest proportions of women researchers within the geosciences (WILSON, 2019; BERHE; GHEZZEHEI, 2020; CARTER et al., 2021).

Given this scenario, the increasing pressure from feminist movements led to a consequent increase in gender studies with different multi and interdisciplinary approaches. These studies aim to understand the construction, characteristics, dynamics, and changes of gender relationships over time. They critically analyze how gender identities, roles, and relations constructed by a given society in a certain historical period influence various aspects such as the economy, politics, environment, health, education, and personal lives. Often intersected with other marginalized categories, including race, ethnicity, class, sexuality, disability, and

nationality, gender studies investigate how these intersections shape individuals' experiences and opportunities. Research on gender and STEM has resulted in initiatives like the National Science Foundation ADVANCE program in the United States (US), established in 2001, to increase women's representation among STEM faculty through institutional transformation (DeARO; BIRD; RYAN, 2019). The growing body of research has raised awareness of gender disparities in education and careers in science and technology, pressuring educational institutions to take action by implementing measures or conducting further studies to address and rectify these imbalances.

Although gender parity has not been fully achieved, there has been a 20% increase in the proportion of women earning bachelor's, master's, and doctoral degrees in science and engineering in the US from 1975 to 1995 (PRESTON, 2004). In soil science, there has also been an increase in the enrollment of women in undergraduate courses offered by US institutions from 2009 to 2014, despite a decline in their percentage due to a greater number of men enrollments during the same period (BREVIK et al., 2018). Over the past decade, women have outnumbered men in master's and doctoral degree programs in soil science at US universities, in addition to a growth of approximately 44% in women's membership and participation in the Soil Science Society of America (SSSA) meetings (VAUGHAN et al., 2019). However, women still face challenges in attaining leadership positions in soil science related careers, receiving proportionate recognition through SSSA awards, and experiencing attrition as they progress in their careers (VAUGHAN et al., 2019).

In Sub-Saharan Africa, women's participation in agricultural research and development has shown growth in the 2000s, with the number of women agricultural researchers more than doubling compared to men. However, the proportion of women professionals employed in agriculture lags behind the proportion of women students enrolled in agricultural science bachelor's degrees (BEINTEMA, 2014). This is possibly a good indicator for the future, but currently, women presence decreases with career advancement in science and technology, and they tend to be overrepresented in lower positions and underrepresented in high-level research and management positions compared to men (BEINTEMA, 2014).

Exploring gender issues across various fields and disciplines is fundamental for enhancing awareness of gender equity and removing obstacles on women's

academic and professional paths (CARTER et al., 2021; BERHE et al., 2022). This paper aims to contribute to this effort by conducting a bibliometric and bibliographic review of gender studies within the field of agricultural and soil science using the Web of Science and Scopus databases. The objective is to synthesize and discuss the existing literature, providing both a historical and contemporary context, and identifying the geographical distribution of publications, key journals, trends, gaps, and research opportunities. Our work supports the United Nations' Sustainable Development Goals for soil sustainability (UNITED NATIONS, 2019; LAL et al., 2021), striving to create a more inclusive, equitable and fairer environment for women in science.

3.2.2 Data acquisition

The data was obtained from the Clarivate Analitics' Web of Science (WoS) database – using the Web of Science Core Collection and the SciELO Citation Index – and from Elsevier's Scopus, using institutional access from the Federal University of Santa Maria, Brazil. Advanced searches were carried out by combining terms referring to gender studies and fields of knowledge separated into two groups, agricultural sciences (AS) and soil science (SS), in the titles, abstracts and keywords of the documents. The greatest possible number of terms referring to gender studies known in the main publications on the topic was included, however, it is worth mentioning that due to this methodology, some documents may still have been left out of the results found in this research. The complete codes with the terms used in the searches are contained in Charts 3.1 and 3.2. The search considered the following document types: article/research article, review, book, book chapter, proceedings paper/conference paper with DOI and editorial material published in English, Portuguese and Spanish; from 1945-2022 in WoS and from 1960-2022 in Scopus.

Chart 3.1 – Code for the Web of Science advanced search

Group	(TS=(("Soil Science" OR "Soil Sciences" OR Soil NEAR/2 Sciences)	(TS=(("Agricultural Science" OR "Agricultural Sciences" OR Agronomy OR "Crop Science" OR "Crop Sciences" OR Crop NEAR/2 Sciences)
Terms	AND ("Author Gender" OR "Female Authors" OR "Female Authorship" OR "Female Gender" "Female Participation" OR "Female Researchers" OR "Female Scientists" OR "Female Under-representation" OR "Gender Analysis" OR "Gender Authorship" OR "Gender Bias" OR "Gender Biases" OR "Gender Composition" OR "Gender Demographics" OR "Gender Differences" OR "Gender Disparity" OR "Gender Distribution" OR "Gender Diversity" OR "Gender Equality" OR "Gender Equity" OR "Gender Gap" OR "Gender Identity" OR "Gender Inequality" OR "Gender Inequity" OR "Gender of Students" OR "Gender Parity" OR "Gender Participation" OR "Gender Ratio" OR "Gender Representation" OR "Gender segregation" OR "Gender Studies" OR "Gender Study" OR "Gender Trends" OR "Gender-blind" OR Girl* OR "Glass Ceiling" OR "Leaky Pipeline" OR "Participation of Women" OR "Segregation by gender" OR Wom?n OR "Women Empowerment" OR "Women's Role" OR "Woman Studies" OR "Woman Study" OR "Women Authors" OR "Women Authorship" OR "Women Participation" OR "Women Researchers" OR "Women Scientists" OR "Women Studies" OR "Women Study" OR "Women Under-representation")))	

Chart 3.2 – Code for the Scopus advanced search

Group	TITLE-ABS-KEY(("Soil Science" OR "Soil Sciences" OR Soil W/2 Sciences)	TITLE-ABS-KEY(("Agricultural Science" OR "Agricultural Sciences" OR Agronomy OR "Crop Science" OR "Crop Sciences" OR Crop W/2 Sciences)
Terms	AND ("Author Gender" OR "Female Authors" OR "Female Authorship" OR "Female Gender" OR "Female Participation" OR "Female Researchers" OR "Female Scientists" OR "Female Under-representation" OR "Gender Analysis" OR "Gender Authorship" OR "Gender Bias" OR "Gender Biases" OR "Gender Composition" OR "Gender Demographics" OR "Gender Differences" OR "Gender Disparity" OR "Gender Distribution" OR "Gender Diversity" OR "Gender Equality" OR "Gender Equity" OR "Gender Gap" OR "Gender Identity" OR "Gender Inequality" OR "Gender Inequity" OR "Gender of Students" OR "Gender Parity" OR "Gender Participation" OR "Gender Ratio" OR "Gender Representation" OR "Gender Segregation" OR "Gender Studies" OR "Gender Study" OR "Gender Trends" OR "Gender-blind" OR Girl* OR "Glass Ceiling" OR "Leaky Pipeline" OR "Participation of Women" OR "Segregation by Gender" OR Wom?n OR "Women Empowerment" OR "Women's Role" OR "Woman Studies" OR "Woman Study" OR "Women Authors" OR "Women Authorship" OR "Women Participation" OR "Women Researchers" OR "Women Scientists" OR "Women Studies" OR "Women Study" OR "Women Under-representation"))	

We selected the citation report from “All Databases” in WoS. If a document appeared in both WoS and Scopus searches, we opted for the highest citation count.

Basic information extracted from the documents included: name of authors, title of publication, year of publication, country, name of the journal of publication, DOI, address of the corresponding author, type of document, number of times it was cited and language of publication. The raw data files were organized in an electronic worksheet. After organizing the data, the abstracts or the full texts of the documents were read to verify whether the publication fit the research objective. The criteria for this filtering took into account gender studies as the main theme or as a category of analysis/variable, with or without comparison between genders, in any field linked to agricultural sciences or soil science. Studies that reported data on students from agricultural and/or soil science courses only as a sample or compared women and men, but without the research topic being linked to the fields mentioned, were not included in the analysis.

For the publication country reference, the following were considered (in order of priority): the location indicated by the corresponding author address; the location of the first author; the location of the university informed in the document; the location informed in the “Indexed keywords” (or “Regional Index”) on the Scopus website; location informed in the author's data available on the WoS website. If none of these data were provided, the “country” category was left blank. The language of some documents was not included in the downloaded metadata, so these were filled in by verifying the information that was on the WoS/Scopus website or in the main text of the original document. When the year of publication found in a document differed from the one indicated by the metadata, the former was selected.

3.2.3 Results and discussion

First and foremost, it is important to acknowledge the biases and limitations within the WoS and Scopus indexes. According to Pranckutė (2021), these databases exhibit a language bias by prioritizing English publications, which leads to the underrepresentation of research in other languages. This creates a disadvantage for non-English-speaking researchers and limits the diversity of perspectives and knowledge. Country bias is also evident, with certain countries being overrepresented due to the concentration of major academic publishing companies, such as The Netherlands, United Kingdom (UK), and US. As a result, research from other countries may be underrepresented, leading to a skewed view of global

scholarly output. Additionally, there is bias in the fields of knowledge representation, with lower coverage in humanities, arts, and social sciences, and overrepresentation in natural sciences, engineering, and biomedical research. This bias can impact the visibility, recognition, and dissemination of research across different fields of knowledge, affecting the perception and evaluation of scholarly output. Furthermore, both WoS and Scopus primarily focus on journal indexing. The limited coverage of books and conference proceedings in these databases impairs their effectiveness in disciplines where these source types are prevalent. However, Pranckutė (2021) highlights that despite the existence of alternative databases, their reliability and validity are still questionable and some sources are highly specialized and not suitable for broad analysis and evaluation of multidisciplinary units. Therefore, WoS and Scopus are still considered the most reliable sources of bibliographic data for research analyses and evaluations (PRANCKUTĖ, 2021).

Hereupon, 78 publications were found for the AS group (69 article/research article, 1 book, 4 book chapters and 4 proceedings paper/conference paper) and 22 results for the SS group (14 article/research article, 2 book chapter, 2 editorial material and 4 review). The most frequent language in the publications was English (n = 86), followed by Portuguese and Spanish (n = 7 each). The country with the highest number of publications was the US, followed by Brazil (Table 3.1). In the global context and considering all fields of knowledge, the US is the country that publishes the most gender research (ALLAGNAT et al., 2017). From 1996 to 2000, the US had more than 4,000 publications and this number almost doubled from 2011 to 2015. However, there was also an increase in publications in other countries, mainly in the European Union, where the growth rate was 4.3 times higher from 2011 to 2015, compared to the period from 1996 to 2000, exceeding the growth rate of the US.

The US had the highest sum of citations (548) (Table 3.1). However, considering the average citations, Colombia leads with one paper that was cited 402 times, followed by Belgium and Finland (26 and 22 average citations, respectively). Overall, the number of times each publication was cited is low: 24 had no citation and 17 had only 1 citation, which corresponds to 41% of the evaluated publications. However, 56% of these publications are still within the 5-year citation window, which is the time needed for a publication to be recognized and cited in the multidisciplinary sciences, considering a Spearman correlation of 0.9 (WANG, 2013). Only 16

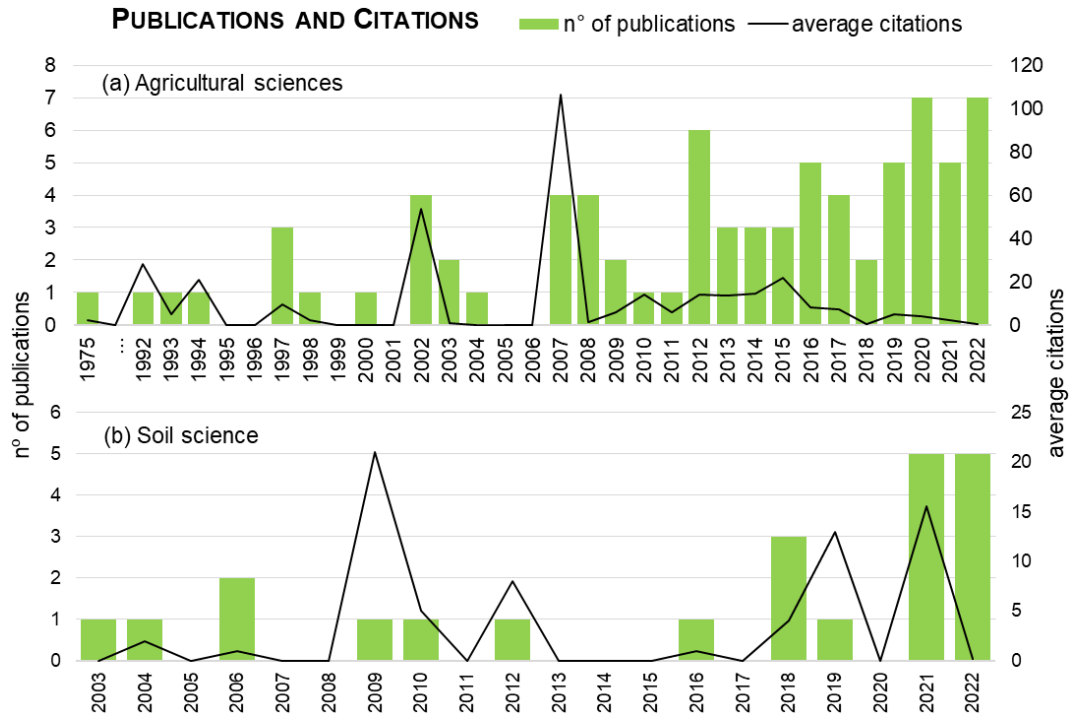
publications have 20 or more citations and only 2 have more than 100 citations. In the publications of the SS group, the highest averages of citations occurred in 2009 (21 citations) and in 2021 (15.6 citations) (Figure 3.1b).

Table 3.1 – Number of publications and citations in agricultural and soil sciences gender studies by country (1975-2022)

Country	Publications	Sum of citations	Average citations
United States	38	548	14.4
Brazil	9	38	4.2
Mexico	5	15	3
Spain	5	2	0.4
Kenya	4	24	6
England	4	18	4.5
Netherlands	3	39	13
Italy	3	35	11.7
Russia	3	2	0.7
Finland	2	44	22
Canada	2	13	6.5
Iran	2	19	9.5
N/A(1)	2	3	1.5
Argentina	1	0	0
Belgium	1	26	26
Cameroon	1	7	7
China	1	14	14
Colombia	1	402	402
Cuba	1	0	0
Ecuador	1	1	1
Hungary	1	4	4
India	1	0	0
Japan	1	21	21
Malawi	1	1	1
Niger	1	3	3
Sweden	1	6	6
Uganda	1	0	0
Uruguay	1	8	8
Venezuela	1	1	1
Thailand	1	0	0
Norway	1	0	0

(1)Not available.

Figure 3.1 – Number of publications and average citations in gender studies in agricultural sciences (1975-2022) (a), and soil sciences (2003-2022) (b)

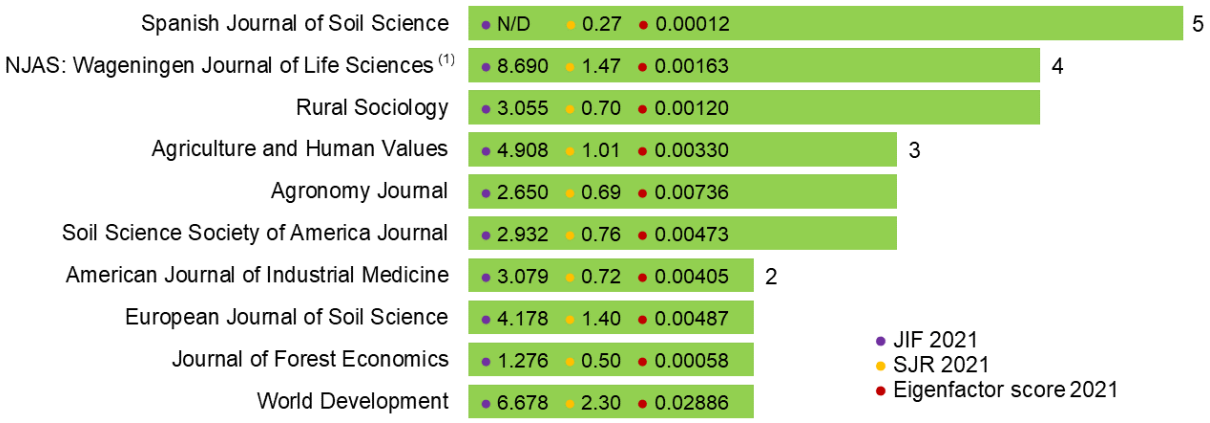


It is noteworthy that, in general, in addition to the SS having a low total number of publications on gender, the published works do not seem to achieve recognition and significant interest from the scientific community. In the AS group, the average citations increase considerably, mainly in 2007 (106 citations) and 2002 (53.7 citations) (Figure 3.1a). From 2008 onwards, the decrease in average citations can be attributed to the rise in both the frequency and number of publications, which were scarcer before this period. The publications from the last five years (2022 to 2018), considered to still be in the “citation window”, despite totaling 40 studies in the AS and SS groups, have a very low average of citations (4.3 citations). Thus, it is possible that overall citations would increase if more researches on gender studies in agricultural and soil sciences are published, as the existing bibliographic material on the subject can be used in future research – which, consequently, may also increase the visibility on the topic.

The journals that presented the highest number of publications were the *Spanish Journal of Soil Science* (n = 5, 1 citation total), due to their special issue

"Women in Soil Science" published in 2022 (FRANCIS; POCH; VIDAL-DURÀ, 2022), followed by the *NJAS: Wageningen Journal of Life Sciences* and *Rural Sociology* (n = 4 each) (Figure 3.2) – the former with an average of 20.5 citations per publication, ranging from 6 to 32 citations, and the latter with an average citation of 14.7, ranging from 0 to 29 citations. However, *World Development* journal had the highest number of citations in its 2 published papers, 149 and 46 citations, both from the US, which can be explained by its highest impact factor in two of the three indexes analyzed among the ten journals with the highest number of publications (Figure 3.2). In a global context, the publications on gender with the greatest impacts citations are from the US, UK and Denmark, where they receive, respectively, 35, 34 and 31% more citations than the world average (ALLAGNAT et al., 2017). In spite of that, while citations provide an indication of a publication's impact, they are just one way to measure it. Impact can also be evaluated considering factors such as practical application, policy changes, societal influence, inspiration for further research, and contributions to advancing knowledge. Thus, relying solely on citation counts may not capture the full extent of a publication's impact.

Figure 3.2 – Top 10 journals with the highest number of publications in gender studies in agricultural and soil sciences (1975-2022). JIF (Journal Impact Factor), SJR (SCImago Journal Rank) and Eigenfactor score are indicators that measure the scientific influence of scholarly journals. (1)Currently known as NJAS: Impact in Agricultural and Life Sciences



Sixty-two journals had only 1 publication – which includes the Brazilian journals *Cadernos de Educação, Tecnologia e Sociedade*, *Cadernos Pagu*, *Ciência Rural*, *Educação e Pesquisa*, *Revista Artemis* and *Revista Brasileira de Ciência do Solo*. From 2011 to 2015, Brazil accounted for 3% of global publications on gender, and obtained a Field-Weighted Citation Impact of 0.56, meaning that the publications receive 44% less citations than the global average (ALLAGNAT et al., 2017). However, the study took into account articles with the word “gender” in the title, so countries that do not have English as their native language or that do not usually publish in English may have been strongly underestimated by this methodology.

In the AS group, the main topics covered by the publications were the proportion of women in industry and other areas, risk analysis, agricultural research in developing countries, injury caused by rural work, and agricultural crops. In the SS group, the main topics were women soil scientists in the academy, life stories and contribution of women soil scientists, risk analysis, and geophagy as supplementation of micronutrients.

3.2.3.1 Gender studies in 1975

The analysis of gender studies within agricultural and soil sciences is intricately intertwined with the historical trajectory of feminist movements. By examining the broader context shaped by these movements, valuable insights can be reached into the current landscape of gender research. One pivotal phase in this trajectory is the second wave of feminism, which originated in the US during the 1960s and extended into the mid-1980s, spreading its influence across Western societies (McCANN et al., 2019). Guided by the slogan “The personal is political”, this wave witnessed transformative protests, marches, and strikes that challenged the existing societal norms. The 1970s, in particular, marked a significant turning point as publications and academic studies exploring the phenomenon of men privilege emerged. The researchers delved into issues surrounding sexuality, family dynamics, the labor market, and reproductive rights. By addressing these topics, the second wave of feminism extended the scope of gender discourse and furthered the cause of gender equality (McCANN et al., 2019).

Following these steps, in 1972 emerged in Italy the idea that the state should pay women for domestic service provided by them to their families. The concept

gained weight and became the international movement “Wages for Housework” (McCANN et al., 2019). It is in this context that the first publication (and the only one until 1992) of the AS group appears: *The careers of professional women and men in Finland* (ESKOLA; HAAVIO-MANNILA, 1975) (Figure 3.1a). The authors used a questionnaire to evaluate the social prerequisites imposed on men and women for success in their careers across six men-dominated fields, such as agricultural sciences, engineering, and forestry.

Eskola and Haavio-Mannila (1975) introduced the paper with surprising statistics for its time, revealing that Finnish universities had already achieved gender parity among students by the mid-1960s. Furthermore, in 1970, 43% of all university degrees were awarded to women. By 1971, women would already made up 45% of Finland’s workforce. However, even with these promising numbers, the study revealed that women, despite having similar qualifications, earned only 60 to 70% of men’s salaries. Additionally, there was a shortage of adequate day care centers, and that men’s participation in domestic activities were no higher than any other country in Europe. These findings aligned with current research (RIDGEWAY, 2011; AUSPURG; HINZ; SAUER, 2017; ORTIZ-OSPINA; ROSER, 2018), indicating that women were significantly behind men in both professional status and salary, even though they were in better starting positions in terms of social status, educational performance and organizational activity in youth.

The study also showed that the unequal division of labor in domestic life was one of the structural barriers that maintained gender inequality in working life (ESKOLA; HAAVIO-MANNILA, 1975). It is important to reinforce that Finnish women in the 70s had high numbers of schooling, political presence and workforce, but still there was a clear gender division of labor, great inequality in the workplace and a high pay gap between women’s and men’s wages. It was widely recognized that women had much more difficulty reaching the top of their careers than men did – a phenomenon that would be coined as the “glass ceiling”, the invisible, barely surmountable, barrier that women face to rise professionally, including in scientific careers (ROSSER, 2004).

These types of inequities and barriers continue to be encountered in the contemporary world. Currently, in the US and in other economically advanced nations, women’s average wages are approximately 83% of men’s wages (PAYSCALE, 2023), even though women reversed the education gap and greatly

reduced the experience gap (schooling and actual labor market experience) from 1981 to 2011 (BLAU; KAHN, 2017). However, it is important to note that the reality for women of different racial and ethnic backgrounds can vary significantly. In the US, Black and Latina women currently earn approximately 67 and 57 cents, respectively, for every dollar earned by white, non-Hispanic men in 2021 (NATIONAL WOMEN'S LAW CENTER, 2023). The wage gap persists when comparing to other white women, even after accounting for factors such as education, experience, and occupation. Black and Latina women in the US with a bachelor's degree receive 3 and 4 cents less, respectively, compared to their white counterparts with the same education (PAYSCALE, 2023). These findings illustrate that the wage inequality faced by women extends beyond gender alone, and intersecting factors such as race and ethnicity significantly impact the disparities experienced by women.

