

Economic and Social Aspects of the Decorative Dried Plant Value Chain in the Brazilian Cerrado

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Abstract: The commerce of decorative dried plants from the Brazilian Cerrado Biome provides cultural transmission, and essential revenue for low-income families. We investigated this production value chain over the past decade, assessing its economic and social relevance and mapping the main actors involved, and characterizing the interviewed participants, as well as the foreign trade trends over 50 years. Data was gathered through interviews with 67 actors across six municipalities and from official trade databases (AliceWeb and ComEx Stat). Our results show an active value

Received: 4 June 2025; accepted: 7 April 2026;
published online _____

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s12231-026-09676-2>.

Ethnobotany and Economic Botany, XX(X), 2026, pp. 1–21

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Published online: 26 May 2026

chain encompassing diverse actors, products, and importing countries. Despite long-term engagement in the trade (20–50 years for most participants) and its role as the primary income source for 38.5% of respondents, 57.1% of them earn below the minimum wage. Younger generations show declining interest, influenced by economic constraints, exportation decline, stricter environmental legislation, and alternative educational and professional opportunities, including due to urbanization. However, current market transformations, including the growth of online sales, present emerging opportunities for them. While exports of dried flowers and buds have diminished considerably since the 1970s, a stable market demand for other decorative dried plant parts has persisted for nearly five decades. Finally, we suggest innovations in the value chain to support the sustainable continuity of this complex socioenvironmental system.

Keywords: Bioeconomy, Everlasting flowers, Extractivism, Non-timber forest products, NTFP, Sociobiodiversity

Resumo: O comércio de plantas secas decorativas do Cerrado brasileiro contribui para a transmissão cultural e a subsistência de diversas famílias de baixa renda. Investigou-se esta cadeia produtiva de valor ao longo da última década, mapeando-se os principais atores envolvidos e caracterizando-se os participantes entrevistados, bem como as tendências do comércio exterior nos últimos 50 anos. Foram realizadas entrevistas com 67 participantes em seis municípios e análise de dados dos sistemas AliceWeb e ComEx Stat. Observa-se uma cadeia de valor ativa, com diversos participantes, produtos e países importadores. A maioria dos trabalhadores atua no setor há 20–50 anos, sendo essa a principal fonte de renda para 38.5% deles, contudo 57.1% recebem menos que um salário mínimo. Há desinteresse dos jovens devido ao baixo retorno financeiro, declínio das exportações, endurecimento das leis ambientais, surgimento de outras oportunidades educativas e profissionais, devido inclusive à urbanização. Entretanto, novidades no mercado, incluindo o crescimento das vendas online, representam novas oportunidades para eles. Embora as exportações de flores e botões secos tenham declinado desde a década de 1970, a demanda por plantas secas decorativas mantém-se estável. Inovações na cadeia de valor são recomendadas para a continuidade sustentável desse complexo sistema socioambiental.

Introduction

The Cerrado is the most biodiverse savanna and is one of the 36 global biodiversity hotspots (Myers et al., 2000; Strassburg et al. 2017). This vast Brazilian biome harbors exceptional biological wealth, with more than 13,000 plant species, approximately 40.4% of which are endemic (Brazil Flora Group 2022; Fernandes et al. 2016; Flora e Funga do Brasil 2025; Mendonça et al. 2008). Beyond its biological richness, the Cerrado supports significant cultural diversity, encompassing numerous Indigenous peoples and Traditional Communities. The provision of plant-based products from the Cerrado is a vital ecosystem service for these groups, providing materials for a wide array of uses such as food, spices, bark products, forage, timber, honey production, medicine, oil, fiber, tanning, textiles, dyes, ornamentals, and crafts (Almeida et al. 1998).

Protecting the Cerrado's socio-ecological richness and fostering value chains for its non-timber forest products (NTFPs) are crucial to counteract the prevailing view of the Cerrado primarily as "the breadbasket of Brazil," driven mainly by incentives for agribusiness expansion (Mello et al. 2023). As Brazil's second-largest biome, the Cerrado faces extensive devastation from conversion into large-scale cattle pastures and monoculture crops (Fernandes et al. 2016; Pereira et al. 2024). Improving NTFP value chains offers a potentially ecologically sound, socially just, and culturally valuable alternative for leveraging Cerrado's resources.

Decorative dried plants present low moisture content, and so are able to maintain their shape and color long after being harvested and dried (Giulietti et al. 1996). They include a wide range of plant parts, such as inflorescences, fruits, seeds, branches, stems, bark, leaves, and

leaf sheaths, which come from various plant groups, including grasses, palms, trees, mosses, and lichens. These materials are used in floral arrangements, crafts, funeral wreaths, and pot-pourri (Cook et al. 2015; Tucker et al. 2010; Fig. 1, 2). In Brazil, decorative dried plants are predominantly gathered from some Cerrado ecosystems. A survey in just two municipalities

in Minas Gerais state documented 102 species being used, excluding unidentified ones (Instituto Terra Brasilis 1999), indicating a potentially much higher actual number. Recent studies focusing on the Espinhaço Range in Minas Gerais found trade involving over 400 species, primarily from mountainous ecosystems (Silva and Sano 2025). Examples include