These examples demonstrate that societal, political, economic, and institutional changes alone cannot eradicate the systemic inequality perpetuated by cultural beliefs regarding differences in status between men and women, or on other words, gender stereotypes. Apart from cultural traditions, various other factors contribute to the formation of gender stereotypes, including media representations, parental influences, peer pressure, educational systems, institutional dynamics, and individual cognitive processes. By centering gender as a primary framework for organizing social relationships, individuals activate beliefs about gender status in all interactions. These cultural beliefs end up implicitly shaping behavior and judgments in ways that, over time, reproduce gender inequality in both professional and domestic realms, exerting significant control over resource allocation, power dynamics, and mitigating the impact of transformative forces (RIDGEWAY, 2011).

In the long-term, the trend has been a substantial reduction in the gender wage gap, but the progress has been slower and more uneven since the 1980s. Additionally, increases in women's labor-force participation rates and reductions in occupational segregation by gender have plateaued or slowed since the 1990s (RIDGEWAY, 2011; BLAU; KAHN, 2017). These findings align with the concept that gender inequality is in constant reconstruction, persisting and evolving despite some improvements (RIDGEWAY, 2011). It suggests that ongoing social processes and interactions actively maintain and reproduce gender inequality. Even in contexts where gender norms and stereotypes are deeply entrenched, the dynamics of gender inequality continue to evolve. In new and changing contexts, such as technological

advancements, globalization, or shifts in cultural attitudes, gender inequality adapts and takes on new manifestations. Given the dynamic nature of gender inequality, it is necessary a perpetual commitment to vigilance and active intervention in order to address and rectify the persisting disparities.

3.2.3.2 Gender studies from 1990 to 2011

A long period of 16 years followed until the next paper about gender was published in 1992 in the AS group (Figure 3.1a), which demonstrates the lack of discussion on the subject within the field – even worse is the situation of the SS, which would have its first paper published only in the following decade (Figure 3.1b).

Now in the third feminist wave, the early 1990s yielded only three publications in the AS field (BEUS; DUNLAP, 1992; OPOLE, 1993; FERGUSON, 1994) (Figure 3.1a). The articles discuss the importance of women in maintaining sustainable or alternative agriculture, themes that refer to the ecofeminist movement, a position which argues that there are important connections between the treatment given to women, people of color, and low socioeconomic classes and the one given to the non-human natural environment (WARREN, 1997). The late 1980s and early 1990s were a promising time for ecofeminist publications. The inclusion of the importance of women in a chapter of Agenda 21 in Rio-92 also showed the influence of the movement (BUCKINGHAM, 2015). In 1993, sociologist Maria Mies and philosopher/activist Vandana Shiva published the first edition of the book *Ecofeminism* (MIES; SHIVA, 1993), considered a feminist classic nowadays.

The ecofeminist perspective is also addressed in Ferguson's (1994), to advocate for women's centrality in the promotion of a more sustainable agriculture. The research is based on feminist critiques of science and approaches that advocate for the deconstruction and reconstruction of agricultural scientific practice. The author criticizes the development of agriculture originated through masculinized Western science – which refers to the dominant scientific practices and methodologies that have historically been shaped by men's perspectives, values, and biases within Western societies. This approach often prioritizes objectivity and rationality, while devaluing or excluding alternative ways of knowing and marginalized voices. Based on a case study from Malawi, Africa, Ferguson's (1994) highlights that despite the central role of women farmers' knowledge and practices in the country's agricultural

and social sustainability, they are excluded from national African agricultural research and development programs. The paper by Beus and Dunlap (1992) surveyed the faculty of the College of Agriculture and Home Economics at Washington State University, with regards to alternative agriculture. At the time there were growing criticisms of agricultural scientific research under the bias of conventional agriculture, that is, non-ecological and non-sustainable. The study revealed that women were more likely than men to support environmental protection, the use of appropriate technologies, risk prevention and other issues related to alternative agriculture. Opole (1993), sought to revalidate women's knowledge of indigenous vegetables, criticizing the methods and concepts of scientific research and the implications that policy has within the agricultural sciences, the educational system and the media in relation to local knowledge and Indigenous cultures.

In the 2000s, 6 articles on gender were published in SS, the first of which was in 2003 (Figure 3.1b). The studies discuss the career opportunities of Russian women in science, taking soil science as an example (SYCHEVA, 2003, 2006). They highlight the history of achievements of women soil scientists in the US (LEVIN, 2005) and Russia (SYCHEVA, 2006); reconstruct the importance of social structure, markedly the influence of gender and class, in the development of soil science in Hungary (ENGEL-DI MAURO, 2006); analyze the physiological function of soil stick consumption in Tanzania – a common habit especially in pregnant women and children – in terms of micronutrient supply and adsorption capacity for materials such as toxins (YANAI et al., 2009); and describe the connection of soil science with geology, through the life and contribution that the father and soil scientist William Tharp had to the life and career of oceanographic cartographer Marie Tharp (LANDA, 2010).

The feminist debate in the world context was not so effervescent in the 2000s and the AS group had a small increase from 7 publications in the 1990s to 18 publications in the following decade (Figure 3.1a). However, several initiatives to increase women's participation in academia and STEM fields were launched around the 2000s in many countries, such as the National Science Foundation ADVANCE Program (US), National Girls Collaborative Project (US), The Millennium Project (US), Anita Borg Institute for Women in Technology (US), Athena Swan Charter (UK), Women in Engineering programs (Australia), Women in STEM programs (Australia, Canada, India), The Science Foundation Ireland ADVANCE Program (Ireland), and

Women and Science Program (Brazil). Although slowly and modestly, these efforts were beginning to have an effect within the academic environment of the agricultural sciences in the following years.

The paper by Fiúza et al. (2009) discusses two main points that help to explain the gender stereotype perpetuated in the agrarian space as a whole: 1) gender division of labor, where men are associated with productive and public work and women with reproductive and private work; and 2) technological sexism in rural areas, in which women are restricted to technical, managerial, environmental and group organization information and knowledge – due to the perpetuation of cultural thinking that considers women in a hierarchical condition complementary to men. Taking Brazil as an example, the authors argue that the interventionist practices that technical assistance and rural extension institutions carry out with women are aimed at administrative work and home care, while for men, the practices are of technological orientation, aimed at improving productivity and rationality in property management. Despite these institutions having a political environment favorable to a more equitable gender relationship in policies aimed at rural development, they were not able to break with the cultural markers of gender as there was no training nor awareness of their technicians (FIÚZA et al., 2009). As argued in the previous section, the main reason for the persistence of gender inequality is precisely these everyday practices marked by the cultural gender stereotype, which always end up distributing power and resources to men (RIDGEWAY, 2011).

The prevalence of these gender stereotypes in the agrarian space, which extend to academic and research institutions, intersects with the issue of inadequate support for historically marginalized communities within the field of agricultural and soil science. This lack of support may manifest in various ways, such as limited access to resources, funding, mentorship, career advancement opportunities, or a lack of representation and inclusion within the field (CARTER et al., 2021). However, there is a notable transformation taking place as the demographics of the field shift towards a more diverse community, with increased representation of individuals from marginalized groups (VAUGHAN et al., 2019; CARTER et al., 2021). And, precisely, to effectively address environmental challenges and cater to increasingly diverse populations in our globalized world, it is essential to establish a more diverse scientific working group. Embracing anti-exclusionary attitudes at every level –

individual, institutional, and societal – is essential. Carter et al. (2021) provide a list of responses and actions that can be taken at each of these levels in soil science.

Practices involving exclusion and harassment must never be tolerated and proactive measures must be taken to protect affected individuals and prevent its recurrence. This includes implementing clear reporting mechanisms, providing support for victims, conducting thorough investigations, and taking disciplinary actions against offenders (MARÍN-SPIOTTA et al., 2020). These steps ensure the safety and well-being of those impacted and foster a culture of respect and inclusivity in the agricultural and soil sciences.

3.2.3.3 Gender studies from 2012 to 2022

The feminist movement only re-energized itself from the second decade of the 2000s onwards: powerful manifestations driven by the forces of social networks, and led in large part by the generations of Millennials and Gen-Z, began to emerge denouncing cases of harassment and demanding pay equity, becoming what some authors already recognize as the fourth feminist wave (McCANN et al., 2019). Between 2011 and 2015, more than 23,000 scholarly papers with “gender” in their title were carried out worldwide – corresponding to a growth rate 2.7 times higher than the period from 1996 to 2000 (ALLAGNAT et al., 2017). The study also found that more varied terms were included in the researches, such as feminism, representation, gender stereotyping, gender wage gaps, and technology, in addition to the emergence of new subtopics focusing on gender classification and identification.

In this context, from 2012 onwards, there was an increase in the number of publications in the AS and SS: together, the groups accounted for 66 publications (40 and 16 publications, respectively) (Figures 3.1a and 3.1b). It is noteworthy that of all 100 publications in the two fields, 50% were published since 2016, a considerable percentage when it is noted that the other half are distributed over a period of 40 years (1975-2015) – it is important to observe that from 2016 onwards, feminist protests took on an even stronger impulse, especially in reaction to the new US presidency. Considering the most recent articles, 9 discuss demographic trends in agricultural or soil sciences (5 of them on the US, 2 in Italy, 1 in Uruguay and 1 in Brazil). Berhe (2020) argues that scientists should pay attention to the demography

of the field they are a part of, as the demography of groups and institutions can provide insight into the culture, climate, equity, and inclusion of minority scholars in the field.

Cho, Chakraborty and Rowland (2017) conducted a study on gender representation in various sectors of the US, including faculty positions at Land Grant Institutions (LGI's) in soil science, agronomy, crop science, plant science, and natural resources/environmental science; three agricultural sciences societies; industry sector; main crop and soil sciences journals; and in the Agricultural Research Service of the United States Department of Agriculture (USDA-ARS). The study revealed that although there has been an increase in women representation among agricultural science faculty, significant gender disparities persist in leadership positions across LGI's, professional societies, industry, and government research. These imbalances do not align with the number of women earning PhD's in agricultural science. While progress has been made, further assessment and support are necessary to address inequalities in rank, salary, and overall representation.

Brevik et al. (2018) provided an overview of trends in soil science in the US at the undergraduate level from 2009 to 2013 and is broader in the demographic variables used, one of which is gender. Over the 5-year study, the total number of women in soil science courses increased, but the percentage of women declined compared to total enrollment in four of the seven courses analyzed. Soil biology/microbiology courses had consistently high women enrollment (over 45%), while soil fertility, pedology, soil chemistry, and soil physics had lower percentages (around 35%).

Carter et al. (2021) discussed the mechanisms of marginalization of minority groups in soil science, considering both historical and contemporary context, bringing the US soil science data about Blacks, Indigenous and People of Color (BIPOC), international academics, women, LGBTQIAP+, people with disabilities and from economically disadvantaged communities.

Bukstein and Gandelman (2019) measured research productivity and analyzed the existence of glass ceilings in academia in Uruguay, by evaluating gender biases in the National System of Researchers (SNI), the largest national research incentive program in Uruguay. The study indicated that women researchers have a 7.1 percentage point lower probability of being accepted into the program and

the gender gap is wider at the upper ranks of the SNI hierarchy. However, the authors found no gender differences in the field of agricultural sciences.

Ruggieri, Pecoraro and Luzi (2021) analyzed the scientific production of researchers from the National Research Council (CNR), the largest governmental research organization in Italy, in relation to gender in some disciplinary fields and open access (OA) publication modes. The results showed that the ratio of women's production in agricultural sciences is closest to parity (49.2% of the articles were published with women as first authors, and 42.4% had women as contributing authors). However, the general proportion of OA is very low in contrast to international results and the OA articles with contributions from women in agricultural sciences were the lowest among all disciplines analyzed (21%). Moreover, when considering the total number of publications in all disciplines, there is a women's slightly higher propensity toward OA (36.3 vs. 34%).

Similarly, Reichert et al. (2022) analyzed the profiles of applicants for research productivity grants (PQ) in the field of agronomy of the Council for Scientific and Technological Development (CNPq), the largest governmental research organization in Brazil. The results showed that 75.8 % of agronomy PQ fellows are men. At the upper level of grants, the relative participation of women researchers is even lower, with none at the higher fellowship category (PQ-1A). Women are more involved in human resource training (advising students), publishing more in non-JCR journals, and are older at lower fellowship levels (PQ-1C, PQ-1D and PQ-2) and without fellowship. Meanwhile, men have greater scientific production, H and m indices, and m increase as the number of years after doctorate thesis defense advances. The conclusions affirm that the lower access and career advancement of women is a gap and there are fewer opportunities for success and advancement for women in agronomy in Brazil.

To date, the papers by Vaughan et al. (2019), Dawson, Brevik e Reyes-Sánchez (2021) and Adamo et al. (2022) are the only ones to bring quantitative data of gender disparity specifically within soil science. Vaughan et al. (2019) showed that in the US, women make up only 26% of soil scientists employed in federal agencies and 20% of soil scientists in private industries. Within academia, 36% of soil scientists hold the position of assistant professor, and as the academic ladder increases, the percentage decreases: 24% are associate professors and 18% are full professors. In academic units that offer graduate programs in soil science, only

13.5% of department heads and directors are held by women. These data clearly indicate low rates of retention and career advancement for soil scientists over time, even with women making up 54 and 53% of students enrolled in master's and doctoral programs, respectively, in the US. According to Vaughan et al. (2019), soil biology is the subdiscipline with the highest presence of women in the academic faculty (51%), in contrast to soil chemistry (23%), pedology, soil biochemistry, soil management (19% each), soil fertility (15%) and soil physics (13%), which has the lowest percentages of women.

Dawson, Brevik e Reyes-Sánchez (2021) made a preliminary worldwide survey of the distribution of women and men in 44 soil societies that are members of the International Union of Soil Sciences (IUSS); of keynote speakers at international soil science conferences; and on the editorial boards of nine international journals with a Q1 rating (this rate is based on the journal's Impact Factor score, meaning that it performs better than at least 75% of the ones in the same category). The results attested that soil science is a predominantly men field and still needs a lot of progress and effort to achieve gender equity. The global average of women as members in soil societies is 32%, with the African continent having the highest percentage of women (40%) and Asia the lowest (22%). Only 20% of all soil society presidents have been women; on average, they were just 6 % of keynote speakers at the World Congress of Soil Science (WCSS) and 21% at the Soil Science Society of America (SSSA) meetings; and, on average, they make up 30% of the editorial boards of the analyzed international journals.

It should be noted that in the study by Dawson, Brevik e Reyes-Sánchez (2021) there was little response from soil societies belonging to the continents of Africa and Oceania, which may not faithfully portray the gender panorama of these regions and may have had an influence on the global average. Thus, the authors recommend that more detailed and in-depth studies be carried out around the world in order to have a picture as close as possible to reality about the gender disparity in soil science as a whole.

Adamo et al. (2022) shows that gender equality has not been achieved yet in soil science in Italy. The results of the study, representative of the glass ceiling, are similar to the trends mentioned in the studies cited above. The authors analysed gender data on soil scientists in the last 20 years in public research institutions, universities and soil science societies. In the Council for Research and Agricultural

Economics, a public research institution, there is a slight prevalence of women in the researcher profile (54%) and men are prevalent in the technical profile (60%). However, women remain predominant in the managerial level of the Central Administration and the top positions are still mainly held by men. In the National Research Council, considering the working permanent research staff, 43% are women and 57% are men. At the highest degree (equivalent to full professor), women account for 33% of positions. As the level of positions decreases, the prevalence of women increases (39.5% as associate professor and 46.5% as assistant professor), despite there being no difference in publications between women and men at any of the professional levels.

The study also highlights that in universities the percentage of women in the pedology and agricultural chemistry sectors has increased from 25 to 40% in the period of 2001 to 2021, but when only the pedology sector is considered, the percentages are lower (10 to 32%). In regards to the career level, the trend of a lower number of women at top positions was well visible in all datasets and all years: in 2021 only 26% of the full professors were women and the percentage is even lower in the pedology sector (15%). In the scientific societies, the percentages of women affiliated was always lower than men (~30%). The highest presence of women in the Italian Society of Agricultural Chemistry (~40%), compared to the Italian Society of Soil Science (SISS) and the Italian Society of Pedology (SIPe), can be explained by the presence of soil science subdisciplines like soil chemistry and biology (ADAMO et al., 2022). Thus, along with Brevik et al. (2018) and Vaughan et al. (2019), it is possible to assume that if the majority of senior positions in soil sciences were occupied by women, the research lines of highest priority in graduate programs would not be the same as the current ones. Berhe and Ghezzehei (2020) also argue in this sense, saying that the dominance of a single group within the scientific community is shaping the types of scientific and/or societally relevant questions prioritized and the approaches employed.

In addition to their insights on the influence of group dominance on research priorities and methodologies, Berhe and Ghezzehei (2020) further highlight its impact on the culture, climate, and interpersonal dynamics within the scientific community. They argue that this dominance affects how we treat one another and emphasize that taking no action to address this issue sends a message to future scholars, implying acceptance or indifference towards existing inequities. This editorial

specifically addresses the lack of racial diversity in soil science, examining its underlying causes and shedding light on the essential aspects of diversity, equity, and inclusion within the field.

Similar results evidencing the glass ceiling in agricultural sciences were found in Brazil. Fiuza, Pinto and Costa (2016) studied the factors that contribute to gender inequalities and the mechanisms through which these persisted at Federal University of Viçosa (UFV). The study revealed that, in 2013, out of 200 professors with a minimum of 10 years since obtaining their doctorate, only 20 were women. A higher percentage of men were found at all qualification levels, with decreasing women percentages as qualifications advanced. An exception to this trend was the postdoctoral level, where women professors had a higher qualification percentage, which may indicate a particular strategy of these researchers to increase their career opportunities.

Fiuza, Pinto and Costa (2016) found that gender disparities in agricultural science at UFV were perpetuated by factors linked to professors' educational backgrounds. The university where men professors obtained their undergraduate degrees played a key role in their progression to faculty positions, unlike women professors. While undergraduate education had a lesser impact on women professors, a master’s degree held slightly more significance, but still lagged behind that of men professors. The authors assumed that initial connections during undergraduate studies facilitated the transition to faculty positions for men students. This link between the university of origin and professorial status prompted an analysis of gender’s influence on mentoring relationships. At undergraduate level, women professors mentor men and women proportionately, while men professors tend to mentor more men. At the master’s and doctorate levels, both women and men professors tend to mentor more men. This may indicate that for women academics that there is no professional sociability marked by belonging to the same gender, as occurs among men (FIÚZA; PINTO; COSTA, 2016).

In the research by Oliveira and Serra (2018), the authors trace the relationship between sociodemographic attributes (education, marriage, average number of children, etc.) and the career development of women from six research institutes and 15 centers of scientific and technological research in São Paulo, Brazil, in the agribusiness sector. The study confirmed that gender is an important variable to determine the occupation of senior management positions and that the higher the

hierarchical level of the position, the lower the number of women – a phenomenon that is not explained by their qualifications and productivity. Furthermore, men have a greater volume of books, chapters, texts, and articles, while women have a higher volume of conference proceedings. Drawing on prior research that suggests women often have fewer collaboration opportunities compared to men, the authors link this difference in publications to the challenges women face in publishing beyond conference proceedings. However, in the younger generation (≤ 44 years), men and women demonstrated a closer parity in the average total publication output (82.7 and 78, respectively). Also, in this same age group, women had a higher average annual publication increase. Due to these factors, along with the higher level of education among younger women, Oliveira and Serra (2018) propose that there is potential for future attainment of parity or even a reversal in the scientific productivity rates between men and women in the agricultural field in Brazil.

The study also showed that the productivity of women researchers increased with number of children, contrary to the commonly used argument that women with children would have greater limitations to ascend to high positions. In the study sample, women researchers on average had fewer children than men researchers. These findings reveal that the intersection of scientific qualification, maternity, and productivity argument was insufficient to explain low women's presence in the highest management positions (OLIVEIRA; SERRA, 2018).

Two bibliographic reviews on gender in soil science were published in the women's special issue of the *Spanish Journal of Soil Science* in 2022. Reyes-Sánchez and Irazoque (2022) deals with the lack of diversity in science, discussing its importance and benefits, such as in solving complex problems. They highlight the importance of recognizing Indigenous peoples in building knowledge in soil science and science as a whole, and emphasizes women, bringing information on their inclusion, or the lack of, in soil science and the history of some women scientists in the fields of geology, earth science and soil science. Díaz-Raviña and Caruncho (2022) explores the contribution of women in soil science in Spain for the period 2000-2021, in addition to bringing the current contribution of women from different countries to soil science, with special attention given to Russian and Soviet women.

Additionally, several case studies focusing on gender disparity have also been conducted in the last decade, with themes ranging from the difficulty of crop diversification in Kentucky, US, due to the strong association of tobacco planting with

masculinity (FERRELL, 2012); the inclusion of women in the shea supply market in Mali (SIDIBÉ et al., 2012); the invisibility of women as farmers in Syria (GALIÈ, 2013); the gender dimension in the entrepreneurial learning process in The Netherlands (SEUNEKE; BOCK, 2015); to the experiences of women faculty in colleges of agriculture in the US (NIEWOEHNER-GREEN; RODRIGUEZ; McCLAIN, 2022).

3.2.3.4 Gaps in literature

In the last two decades, the identity of soil science has been undergoing a transformation. Once closely associated with agronomy, the field now encompasses a broader range of disciplines, including earth and environmental sciences, ecology, and natural resources management (BREVIK, 2019). Interestingly, this shift coincides with an increased influx of women into the field of soil science. One possibility is that the changing demographic composition is leading to a redefinition of the field itself. As more women enter the discipline, new perspectives and approaches may emerge, potentially challenging traditional paradigms. Another possibility is that the broader emphasis on environmental issues within soil science may be attracting more women to the field. However, empirical data to definitively confirm or refute these hypotheses is lacking. Further research is necessary to gain a comprehensive understanding of the dynamics at play in the gender composition of soil science and its potential implications. Also, other several gaps were identified in the study of gender in agricultural and soil sciences, such as:

- *Diverse national perspectives:* More studies on gender are needed across a wide range of countries and regions, encompassing diverse cultural, social, and economic contexts. Conducting studies in different countries allows for the identification of patterns, similarities, and differences in the challenges faced by women in agricultural and soil sciences, enabling a more nuanced understanding of the underlying causes of gender disparities within the field.
- *Intersectional studies:* Existing research often focuses on gender as the primary identity, overlooking the experiences and challenges faced by women with intersecting identities. Future studies should explore the complex interplay of gender with other dimensions, such as race, ethnicity, sexual

orientation, disability, and socioeconomic background, to uncover the unique barriers faced by diverse groups of women.

- *Gender-based violence and harassment:* Research exploring the prevalence and impact of gender-based violence and harassment within agricultural and soil science environments is scarce. Further investigation is necessary to shed light on these issues, identify contributing factors, and develop effective prevention and support mechanisms for women facing such challenges.
- *Evaluation of policies and practices:* Future research should assess the effectiveness of existing programs, interventions, and initiatives designed to promote gender equality, diversity, and inclusivity, providing evidence-based recommendations for institutions and policymakers. As well as the evaluation of the impact of mentorship programs, networks, and support structures on women's professional development and retention in the fields of agricultural and soil sciences.

3.2.4 Final considerations

Although the number of publications on gender in agricultural sciences has increased since 2016, it remains lower compared to other fields in geosciences. In soil science, the scarcity of publications is even more pronounced, providing an incomplete understanding of gender disparity within specific countries or global regions. Therefore, it is fundamental to conduct further research on the participation, contribution, and inclusion of women in these fields. Specifically, it is recommended to undertake detailed and in-depth researches, such as demographic studies that provide historical and gender-disaggregated data, across a wide range of countries and regions. These studies will offer a more accurate depiction of the gender disparity in agricultural and soil science as a whole, enabling the analysis of gender trends and enhancing decision-making efficiency and equity policies.