Fig. 1. Decorative dried plants from the Cerrado. **a** and **(b)** Fair in Brasília, in the Central Plateau of Brazil, where floral arrangements made with a wide variety of plant parts are sold. **c** Fair in Diamantina, in the Southern Espinhaço, where everlastings predominate. **d** Artisans producing bouquets of inflorescences. **e** Floral arrangements at a fair in Belo Horizonte, made with woody fruits, seeds and branches of dried plants. **f** “Roses” made with skeletonized leaves (a process by which the leaf parenchyma is destroyed, leaving only the vascular elements of the leaves)



Fig. 2. Everlastings are a special category of dried plants from the Cerrado, consisting of inflorescences and buds from some botanical families, especially Eriocaulaceae. **a** Everlasting flower gatherer in Diamantina, in the Southern Espinhaço. **b** *Comanthera elegans* (Bong.) L.R.Parra & Giul., the everlasting with the greatest commercial value, drying in the sun after being harvested in native fields; **(c)** An actor in the production value chain carrying bouquets of everlastings. **d** Warehouse where dried plants are stored and processed to be sold. **e** A truck being loaded for transportation; **f** Funeral wreaths of dried plants from the Cerrado, a typical product of the Southern Espinhaço, in which everlastings predominate. Photos (b) and (c) were kindly provided by Maíra Goulart

Chamaecrista orbiculata (Benth.) H.S.Irwin & Barneby, *Gomphrena* L. spp., *Roupala montana* Aubl., *Syagrus glaucescens* Glaz. ex Becc., and *Vellozia squamata* Pohl.

Among Brazilian decorative dried plants, "sempre-vivas" (everlastings) hold significant economic, traditional, and conservation importance. They are commonly sold in street

markets, craft shops, and online. Commercialized everlasting encompass over 49 species, mainly inflorescences from families like Cyperaceae, Eriocaulaceae, Poaceae, Rapateaceae, and Xyridaceae (Giulietti et al. 1996). However, for flower gatherers, the term refers specifically to *Comanthera* L.B.Sm. subg. *Comanthera* (Eriocaulaceae) (R. Ramos, personal communication). These inflorescences are used for home decoration, bridal bouquets, and funeral wreaths (Fig. 2; Instituto Terra Brasilis 1999; Parra et al. 2010). Although dried plants occur throughout the Cerrado, everlastings have been traditionally harvested in the Campo Rupestre (rupes-trian grassland) ecosystem. This ecosystem lies partly within the Cerrado biome but is primarily found along the Espinhaço Mountain Range in the states of Minas Gerais and Bahia, with some isolated occurrences in the state of Goiás (see Fernandes 2016). Nowadays, harvesting efforts are concentrated mainly in the Minas Gerais portion of the Espinhaço range.

In the southern Espinhaço region, the people who collect everlastings, self-identified as traditional flower gatherers, also collect other types of decorative dried plants during low everlasting periods (August–December), like fruits/seeds (Sept–Nov) and less seasonal vegetative parts (Instituto Terra Brasilis 1999; Martins 2019). These authors reviewed historical records, finding commercialization of dried plants dating back to 1930, but local collection likely predates this. Flower gatherers are considered traditional communities due to their intergenerational way of life, which combines small-scale farming, livestock, and plant/mineral extraction (Monteiro 2022). Their knowledge and practices are recognized globally, included in the FAO's Globally Important Agricultural Heritage Systems (GIAHS) (Food and Agriculture Organization of the United Nations 2020), and as intangible cultural heritage (IEPHA 2023).

Some everlasting species, which have been subject to market and taxonomic studies, are deemed threatened locally or regionally due to commercial exploitation (Giulietti et al. 1987, 1996; Mendonça and Lins 2000). Consequently, certain species are listed as endangered, and their wild collection is prohibited (COPAM 1997, 2008; Ministério do Meio Ambiente 2008, 2014, 2022). However, the actual impact of extractivism on plant populations, is poorly understood due

to a lack of long-term monitoring. For example, in a 3-year recent population study on *Comanthera elegans* (Bong.) L.R.Parra & Giul., Novato et al. (2025) found that the traditional management practice that combines late harvest and fire increased flowering rates and population growth, contributing to the sustainability of these species' populations.

Historically, the extraction of dried plants from the Cerrado was a primary, sometimes sole, economic activity for many low-income rural families (Instituto Terra Brasilis 1999). This activity was crucial for preserving the flower gatherers' cultural identity and sense of belonging. Some reports indicate that the extraction of everlastings peaked in the 1970s, as evidenced by foreign trade data, media reports, and testimonies from participants in the supply chain (see Instituto Terra Brasilis 1999; Martins 2019), followed by a subsequent decline. For other decorative dried plants, however, no reliable quantitative data are available. Thus, significant gaps remain regarding the current economic significance of this trade, its social importance, and the structure of its production value chain.

This study examines the state of the decorative dried plant trade in the Cerrado over the past decade, evaluating its economic and social relevance. We aimed to answer the questions: what is the socioeconomic profile of the actors involved in the production value chain? Where are they geographically situated? What is the value chain structure? How has foreign trade in Brazilian dried plants behaved over the last 50 years? Does the trade in artificial plants influence the trade in Brazilian decorative dried plants? This research highlights critical knowledge gaps in understanding this sector's dynamics. Bridging these gaps with robust scientific data is vital for developing more effective policies, promoting sustainable practices, and ensuring the long-term viability of this activity for local communities while preserving the Cerrado's ecological balance and cultural heritage.