Promoting diversity within any field is essential for bringing different perspectives and driving innovation in science, as we create an environment that nurtures creativity, encourages critical thinking, and paves the way for groundbreaking discoveries. Greater participation of women in workforce has multiple positive effects: enhances collective intelligence, optimizes the production and utilization of expertise (NIELSEN et al., 2017), and yields research with higher quality

(CAMPBELL et al., 2013). Considering that much of the documented history of agricultural and soil sciences has been shaped by men, research choices, decisions, questions, and answers have largely been influenced by their specific perspective. Therefore, it is worth reflecting on whether agricultural and soil sciences would have evolved differently, including the prioritization of certain research lines, if all contributions, experiences, opinions, and voices were given equal weight, regardless of gender.

It is important to acknowledge that as discussions and policies concerning gender equality increase in both public and private spheres, a backlash often follows, manifesting as persisting deeply ingrained sexism. Consequently, educational institutions must actively work towards increasing the representation of women within their environments. It is imperative for these institutions to prioritize raising awareness among students, faculty, and staff regarding gender disparities in academia and how gender biases influence decision-making (WINSLOW; DAVIS, 2016; FAO, 2020). In addition to these institutional efforts, each scientist must recognize their own responsibility in shaping the trajectory of their field, not only in terms of scientific rigor and quality but also in promoting equity and fair treatment for all practitioners.

While research that focuses on gender representation in fields such as soil science is vital for understanding and addressing gender disparities, it is essential to acknowledge that solely concentrating on gender can inadvertently perpetuate discrimination and exclude other marginalized identities. By solely examining gender, we risk disregarding the experiences and challenges faced by women who do not conform to the traditional narrative of being White, cisgender, heterosexual, and abled. Thus, adopting an intersectional approach is essential, taking into account the intersecting identities and experiences of individuals, including race, ethnicity, sexual orientation, gender identity, disability, and more. Embracing intersectionality in research leads to a more comprehensive understanding of the barriers and biases encountered by a diverse range of women in the scientific community, ultimately promoting more inclusive and equitable practices that genuinely address systemic issues.

Supplementary material

Chart 3.1-S – Other publications on gender studies in agricultural and soil sciences from 1990 to 2011

RESEARCH TOPIC	REFERENCE
Biofortification	PFEIFFER; McCLAFFERTY, 2007
Exposure and access to agricultural science for underrepresented students	JONES, 1997
Gender and agricultural production	BERG LEJON et al., 2011 MUZIRA et al., 2007 DOSS, 2002
Gender studies in academia and agricultural research	CROWE; GOLDBERGER, 2009 CHAPARRO-MARTÍNEZ; MARZAL, 2008 ZARAFSHANI et al., 2008 TAYLOR, 2007 ALSTON-MILLS, 2003 ELEY et al., 2003 BUTTEL; GOLDBERGER, 2002 GLADWIN et al., 2002 ROSENZWEIG; RUSSO, 2000 GOMES, 1998
Gender violence among agronomic students	GARCÍA; CASTRO, 2008
Life stories and contributions of women scientists	McINTOSH; SIMMONS, 2008 ALLEN, 1997a, 1997b
Risk analysis	ZHANG et al., 2010
Women in agricultural sciences in Brazil (early 20th century)	OLIVER; FIGUEIRÔA, 2007
Women in agricultural sciences in Spain	de FELIPE ANTÓN, 2002
Women workforce in industrial sector in India	CHADHA, 2004

Chart 3.2-S – Other publications on gender studies in agricultural and soil sciences from 2012 to 2022

RESEARCH TOPIC	REFERENCE
Biofortification	CHIUTSI-PHIRI et al., 2021 JOY et al., 2019, 2022
Burnout Syndrome during the COVID-19 pandemic	AZZI et al., 2022
Comprehension retention in agriculture and natural resources among 8th grade students	DORMODY et al., 2020
Domestic matters and the production of scientific knowledge	OPITZ, 2016
Empowerment of rural women	SAVARI et al., 2020 GALIÈ et al., 2017
Food security	MOSELEY; OUEDRAOGO, 2022
Gender and agricultural production	PASTERNAK et al., 2017 ST. CLAIR, 2016 KUULUVAINEN et al., 2014 NIBA et al., 2012
Gender and health	THYS et al., 2016
Gender studies in academia, agricultural research, and professional career	CARNEIRO et al., 2022 TARJEM et al., 2022 ARIAS et al., 2021 McLELLAN, 2021 van der BURG, 2020 NÚÑEZ-ROCHA et al., 2020 SALOMÓN-DÍAZ et al., 2020 GIMENO et al., 2019 BARBOSA et al., 2018 QUICHIMBO MIGUITAMA et al., 2018 GLENNA; RANSOM, 2016 FÉNYES, 2015 BEINTEMA, 2014 EZEZIKA et al., 2013
Gustatories preferences	MEDINA TORRES et al., 2017
How authors of history textbooks write about agricultural science, farming, and community	HOWLEY et al., 2013
Improvement of smallholder farming systems in Africa	WORTMANN et al., 2020
Indigenous women in academia	CHÁVEZ-ARELLANO, 2020
Life stories and contributions of women scientists	GERASIMOVA, 2022 PETT-RIDGE, 2018 CERNANSKY, 2016 TÜNDERN-SMITH, 2014
Participatory methodologies	OSUMBA et al., 2021 WALKER et al., 2021
Religion and agricultural practices	SPALING; KOOY, 2019
Risk analysis	McCURDY; KWAN, 2012a, 2012b McCURDY et al., 2012 MORENO-SANTINI et al., 2012

4 GENDER EQUITY IN SOIL SCIENCE IN BRAZIL: STILL AT THE BEGINNING OF A LONG JOURNEY

Highlights:

- We analyzed Brazil's soil science gender composition over nearly two decades.
- Women students have achieved parity at the PhD and are nearing parity at the MSc level.
- Women faculty face barriers to reaching decision-making and leadership positions.
- SBCS lacks gender diversity in membership, representative positions and awards.
- Deep systemic gender disparity is evident in Brazilian soil science.

Abstract: Current studies have highlighted a significant gender disparity within the field of soil science. However, the scarcity of research and data on this issue can hinder the urgent need for addressing it and effecting meaningful changes. The objective of this paper is to conduct the first demographic survey of Brazilian soil science, focusing on the gender composition over time at different academic and professional levels, as well as peer recognition. We examine metrics of students and faculty from all Brazilian soil science graduate programs (2004-2021); and members, representatives, and awards of the Brazilian Soil Science Society (SBCS) (1947-2023). The findings reveal a concentration of graduate programs with the highest evaluation scores in the South and Southeast regions of the country, reflecting regional disparities in resources and infrastructure. In 2021, gender parity in doctoral enrollments was achieved, and women aged 25 to 29 became the majority of soil science students. However, the presence of women in faculty is still very low (19% compared to men). Moreover, the proportion of women faculty members decreases as the hierarchical level of the position increases, indicating that attrition occurs along the career ladder. The faculty shows a trend towards aging, especially among men, indicating a potential wave of retirements in the coming years. Women constitute only 30% of SBCS affiliations, which are predominantly comprised of men professors. There has been a sharp decline in the overall number of affiliates over the past 10 years, especially among students. Women are also a minority in the SBCS representative positions and are less recognized through its awards. We found that there is a difference in thematic interests within soil science by gender, both at subdisciplines and at SBCS divisions and commissions, with women being more

present in soil biology and men in soil physics and management. We emphasize the pressing need to address and correct the disparities and inequities found by our study, offering recommendations aiming at broader systemic and cultural reforms within the soil science community.

Keywords: women studies; graduate degree; SBCS; disparity; soil scientometrics.

4.1 Introduction

Gender equity focuses on ensuring fair and unbiased treatment for individuals of all genders, considering their respective needs. To provide equivalent rights, benefits, obligations, and opportunities, the approach may include equal treatment or treatment that is different (adapted from INTERNATIONAL LABOUR ORGANIZATION, 2007). The pursuit of gender equity in science has gained increasing prominence, as it not only shapes the composition of the scientific community but also influences the quality and innovation of research outcomes (CAMPBELL et al., 2013). Recognized as a Sustainable Development Goal by the United Nations, gender equity is essential for sustainable soil management (UNITED NATIONS, 2019), as it promotes the active involvement of women in education, both as students and educators, in decision-making processes, and in leadership roles (LAL et al., 2021). Nevertheless, when it comes to gender-related studies within the field of soil science, they remain notably scarce and receive limited attention.

Recent studies have offered valuable data and insights into the challenges surrounding gender in soil science, highlighting the importance of the issue and the broader implications it holds for the discipline. Over the past decade, women have surpassed men in master's and doctoral degrees in soil science at universities in the United States (US), and with the Soil Science Society of America (SSSA) witnessing a ~44% growth in women's membership and participation in meetings, while men's membership has shown a decline (VAUGHAN et al., 2019). In Italy, women constitute the majority of researchers in the Council for Research and Agricultural Economics, comprising 54% of the workforce (ADAMO et al., 2022). The concern for gender equity is also reflected in the International Union of Soil Sciences (IUSS), which, in its bye-laws – secondary rules that support the Statute –, has outlined that the

Executive Committee should pay special attention to proposing a list of Permanent Committee Members with equal gender representation (IUSS, 2023).

However, despite some progress, gender inequity persists and soil science remains a predominantly men-dominated field in many countries. On a global scale, women's membership in soil societies and on the editorial boards of soil international soil science journals are approximately one-third of the men's rate. Moreover, women have held only 20% of presidencies in soil societies, their participation as keynote speakers at the World Congress of Soil Science (WCSS) and SSSA meetings has been as low as 6 and 21%, respectively (DAWSON; BREVIK; REYES-SÁNCHEZ, 2021), and they are significantly underrecognized through soil societies Fellows and awardees (VAUGHAN et al., 2019). Researches also revealed a concerning trend where the representation of women in soil science diminishes as positions rise up the hierarchy (VAUGHAN et al., 2019; ADAMO et al., 2022). This global overview of gender equity in soil science sets the stage for our specific exploration in soil science in Brazil, as a diversity portrait across different nationalities and regions of the world is essential to understand the true extent of the issue within the field.

In pursuit of this goal, this paper is the first to provide and discuss historical and current gender distribution data for all Brazilian graduate programs in soil science and for the Brazilian Soil Science Society (SBCS). We aim to gain a deeper understanding of the demographic shift occurring within soil science, the implications for the field's future and the changes that lie ahead. We hope the findings of this research can be used as instrument to foster a more inclusive, equitable and fairer soil science community.

To assess gender disparities in soil science academia, we conducted an extensive analysis of master's (MSc) and doctoral (PhD) degrees students on enrollments, degrees earned, dropouts/shutdowns, age group, and migratory students. To explore the transition into soil science professions, career advancement, representation in leadership positions, and peer recognition, we examined the gender distribution among faculty members as professors, coordinators, department heads/chairs, age group, and subdisciplines, as well as SBCS membership, office positions, and awards/honors. Drawing data from multiple sources, our study spans 17 years in graduate programs (2004-2021), and 76 years within the SBCS (1947-2023), enabling us to identify trends and patterns.

4.2 Data acquisition

Initially, we conducted a search in 2023 on Plataforma Sucupira (https://sucupira.capes.gov.br/) to identify MSc and PhD graduate programs specifically containing the word “soil” in their titles. Subsequently, we collected data from Dados Abertos CAPES (https://dadosabertos.capes.gov.br/) for students and faculty from these programs covering the period from 2004 to 2021. This data encompassed both permanent and collaborator faculty information. For details on faculty subdisciplines, we extracted data from the graduate programs’ websites. To analyze faculty rank, we sourced faculty names from Plataforma Sucupira in 2023 and obtained rank levels from each faculty member’s curriculum on Plataforma Lattes (https://lattes.cnpq.br/), via email requests and/or by accessing the universities’ departmental websites. Universities that employed career plans distinct from federal universities were excluded from this analysis when we could not match the faculty rank level.

Data related to scholarships for international mobility programs were gathered from Dados Abertos CAPES spanning from 2009 to 2019. We considered only data categorized under both “ciências agrárias” (agrarian sciences) and “agronomia” (agronomy). Information regarding coordinators and vice-coordinators was compiled through searches in the Diário Oficial da União (https://in.gov.br/servicos/diario-oficial-da-uniao/), Rectorate Minutes available on university websites, email correspondence with graduate programs, and/or responses received from Ombudsman’s Offices (for state universities) and Plataforma Fala.BR (https://falabr.cgu.gov.br/) (for federal universities). Notably, the Coordination for the Improvement of Higher Education Personnel (CAPES) removed gender disclosure from their data due to the General Data Protection Law (BRASIL, 2018). Consequently, gender could only be identified through names, pronouns used in Plataforma Lattes curricula, and/or photographic clues. As a result, the research was limited to binary gender categories (woman or man), and we cannot rule out that biases may have occurred.

Data from the SBCS were provided exclusively for this study through request via the secretary’s office email (sbcs@sbcs.org.br) (SBCS, 2023). In the SBCS, members select their gender at registration on the website, but only the mandatory options “M” (male, “F” (female), and “does not apply” are provided

(https://sbcs.org.br/sistema-socios/associar/). Of note, the option “does not apply” refers to legal agencies rather than other gender identities. Data on the Board of Directors from 2011 to 2021 were obtained via email from SBCS (SBCS, 2023). Data from previous years were sourced from Oliveira, Medeiros e Farias (2015), the SBCS website, and SBCS Informative Bulletins. Regarding the divisions and commissions data, we used the first option chosen by the member at registration. When the first option was left blank by the member, the second option was used. In some cases, both options were left blank, and these data were consequently excluded from the total count of members in the division or Commission analysis. Data on awards and honors were compiled from Oliveira, Medeiros e Farias (2015) and the SBCS website.

4.3 Results and discussion

Currently, there are 14 active graduate programs in soil science (or with a concentration on soil), all offering both MSc and PhD degrees (Table 4.1). All programs receiving the highest evaluations from CAPES, scores 7 and 6, are located in the country’s South and Southeast regions, reflecting regional differences in resources and infrastructure. CAPES’ Quadrennial Assessment is the primary quality indicator for Brazilian graduate programs, influencing public funding transfers, diploma issuance, and deactivation of programs with scores below 3. This may explain the incorporation of UFPI’s “Agronomy (soil and plant nutrition)” and UFPB’s “Soil and ecosystem quality” programs into “Agricultural sciences” programs in 2018 and 2019, respectively (Table 4.1).

Table 4.1 – Graduate programs in soil science (or with a concentration on soil) in Brazil

(continues)

Graduate program	University	CAPES score[1]		State	Region	Year of fundation	Data start year		Data end year
		MS	PhD				MS	PhD	
Agronomy (soil and plant nutrition)[3]	Fed. Univ. of Piauí (UFPI)	3[2]	-	PI	Northeast	2009	2009	-	2018
Agronomy (soil sciences)	Fed. Rural Univ. of Rio de Janeiro (UFRRJ)	7	7	RJ	Southeast	1972	2004	2004	2021

(conclusion)

Agronomy (soil)	São Paulo State University (UNESP)	5	5	SP	Southeast	1996	2004	2005	2021
Soil and ecosystem quality[3]	Fed. Univ. of Recôncavo da Bahia (UFRB)	3[2]	-	BA	Northeast	2010	2010	-	2019
Soil and plant nutrition	Univ. of São Paulo (USP)	7	7	SP	Southeast	1964	2004	2004	2021
Soil and water management[4]	Fed. Rural Univ. of the Semi-arid Region (UFERSA)	4	4	RN	Northeast	2008	2008	2012	2021
Soil and water management and conservation	Fed. Univ. of Pelotas (UFPEL)	4	4	RS	South	2011	2011	2011	2021
Soil science	Fed. Univ. of Rio Grande do Sul (UFRGS)	6	6	RS	South	1965	2004	2004	2021
Soil science	Fed. Univ. of Lavras (UFLA)	7	7	MG	Southeast	1976	2004	2004	2021
Soil science	Fed. Univ. of Ceará (UFC)	4	4	CE	Northeast	1976	2004	2011	2021
Soil science	Fed. Rural Univ. of Pernambuco (UFRPE)	5	5	PE	Northeast	1977	2004	2004	2021
Soil science[5]	Fed. Univ. of Paraíba (UFPB)	3	3	PB	Northeast	1977	2004	2011	2021
Soil science	Fed. Univ. of Paraná (UFPR)	5	5	PR	South	1978	2004	2012	2021
Soil science[6]	Santa Catarina State University (UDESC)	5	5	SC	South	1997	2004	2008	2021
Soil science[7]	Fed. Univ. of Santa Maria (UFSM)	7	7	RS	South	1971	2004	2004	2021
Soil science and plant nutrition	Fed. Univ. of Viçosa (UFV)	6	6	MG	Southeast	1977	2004	2004	2021

[1]CAPES score (scale from 1-7, with 7 being the top rating) according to the Quadrennial Assessment 2021 (2017-2020).
[2]CAPES score (scale from 1-7, with 7 being the top rating) according to the Quadrennial Assessment 2017 (2013-2016).
[3]Program name changed to "Agricultural sciences" in 2018 and 2019, respectively. Data after those years were not used.
[4]Program name was "Agronomy (soil science)" until 2013.
[5]Program name was "Soil and water management" until 2013.
[6]Program name was "Soil sciences" until 2005, and "Soil management" until 2010.
[7]Program name was "Soil Biodynamics" until 1988, and "Agronomy" until 2003.

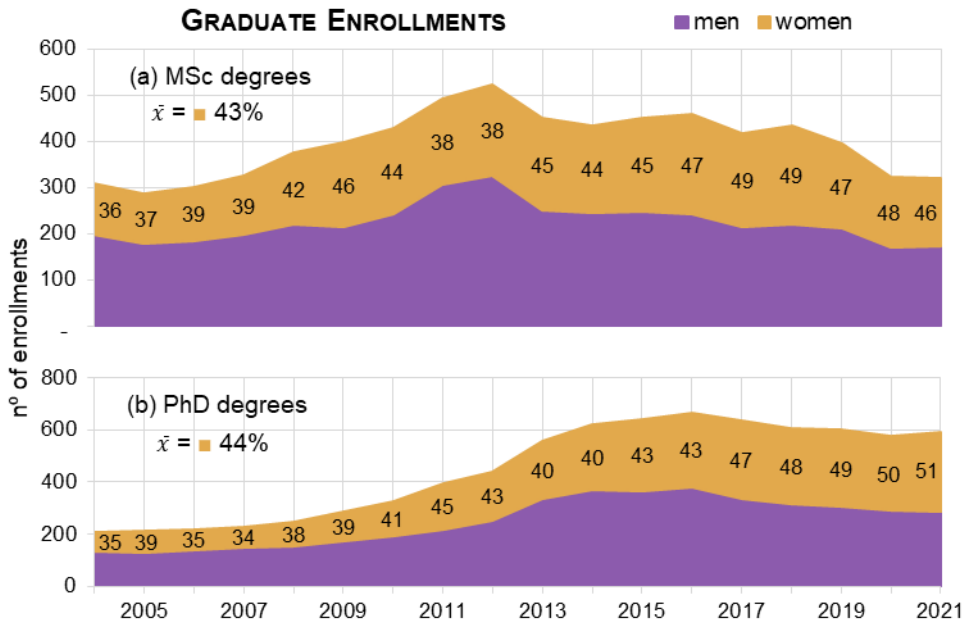
4.3.1 Graduate enrollments

Through the analysis of the historical data series on enrollments in MSc and PhD programs, we identified trends in gender distribution showing that women are increasingly pursuing graduate degrees in soil science in Brazil (Figure 4.1). Although women were a minority in the number of enrollments in all years analyzed for the MSc (n = 3,083 of 7,113) and in almost all years for the PhD (n = 3,519 of 8,031), in general, women showed a trend of growth in enrollments, especially in PhD programs, while men showed volatile growth rates in both graduate degree levels over the years. In 2004, there were notable disparities between the number of enrollments in soil science programs: women represented slightly over one-third of all graduate students, comprising 36% in MSc degrees and 35% in PhD degrees. By 2021, the proportion of women increased to 46% at the MSc level and reached parity with 51% at the PhD level (Figure 4.1). Considering the historical trend of higher

annual growth in women's enrollments compared to men, it is possible to assume that women may also achieve parity or even a majority in MSc enrollments in the coming years.

Although there has been growth, Brazilian figures still lag behind the enrollment rates of women in soil science at North American universities. In 2004, women comprised 46% of students in master's degrees and 38% of students in doctoral degrees, increasing to 54 and 53% by 2017, respectively, indicating a continuous upward trend (BAVEYE et al., 2006; VAUGHAN et al., 2019). The proportion of women in soil science in Brazil is also lower when compared to the national average of women in the agrarian sciences and the average across all fields of knowledge (CANDIDO et al., 2023).

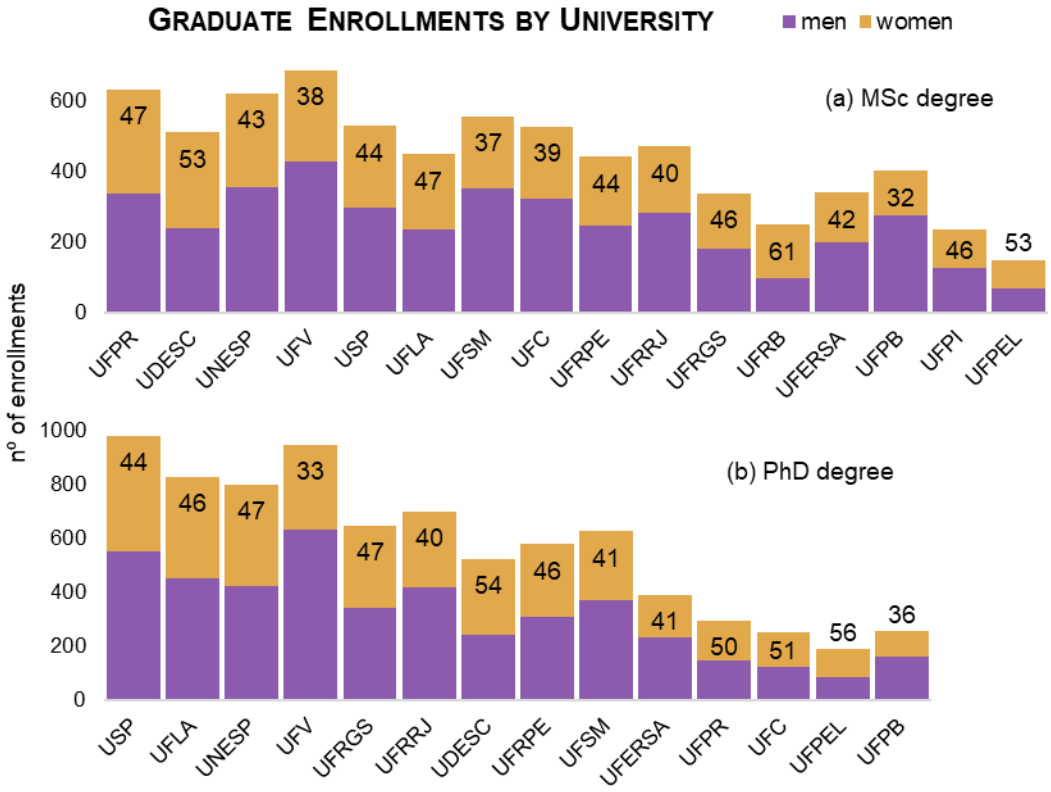
Figure 4.1 – Enrollments in MSc (a) and PhD (b) degrees in soil science in Brazil from 2004 to 2021. Numbers on the graphs correspond to the relative percentage of women for each year. Note different scales on graphs (a) and (b)



Currently, only two of the 16 soil science graduate programs analyzed achieved majority or parity in gender distribution: UFPEL's and UDESC's programs, with women representing 53% in MSc degrees and 56 and 54% in PhD degrees, respectively (Figure 4.2). Notably, UFPR's and USP's programs stand out for having

the highest absolute numbers of women in the last 17 years, with 293 in master's and 427 in doctoral degrees, respectively (Figure 4.2). However, when analyzing only the absolute numbers, it should be taken into account that the results are more related to the annual number of available spots and scholarships, which are influenced by factors such as the CAPES score, and the program's length of time, rather than solely issues related to gender.

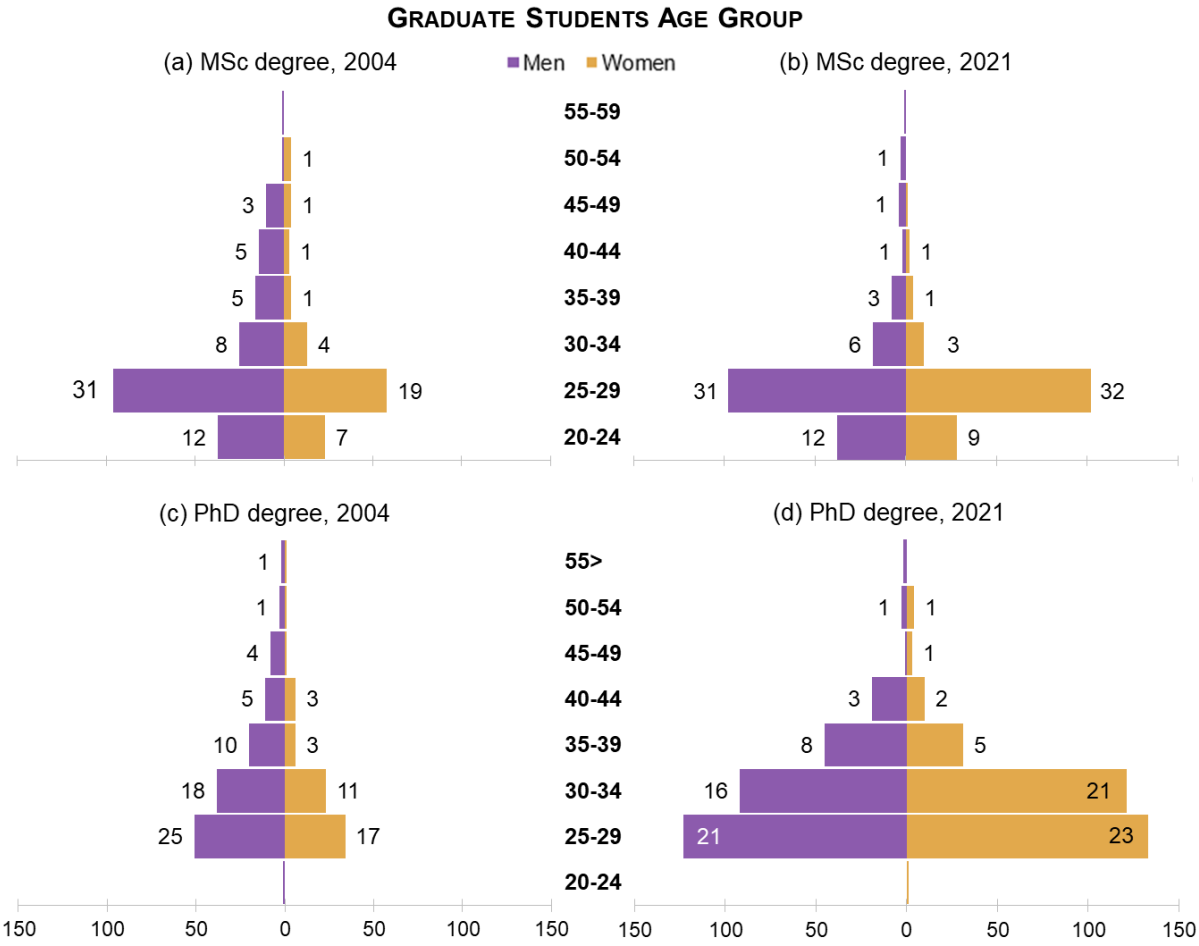
Figure 4.2 – Enrollments in MSc (a) and PhD (b) degrees in soil science in Brazil by university (2004-2021). Universities are categorized in descending order based on the absolute number of women. Numbers on the bars correspond to the relative percentage of women for each university. Note different scales on graphs (a) and (b)



There has been a noticeable trend towards younger students in soil science, especially among women (Figure 4.3). Currently, the majority of graduate students in soil science in Brazil are women aged 25 to 29 years, who comprise 32% of all students at the MSc level (n = 102 of 319) and 23% at the PhD level (n = 133 of 588). This comprises over half of all women in soil sciences graduate degrees solely in this

age group (52%, n = 235 of 450). This marks a significant shift from 2004 when men dominated all student age groups in both degrees. Additionally, women aged 30 to 34 years, when compared to men, also hold a majority in PhD programs, accounting for 21% of all students (Figure 4.3).

Figure 4.3 – Age distribution of students persuing MSc (a) (b) and PhD (c) (d) degrees in soil science in Brazil in 2004 and 2021. Numbers on the bars correspond to the percentage of women and men students relative to the total number of students for each graduate degree and year

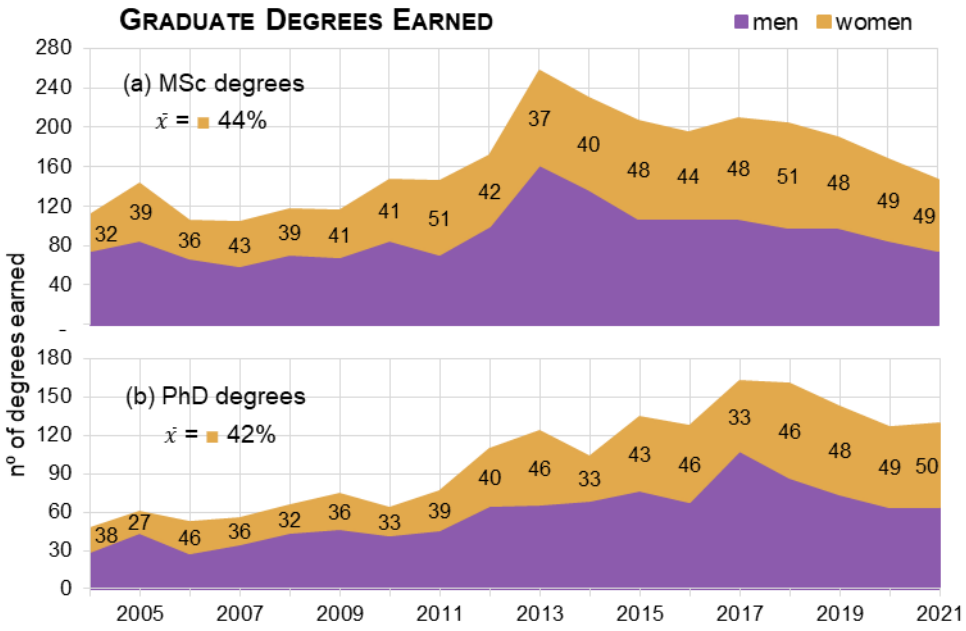


4.3.2 Graduate degrees earned

There is a positive trend in the number of women earning graduate degrees in soil science in Brazil compared to men, considerably narrowing the gender gap in

recent years (Figure 4.4). In 2004, women earned slightly over a third of soil science's degrees (32% at the MSc level and 38% at the PhD level). In contrast, in the last 5 years for MSc degrees and the last 3 for PhD degrees, the proportions of women have consistently been above 48%. Although the annual growth rates are highly variable for both genders, the rates of degrees received by women have generally been more positive, and they have shown a quicker recover after the years of decline (Figure 4.4). If this trend continues, women may close the gap or even surpass men in the number of degrees earned in the near future. For comparison purposes, in the US between 2013 and 2018, an average of 46% of all advanced soil science degrees were granted to women, with percentages ranging from 38 to 53% for MSc degrees and 33 to 53% for PhD degrees (VAUGHAN et al., 2019).

Figure 4.4 – Degrees earned in MSc (a) and PhD (b) degrees in soil science in Brazil from 2004 to 2021. Numbers on the graphs correspond to the annual relative percentage of degrees earned by women. Note different scales on graphs (a) and (b)

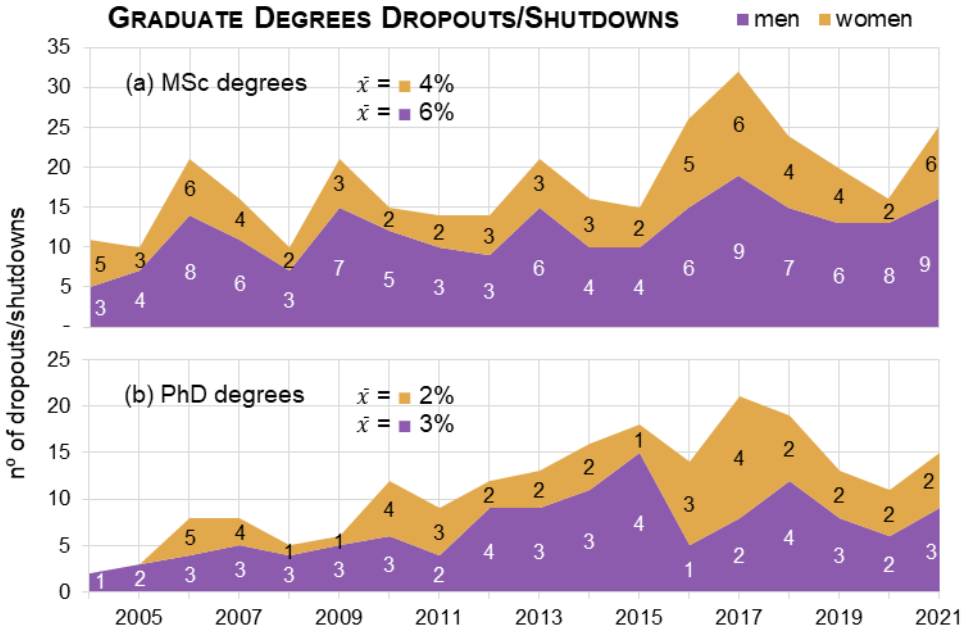


4.3.3 Graduate degrees dropouts/shutdowns

The dropout and shutdown rates reflect students who discontinued or were dismissed from their graduate studies, respectively. Over the past 17 years, women

in Brazil's soil sciences programs have demonstrated lower average dropout/shutdown rates than men (Figure 4.5). At the MSc level, these rates were 4% for women and 6% for men, while at the PhD level, they were even lower, with 2% for women and 3% for men. Surprisingly, this trend contradicts the general pattern observed in the field of science, technology, engineering, and mathematics (STEM) (UNESCO, 2017). These figures might be influenced by the nearly equal gender distribution among Brazilian soil science graduate students (Figure 4.1). A study by Bostwick and Weinberg (2018) suggested that women in STEM are more prone to dropping out in the first year of doctoral studies in programs with less than 38.5% of women representation. Additionally, although the overall proportions have fluctuated over the years, and the average rate remains low, there is a general upward trend in the number of dropouts/shutdowns for both genders and graduate levels (Figure 4.5), possibly linked to increasing enrollment numbers (Figure 4.1).

Figure 4.5 – Dropouts/shutdowns from MSc (a) and PhD (b) degrees in soil science in Brazil from 2004 to 2021. Numbers on the graphs represent the annual percentage of women and men dropouts/shutdowns relative to their respective total enrollments for that year. Note different scales on graphs (a) and (b)



4.3.4 Migratory graduate students

From 2010 to 2019, across all destination countries, women students received a higher average number of CAPES' exchange scholarships than men in graduate programs within the field of agricultural sciences/agronomy in Brazil (55%, n = 640 of 1,174; Table 4.2). Among these scholarships, 1,165 were designated for sandwich doctorate, 4 for full doctorate, and 5 for sandwich master's programs (of which 54, 25 and 100% were granted to women, respectively). Notably, women held ~60% of the scholarships in European countries (n = 321 of 545), and ~70% in Latin America countries (n = 34 of 49). Surprisingly, these findings diverge from the national trend, wherein women researchers exhibit lower migration rates compared to men (ALLAGNAT et al., 2017). In Asian countries, despite the low number of scholarships granted, women were the minority (20%, n = 2 of 10), as well as in Oceania (41%, n = 20 of 49) (Table 4.2).

The top tem countries that received the highest number of exchange students collectively accounted for 90% of all scholarships offered, and they exclusively represented nations from the global North. Among these countries, the US attracted nearly the same number of students as the European countries (41 vs. 46%) (Table 4.2). Equal proportions of women and men exchange students in the US and Germany possibly indicate the existence of rules promoting gender equity in scholarship allocation. Japan, the Czech Republic, and Paraguay also had an equal distribution in the number of scholarships between genders. However, since the number of scholarships was low, the equitable distribution might have been by chance and not due to gender equity policies.

From 2004 to 2021, soil science programs in Brazil welcomed 309 foreign students (Figure 4.6). Foreign women constituted the minority in both MSc (29%) and PhD degrees (46%). Overall, foreign students were predominantly from Latin American countries (43% men and 22% women at the MSc level, and 41% men and 39% women at the PhD level), mainly from Colombia (n = 61) and Peru (n = 34) (Figure 4.6). This trend can be attributed to factors such as geographic proximity, linguistic similarities between the Portuguese and Spanish, and cultural connections among Latin American countries, all of which facilitate and even incentivize the arrival of students in Brazil. Additionally, governmental economic incentives and such as the exemption of visas within the Mercosur countries, contribute to this trend.

Beyond the Latin American context, the second-largest proportion of foreign students in master's and doctoral programs comes from the African continent (18 and 6%, respectively), mainly from Mozambique (n = 22) (Figure 4.6), a nation where Portuguese is also the official language.

To attract more foreign students, especially from countries beyond Latin America, Brazilian soil science programs should offer more subdisciplines in English, either on a regular basis or as a permanent part of their curriculum. This approach could also help improve English language proficiency, addressing the primary challenge faced by Brazilian students applying for international mobility scholarships (MORAES; COSTANTI, 2022).

Table 4.2 – Recipients of CAPES exchange scholarships in graduate degrees in agricultural sciences/agronomy in Brazil by destination country (2010-2019)

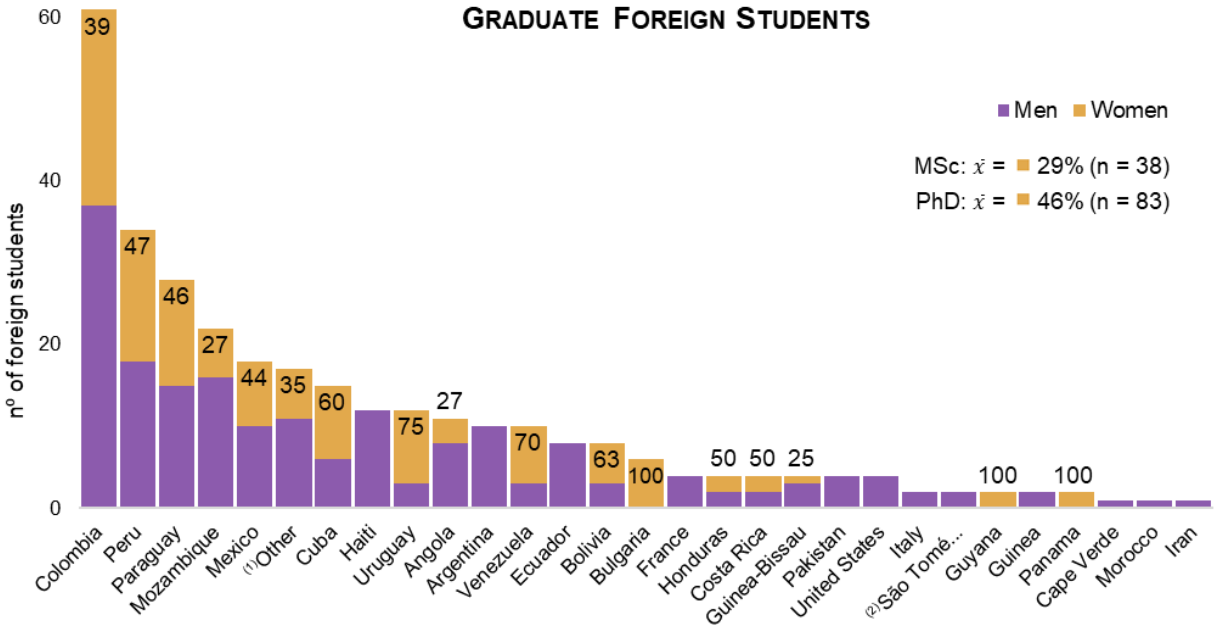
(continues)

Country	Women	%	Men	%	Total
United States	239	50	239	50	478
Spain	78	63	45	37	123
Portugal	47	61	30	39	77
The Netherlands	38	60	25	40	63
France	30	49	31	51	61
Italy	35	63	21	38	56
Germany	26	50	26	50	52
United Kingdom	28	56	22	44	50
Canada	23	56	18	44	41
Australia	17	44	22	56	39
Belgium	14	52	13	48	27
Argentina	10	67	5	33	15
Cuba	8	62	5	38	13
Mexico	8	80	2	20	10
New Zealand	3	30	7	70	10
Denmark	6	75	2	25	8
Ireland	4	57	3	43	7
Sweden	4	67	2	33	6
Uruguay	5	71	2	29	7
Japan	2	50	2	50	4
Czech Republic	2	50	2	50	4
Norway	2	67	1	33	3
Switzerland	2	67	1	33	3
Austria	2	100	0	0	2
Philippines	0	0	2	100	2

(conclusion)

Israel	0	0	2	100	2
Paraguay	1	50	1	50	2
Chile	2	100	0	0	2
Cape Verde	0	0	1	100	1
Russia	0	0	1	100	1
Thailand	0	0	1	100	1
South Africa	1	100	0	0	1
Slovenia	1	100	0	0	1
Finland	1	100	0	0	1
Poland	1	100	0	0	1
	640	55%	534	45%	1,174

Figure 4.6 – Foreign students' enrollments in soil science graduate degrees in Brazil by country of origin (2004-2021). Numbers on the bars correspond to the relative percentage of women foreign students. (1)Countries of origin were not reported. (2)São Tomé and Príncipe



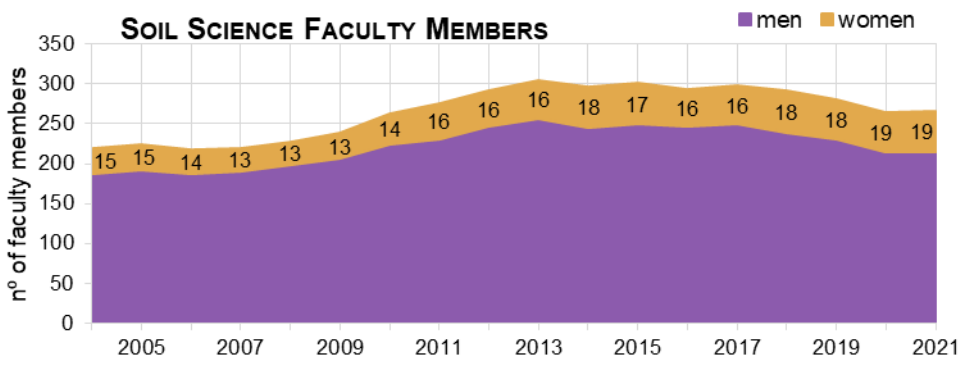
4.3.5 Faculty members

The representation of women faculty in soil science graduate programs in Brazil has seen very little progress from 2004 to 2021, with the proportion increasing

from 15 to only 19% (Figure 4.7). Unfortunately, this modest increase has proportionally mirrored the slow growth also observed in Brazilian agricultural sciences faculty, which went from 22% in 2004 to 26% in 2020 (CANDIDO et al., 2023). In contrast, naaly had na increase in the proportion of women faculty in soil science from 25 in 2001 to 40% in 2021 (ADAMO et al., 2022). In the US, the proportion of women faculty is closer to Brazil's, but remains higher, at 24% (VAUGHAN et al, 2019).

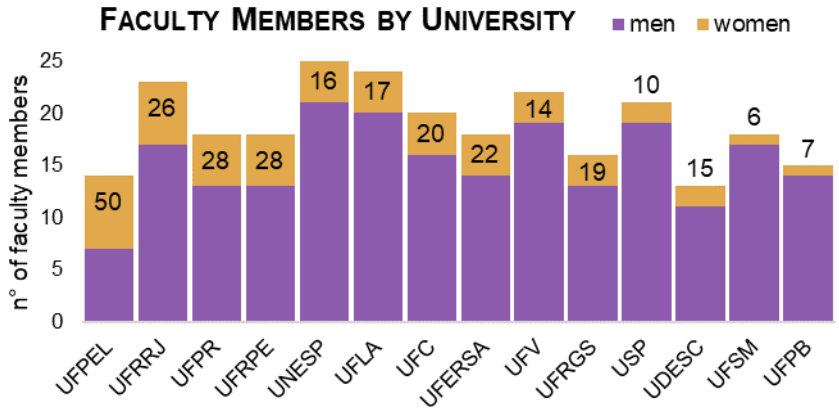
The total number of faculty also increased from 220 members in 2004 to 266 in 2021, a growth of approximately 21%. It is worth noting that the decline in the number of men professors around 2018 (Figure 4.7) is due to the deactivation of the UFPI and UFRB's programs (2018 and 2019, respectively), as 25 of the 30 faculty in these programs were men. Although the growth rate for women faculty in soil science is notably higher – around 60% compared to 14% for men – absolute difference in the number of faculty of each gender has increased. Specifically, the difference went from 156 men in 2004 to 164 men in 2021. This means that, in absolute terms, the gender gap in soil science faculty in Brazil is actually widening, and the growth in the number of women faculty, although encouraging, is still not sufficient to close this gap. In other words, while relative metrics may indicate some positive advancements, albeit modest, in the representation of women, absolute metrics reveal that there is still a long way to go to achieve gender parity. Both perspectives are important for a comprehensive understanding of the issue and to inform effective strategies for inclusion and gender equity.

Figure 4.7 – Faculty members in soil science graduate programs in Brazil from 2004 to 2021. Numbers on the graph correspond to the annual relative percentage of women faculty



Currently, 13 out of the 14 active graduate programs in soil science in Brazil have less than one-third women faculty, with averages ranging from 6 to 28% (Figure 4.8). The programs at UFSM and UFPB have the lowest numbers of women faculty, with only one each, compared to 17 and 14 men, respectively. The only exception is UFPEL's program, where the number of men and women is equal (7 each, Figure 4.8). However, this gender parity in UFPEL's faculty is a recent development, achieved only in 2021, and is more attributable to a decrease in the number of men faculty than to an increase in women faculty. Nevertheless, in the historical average (2004-2021), UFPEL's program has maintained the highest proportion of women faculty (35%), although this still represents a relatively low average. The programs with the lowest historical averages are at UFSM (6%), UFRGS, UDESC, and USP (9% each) (Figure 4.8). It's worth noting that, according to the CAPES score (Table 4.1), UFSM, USP, and UFRGS have excellence programs in soil science, but they lag significantly in achieving gender parity among their faculty.