Materials and Methods

STUDY AREA

Data were obtained in cities (and their districts) known for dried flower harvesting and commerce: Belo Horizonte, Datas, Diamantina

(including the districts of Guinda, Sopa, Galheiros, Batatal, and São João da Chapada), and Gouveia (including the district of Cuiabá) in Minas Gerais; Brasília in the Federal District; and São Paulo in São Paulo state.

CHARACTERIZATION OF THE ACTORS IN THE VALUE CHAIN

Our research focused on the actors within the decorative dried plants' production value chain. The functional roles performed can be categorized as follows:

- Flower gatherers (“*apanhadores de flores*”): inhabitants of small villages in the countryside who gather plants from grasslands, savannas, forests, and mountain ecosystems. They sell minimally processed plants (primarily dried) to middlemen. Harvesting occurs year-round due to the variety of available species and plant parts. In the Southern Espinhaço Range (including Diamantina, Datas, Gouveia), families practice seasonal transhumance, seasonally migrating from lower mountain areas (where they farm) to higher altitudes for livestock grazing during the dry winter and collecting decorative dried plants. They often reside in rock shelters or temporary huts for months. Harvesting also happens near Belo Horizonte and Brasília, including pruned exotic species from urban landscaping. Urban harvesters often also function as artisans.
- Cultivators (“*donos de plantações*”): We interviewed one individual near Diamantina who cultivated decorative dried plants and worked with flower gatherers. Records of cultivation within this value chain are scarce, but historical information dates back to the 1970s (Moreira et al. 2017), while herbarium collections show former cultivation areas. Current studies explore experimental cultivation of decorative dried plants, but traditional local practices remain largely uncharacterized.
- Local Traders/middleman (“*intermediários locais*”): Rural residents who buy plants from nearby harvesters, consolidate them, and sell to larger middlemen.
- Large Traders/exporters/middlemen (“*grandes intermediários/exportadores*”): Urban residents who centralize large quantities of plants in warehouses, selling to clients nationally or internationally. They employ workers for processing, storage, and logistics.
- Processors (“*processadores*”): Workers who prepare plants by sorting, arranging bouquets, dyeing, and cutting stems per customer needs. They are employed by local and large middlemen, and work in warehouses. A notable segment in the Southern Espinhaço used to be the production of everlasting funeral wreaths, which was growing at the time of the research. Some women used to assemble small everlasting bouquets on bamboo sticks called “*florzinhas*” at home, used by others to make wreaths.
- Artisans (“*artesãos*”): Rural or urban residents creating crafts like arrangements, decorative balls, potpourri, etc. Some collect materials, others buy, or do both. Many urban artisans are originally from the countryside, especially Meridional Espinhaço, and return periodically for plant collection. The artisans that used to produce funeral wreaths are called “*coroeiros*”.
- Retailers (“*vendedoras varejistas*”): Located in cities, selling crafts at fairs, markets, shops, e-commerce, or funeral stores. Stallholders often process products, while shopkeepers usually only resell finished items with less interaction in the value chain.
- Consumers (“*consumidores*”): Individuals buying decorative dried plants as raw materials (for decorating/crafting) or finished products (crafts, wreaths).

However, considering that each actor may perform more than one function in the value chain, and in order to have a representative sample size per category to carry out the statistical analyses, it was necessary to merge these functional roles

into the following categories: artisan (processors and artisans – except “*coroeiros*”); gatherer (flower gatherers); coroeiro (“*coroeiros*”); middlemen (local traders/middlemen, large traders/exporters/middlemen); stallholder/artisan (retailers that declared themselves to be artisans). Consumers were not interviewed in this study, although they are part of the value chain. Only one interviewee was identified as a cultivator, and this person also acted as a middleman; therefore, cultivators were not treated as a separate category in the quantitative analyses.

INTERVIEWS

Between 2013 and 2014, we conducted face-to-face, semi-structured interviews with actors across various roles in the production value chain. In order to select participants, we accessed all the stalls selling decorative dried plants in four different fairs at Belo Horizonte, Brasília and São Paulo. All the actors who agreed to answer our questions were interviewed. In other locations, particularly in rural areas, we used the snowball sampling technique, in which two initial informants (a tour guide and a villager) introduced us to everyone they knew who was involved with decorative dried plants. These individuals, in turn, recommended others. Our intention was to include all stakeholders in the research, effectively conducting a census. Although we did not fully achieve this goal (especially in the countryside), we believe that our sample represents the reality of most actors in the study region.

The research goals were predefined by the researchers, and then collaborators were invited to take part in the study. Prior to their involvement, they were individually, comprehensively informed about the study's objectives, justification, risks, benefits and procedures, and their rights. To address power imbalances, interviews were conducted in the participants' homes or workplaces, utilizing accessible language, and permitting them to review their responses, not answer a question, interrupt or abandon the interview at any time. Furthermore, a Free Prior Informed Consent (FPIC) form was obtained from all field interviewees who consented to participate in this research. Five trained researchers conducted the interviews, which ranged from 11 min to 1 h and 23 min. Participants we met again

after the research was completed were informed about its outcomes, and the resulting materials (such as a magazine article) were delivered to their association.

The interviews used a semi-structured questionnaire covering sociodemographic factors [gender, age, education, ethnic group, time in field, work organization (i.e. whether people work alone, in familiar groups, or in other groups), birthplace, residence], and economic questions (income, other financial activities). Ethnic-racial categories followed the standards of the Brazilian Institute of Geography and Statistics (IBGE), responsible for the Brazilian Census.

We interviewed 67 actors, including 7 women and 2 men artisans; 4 women and 8 men flower gatherers; 4 women and 2 men “*coroeiros*”; 20 women and 11 men stallholder-artisans; and 9 men, but no women, acting as middlemen (one of whom was also a cultivator). Among those interviewed, 52.2% were women and 47.8% were men. The largest ethnic-racial category was brown (“*pardo*”) – individuals with multiple ancestry, especially those with a combination of Indigenous, European, and African origins), self-identified by 35.8%. In addition, 19.4% responded as white and 7.5% as black, with 35.8% falling into the ‘others’ category (ESM, Appendix 1a).

Most interviewees (97%) were 27 years or older, with 38.8% aged 51–60 and only 8.8% under 30. The majority (34.3%) had 41–50 years in the field, and 71.6% had worked with dried plants for 21–50 years (ESM, Appendix 1b).

Many actors learned the profession from relatives, with the transmission of knowledge through non-formal spaces, orally, and by observing the practices adopted by the elderly. Starting ages varied widely, from early childhood to 42, most commonly between 6 and 10 years old (32.8%; ESM, Appendix 1c). Work organization shows 65.7% are part of family groups, 19.4% work alone, and 19.3% are in companies, associations, or cooperatives, considering that some actors belong to more than one category.

Education levels ranged from 1st–4th grade of elementary school (41.3%) to incomplete higher education, with 15.9% being illiterate (ESM, Appendix 1d). For 38.5% of the interviewees, plant collection is the sole income source. The

remaining 61.5% supplement income with agriculture, forestry, livestock, retail, hospitality, transport, security, construction, domestic work, crystal collection, mining, public office, scholarships, or pensions. Many women are housekeepers. Among those with supplementary income, 32.5% report dry plant work as their primary job.

Monthly individual income from decorative dried plants ranged from US\$16.3 to US\$2,169.3. Notably, 57.1% out of 49 interviewees earned less than the 2023 national minimum wage of US\$268.9 in 2023 (ESM, Appendix 1e).

Finally, to map the production value chain geographically, we collected data on participants' birthplaces and residences and asked about the locations of their professional partners. This information was then visualized on a map.

INTERNATIONAL TRADE

International trade data were compiled for historical characterization of decorative dried plant exports. Data from 1989 to 1996 were accessed from the Brazilian Ministry of Development, Industry, and Foreign Trade's AliceWeb system (SECEX [Secretaria de Comércio Exterior] 2012). Data from 1997 to 2023 were gathered from the Ministry of Economy's ComEx Stat system (Ministério da Economia 2024). Export data for weight of dried flowers and buds from 1974 to 1988 were sourced from Instituto Terra Brasilis (1999). Monetary values (USD) in the time series were adjusted for U.S. inflation through 2023 (Bureau of Labor Statistics 2024). We analyzed only export data due to a lack of reliable data for the national market.

The "dried flowers and buds" category, including everlastings, corresponds to AliceWeb classifications: "dried/cut flowers and buds for ornamentation," "bleached, dyed, impregnated flowers/buds, etc." (1989–1996), and "dried flowers and buds, etc., cut for bouquets, etc." (1997–onward). The "other parts of dried plants" category includes: "dried leaves/foilage/branches, etc., for bouquets and ornamentation" (1989–1996), and "dried foliage, leaves, branches of plants, etc., for bouquets, etc.," "other foliage, leaves, branches, and other plant parts without flowers or flower buds, and herbs, mosses, and lichens for bouquets or ornamentation, fresh, dried, bleached, dyed, impregnated,

or otherwise prepared," and "mosses and lichens for bouquets or ornamentation" (1997–onward).

We also analyzed the trends in imports and exports of artificial plants (made of plastic, etc.), considering them competitors that might affect sales of decorative dried plants. Additionally, we assessed temporal changes in the price per unit weight for dried flowers and buds, other dried plant parts, and artificial plants. Finally, we identified the primary countries importing Brazilian decorative dried plants. Currency values (income, etc.) were adjusted for inflation to 2023 Brazilian Reais (R\$) and converted to US Dollars using the 12/29/23 exchange rate (Banco Central do Brasil 2024a, b).

DATA ANALYSIS

We employed the Chi-square test to assess significant associations between categorical variables: gender, type of work with dried plants, work organization, years in the business, age starting the activity, whether it's primary or supplementary income, education level, and minimum income from the activity. The significance and strength of association were presented in a matrix, with Cramer's V statistic indicating strength (0 for no association, 1 for perfect association) depicted by a color scale (Friendly and Meyer 2016). Relationships between variable categories were visualized using mosaic plots generated with the 'mosaic' function from the R package 'vcd' (Meyer et al. 2006).