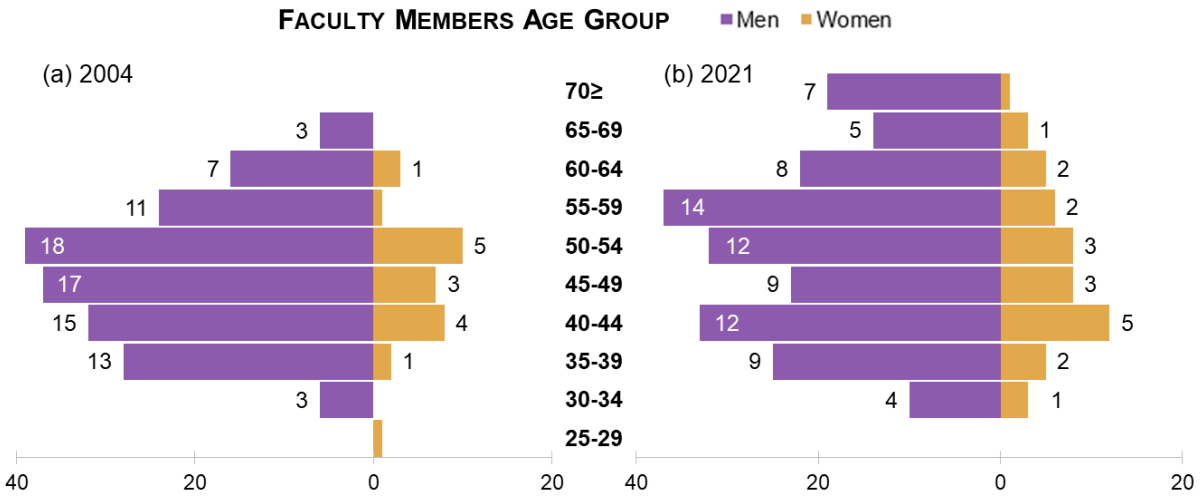
Figure 4.8 – Faculty members in soil science graduate programs in Brazil by university (2021). Universities are categorized in descending order based on the absolute number of women. Numbers on the bars correspond to the relative percentage of women faculty for each university



The age group analysis across two distinct time points, 2004 and 2021, revealed that gender disparity among soil science faculty members in Brazil is

evident and persistent in favor of men in all age groups (Figure 4.9). Overall, soil science women professors are younger than men professors, indicating the recent entry of women into the faculty. In 2021, around a quarter of all women faculty were aged 40-44 years (5% in relation to total), while the largest proportion of men was found in the age group of 55-59 years (14% in relation to total). Another noteworthy trend is the increase in faculty members aged 60 years and above, a phenomenon particularly pronounced among men (total proportion of faculty in this age group increased from approximately 11% in 2004 to 24% in 2021) (Figure 4.9).

Figure 4.9 – Age distribution of faculty members in soil science programs in Brazil in 2004 (a) and 2021 (b). Numbers on the bars correspond to the percentage of women and men faculty relative to the total number of faculty members for each year



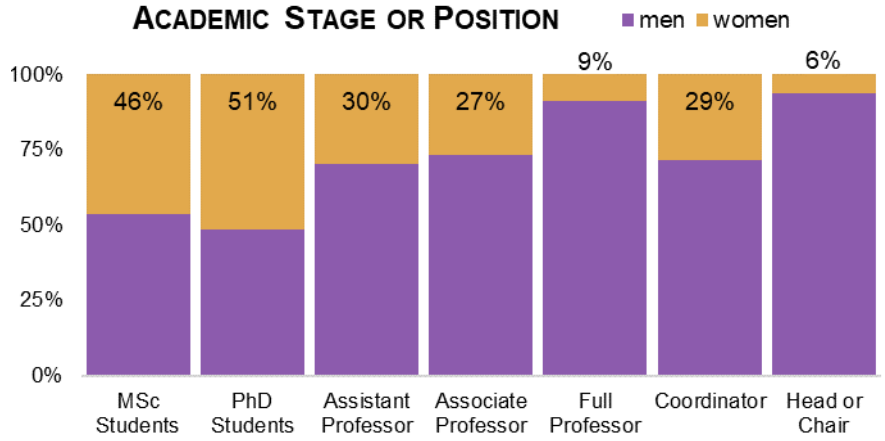
The aging trend among men faculty members suggests an imminent wave of retirements, which could potentially create opportunities for increasing women faculty representation if these vacancies are intentionally filled with a focus on gender equity. However, it's important to understand that the mere departure of older professor, just as the increased entry of women into soil science, is not sufficient and will not automatically ensure greater equity. Proactive measures are necessary to ensure that women fill these positions and receive the necessary support to advance in their academic careers. This requires the recognition and addressing of systemic barriers that have historically impeded women's progression in academia, and an

active commitment to affirmative actions and institutional policies that promote gender equity.

4.3.6 Academic stage and leadership positions

A clear trend emerges concerning the decline in the proportion of women as the academic hierarchy in soil science increases (Figure 4.10). While women constitute 51% of PhD students (Figure 4.1), only 22% hold professorial roles, with 30% serving as Assistant Professors, 27% as Associate Professors, and a mere 9% as Full Professors (Figure 4.10). The proportions are even smaller in leadership positions, with only four out of the 14 active programs currently being coordinated by women (29%), and just one program having a woman in the position of Head or Chair of Department (6%) (Figure 4.10).

Figure 4.10 – Gender distribution of graduate students (2021), faculty members, Coordinators, and Heads or Chairs of Departments (2023) housing soil science programs. Percentages on the graph is the relative porcentage of women for each category



In addition to the data for the most recent year (2021), we conducted an analysis of a total of 129 past tenures in coordination and 81 in vice-coordination roles within soil science programs in Brazil. Our findings reveal that, respectively, only 16 and 15 of these tenures (12 and 19%) were held by women. These low

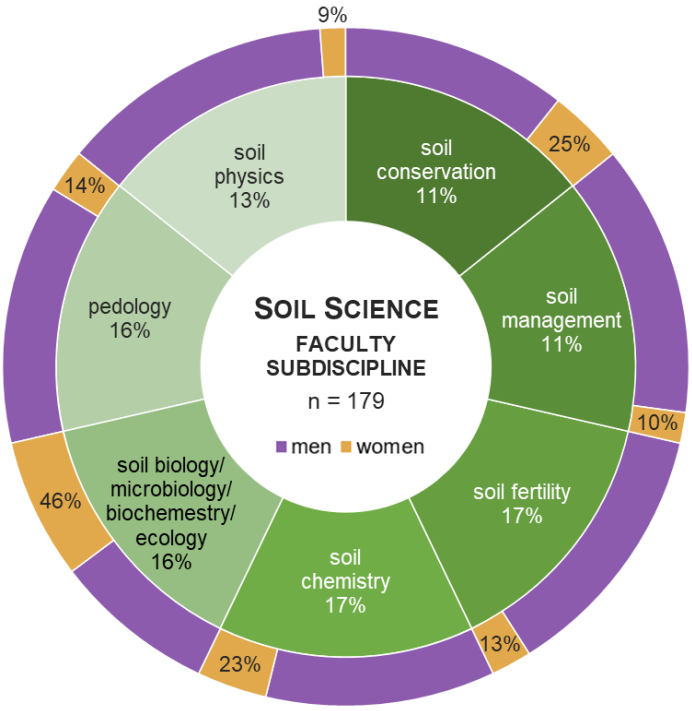
percentages are not explained by the historical distribution of the graduate student population. The current relative proportion of women faculty across all academic ranks remains lower than the proportion of women graduate students in soil science 17 years ago (~35% women) (Figure 4.1). This suggests that a considerably smaller number of women have transitioned from PhD degrees into faculty positions and/or have sustained their careers in academia compared to men, painting a rather pessimistic picture for Brazilian soil science in the short and medium term.

Furthermore, it is deeply concerning that this is not a problem limited solely to Brazil. Examples from other countries also demonstrate a similar descending trend in the proportion of women as hierarchical levels increase. In the US, despite women constituting more than half of the graduate students, 36% are Assistant Professors, Professors, 24% are Associate Professors, 18% are Full Professors, and only 13% hold the position of Head or Chair of Department (VAUGHAN et al., 2019). Italian universities, within the sector of pedology, also follow a similar pattern, with women as Assistant and as Associate Professors corresponding to 38% each of total faculty, and only 14% (n = 1) as Full Professors (ADAMO et al., 2022).

4.3.7 Faculty members by subdiscipline and field of knowledge

The faculty distribution across subdisciplines in soil science programs in Brazil is relatively balanced (Figure 4.11). With an 11-17% average range (n = 179), faculty are allocated between pedology, soil biology (encompassing also microbiology, biogeochemistry, and ecology), soil chemistry, soil fertility, soil management, soil conservation, and soil physics. However, there are evidente differences in gender representation within these subdisciplines (Figure 4.11). The lowest composition of women faculty is in soil physics (9%) and soil management (10%), followed by soil fertility (13%), pedology (14%), soil chemistry (23%), and soil conservation (25%). In contrast, soil biology stands out with the highest proportion of women faculty (46%). These findings are strikingly similar to those reported for soil science in the US (VAUGHAN et al., 2019), suggesting a potential pattern in soil science’s faculty gender distribution based on the thematic focus of the subdiscipline.

Figure 4.11 – Soil science faculty by subdiscipline from soil science programs in Brazil (2023). Percentages within the chart are the relative percentage of faculty in each subdiscipline. Percentages of women faculty (orange) is relative to men faculty for each subdiscipline



The analysis of the main fields of knowledge of faculty training by gender also reveals the same thematic focus trends (Tables 4.3 and 4.4). Almost one-third of both men and women professors had training in the fields of agronomy, agricultural engineering, or agrarian sciences, followed by soil science. Considering other areas, women professors come from courses linked to microbiology and biochemistry (9 vs. 3% of men) and chemistry (6 vs. 3% of men) (Table 4.3), as well as other engineering, geosciences, and conservation of nature or soil and water. On the other hand, men have a greater presence in areas such as soil fertility and fertilization (5 vs. 2% of women), and soil management and conservation (4 vs. 2% of women), in addition to irrigation and drainage, genesis, morphology and classification of soils, and physics (general and soil) (Table 4.4).

Table 4.3 – Top 10 fields of knowledge for the highest degrees obtained by women faculty members in soil science, compared with those of men faculty members (2004-2021). Percentage of women and men faculty is calculated relative to the total number of faculty members within each gender

Field of knowledge	Women	Men
	%	
Agronomy, agricultural engineering, agrarian sciences	31	31
Soil science	28	30
Microbiology, biochemistry (general/soil/agricultural)	9	3
Chemistry (general/soil)	6	3
Engineering (other)	4	1
Geosciences	3	0.2
Phytotechny	2	3
Conservation (nature/soil and water)	2	0.4
Soil fertility and fertilization	2	5
Soil management and conservation	2	4

Table 4.4 – Top 10 fields of knowledge for the highest degrees obtained by men faculty members in soil science, compared with those of women faculty members (2004-2021). Percentage of men and women faculty members is calculated relative to the total number of faculty members within each gender

Field of knowledge	Men	Women
	%	
Agronomy, agricultural engineering, agrarian sciences	31	31
Soil science	30	28
Soil fertility and fertilization	5	2
Soil management and conservation	4	2
Irrigation and drainage	3	0
Phytotechny	3	2
Genesis, morphology and classification of soils	3	0.5
Chemistry (general/soil)	3	6
Physics (general/soil)	3	0.8
Microbiology, biochemistry (general/soil/agricultural)	3	9

4.3.8 Brazilian Soil Science Society (SBCS)

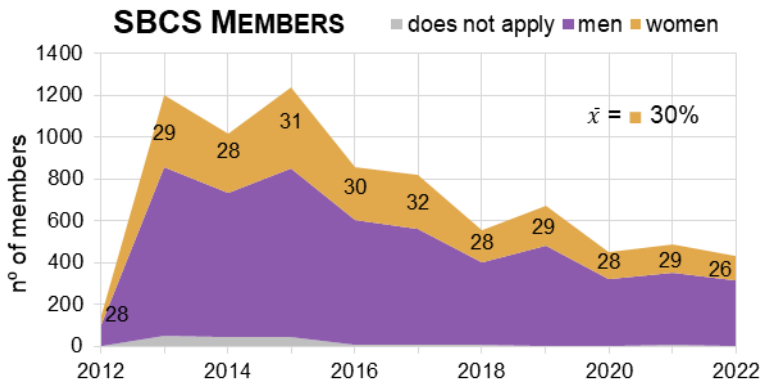
The SBCS is the only soil scientist professional organization in Brazil. Established in 1947, the SBCS is a non-profit civil entity that is currently headquartered at the Federal University of Viçosa, in Minas Gerais. Since 2012, the SBCS has transitioned to a digital system for information management and member data collection. The society follows the same organizational structure of the IUSS, consisting of Regional (RN) or State Nuclei (SN) and four divisions that are subdivided into commissions (OLIVEIRA; MEDEIROS; FARIAS, 2015).

4.3.9 SBCS membership

Women have consistently comprised a minority in SBCS membership, with an average of 30% over the past decade (Figure 4.12). In 2022, this percentage decreased to 26% (n = 431), reaching the lowest proportion of women members in our analysis. Both figures fall below the global average of 32% for soil science societies (DAWSON; BREVIK; REYES-SÁNCHEZ, 2021). Overall, SBCS membership peaked in 2015 (n = 1,189), possibly influenced by the International Year of Soils (FAO, 2015). Since then, there has been a general trend of decline. Both genders have followed a similar trend, indicating that external factors likely impacted membership rates for both genders (Figure 4.12). The recession of the Brazilian economy in the last decade and the COVID-19 pandemic in recent years (THE WORLD BANK, 2022), may had an impact in the decline of overall members, discouraging active participation in the society.

In a global study conducted in 2020 (DAWSON; BREVIK; REYES-SÁNCHEZ, 2021), the Venezuelan (54%), Argentine (50%), and Colombian (46%) Soil Science Societies had the highest percentages of women members in Latin America, with SBCS ranking behind nine countries out of 16. However, the data cannot indicate trends in gender equity within these societies. At the SSSA, the average women's membership in the last 20 years also mirrors that of the SBCS, but with the difference of a substantial 43% increase in the past decade, in contrast to an 8% decrease in men's membership (VAUGHAN et al., 2019).

Figure 4.12 – Members in the Brazilian Soil Science Society (SBCS) from 2012 to 2022. Numbers on the graph correspond to the percentagem of women members relative to the total membership for each year



The student category had the sharpest decline na SBCS membership, with an average loss of 88% of both women and men members over the past 10 years (Table 4.5). In 2013, the category of graduate and undergraduate students constituted, respectively, 19 (n = 223) and 10% (n = 119) of the total membership (n = 1,198). However, by 2022, these figures had plummeted to 8 (n = 36) and 2% (n = 9) of the total membership (n = 431). By comparison, in the SSSA the proportion of women students nearly doubled from 2009 to 2018 (VAUGHAN et al., 2019). An important factor that may have contributed to the decline of student members is the devaluation of graduate scholarships in Brazil. By the end of 2022, graduate scholarships had completed a decade without adjustment, resulting in a 78.6% lag in relation to inflation, making the financial viability of paying the fees of scientific societies increasingly challenging (MAIA, 2022).

Regarding all membership categories, women had the highest proportional loss with a 67% decline over the past 10 years, but men also witnessed a comparable 61% decrease (Table 4.5). The academic background of SBCS members, averaged over the period from 2012 to 2022, showed that 74% had PhD degree (28% women), 14% had MSc degree (34% women), and 12% had undergraduate degree (37% women). Notably, when we compared the gender composition of members with PhD degrees to the corresponding trends among PhD

degree recipients in soil science over the past 17 years (Figure 4.3), a clear gender gap in SBCS membership became apparent.

Although women students are on parity with men students in graduate programs (Figure 4.1), their overall representation in the SBCS is relatively low compared to other categories. Thus, the general average of women participation in the SBCS (Figure 4.12) seems to reflect more the proportion of women with graduate titles and working with reasearch or as professors, rather than the parity observed specifically among students in graduate programs.

Additionally, despite the total number of members in the university professor category decreasing from 457 to 250 members, the proportion of representation for this category compared to other types of membership notably increased from 38 to 58%. These trends altogether highlight the challenges SBCS currently faces in sustaining the active engagement of its members, particularly among women students, and also highlight the dominance of men faculty members in the society.

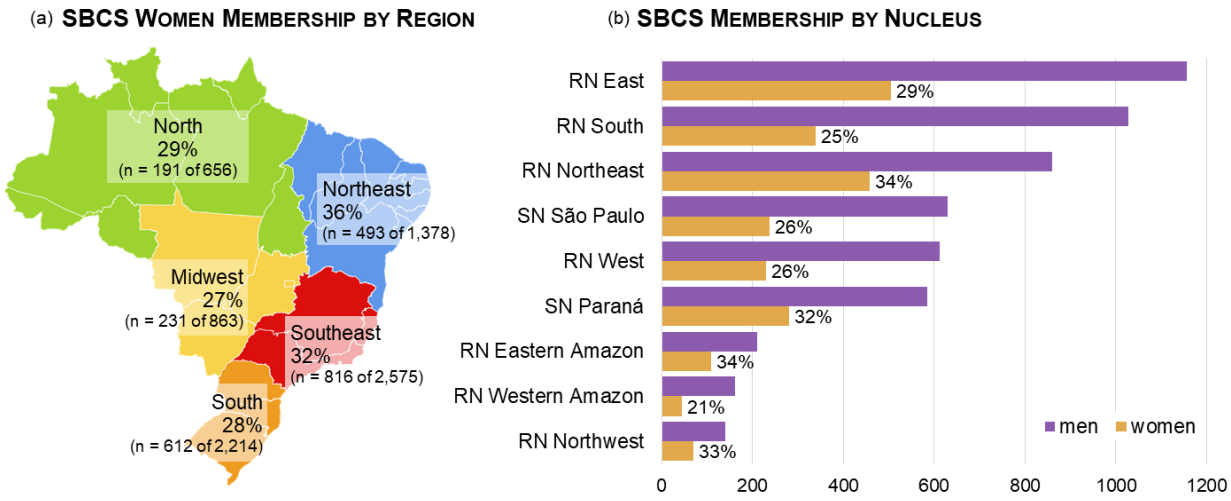
Table 4.5 – Women membership in the Brazilian Soil Science Society (SBCS) in 2013 and 2022. The 10-yr difference in affiliation rates between women and men is quantified as a percentage over the 2013 baseline value

	Women Membership				**10-yr change**	
	2013		**2022**		**Women**	**Men**
	n°	% of total	n°	% of total	%	
All categories of membership	343	29	114	26	–67	–61
University professor	112	25	67	27	–40	–46
Research	63	25	19	21	–70	–61
Graduate student	89	40	20	56	–78	–88
Undergraduate student	51	44	1	11	–98	–88
Other	28	19	7	15	–75	–53

Analyzing SBCS membership data across Brazilian regions and their affiliated nuclei, it becomes evident that membership dynamics are influenced by regions housing universities offering prestigious soil science programs (Figure 4.13, Table 4.1). The Southeast region stands out with the highest total membership in the last decade (n = 2,575), as well as the largest number of women members (n = 816) (Figure 4.13a). This prominence can be attributed to the presence of institutions such

as USP, UFLA, and UNESP (Figure 4.2). It's also noteworthy that the Northeast region have the highest proportional representation of women (36%) (Figure 4.13a). Although members at registration may not always choose the same state of affiliation as their chosen RN or SN, the RN East records the the highest membership count (n = 1,718) (Figure 4.13b). Conversely, lower membership figures in the RN Northwest, RN Western Amazon, and RN Eastern Amazon (Figure 4.13b) can be attributed to low population density and the absence of soil science universities in the Northern region. Among the states, Minas Gerais leads in total membership and women members (n = 272 of 977), followed by São Paulo (n = 254 of 908), and Rio Grande do Sul (n = 225 of 891).

Figure 4.13 – Membership in the Brazilian Soil Science Society (SBCS) by Brazilian region (a) and Regional or State Nucleus (b) (2012-2022). Percentage of women is relative to the total membership for each region (a) and Nucleus (b). RN = Regional Nucleus; SN = State Nucleus



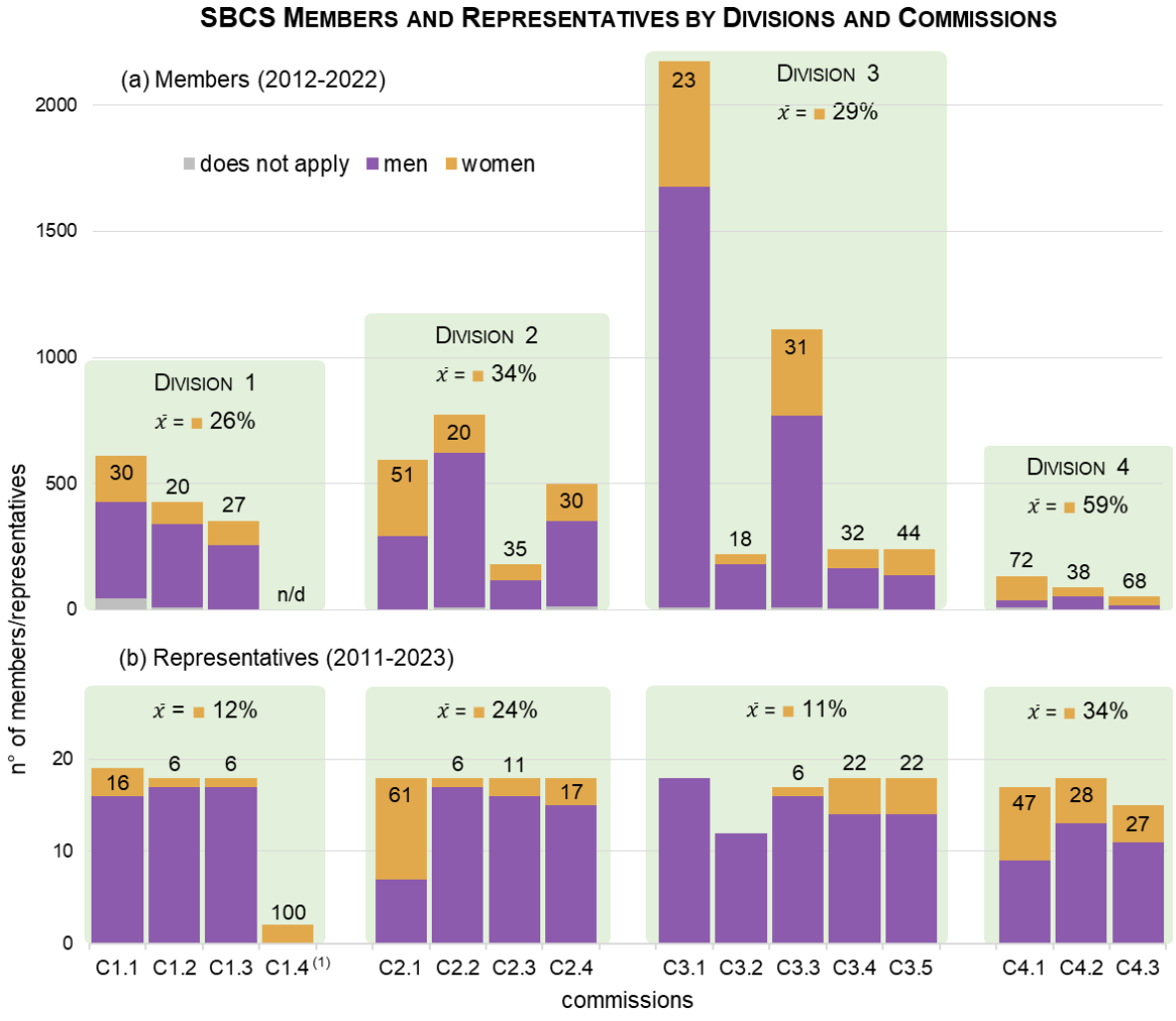
4.3.10 SBCS members and representatives by Divisions and Commissions

At registration in the SBCS, members choose their preferred subdiscipline from four main divisions. Each division (D) allows members to further narrow their focus by selecting specific topics from various commissions (C). The gender distribution across these thematic areas generally mirrors that observed within faculty subdisciplines. Women have established a notable representation of 59% in D4

“Soils, Environment, and Society” (Figure 4.14a). The proportions are even more pronounced in the commissions related to this division, notably C4.1 “Soil Education and Public Soil Perception” and C4.3 “History, Epistemology, and Sociology of Science”, where women constitute 72 and 68% of the membership, respectively (Figure 4.14a). These figures highlight women’s interest in these areas and underscore their decisive role in shaping the discourse around soil science and its societal implications. Another commission where women are a majority is C2.1 “Soil Biology”, accounting for 51% of its members (Figure 4.14a), reflecting also the higher proportion of women found in the faculty subdisciplines (Figure 4.11). However, this representation pattern is not uniform across all SBCS subdisciplines. Lower rates of women’s representation are observed in D1 “Soil in Space and Time”, and D3 “Soil Use and Management”, where women constitute 26 and 29% of the members, respectively. The gender disparity is particularly glaring in C3.2 “Correctives and Fertilizers” (18%), C1.2 “Soil survey and classification”, and C2.2 “Soil physics” (20% each) (Figure 4.14a).

Regarding the divisions representatives, D4 “Soils, Environment, and Society” has the highest average percentage of women at 34%, while D3 “Soil Use and Management” has the lowest at 11% (Figure 4.14b). Among the representatives of the commissions established in 2011, C2.1 “Soil Biology” stands out with 61% of its representatives being women, along with C4.1 “Soil education and public soil perception”, with 47%. However, two commissions stand out for not having any women representatives: C3.1 “Soil fertility and plant nutrition”, which boasts the highest total membership, and C3.2 “Correctives and fertilizers” (Figure 4.14b). Unfortunately, the gender disparity within the SBCS becomes even more apparent when we notice that D4 has the smallest overall membership (4%, n = 274), in contrast to D3, which has the strikingly largest membership (52%, n = 3,989).

Figure 4.14 – Members (a) and representatives (b) in the Brazilian Soil Science Society (SBCS) by Division and Commission. Percentage of women is relative to the total membership for each division. Numbers on the bars correspond to the percentage of women relative to the total membership for each commission. Note different scales on graphs (a) and (b). n/d = no data. Division 1 – Soil in space and time: C1.1 Soil genesis and morphology, C1.2 Soil survey and classification, C1.3 Pedometrics, [(1)]C1.4 Paleopedology (established in 2019); Division 2 – Soil processes and properties: C2.1 Soil biology, C2.2 Soil physics, C2.3 Soil mineralogy, C2.4 Soil chemistry; Division 3 – Soil use and management: C3.1 Soil fertility and plant nutrition, C3.2 Correctives and fertilizers, C3.3 Soil and water management and conservation, C3.4 Land use planning, C3.5 Pollution, soil remediation and recovery of degraded areas; Division 4 – Soils, environment and society: C4.1 Soil education and public soil perception, C4.2 Soils and food security, C4.3 History, epistemology and sociology of science



Within the SSSA, a similar pattern emerges, where divisions such as “Soil Education and Outreach” (46%), “Soil Biology” (43%), and “Urban and Anthropogenic Soils” (39%) lead with higher women representation. This trend is even more pronounced among women graduate students, with their proportions in these divisions being at 55, 53, and 41%, respectively. In contrast, divisions like “Soil Physics and Hydrology” (18%), “Soil Fertility and Plant Nutrition” (23%), and “Consulting Soil Scientists” (24%) have the lowest women membership rates. Additionaly, exploring graduate student membership in the SSSA, this low influx of women also holds among additional divisions: “Soil Mineralogy”, “Forest, Range, and Wildland Soils”, and “Soils and Environmental Quality” (VAUGHAN et al, 2019). In Italy, women were more prevalent in societies with a primary focus on biology and chemistry, as opposed to those concentrating on pedology and hydrology, and were similarly more prominent in scientific journals emphasizing ecology, environmental sciences, and biology (ADAMO et al., 2022). Collectively, these numbers reveal areas with marked gender disparities, highlighting the need for measures to promote inclusion and stimulate more balanced engagement throughout the discipline of soil science. However, they also reveal areas where women have greater interest within soil science.

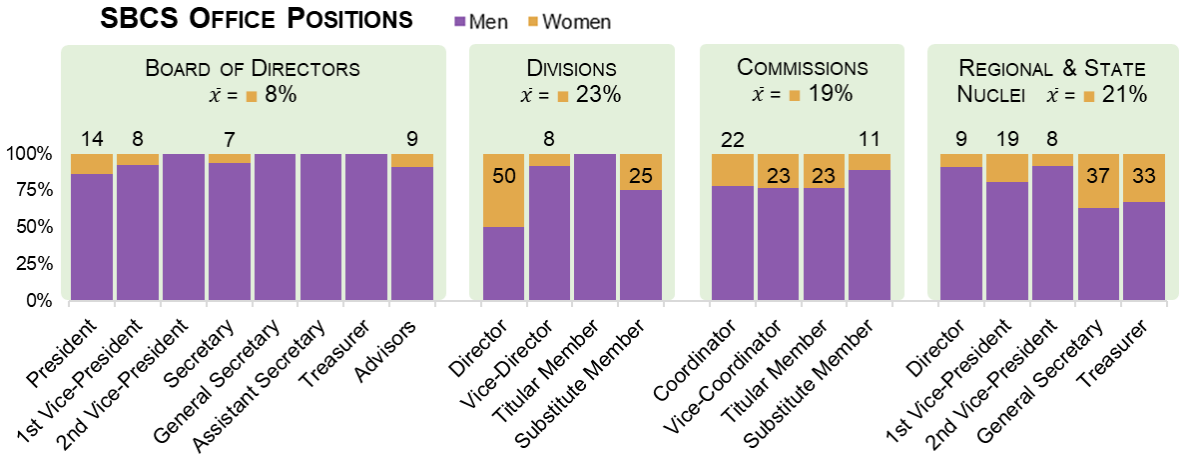
4.3.11 SBCS leadership positions and awards

The SBCS was established in 1947 with 31 founding men members (BARBOSA, 2023). Since then, the society has shown a slow progression towards the inclusion of women in its leadership roles. It took 46 years after its foundation for the first women to join the society's Board of Directors, one serving as Secretary and another as an Advisor. In 1999, a woman assumed the Vice-Presidency of the society for the first time, and two years later, she became its first women President (OLIVEIRA; MEDEIROS; FARIAS, 2015). It was not until 12 years later that the second women President was elected for the terms of 2015/2017 and 2017/2019. Currently, the Boars of Directors is still led by a woman, the third to hold this position, along with a women vice-chair, both for the terms of 2019/2021 and 2021/2023. Thus, unsurprisingly, in 73 years of the SBCS’s history, women accounted for just 5% (n = 36 of 459) of the Board of Directors’ representatives (Figure 4.15). In the role of

President, women accounted for 14% (n = 5 of 37). Similar trends are visible in the role of the 1st Vice-President (8%, n = 3 of 38), and Advisor (9%, n = 26 of 280). In the positions of 2nd Vice-President, General Secretary, Assistant Secretary, and Treasurer, women's representation has been completely absent (Figure 4.15).

In the divisions of the SBCS, there is an indication of progress towards gender parity in the role of Director, which depicts an equal distribution of men and women (Figure 4.15). However, it is important to note that this position has only been held by 12 individuals, and this balance is not mirrored in other roles. Within the SBCS commissions, women comprise less than a quarter of the representatives, with proportions ranging between 11 and 23%. Furthermore, in the Regional and State Nuclei of the SBCS, women are more likely to hold positions such as General Secretary and Treasurer, while men predominantly occupy top roles such as Director and Vice-President (Figure 4.15).

Figure 4.15 – Representatives in the Brazilian Soil Science Society's (SBCS) Board of Directors (1947-2023), Divisions (2011-2023), Commissions (2011-2023), and Regional and States Nuclei (2011-2022) by office position. Percentage of women representatives is relative to men representatives for each category. Numbers on the bars correspond to the relative percentage of women representatives for each category and office position



Currently, only 20% of the soil science societies affiliated with the IUSS are led by women presidents. Notably, this percentage is lower than the 32% global average

of women membership (DAWSON; BREVIK; REYES-SÁNCHEZ, 2021). As in the SBCS, the proportion of women in other related scientific societies' leadership roles also reflects a broader issue of underrepresentation. For instance, in the SSSA, founded in 1936, a mere 2.4% (n = 2) of its presidents have been women, with terms occurring in 2005 and 2015. Similarly, the Agronomy Society of America (ASA), established in 1907, has seen only 2.7% of its presidents as women, all of whom have served since 2013 (VAUGHAN et al., 2019). In Italy, both the SISS and SIPe demonstrate a similar pattern of gender inequity within their executive boards (ADAMO et al., 2022).

Despite this reality, the Solos Floripa 2023 conference – held in Brazil, combining the XXIII Latin American Congress of Soil Science (CLACS) and the XXXVIII Brazilian Congress of Soil Science (CBCS) – witnessed a historical milestone for women's leadership in soil science. For the first time, it brought together the first women presidents of the IUSS and the Latin American Society of Soil Science (SLCS), Laura Bertha Reyes-Sánchez and Elisângela Benedet da Silva (terms of 2021-2022 and 2019-2021, respectively), along with the then-president of the SBCS (2019-2021 and 2021-2023), Lúcia Helena Cunha dos Anjos. This significant moment underscored the growing influence and recognition of women within the Latin American soil science community, highlighting recent progress in gender equity within leadership dynamics in the field.

The acknowledgment of soil scientists' contributions to the discipline through awards and honors is an important form of peer recognition. However, it is clear that within the SBCS, women have not been sufficiently recognized. Out of 94 titles awarded, only 7 (7%) have been conferred to women (Table 4.6). This pattern of low recognition extends beyond the SBCS to other organizations such as the SSSA, ASA, Crop Science Society of America, and European Geosciences Union (VAUGHAN et al., 2019; DAWSON; BREVIK; REYES-SÁNCHEZ, 2021).

Table 4.6 – Awards and honors granted by the Brazilian Soil Science Society (SBCS)

Award or Honor	Women	%	Men	%	Total
Soil Science Commendation[(1)]	0	0	2	100	2
Honorary Members	1	8	12	92	13
Meritorious Members[(1)]	0	0	7	100	7
Honors	2	11	17	89	19
Posthumous Honors	3	7	43	93	46
Antonio Carlos Moniz Award	1	14	6	86	7
	7	7	87	93	94

[(1)]The category no longer exists in the current SBCS Statute.

4.3.12 Advancing soil science in Brazil: a call for equity

Our analysis of the demographic evolution of soil science in Brazil reveals a consistent increase in the proportion of women in graduate programs over almost the last two decades. In the past five years, women have earned nearly half of the graduate degrees in the field. However, this growing representation of women in academia does not find a proportional reflection in professional landscape or peer-recognition. Although women are near parity in graduate programs, their limited advancement in academic careers, professional societies like the SBCS, and in receiving awards, reflects a broader issue of underrepresentation.

Our results also highlighted a marked prevalence of women faculty in Brazil working in soil science subdisciplines related to biological sciences and ecology. In the SBCS, women have a substantial relative proportion in commissions focused on soil education and public perception of soil, as well as on soil science history, epistemology, sociology, and soil biology. These trends indicate a shift in the identity of soil science in Brazil towards broader applications in education, social and environmental issues, and natural resources, closely paralleling those observed in the US, Canada and the SSSA (BAVEYE et al., 2006; BREVIK et al., 2018; VAUGHAN et al., 2019, ADAMO et al., 2022). Collectively, these observations suggest that these changes in soil science are not occurring merely by coincidence. The evolving entry of women into soil science marks a key step towards gender diversity and significantly contributes to the field's progress. By bringing new interests and perspectives, women are helping to shape a future for soil science that is more

responsive, integrated, and sustainable. This paradigm shift reflects a growing recognition that soil science, like any scientific field, must constantly evolve to meet the emerging needs of society and the environment.

The advancement in graduate studies are influenced by multiple and overlapping factors at biological, family and peer, school, and societal levels (UNESCO, 2017). Our findings indicate that men students in soil science are more sensitive to the factors that influence the decision to drop out. For instance, in a patriarcal and sexist culture with stereotypical masculinities and strong gender-biased roles like Brazil's (BALDWIN; DeSOUZA, 2001), men are often still seen as the main providers. The pressure to secure a well-paying job after graduation may lead them to consider dropping out if they perceive that graduate studies do not offer a return on the investment as expected. For women, on the other hand, graduate studies could potentially enhance and provide a more stable career trajectory, encouraging them to pursue their studies – or, given the persistent gender inequity in the workplace, a graduate degree also may be the only way for women to level the playing field, earning credentials that help them overcome professional barriers. Furthermore, higher education can be seen as a form of empowerment and a way to challenge patriarchal norms. Therefore, continuing in graduate studies can be both a personal decision and a political statement.

The systemic nature of the gender disparity revealed by our study suggests that this issue is deeply entrenched in the field of soil science across Brazil. The results highlighted are symptomatic of a glass ceiling, which refers to an invisible but palpable barrier that prevents women from advancing to higher hierarchical levels, despite their qualifications and achievements (ROSSER, 2004). While women may enter in soil science at similar rates as men, their transition and progression to higher academic ranks is often stymied. Women faculty, in particular, encounter numerous barriers, including receiving fewer research fellowships and grants (PEREDA et al., 2022; REICHERT; COUTO; SCHIR, 2022), being less likely to be named as authors on articles (ROSSITER, 1993; ROSS et al., 2022), being assigned less prestigious tasks (CARRIGAN; QUINN; RISKIN, 2011), being perceived as less competent than men with similar qualifications (MOSS-RACUSIN et al., 2012), and experiencing lower promotion rates even when outperforming men (BENSON; LI; SHUE, 2023).

Paradoxically, women faculty often shoulder heavier workloads, including spending more time on campus service, advising students, and performing teaching-

related activities (O'MEARA et al., 2017). Additionally, they are often viewed as more approachable by their students, which can result in greater work requests, special favors, friendship behaviors, and expectations that their requests will be met (O'MEARA et al., 2017; EL-ALAYLI; HANSEN-BROWN; CEYNAR, 2018). This dynamic leaves women with less time for their own research, perpetuating a cycle that hampers their chances of publishing, earning tenure, obtaining research grants, and career progression. Moreover, the existence of a glass ceiling has broader societal implications. It sends a discouraging message to aspiring girls and women, potentially deterring them from pursuing scientific reasearch careers (UNESCO, 2017), feeding back into the cycle of underrepresentation.

Blickenstaff (2005) emphasizes that the underrepresentation of women in STEM is not due to lack of qualification, competence, commitment, or biological differences. In fact, the factors behind the lack of gender diversity in STEM are complex and multifactorial, resembling layers of a gender-based filter – or barriers. While no single factor can be identified as the primary cause, some significant barriers can be highlighted, such as implicit biases – unconscious beliefs and attitudes that influence the behavior of the majority group or those in positions of power. These biases can manifest in microaggressions that, although often subtle, contribute to the perpetuation of structural inequity (McGEE, 2016; MARÍN-SPIOTTA et al., 2020).

Reflecting this phenomenon, the metaphor of a "chilly climate" is often used to illustrate how seemingly trivial practices can accumulate, negatively affecting the emotional well-being and mental health, as well as the learning, engagement, and the sense of belonging. This process can result in decreased self-confidence and may lead to segregation, lower professional expectations, or even career abandonment (HALL; SANDLER, 1982; CABAY et al., 2018). One type of implicit bias is affinity bias (i.e., homophily), which leads us to prefer individuals who are similar to ourselves. Thus, when leadership is predominantly composed of white men, new leadership nominations are also likely to consist of white men, who, in turn, will tend to recognize, promote, and award white men (GRUMMELL; DEVINE; LYNCH, 2009; HURLEY, 2014). Affinity bias perpetuates a cycle of gender inequity and may explain the lower rates of women soil scientists in senior faculty positions, leadership roles in scientific societies, and nominations to awards, as demonstrated extensively in our study.

Another notable example of implicit bias is the “Matilda Effect”, which highlights the discrimination faced by women in receiving scientific awards, with their contributions often being overlooked or attributed to men (ROSSITER, 1993). This phenomenon reinforces gender stereotypes and exacerbates inequity in the scientific field, adversely affecting women’s visibility, career progression, and representation in prominent positions and prestigious awards. Interestingly, Holmes et al. (2011) noted that women are more represented in awards for early career achievements and in service and education sectors, suggesting a nuanced landscape of recog nition where women's contributions are acknowledged differently across various stages and areas of their careers. However, the scarcity of women nominations for research awards and the tendency to favor men candidates in selection processes reflect how unconscious gender bias and entrenched stereotypes continue to shape recognition in the scientific community.

In discussions on diversity and representation, we have to address the long-standing issue of the global North devaluing scientific research from the global South. The phenomenon of "parachute science" (or "helicopter research"), where Northern researchers extract data and resources from the South without equitable partnerships or acknowledging local contributions, exemplifies this imbalance (DAHDOUH-GUEBAS et al., 2003; MINASNY et al., 2020). These practices perpetuate neocolonial legacies and undermine scientific integrity. They overlook the rich knowledge in the global South, impeding the development of more robust and culturally sensitive scientific advancements. This is especially critical within the context of soil science's efforts to address global environmental challenges. Resolving this issue requires a systemic change in research collaboration structures, emphasizing inclusion and equal recognition of work by scientists from the global South, while ensuring equitable benefits for both researchers and the affected communities.

Moreover, it is essential to consider how the culture of objectivity in science can inadvertently favor discrimination by disregarding the role of feelings, emotions, identities, and ideologies in scientific work (HARAWAY, 1988). The belief in objective and meritocratic science ignores structural barriers faced by women (CECH; BLAIR-LOY, 2010), such as biases in recruitment (MOSS-RACUSIN et al., 2012), unequal allocation of resources (BRONSTEIN; FARNSWORTH, 1998), and sexual harassment (MARÍN-SPIOTTA; NANDIHALLI; MURPHY, 2018). These conditions

contribute to a distorted assessment of scientific achievements, negatively affecting women, especially in fields historically dominated by men, such as soil science.

The influence of these factors on decision-making and daily interactions underscores the need for conscious and deliberate strategies to combat them. The distinction between equality and equity is fundamental to advancing this purpose. While equality focuses on providing identical conditions for all individuals, equity demands recognition and implementation of differentiated measures aimed at correcting historical and systemic inequities (INTERNATIONAL LABOUR ORGANIZATION, 2007). Therefore, adopting a multifaceted and integrated approach implemented at institutional, individual, and collective levels, coupled with affirmative actions – not as a detriment to men but as a means of achieving justice for women – is strategic in addressing men dominance and persistent gender disparities in soil science.

In this context, graduate programs, scientific societies and research funding agencies need to adopt equitable, diverse and inclusive values, diversify their leadership, and evaluate current practices to create an environment that encourages the full participation of women (HALL; SANDLER, 1982). Some suggestions to facilitate this process include:

- Gathering intersectional data, supporting interdisciplinarity, qualitative methods, and studies addressing equity issues (MATTHEIS; MURPHY; MARÍN-SPIOTTA, 2019).
- Expanding the available gender identity options during membership, application, and subscription processes – as well as include options for race/ethnicity. The SSSA already provides the options “female”, “male”, “gender non-binary”, and “prefer not to answer” for voluntary gender data collected about members (CARTER et al., 2021). We suggest that “female” and “male” be corrected to “cisgender woman” and “cisgender man”, along with the inclusion of “transgender woman”, “transgender man”, “gender non-binary” and “other”. The collection of such data will become an essential and invaluable tool for formulating targeted and effective actions aimed at promoting inclusion and equity for all individuals in the field.
- Developing codes of conduct to ensure equitable treatment, creating awareness, holding people accountable, and addressing harassment in the

academic environment and in fieldwork (MARÍN-SPIOTTA; NANDIHALLI; MURPHY, 2018). As an example, the American Geophysical Union (AGU) has a Scientific Integrity and Professional Ethics Policy, with a general code of conduct directed at members (AGU, 2023). This includes principles, responsibilities, recommendations for graduate advisors, and the inclusion and definition of harassment, bullying, and discrimination, characterizing these acts as scientific misconduct (KUO, 2017). Additionally, the AGU has codes of conduct for authors, contributors, editors, and reviewers of publications (AGU, 2023); Board of Directors members (AGU, 2024a); Council members (AGU, 2024b); and meetings and events (AGU, 2024c).

- Implementing an affirmative action policy that sets quotas for the selection of women faculty members, consciously selecting more women than men, aiming to achieve equitable representation within the faculty. Reviewing gender ratios periodically to monitor progress and adjust the policy as needed.
- Actively recognizing and combating sexism, racism, and colonialism in science, publicly standing against these and any other forms of prejudice, and actively committing to inclusive teaching and research practices (BERHE; GHEZZEHEI, 2020).
- Actively and continuously promoting the work of women across diverse media (e.g. social networks, official websites, bulletins, newsletters, special edition publications in journals). This strategy involves disseminating their achievements, research, and contributions not just on specific or commemorative dates but as a consistent and ongoing effort.
- Forming research groups, offering classes and lectures, and implementing communication strategies that focus on gender disparities in soil science.
- Recruiting students and faculty from diverse identities and backgrounds, challenging stereotypes, revising nomination and selection committees, reviewing award criteria, diversifying event sponsorships, ensuring equitable representation in leadership roles, keynote speaking opportunities, awards, and involvement in political decisions (HOLMES et al., 2011; WILLIAMS; PHILLIPS; HALL, 2014).
- Ensuring equity in aspects such as workload, access to education, and promotion opportunities. Women, in particular, should not be burdened with

additional tasks in service or teaching at the expense of research. Moreover, it's important to balance domestic responsibilities and ensure job stability, especially for pregnant women and mothers (DAWSON; BREVIK; REYES-SÁNCHEZ, 2021).

- To the SBCS, which is currently predominantly composed of men professors, we recommend to consider the possibility of reducing membership and/or publication fees for women. Currently in agricultural sciences, the publication ratio is 0.82 women to every man who publishes an article in Brazil (KLEIJN et al., 2020). Furthermore, the probability of women obtaining funding grants from CNPq (National Council for Scientific and Technological Development) and FAPESP (The São Paulo Research Foundation) is significantly lower than that of their men counterparts (–5.6 p.p. and –8.8 p.p., respectively) (PEREDA et al., 2022). Therefore, this affirmative action could increase women's presence and representation in SBCS, while also demonstrating that the society supports and encourages women's publications in the RBCS.
- To the SBCS, similarly to practices implemented by the IUSS, we recommend the provision of scholarships for women doctoral students or early career researchers (e.g. national/international conference grants). Eligibility criteria such as race, social class, and geographic location could also be considered in the selection process to ensure broad and inclusive representation.