Results

The value chain for decorative dried plants in the Cerrado primarily follows three main pathways (Fig. 3). The first involves flower gatherers harvesting plants and selling them as raw materials, often after minimal processing, through one or two middlemen who consolidate the production, to customers in Brazil or abroad. The second pathway involves artisans who collect or purchase plants to create objects, which they sell directly or through marketplaces, stores, or small shops. The third pathway, specific to the Southern Espinhaço region, involves buying plants, assembling small everlasting bouquets which are used by "*coroeiros*" to create funeral wreaths on

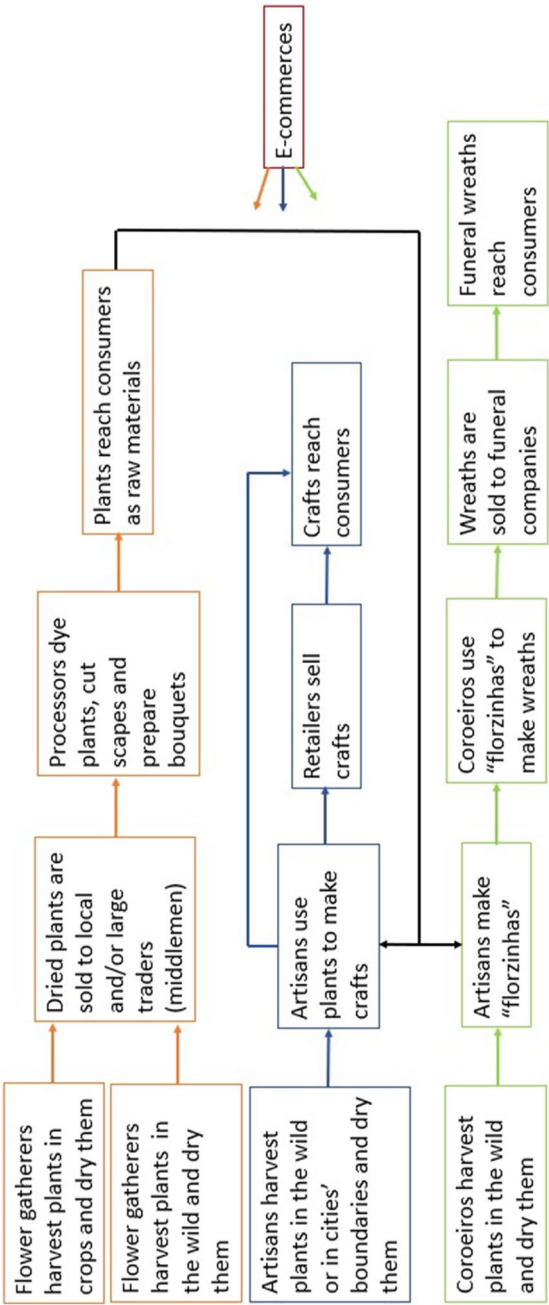


Fig. 3. The supply chain for decorative dried plants, from harvest to final sale. The three pathways are for raw materials (orange), crafts (blue) and funeral wreaths (green). Note that various actors can use e-commerce

straw bases sold to funeral companies and ultimately to consumers.

The interviewees originated from 24 Brazilian cities in the states of Bahia (BA), Ceará (CE), Goiás (GO), Minas Gerais (MG), Pará (PA), Piauí (PI), São Paulo (SP), and the Federal District (DF). Their current locations and those of their professional partners spanned 68 Federal District administrative regions and cities in Bahia (BA), Ceará (CE), Espírito Santo (ES), Goiás (GO), Minas Gerais (MG), Rio de Janeiro (RJ), Santa Catarina (SC), and São Paulo (SP) (Fig. 4).

Statistical analysis (Chi-square test) revealed significant correlations ($p < 0.05$) between several categorical socioeconomic variables (Fig. 5). Work purpose (e.g., artisan, flower gatherer) correlated with most variables except working time, including gender, minimum income, income source, education level, starting age, and work organization. Working time was associated with education level and starting age. Education level correlated with minimum income. Work organization related to starting age, and income source was associated with gender (Fig. 5).

Specifically, women predominantly worked as artisans and stallholders/artisans, while men were more often flower gatherers and middlemen (Fig. 6a). Higher incomes are associated with stallholder/artisan and middleman roles; lower incomes with artisan and flower gatherer roles (Fig. 6b). Stallholders/artisans are more likely to rely solely on dried plant work for income, while middlemen have complementary income (Fig. 6c). Flower gatherers generally have lower education levels (Fig. 6d). Starting age varies: artisans and flower gatherers tend to start young; stallholders/artisans and “coroeiros” later (Fig. 6e). Artisans and flower gatherers often work alone; “coroeiros” tend to work collectively (non-family); stallholders/artisans often work with family (Fig. 6f). Early starters tend to work alone; later starters in groups, especially non-family organizations (Fig. 6g). Those starting earlier have worked longer (Fig. 6h). Lower education correlates with longer tenure (Fig. 6i) and lower minimum income (Fig. 6j). Women are more likely to rely solely on dried plant work; men tend to supplement it (Fig. 6k).

Historically, Brazilian imports of dried flowers, buds, foliage, and other dehydrated plant

parts have been minimal in quantity and value (Fig. 7a, c). Exports showed a major peak, particularly for flowers and buds, in the 1970s, reaching 880 tons in 1979. Values declined from 1981 to 1999, then stabilized at their lowest level since 2000, ranging from 11 tons to less than 1 ton annually (Fig. 7b, 7d). Exports of other dried plant parts began in 1989, reaching intermediate values similar to flowers/buds. Volumes ranged from 121 to 485 tons/year, except 2001–2005 when they rose to 537–907 tons. During this period, the exports peaked like flowers and buds in 1979, with a maximum currency value of US\$3.09 million in 2023 (Fig. 7b, d).