4.4 Final considerations

The unprecedented analysis conducted in our study reveals that soil science in Brazil has always been, and continues to be, a men-dominated field. While women have nearly achieved parity in enrollment and degrees earned in soil science graduate programs, they still face barriers in attaining leadership, senior academic positions, and recognition within the SBCS. This scenario reflects deeper systemic issues. Ensuring women's effective inclusion, with fair advancement opportunities and support, is vital for the discipline's future. The shift towards a more diverse inclusive field is promising, but it hinges on a commitment to equity-oriented practices and actions at the individual, collective, and institutional levels. Soil science in Brazil will truly mirror the society it serves and realize its full potential only by altering

cultural, structural, and systemic norms, thereby fostering genuine inclusivity and diversity within the scientific community.

Supplementary material

Disclaimer: The names provided in this document are of public domain. If you are one of the individuals whose name has been mentioned, and your gender or other information has been incorrectly identified, please contact us at beatriz.wb@gmail.com and we will be gladly willing to correct it.

Table 4.1-S – Coordinators and Vice-Coordinators of Brazilian soil science graduate programs. Women are marked in red.

(continues)

University	Coordinator	Term	Vice-Coordinator	Term
UDESC	Marcelo A Moreira	2022/may/15 - 2024/may/14	n/d	n/d
	Mari L Campos	2020/may/14 - 2022/may/14	n/d	n/d
	Jackson A Albuquerque	2018/dec/18 - 2020/may/13	n/d	n/d
	Julio C P Santos	2017/mar/1 - 2018/dec/17	n/d	n/d
	Álvaro L Mafra	2014/feb/28 - 2017/feb/28	n/d	n/d
	David Jose Miquelluti	2012/mar/2 - 2014/feb/27	n/d	n/d
	Luciano C Gatiboni	2010/jan/1 - 2012/mar/1	n/d	n/d
	Paulo C Cassol	2008/nov/1 - 2009/dec/31	n/d	n/d
	Osmar K Filho	2007/june/1 - 2008/oct/31	n/d	n/d
	Jaime A Almeida	2004/oct/1 - 2006/sept/30	n/d	n/d
	Jaime A Almeida	2002/oct/1 - 2004/sept/30	n/d	n/d
	Jackson A Albuquerque	2000/sept/1 - 2002/sept/31	n/d	n/d
	Jaime A Almeida	1998/sept/1 - 2000/aug/31	n/d	n/d
UFC	Raul S Toma	2021/aug -	Arthur P A Pereira	2021/aug -
	Jaedson C A Mota	2019/june - 2021/july	Mirian Cristina G Costa	2019/june - 2021/july
	Mirian C G Costa	2017/june - 2019/may	Jaedson Cláudio A Mota	2017/june - 2019/may
	Mirian C G Costa	2015/june - 2017/may	Jaedson Cláudio A Mota	2015/june - 2017/may

(continuation)

UFC	Raimundo N A Junior	2013/june - 2015/may	Mirian Cristina G Costa	2013/june - 2015/may
	Raimundo N A Junior	2011/june - 2013/may	Tiago O Ferreira	2011/june - 2013/may
	Ricardo E Romero	2009/june - 2011/may	Raimundo N A Junior	2009/june - 2011/may
	Ricardo E Romero	2007/june - 2009/may	Raimundo N A Junior	2007/june - 2009/may
	Ricardo E Romero	2006/oct - 2007/may	Raimundo N A Junior	2006/oct - 2007/may
	Teógenes S Oliveira	2004/may - 2006/sept	Ricardo E Romero	2004/may - 2006/sept
	Vânia F F Gomes	2002/june - 2004/may	Teógenes S Oliveira	2002/june - 2004/may
	Vânia F F Gomes	2000/june - 2002/may	Teógenes S Oliveira	2000/june - 2002/may
UFERSA	Daniel V Silva	2023/jan/9 - 2025/jan/9	Reginaldo G Nobre	2023/jan/9 - 2025/jan/9
	Daniel V Silva	2020/sept/28 - 2022/dec/29	Jeane C Portela	2020/sept/28 - 2022/dec/29
	Luis C A L Filho	2018/sept/27 - 2020/sept/28	Suedêmio LSilva	2018/sept/27 - 2020/sept/28
	Fábio H T Oliveira	2018/feb/2 - 2018/sept/27	Rafael O Batista	2018/feb/2 - 2018/sept/27
	Nildo S Dias	2016/jan/25 - 2018/feb/2	Marcelo T Gurgel	2016/june/7 - 2018/feb/2
UFLA	Bruno M Silva	2021 - 2025	n/d	n/d
	Bruno M Silva	2020/aug/12 - 2021/july/1	n/d	n/d
	Michele D Menezes	2020/mar/10 - 2020/aug/12	n/d	n/d
	Bruno M Silva	2019/aug/12 - 2020/mar/10	n/d	n/d
	Leônidas C A Melo	2016/aug/16 - 2019/aug/12	n/d	n/d
	Maria L S Silva	2015/feb/10 - 2016/aug/16	n/d	n/d
	Valdemar Faquin	2013/apr/18 - 2015/feb/09	n/d	n/d
UFPB	Milton C C Campos	2021/2023	Raphael M Beirigo	2021/2023
	Vânia S Fraga	2019/2021	Djail Santos	2019/2021
UFPEL	Maria C M Nunes	2022/june/24 -	Pablo Miguel	2022/june/24 -
	Cláudia L R Lima	2020/june/16 - 2022/june/24	Maria C M Nunes	2020/june/16 - 2022/june/24
	Cláudia L R Lima	2018/june/27 - 2020/june/15	Maria C M Nunes	2018/june/27 - 2020/june/15
	Rogério O Sousa	- 2018/june/26	Rita C F Damé	- 2018/june/26
	Rogério O Sousa	2014/apr/22 -	Rita C F Damé	2014/apr/22 -
	Luís C Timm	2011/aug/31 - 2012/june/11	Cláudia L R Lima	2011/aug/31 - 2012/june/11
UFPI	Everaldo M Silva	2018/june/6 - 2019/jan/28	n/d	n/d
	Ronny S Barbosa	2016/may/4 - 2018/june	n/d	n/d

(continuation)

UFPI	Everaldo M Silva	2014/dec/8 - 2016/may/3	Márcio C S Moura	2014/dec/16-2016/aug/3
			Everaldo M Silva	2013/may/16 -
	Glenio G Santos	2012/dec/6 - 2014/jan/31	Romero F V Carneiro	2012/dec/6 - 2013/may/15
	Júlio C A Nóbrega	2010/nov/16-2012/nov/16	Ítalo H L Cavalcante	2010/nov/16 - 2012/nov/16
UFPR	Fabiane M Vezzani	2021/dec - 2023/dec	Jairo C O Junior	2021/dec - 2023/dec
	Jairo C O Junior	2019/dec - 2021/dec	Fabiane M Vezzani	2019/dec - 2021/dec
	Jairo C O Junior	2017/dec - 2019/dec	Volnei Pauletti	2017/dec - 2019/dec
	Volnei Pauletti	2015/dec - 2017/dec	Jorge L M Souza	2015/dec - 2017/dec
	Volnei Pauletti	2013/dec - 2015/dec	Renato Marques	2013/dec - 2015/dec
	Jeferson Dieckow	2011/dec - 2013/dec	Volnei Pauletti	2011/dec - 2013/dec
	Jeferson Dieckow	2009/dec - 2011/nov	Renato Marques	2009/dec - 2011/nov
	Jeferson Dieckow	2009/dec - 2011/nov	Renato Marques	2009/dec - 2011/nov
UFRB	Elton S Leite	2020/mar/2 - 2020/nov/2	Ossival L Ribeiro	2020/mar/2 - 2020/nov/2
	Elton da Silva Leite	2018/mar/8 - 2020/feb/11	n/d	n/d
	Júlio C A Nóbrega	2016/feb/3 - 2018/feb/11	Anacleto R Santos	2016/feb/3 - 2018/jan/31
	Thomas V Gloaguen	2014/mar/12 - 2016/feb/2	n/d	n/d
	Oldair D A V Costa	2012/apr/13 - 2014/feb/4	n/d	n/d
	Jorge A G Santos	2009/dec/15 - 2012/feb/5	n/d	n/d
UFRPE	Giselle GM Fracetto	2023 -	Caroline M Biondi	2023 -
	Giselle GM Fracetto	2021 - 2022	Maria B G S Freire	2021 - 2022
	Edivan R Souza	2018 - 2021	Maria B G S Freire	2018 - 2021
	Clístenes W A Nascimento	2016 - 2018	Valdomiro S S Júnior	2016 - 2018
	Valdomiro S S Júnior	2014 - 2016	Edivan R Souza	2014 - 2016
	Valdomiro S S Júnior	2012 - 2014	Edivan R Souza	2012 - 2014
	Valdomiro S S Júnior	2010 - 2012	Mateus R Ribeiro	2010 - 2012
	Clístenes W A Nascimento	2006 - 2010	Mateus R Ribeiro	2006 - 2010
	José R B Cantalice	2004/june - 2004/sept (Pró-Têmpore)	n/d	n/d
	Emídio C O Filho	2004 - 2006	Maria B G S Freire	2004 - 2006
	Fernando J Freire	2001 - 2004	Clístenes W A Nascimento	2001 - 2004
	Mateus R Ribeiro	1998 - 2000	Izabel Galindo	1998 - 2000

(continuation)

UFRPE	Mateus R Ribeiro	1996 - 1998	Fernando J Freire	1996 - 1998
	Mateus R Ribeiro	1990 - 1996	n/d	n/d
	Antônio F Magalhães	1988 - 1990	n/d	n/d
	Newton P Stamford	1986 - 1988	n/d	n/d
	Mauro C Santos	1984 - 1986	n/d	n/d
	Neydson C M Ferreira	1982 - 1984	n/d	n/d
	Newton P Stamford	1980 - 1982	n/d	n/d
	José P Leite	1977 - 1980	n/d	n/d
UFRGS	Alberto V I Junior	2021/sept/2 -	Tales Tiecher	2021/sept/2 -
	Alberto V I Junior	2019/aug/9 - 2021/aug/8	Tales Tiecher	2019/aug/9 - 2021/aug/8
	Carlos G Tornquist	2017/july/21 - 2019/july/20	Enilson L S Sá	2017/july/21 - 2019/july/20
	Flávio A O Camargo	2015/june/29 - 2017/mar/29	Carlos G Tornquist	2015/june/29 - 2017/mar/29
	Alberto V I Junior	2013/may/27 - 2015/feb/25	Carlos G Tornquist	2013/may/27 - 2015/feb/25
	Alberto V I Junior	2012/nov/30 - 2013/mar/31	Flávio A O Camargo	2012/nov/30 - 2013/mar/31
UFRRJ	Leandro A Santos	2019/july - 2023/oct	Marcos G Pereira	2019/july - 2023/oct
	Everaldo Zonta	2017/feb - 2019/july	Marcos G Pereira	2017/feb - 2019/july
UFSM	Paulo I Gubiani	2023/jan/03 -	Gustavo Brunetto	2023/jan/03 -
	Rodrigo J S Jacques	2020/dec/30 -	Gustavo Brunetto	2020/dec/30 -
			Jean P G Minella	n/d
	Ricardo S D Dalmolin	2018/june/19 -	Leandro S Silva	2018/june/19 -
	Jean P G Minella	2016/june/13 -	Rodrigo J S Jacques	2016/june/13 -
	Carlos A Ceretta	2014/june/11 -	Jean P G Minella	2014/june/11 -
	Rodrigo J S Jacques	2012/june/12 -	Leandro S Silva	2012/june/12 -
	Leandro S Silva	2010/jan/15 -	Ricardo S D Dalmolin	2010/jan/15 -
			Danilo R Santos	n/d
			José M Reichert	n/d
	José M Reichert	2008/july/23 -	Leandro S Silva	2008/july/23 -
	Carlos A Ceretta	2007/jan/15 -	Leandro S Silva	2007/jan/15 -
	Carlos A Ceretta	2005/june/14 -	Dalvan J Reinert	2005/june/14 -
	Carlos A Ceretta	2003/jan/16 -	Antônio C Azevedo	2003/jan/16 -

(conclusion)

UFV	Márcio R Francelino	2021/aug/5 - 2023	n/d	n/d
	Raphael B A Fernandes	2016/aug/15 - 2021/aug/4	n/d	n/d
	Liovando M Costa	2012/oct/3 - 2016/aug/14	n/d	n/d
	Nairam F Barros	2011/mar/9 - 2011/june/21	n/d	n/d
	Liovando M Costa	2011/june/21 - 2012/oct/2	n/d	n/d
	Liovando M Costa	2010/dec/28 - 2011/mar/9	n/d	n/d
	Nairam F Barros	2007/apr/23 - 2010/dec/28	n/d	n/d
	Luiz E Dias	2005/aug/23 - 2007/apr/23	n/d	n/d
	Luiz E Dias	2004/dec/18 - 2005/aug/22	n/d	n/d
	Luiz E Dias	2003/apr/2 - 2004/dec/17	n/d	n/d
	Liovando M Costa	2002/june/26 - 2003/apr/1	n/d	n/d
	Jaime W V Mello	2001/jan/9 - 2002/june/26	n/d	n/d
	Hugo A Ruiz	1998/oct/9 - 2001/jan/9	n/d	n/d
	Liovando M Costa	1996/dec/4 - 1998/oct/9	n/d	n/d
	Liovando M Costa	1992/dec/16 - 1996/dec/4	n/d	n/d
	Antonio C Ribeiro	1989/july/19 - 1992/nov/9	n/d	n/d
UNESP	Teresa C T Pissarra	2022/mar/28 -	Alan R Panosso	2021/july/8 -
	Newton La S Junior	2021/july/8 - 2022/mar/27	Alan R Panosso	2021/july/8 - 2022/mar/27
	José M Junior	2017/june/1 - 2021/july/7	Newton La S Junior	2017/june/1 - 2021/july/7
	José M Junior	2013/june/1 - 2017/may/31	Newton La S Junior	2013/june/1 - 2017/may/31
	Carlos E A Furlani	2010/june/1 - 2013/may/31	José M Junior	2010/june/1 - 2013/may/31
	William Natale	2004/june/1 - 2010/may/31	José F Centurion	2004/june/1 - 2010/may/31
USP	Fernando D Andreote	2020/oct -	Tiago O Ferreira	2017/jan -

*n/d = no data.

Table 4.2-S – Brazilian Soil Science Society (SBCS) Board of Directors representatives. Women are marked in red.

(continues)

Term	President	1st Vice-President	2nd Vice-President	Secretary	General Secretary	Assistant Secretary	Treasurer
1947-1949	Álvaro B Fagundes	José E P Netto	-	Raul E Kalckman	-	-	Fernando Ramos
1949-1951	José E P Netto	Álvaro B Fagundes	-	Moacyr Pavageau	-	-	Leandro Vettori
1951-1953	Álvaro B Fagundes	Wilson A Araújo	-	Fernando Ramos	-	-	Leandro Vettori
1953-1955	Moacyr Pavageau	José E G Araújo	-	Waldemar Mendes	-	-	Adalgiso G Kerigh
1955-1957	Álvaro B Fagundes	José V Sampaio	-	Leandro Vettori	-	-	Adalgiso G Kerigh
1957-1959	Leandro Vettori	Guido Ranzanni	-	Luiz R C Carneiro	-	-	Adalgiso G Kerigh
1959-1961	Waldemar Mendes	João P S O Filho	-	Herodoto C Barros	-	-	Adalgiso G Kerigh
1961-1963	José E G Araújo	José O Melo	-	Raul E Kalckman	-	-	Adalgiso G Kerigh
1963-1965	João W C Lima	Guido Ranzanni	-	Luiz B Oliveira	-	-	Alfredo Kupper
1965-1967	Waldemar Mendes	Natahniel Blomfield	-	Franklin A Oliveira	-	-	Alfredo Kupper
1967-1969	Ernest Poetsch	Raul E Kalckmann	-	Raimundo C Lemos	-	-	Alfredo Kupper
1969-1971	Abeilard F Castro	Aldo F Santos	-	Luiz R C Carneiro	-	-	Raphael D Santos
1971-1973	Abeilard F Castro	Raimundo C Lemos	Luiz B Oliveira	Luiz R C Carneiro	-	-	Raphael D Santos
1973-1975	Raimundo C Lemos	Francisco C Verdade	Bernardo Van Raij	Antonio C Moniz	-	-	Alfredo Kupper
1975-1977	Luiz B Oliveira	Sebastião F G Corrêa	Francisco C Verdade	Antonio C Moniz	-	-	Antonio R Giardinni
1977-1979	Luiz B Oliveira	José E M Graça	Francisco C Verdade	José M A Valadares	-	-	Carlos R Rota
1979-1981	Raimundo F Sousa	Lucedínio P Ribeiro	Francisco C Verdade	Otávio A Camargo	-	-	José M A Valadares
1981-1983	Francisco C Verdade	Délcio P Rockmuller	Antonio C Moniz	Otávio A Camargo	-	-	José M A Valadares
1983-1985	Francisco C Verdade	Luiz F Silva	Antonio C Moniz	Otávio A Camargo	-	-	José M A Valadares
1985-1987	José F M Gomes	Antonio C Moniz	Francisco L Neto	Heitor Cantarelli	-	-	José M A Valadares
1987-1989	José F M Gomes	Fernando B R Silva	Antonio C Moniz	Heitor Cantarelli	-	-	José M A Valadares
1989-1991	Fernando B R Silva	Sergio J Volkweiss	Antonio C Moniz	Otávio A Camargo	-	-	Ruter Hiroch
1991-1993	Egom Klant	Luiz C V Borges	Antonio C Moniz	Otávio A Camargo	-	-	Ronaldo S Berton
1993-1995	Egom Klant	Luiz E F Fontes	Antonio C Moniz	Sonia C F Dechen	-	-	João R F Menk
1995-1997	Luiz E F Fontes	Antonio R Filho	Antonio C Moniz	Sonia C F Dechen	-	-	Márcio Rossi

(continuation)

1997-1999	Antonio R Filho	José R R Perez	Luiz E F Fontes	Antonio C Ribeiro	-	-	Elpídio I F Filho
1999-2001	Antonio C Moniz	Mariangela H Cunha	Luiz E F Fontes	Antonio C Ribeiro	-	-	Elpídio I F Filho
2001-2003	Mariangela H Cunha	Ciro A Rosolem	Victor H A Venegas	João Carlos Ker	-	-	Reinaldo B Cantarutti
2003-2005	Luiz B Oliveira	Mateus R Ribeiro	Victor H A Venegas	João Carlos Ker	-	-	Reinaldo B Cantarutti
2007-2009	Flávio A O Camargo	Fernando F Hernandez	Victor H A Venegas	João Carlos Ker	-	-	Reinaldo B Cantarutti
2009-2011	Flávio A O Camargo	Beno Wendleing	-	-	Victor H A Venegas	Raphael B Fernandes	Reinaldo B Cantarutti
2011-2013	Gonçalo S Farias	José A Dantas	Ivan L Z Bacic	-	Reinaldo B Cantarutti	Raphael B Fernandes	Edson M Mattiello
2013-2015	Gonçalo S Farias	Antonio R Fernandes	Ivan L Z Bacic	-	Reinaldo B Cantarutti	Igor R Assis	Teógenes S Oliveira
2015-2017	Fatima M S Moreira	Antonio R Fernandes	Ivan L Z Bacic	-	Reinaldo B Cantarutti	Igor R Assis	Teógenes S Oliveira
2017-2019	Fatima M S Moreira	Milton F Moraes	Antonio R Fernandes	-	Reinaldo B Cantarutti	Raphael B Fernandes	Igor R Assis
2019-2021	Lucia H C Anjos	Elisangela B Silva	Milton F Moraes	-	Reinaldo B Cantarutti	Raphael B Fernandes	Igor R Assis
2021-2023	Lucia H C Anjos	Elisangela B Silva	Milton F Moraes	-	Reinaldo B Cantarutti	Raphael B Fernandes	Igor R Assis

(continuation)

Term	Advisors
1947-1949	Wilson A Araújo, Guido Ranzanni, Admar L Cruz, João W C Lima, Labiano Jobine, Alcides O Franco
1949-1951	Carlos Del Negro, Fernando Ramos, José E G Araújo, Wilson A Araújo, Guido Ranzanni, Admar L Cruz
1951-1953	José E P Netto, Manuel M Ventura, João W C Lima, Carlos Del Negro, José E G Araújo, Alfredo Kupper
1953-1955	Wilson A Araújo, Álvaro B Fagundes, Hermano Gargantini, João W C Lima, José E P Netto, Manuel M Ventura
1955-1957	João W C Lima, Wilson A Araújo, Hermano Gargantini, José E G Araujo, Alfredo Kupper, Waldemar Mendes
1957-1959	Álvaro B Fagundes, Francisco C Verdade, José V Sampaio, José E G Araújo, Alfredo Kupper, Waldemar Mendes
1959-1961	Marcelo N Camargo, Guido Ranzanni, Herculano P Medina, Álvaro B Fagundes, Francisco C Verdade, José V Sampaio
1961-1963	João P S O Filho, Lindalvo Farias, Waldemar Mendes, Marcelo N Camargo, Guido Ranzanni, Herculano P Medina
1963-1965[(1)]	José O Melo, Herculano P Medina, José B Sampaio, João P S O Filho, Waldemar Mendes
1965-1967	João W C Lima, Guido Ranzanni, Luiz B Oliveira, José O Melo, Herculano P Medina, José B Sampaio
1967-1969	Waldemar Mendes, Herculano P Medina, Franklin S Antunes, João W C Lima, Guido Ranzanni, Luiz B Oliveira
1969-1971	Waldemar Mendes, Herculano P Medina, Franklin S Antunes, Ernest Poetsch, Alfredo Kupper, Raul E Kalckmann
1971-1973	Marcelo N Camargo, Herculano P Medina, Leandro Vettori, Roberto Viana, Ernst Poetsch, Alfredo Kupper