Imports of artificial plants into Brazil have increased steadily since 1994 (Fig. 7a, c), reaching values 8000 times higher than dried plant imports and 10 times higher than the peak dried flower/bud export. The highest import value was US\$29.02 million in 2023 (8393 tons). The price per kilogram of dried flowers and buds decreased in the first half of the historical period, then fluctuated unpredictably, averaging US\$19.37 per kilogram. The price of other dried plant parts remained relatively stable, averaging US\$5.06 per kilogram. Artificial plant prices decreased then stabilized, averaging US\$6.60/kg (Fig. 8a). Dried flowers and buds consistently had the highest price per kilogram.

Between 1989 and 2023, 61 countries imported Brazilian decorative dried plants (dried flowers, buds, and other parts combined), led by the Netherlands (3.87 thousand tons), followed by the United States (2.31 thousand tons), Germany (1.13 thousand tons), and Italy (1.02 thousand tons) (Fig. 8b).

Discussion

Our findings confirm an active decorative dried plant value chain in the Cerrado, characterized by diverse actors often performing multiple functions. For instance, a cultivator might also be a large middleman/exporter, and stallholders are often also artisans. Specialization in gathering is more common by inhabitants of small villages, where actors used to be further from consumer markets and more dependent on middlemen. Exceptions exist, like the Galheiros community, which received NGO support in the 1990s for crafts and sustainable harvesting

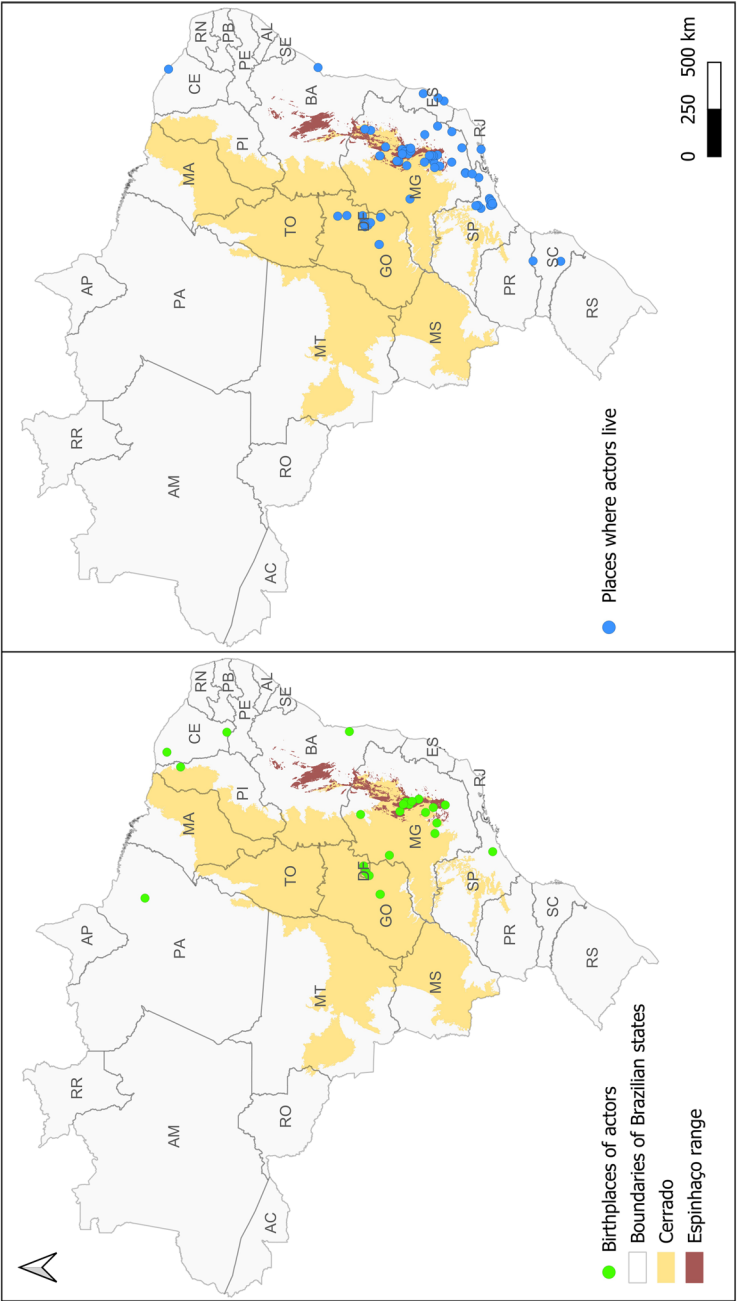


Fig. 4. Map of Brazil showing the cities where the actors in the Cerrado's dried plant production value chain, who were interviewed, were born (left), in addition to the cities where they live (right). Acronyms of states are shown