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1973-1975	Abeilard F Castro, Francisco Grohman, Luiz S Mutti, Marcelo N Camargo, Herculano P Medina, Leandro Vettori
1975-1977	Abeilard F Castro, Francisco Grohmann, Luiz S Mutti, Raimundo C Lemos, Gilson E Bezerra, Paulo T Jacomine
1977-1979	Raimundo C Lemos, Gilson E Ribeiro, Paulo K T Jacomine, Igo F Lopes, Sebastião F G Correa, Clotário O Silveira
1979-1981	Igo F Lopes, Sebastião F G Correa, Clotário O Silveira, Sergio Wolkweiss, Afredo Kupper, Guido Ranzanni
1981-1983	Alfredo S Lopes, Guido Ranzanni, Sergio Wolkweiss, Lucedino P Ribeiro, Luiz R Sousa, Tsuioshi Yamada
1983-1985	Lucedinio P Ribeiro, Luiz R Souza, Tsuioshi Yamada, Egom Klant, Osmar Muzilli, Manlio S Fernandes
1985-1987	Egom Klant, Osmar Muzilli, Manlio S Fernandes, Francisco Verdade, Luiz F Silva, Antonio R Filho
1987-1989	Francisco C Verdade, Luiz F Silva, Antonio R Filho, Gonçalo S Farias, Ibanor Anghinoni, Gabriel A Santos
1989-1991	Gonçalo S Farias, Ibanor Anghinoni, Gabriel A Santos, Sérvulo B Resende, Heitor Cantarella, Ary D Cavedon
1991-1993	Sérvulo B Resende, Heitor Cantarella, Ary D Cavedon, Marcos J Vieira, Caio Vidor, Djair L Almeida
1993-1995	Marcos J Vieira, Caio Vidor, Dejair L Almeida, José X A Neto, Antonio R Dechen, Maria L L Assad
1995-1997	José X A Neto, Antonio R Dechen, Maria L L Assad, Egom Klant, Mauro C Santos, Victor H Alvarez
1997-1999	Victor H A Venegas, Mauro C Santos, Egom Klant, Antonio C Moniz, Antonio R Dechen, Teógenes S Oliveira
1999-2001	Antonio R Filho, Antonio R Dechen, Eduardo G Couto, João R Correia, José M Reichert, Teógenes S Oliveira
2001-2003	Antonio C Moniz, Antonio R Filho, Arnaldo C Filho, Eduardo G Couto, José M Reichert, Quintino R Araújo
2003-2005	Arnaldo C Filho, Ciro A Rosolem, Jaime A Almeida, Mariangela H Cunha, Virlei A Oliveira, Quintino R Araujo
2007-2009	Mateus R Ribeiro, Ricardo S D Dalmolin, Renato Roscoe, Hedinaldo N Lima, Luciano S Souza, Paulo V Torrado
2009-2011	Mateus R Ribeiro, Luiz B Oliveira, Ricardo S D Dalmolin, Gonçalo S Farias
2011-2013	Antônio C Santos, Arnaldo C Filho, Clistenes W A Nascimento, Cristine C Muggler, Fatima M Souza, Flávio A O Camargo, Hugo A Ruiz, José A Dantas, José E Cora, José M Jr, Lucia H C Anjos, Marco A Carneiro, Milton C C Campos, Milton F Morais, Rogério O Sousa
2013-2015	Alaerto L Marcolan, Antônio C Santos, Arnaldo C Filho, Clistenes W Nascimento, Cristine C Muggler, Fatima M Souza, Flávio A O Camargo, Hugo A Ruiz, Ivan L Z Bacic, José A Dantas, José E Cora, José M Júnior, Lucia H C Anjos, Milton F Moraes, Rogério O Sousa
2015-2017	Alaerto L Marcolan, Antônio R Fernandes, Arnaldo C Filho, Cristine C Muggler, Dalvan J Reinert, Eduardo V Lima, Flávio A O Camargo, Gonçalo S Farias, Ildegardis Bertol, José A Dantas, José F Vale Jr, José M Reichert, Júlio C A Nóbrega, Lucia H C Anjos, Marcos G Pereira, Milton F Moraes, Vanderlei R Silva, Zigomar Souza
2017-2019	André G Martins, Cristine C Muggler, Dalvan J Reinert, Flávio A O Camargo, Gonçalo S Farias, Ildegardis Bertol, José F Vale Jr, José M Reichert, Júlio C A Nóbrega, Lucia H C Anjos, Mauricio V Alves, Oromar J Bertol, Paulo G Wadt, Rafael Otto, Robélio L Marchão
2019-2021	Ademir Fontana, Adriel F Fonseca, Alberto C C Bernardi, Antônio R Fernandes, Arnaldo C Filho, Beno Wendling, Deborah de Oliveira, Elisangela B Silva, Fatima M S Moreira, Gonçalo S Farias, Hedinaldo N Lima, José M Reichert, Karina T L Burity, Lucia H C Anjos, Maria E O Escobar, Milton F Moraes, Rafael Otto, Rilner A Flores, Tales Tiecher
2021-2023	Ademir Fontana, Alberto C C Bernardi, Arnaldo C Filho, Beno Wendling, Deborah de Oliveira, Elisangela B Silva, Estêvão V Mellis, Fatima M S Moreira, Glécio M Siqueira, Gonçalo S Farias, José M Reichert, Karina T L Burity, Lucia H C Anjos, Luiz A C Santos, Maria E O Escobar, Milton F Moraes, Nilvania A Mello, Pedro A V Escosteguy, Rilner A Flores

(1)Contains an error in the original source (OLIVEIRA; MEDEIROS; FARIAS, 2015), where two names were repeated.

Source: Until 2009-2011 (OLIVEIRA; MEDEIROS; FARIAS, 2015); after 2011-2013 (SBCS, 2023).

Table 4.3-S – Brazilian Soil Science Society (SBCS) Specialized Divisions representatives. Women are marked in red.

Term	Position	Division 1 Soil in space and time	Division 2 Soil processes and properties	Division 3 Soil use and management	Division 4 Soils, environment and society
2011-2015	*Director*	Lucia H C Anjos	Fatima M S Moreira	José E Corá	Cristine C Muggler
	Vice-Director	Humberto G Santos	Quirijn J Lier	Marcos G Pereira	Nilvania A Mello
	Full Member	Elpídio I F Filho	Valdomiro S S Junior	Wanderley J Melo	Elízio F F Junior
	Substitute Member	Cristiane V Oliveira	Daniel V Perez	Danilo R Santos	Cássio H A Junior
2015-2019	*Director*	Lucia H C Anjos	Dalvan J Reinert	Ildegardis Bertol	Cristine C Muggler
	Vice-Director	Ademir Fontana	Valdomiro S S Junior	Heitor Cantarella	Cassio H A Junior
	Full Member	José M Júnior	Leandro S Silva	Paulo S Pavinato	Gonçalo S Farias
	Substitute Member	Virlei Á Oliveira	Sidney L Sturmer	Paulo G S Wadt	Deborah de Oliveira
2019-2023	*Director*	Ademir Fontana	Arnaldo C Filho	Alberto C C Bernardi	Deborah de Oliveira
	Vice-Director	Milton C C Campos	Quirijn J Lier	Heitor Cantarella	Thiago A R Nogueira
	Full Member	-	-	-	-
	Substitute Member	-	-	-	-

Source: (SBCS, 2023).

Table 4.4-S – Brazilian Soil Science Society (SBCS) Commissions representatives (Division 1 - Soil in space and time). Women are marked in red.

Term	Position	DIVISION 1 – Soil in space and time			
		C 1.1	C 1.2	C 1.3	C 1.4
2011-2015	*Coordinator*	Paulo K T Jacomine	Virlei A Oliveira	Maria L Mendonça	–
	Vice-Coordinator	Humberto G Santos	Lucia H C Anjos	Elpídio I F Filho	–
	Full Member	Cristiane V Oliveira	José A L Neto	César S Chagas	–
		Milton C C Campos	José F Lumbreras	José A Demattê	–
	Substitute Member	Ademir Fontana	Sérgio H Shimizu	Gustavo Vasques	–
		Jaime Almeida	José C A Filho	Ricardo S D Dalmolin	–
2015-2019	*Coordinator*	Lucia H C Anjos	Ademir Fontana	José M Júnior	–
	Vice-Coordinator	Ademir Fontana	Virlei A Oliveira	Ricardo S D Dalmolin	–
	Full Member	Milton C C Campos	Mateus R R Filho	Alexandre T Caten	–
		Tiago O Ferreira	Arcangelo Loss	Cesar S Chagas	–
	Substitute Member	Fabricio A Pedron	Milton C C Campos	Alessandro S Rosa	–
		Valdomiro S Junior	Fabricio A Pedron	Diego S Siqueira	–
2019-2023	*Coordinator*	Ademir Fontana	Milton C C Campos	Waldir C Junior	Ingrid H Terra
	Vice-Coordinator	Marcos G Pereira	José C A Filho	Fabrício S Terra	Marcia R Calegari
	Full Member	Ingrid H Terra	Pablo Miguel	Alessandro S Rosa	–
		Antônio C Azevedo	José F Lumbreras	Ricardo S D Dalmolin	–
	Substitute Member	Virlei A Oliveira	Arcangelo Loss	Márcio R Francelino	–
		José C A Filho	Elilson G B Filho	Gustavo S Valladares	–
		Fabricio A Pedron	–	–	–

*C1.1 Soil genesis and morphology; C1.2 Soil survey and classification; C1.3 Pedometrics; C1.4 Paleopedology.

Souce: (SBCS, 2023).

Table 4.5-S – Brazilian Soil Science Society (SBCS) Commissions representatives (Division 2 – Soil processes and properties). Women are marked in red.

Term	Position	DIVISION 2 – Soil processes and properties			
		C 2.1	C 2.2	C 2.3	C 2.4
2011-2015	*Coordinator*	Elke Cardoso	Quirijn J Lier	Valdomiro S S Júnior	Jaime W V Mello
	Vice-Coordinator	Fatima M S Moreira	José M Reichert	Antônio C S Costa	Paulo G Sr Wadt
	Full Member	Tsai Siu Mui	Cássio A Tormena	Antônio C Azevedo	Daniel Vl Perez
		Maria C M Kasuya	Luciano S Souza	Marcelo M Corrêa	Rogério O Souza
	Substitute Member	Mariangela H Cunha	Paulo L Libardi	Fabrício A Pedron	Giuliano Marchi
		Rogério Melloni	Moacir S D Junior	Vander F Melo	Francisco M Fernandes
2015-2019	*Coordinator*	Sidney L Sturmer	Dalvan J Reinert	Valdomiro S S Júnior	Leandro S Silva
	Vice-Coordinator	Maria C M Kasuya	Quirijn J Lier	Edson C Bortoluzzi	Leonidas C A Melo
	Full Member	Dilmar Baretta	Mozart M Ferreira	Antônio C Azevedo	Clovis D Marcolin
		Mariangela H Cunha	Paulo L Libardi	Yuri L Zinn	Deborah P Dick
	Substitute Member	Arnaldo C Filho	Vilson A Klein	Eloise M V Moraes	Maria B G S Freire
		Fatima M S Moreira	Moacir S D Junior	Vander F Melo	Vander F Melo
2019-2023	*Coordinator*	Arnaldo C Filho	Quirijn J Lier	Eloise M V Moraes	Tales Tiecher
	Vice-Coordinator	George G Brown	Marta V Ottoni	Valdomiro S S Júnior	Vania S Fraga
	Full Member	Dilmar Baretta	Hugo Alberto Ruiz	Vander F Melo	Leonidas C A Melo
		Tsai Siu Mui	Paulo L Libardi	Antônio C S Costa	André G Martins
	Substitute Member	Fatima M S Moreira	José M Reichert	Sebastião B Calderano	Nairam F Barros
		Maria C M Kasuya	Wenceslau G Teixeira	Antônio C Azevedo	Cassio H A Junior

*C2.1 Soil biology; C2.2 Soil physics; C2.3 Soil mineralogy; C2.4 Soil chemistry.

Souce: (SBCS, 2023).

Table 4.6-S – Brazilian Soil Science Society (SBCS) Commissions representatives (Division 3 – Soil use and management). Women are marked in red.

Term	Position	DIVISION 3 – Soil use and management				
		C 3.1	C 3.2	C 3.3	C 3.4	C 3.5
2011-2015	*Coordinator*	Danilo R Santos	–	José Eo Corá	Gustavo S Valadares	Wanderley J Melo
	Vice-Coordinator	Ciro A Rosolém	–	Paulo L Libardi	Marcos G Pereira	Fatima M S Moreira
	Full Member	Davi J Silva	–	João H M Viana	Elízio F F Juniór	Luiz E Dias
		Edicarlos D Souza	–	Selma S Castro	Carlos E P Cerri	Sandra T Teixeira
	Substitute Member	Ibanor Anghinoni	–	Ramon C Alvarenga	Jorge W Cortez	Hugo A Ruiz
		Djalma M G Souza	–	–	José F Lumbreras	Ademir S F Araújo
2015-2019	*Coordinator*	Heitor Cantarella	Paulo S Pavinato	Ildegardis Bertol	Paulo G S Wadt	Álvaro L Mafra
	Vice-Coordinator	Paulo G S Wadt	Reges Heinrichs	Marcos G Pereira	Osvaldo G Filho	Adriana M Ar Accioly
	Full Member	Luciano C Gatiboni	Wellington E X Guerra	Edicarlos D Souza	Adriana M Costa	Guilherme K Donagemma
		Milton F Moraes	Milton F Moraes	Marx L N Silva	Carlos A Flores	Eriberto V S Freitas
	Substitute Member	Adônis Moreira	Heitor Cantarella	João T Filho	Valdinar F Melo	Igor R Assis
		Leonardus Vergutz	Rafael Otto	Alceu Pedrotti	João C Ker	Thiago A R Nogueira
2019-2023	*Coordinator*	Alberto C C Bernardi	Heitor Cantarella	Arcangelo Loss	Viviane C Modesto	Antônio R Fernandes
	Vice-Coordinator	Rilner A Flores	Paulo S Pavinato	Teógenes S Oliveira	Valdinar F Melo	Thiago A R Nogueira
	Full Member	Ciro A Rosolem	Milton F Moraes	Alceu Pedrotti	Kamylla G O Assis	Carolina R M Baretta
		Volnei Pauletti	Samuel V Valadares	Cristiano A Pott	Oldair D V Costa	Tadeu L Tiecher
	Substitute Member	Heitor Cantarella	Maurício V Alves	Ildegardis Bertol	Leonardo S Collier	Clistenes W Nascimento
		Leônidas C A Melo	Luís C Cassol	Yuri J A B Silva	Adriana M Costa	Dilmar Baretta

*C3.1 Soil fertility and plant nutrition; C3.2 Correctives and fertilizers; C3.3 Soil and water management and conservation; C3.4 Land use planning; C3.5 Pollution, soil remediation and recovery of degraded areas.

Souce: (SBCS, 2023).

Table 4.7-S – Brazilian Soil Science Society (SBCS) Commissions representatives (Division 4 - Soils, environment and society). Women are marked in red.

Term	Position	DIVISION 4 – Soils, environment and society		
		C 4.1	C 4.2	C 4.3
2011-2015	*Coordinator*	Cristine C Muggler	Cássio H AJunior	Nilvania A Mello
	Vice-Coordinator	Milton C CCampos	Fábio C Silva	Sandro L Schlindwein
	Full Member	Paulo G S Wadt	José L Junior	Marcos G Pereira
		Paula P P Peixoto	Milton F Moraes	Lúcia R F Luz
	Substitute Member	Antônio C Azevedo	Mari L Campos	Gonçalo S Farias
		Fabrício A Pedron	João H M Viana	José F V Junior
2015-2019	*Coordinator*	Cristine C Muggler	Cássio H AJunior	Gonçalo S Farias
	Vice-Coordinator	Deborah de Oliveira	Thiago A R Nogueira	Cristine C Muggler
	Full Member	Maria L R C L Assad	Maria A P Pierangeli	Tiago S Telles
		Marcelo R Lima	Idemê G Amaral	Julierme Z Barbosa
	Substitute Member	João A Braida	Mario Miyazawa	Marcia R Calegari
		Ricardo S D Dalmolin	Otavio A Camargo	Victor J L Félix
2019-2023	*Coordinator*	Déborah de Oliveira	Thiago A R Nogueira	Vagner L Silva
	Vice-Coordinator	–	Cássio H AJunior	–
	Full Member	Fatima M S Moreira	Adrielle R Prates	–
		Ricardo S D Dalmolin	Maria A P Pierangeli	–
	Substitute Member	Adriana F M Vital	Carlos E G R Schaefer	Gonçalo S Farias
		Francisco S B Ladeira	Elemar A Cassol	Julierme Z Barbosa

*C4.1 Soil education and public soil perception; C4.2 Soils and food security; C4.3 History, epistemology and sociology of science.

Souce: (SBCS, 2023).

Table 4.8-S – Brazilian Soil Science Society (SBCS) Regional and State Nuclei representatives. Women are marked in red.

(continues)

Term	Position	RN Eastern Amazon[1]	RN Western Amazon[2]	RN Midwest[3]	RN Northeast	RN Northwest
2011-2013	*Director*	Antonio C Santos	Milton C C Campos	Marco A C Carneiro	Clistenes W A Nascimento	–
	1st Vice-President	Antonio R Fernandes	José F V Júnior	Carlos H Kurihara	Luciano Souza	–
	2nd Vice-President	Junior C Avanzi	Alaerto Marcolan	Aguinaldo J F Leal	Ignácio Salcedo	–
	General Secretary	Anderson M S Braz	Paulo G S Wadt	Maria L G Campos	Valdomiro Souza	–
	Treasurer	Herdjania V Lima	Anderson C Bergamin	Edicarlos D Souza	Mario A L Junior	–
2013-2015	*Director*	Antonio C Santos	Alaerto Marcolan	Milton F Moraes	Clistenes W A Nascimento	–
	1st Vice-President	Leonardo S Colier	Elizio F F Junior	Aguinaldo J F Leal	n/d	–
	2nd Vice-President	Junior C Avanzi	Valdinar F Neto	Robélio L Marchão	n/d	–
	General Secretary	Anderson M S Braz	Paulo G S Wadt	Virgínia Damin	n/d	–
	Treasurer	Herdjania V Lima	Milton C Campos	Eduardo C Severiano	n/d	–
2015-2017	*Director*	Vânia S Melo	José F V Junior	Milton F Moraes	Júlio C A Nóbrega	Alaerto L Marcolan
	1st Vice-President	Regilene A S Souza	Milton C Campos	Aguinaldo J F Leal	Fernando L D Cintra	Lucielio M Silva
	2nd Vice-President	Eduardo V Lima	Raymundo L S Júnior	Robélio L Marchão	Valdomiro S S Júnior	Elizio F F Junior
	General Secretary	Pedro D Oliveira	João J C Silva	Virgínia Damin	Adriana M A Accioly	Henrique N Cipriani
	Treasurer	Raimundo T L Silva	Valdinar F Melo	Eduardo C Severiano	Bruno O Dias	Stella C G Matoso
2017-2019	*Director*	Antonio R Fernandes	José F V Junior	Robélio L Marchão	Júlio C A Nóbrega	Paulo G S Wadt
	1st Vice-President	Antonio C Santos	Milton C Campos	Cid Campos	Fernando L D Cintra	Henrique N Cipriani
	2nd Vice-President	Khalil M Rodrigues	Raymundo L S Júnior	Dácio Olibone	Valdomiro S S Júnior	Elizio F F Junior
	General Secretary	Régia M R Gualter	João J C Silva	Cícero C Figueiredo	Adriana M A Accioly	Stella C G Matoso
	Treasurer	Vânia S Melo	Valdinar F Melo	Rilner A Flores	–	Marcela Campanharo
2019-2022	*Director*	Glécio M Siqueira	Luiz A C Santos	Rilner A Flores	Maria E Escobar	Karina T L Burity
	1st Vice-President	Augusto J S Pedroso	Douglas M P Silva	Ademir Fontana	Carolina M M Souza	Elaine A D Honoré
	2nd Vice-President	Michele R Ramos	Fernando G Souza	Milton F Moraes	Henrique A Souza	–
	General Secretary	Raimunda A Silva	Carlos H L Matos	Robélio L Marchão	Ygor J A B Silva	–
	Treasurer	João F S Júnior	João J C Silva	Glênio G Santos	Paula R M Araújo	–

(conclusion)

Term	Position	RN East	RN South	SN São Paulo	SN Paraná
2011-2013	*Director*	Hugo A Ruiz	Paulo R Ernani	José M Júnior	Gonçalo S Freitas
	1st Vice-President	Marcos G Pereira	Ledemar C Vahl	Luis R F Alleoni	Oromar Bertol
	2nd Vice-President	Fátima M S Moreira	Luciano C Gatiboni	–	–
	General Secretary	Manoel R A Filho	Mari L Campos	Fernando C Bertolani	Marcelo M L Muller
	Treasurer	Maria C M Kasuya	Jackson A Albuquerque	Ricardo M Coelho	Volnei Pauletti
2013-2015	*Director*	Hugo A Ruiz	Rogério O Sousa	José M Júnior	Oromar J Bertol
	1st Vice-President	Fátima M S Moreira	Walkyria B Scivittaro	Fernando C Bertolani	Arnaldo C Filho
	2nd Vice-President	Marcos G Pereira	Vanderlei R Silva	Janaina B Carmo	–
	General Secretary	André G Martins	Rosane Martinazzo	Rafael Otto	Marcelo M L Muller
	Treasurer	Maria C M Kasuya	Rosa M V Castilhos	Ricardo M Coelho	Volnei Pauletti
2015-2017	*Director*	Marcos G Pereira	Vanderlei R Silva	Zigomar M Souza	Arnaldo C Filho
	1st Vice-President	Ademir Fontana	Clóvis O Rossini	Janaina B Carmo	Nelson Harger
	2nd Vice-President	Ederson C Jesus	Adão M Corsini	José M Júnior	–
	General Secretary	André G Martins	Lisandra P D Flora	Carolina Fernandes	Luís C Cassol
	Treasurer	Maria C M Kasuya	Rodrigo F Silva	Rafael Otto	Tiago S Telles
2017-2019	*Director*	André G Martins	Maurício V Alves	Rafael Otto	Oromar J Bertol
	1st Vice-President	Felipe V Andrade	Carolina Barreta	Estêvão V Mellis	Jeferson Dieckow
	2nd Vice-President	Renato R Passos	Tales Tiecher	Thiago A R Nogueira	–
	General Secretary	Marcos G Pereira	Leandro P Wildner	Zigomar M Souza	Paulo C Conceição
	Treasurer	Maria C M Kasuya	Jaqueline M Oliveira	Reges Heinrichs	Tiago S Telles
2019-2022	*Director*	Beno Wendling	Pedro A V Escosteguy	Estêvão V Mellis	Nilvânia A Mello
	1st Vice-President	Marcos G Pereira	Fabiano Bona	Thiago A R Nogueira	Nerilde Favaretto
	2nd Vice-President	André G Martins	Paulo I Gubiani	Réges Heinrichs	Paulo C Conceição
	General Secretary	Araína H Batista	André Amaral	Célia Regina Grego	Márcia R Celegari
	Treasurer	Wedisson O Santos	Jackson Korchagin	Paulo S Pavinatto	Josiane B Santos

*RN = Regional Nucleus; SN = State Nucleus; n/d = no data.
(1)In 2011-2013, Nucleus' name was RN North.
(2)In 2011-2013, Nucleus' name was RN Amazon.
(3)In 2011-2015, Nucleus' name was RN West.
Source: (SBCS, 2023).

5 CONSIDERAÇÕES FINAIS

Esta tese evidenciou a existência e persistência de disparidades de gênero na ciência do solo no Brasil. O Estudo 1 confirmou uma escassez global de pesquisas dedicadas ao estudo de gênero nas ciências agrárias e do solo, sublinhando a necessidade de mais estudos com dados interseccionais e com análises qualitativas aprofundadas. O Estudo 2 confirmou que a presença das mulheres discentes nos programas de pós-graduação em ciência do solo no Brasil vem crescendo, especialmente nos últimos 10 anos, alcançando a paridade de gênero no doutorado e próximo da paridade no mestrado. No entanto, a presença profissional das mulheres na pós-graduação e na Sociedade Brasileira de Ciência do Solo (SBCS) ainda é substancialmente menor do que a dos homens, principalmente em posições de liderança e quanto maior o nível hierárquico, além de receberem pouco reconhecimento por meio de prêmios e honrarias. Esse descompasso chama atenção para a existência de barreiras sistêmicas e culturais, as quais limitam e impactam negativamente a presença, evolução e reconhecimento das cientistas do solo no Brasil. Além disso, destacam a necessidade urgente da implementação de ações afirmativas e estratégias que corrijam as inequidades destacadas nesta pesquisa. Também ressaltam a importância de promover uma mudança sistêmica e cultural dentro da comunidade acadêmica e profissional da ciência do solo que garanta a equidade, diversidade e inclusão.

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