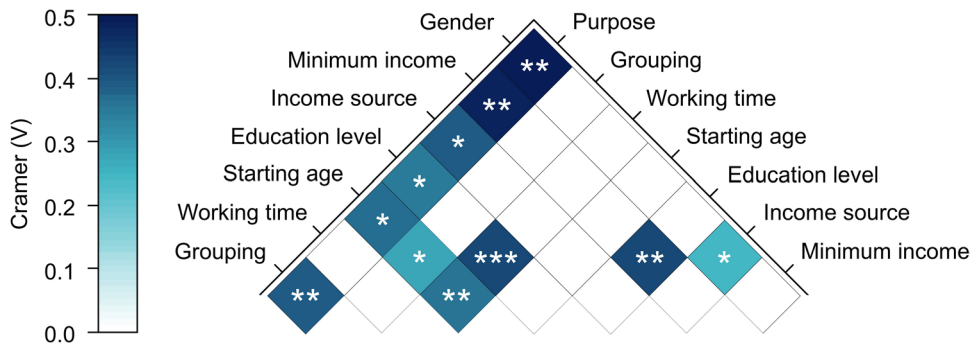


Fig. 5. Association between categorical variables related to socioeconomic aspects of the actors in the Cerrado dried plant production value chain. The variables are: actor's gender, actor's minimum income derived from this activity, income source (whether the activity is a primary or supplementary income), actor's educational level, starting age (age when started working with dried flowers), working time (years in this business), grouping (whether people work alone, in familiar groups, or in other groups), and purpose (type of work with dried plants, such as flower gatherer, artisan, stallholder, etc.). Significant chi-square associations are shown in blue, with $p < 0.05$ (*), $p < 0.01$ (**) and $p < 0.001$ (***). The color scale means the degree of association between pairs of variables, measured through Cramer V statistic

(Instituto Terra Brasilis 1999). Today, they form an artisan association selling to large companies outside their region and practicing small-scale cultivation. Also, recent trends include increased use of marketplaces and online strategies, fostering direct sales between flower gatherers and retailers/consumers.

Many actors operate in their birth regions, suggesting the decorative dried plant trade helps retain people in the countryside. This is notable given that most interviewees have decades of experience, approximately 40% rely solely on this activity, and one-third derive the majority of their income from it. Some individuals who migrated to urban centers return periodically to collect plant material in their hometowns. Others, born elsewhere, have established businesses in these regions, showing the sector attracts people from other areas, providing livelihoods and emphasizing its socioeconomic importance. However, it is essential to note that our sample was not exhaustive, as some municipalities known for everlasting production were not included (Monteiro 2022).

Historically (1930s–1970s), harvesting and processing were done by women and children, while men dominated trade as landowners, middlemen, and exporters (Martins 2019). Our study found both genders involved in gathering, crafting, and trade. Overall, gender was not significantly correlated with minimum income, since

women were prevalent in both lower-income (artisan) and higher-income (stallholder/artisan) roles, whereas men predominated in the low-income role of flower gatherer and the high-income role of middleman.

This value chain has a crucial multiethnic-racial dimension, involving many black and brown individuals. Particularly in the Meridional Espinhaço, many actors from communities like Mata dos Crioulos, Quartel do Indaiá, Vargem do Inhaí (Diamantina), and Raiz (Presidente Kubitschek) are quilombolas (Afro-Brazilian groups descended from enslaved people who established settlements of resistance to slavery and who maintain distinct cultural, social, and territorial identities).

The fact that most actors started early suggests that this work has been a lifelong activity for many, even though many also engage in other types of labor. Interviewees aged 81–90 were born in the 1930s, coinciding with the start of the everlasting trade (Instituto Terra Brasilis 1999; Martins 2019). Backdating from 2014, those aged 51–60 were young adults during the late 1970s peak in Brazil's everlasting exports. Thus, most actors likely started during a booming everlasting trade era.

Young people, in turn, lacked interest in this activity in 2014 due to factors including urbanization (youth moving to cities), government incentives for higher education, low financial

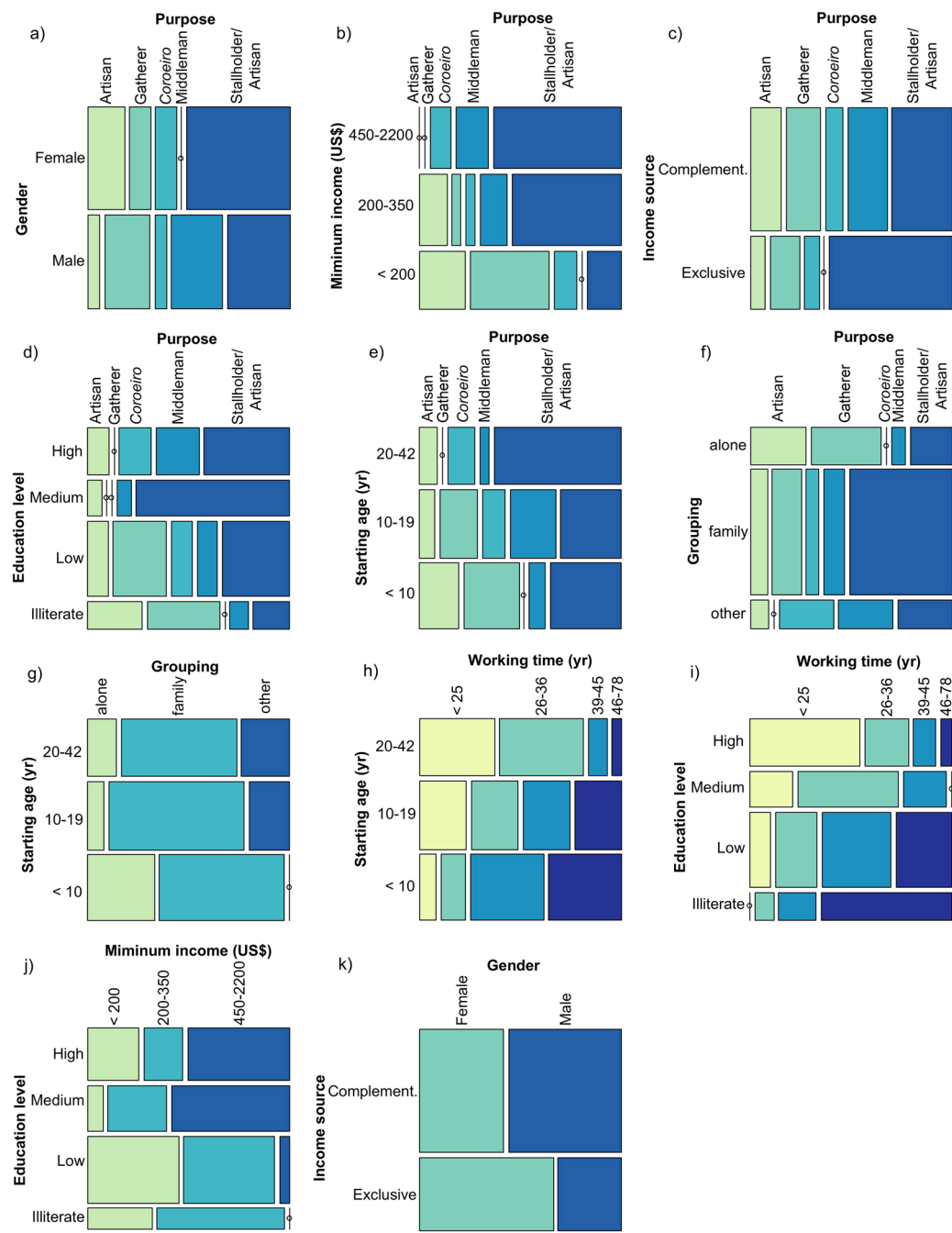


Fig. 6. Mosaic graphs for significant Chi-square tests showing the relationship between socioeconomic variables. “Gatherer” refers to flower gatherer

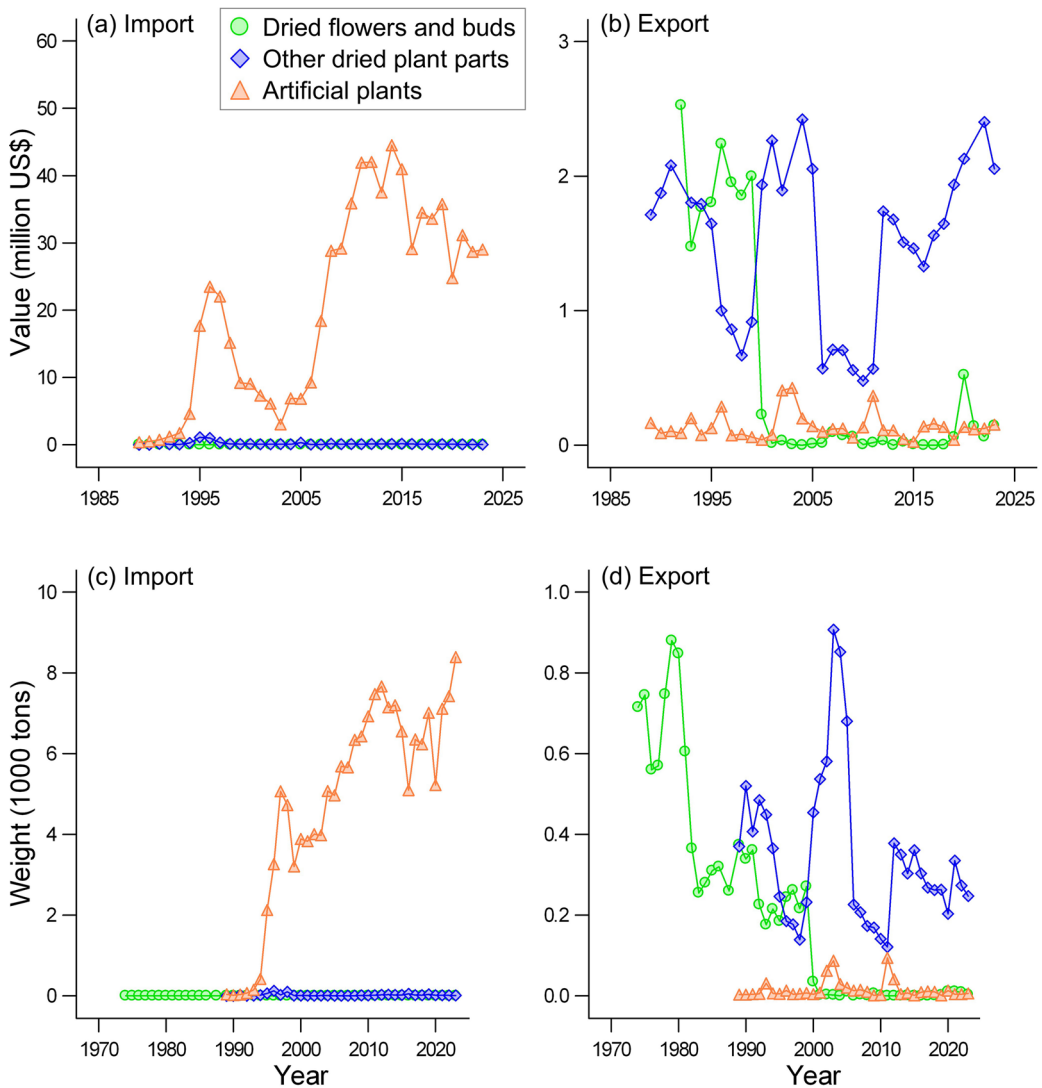
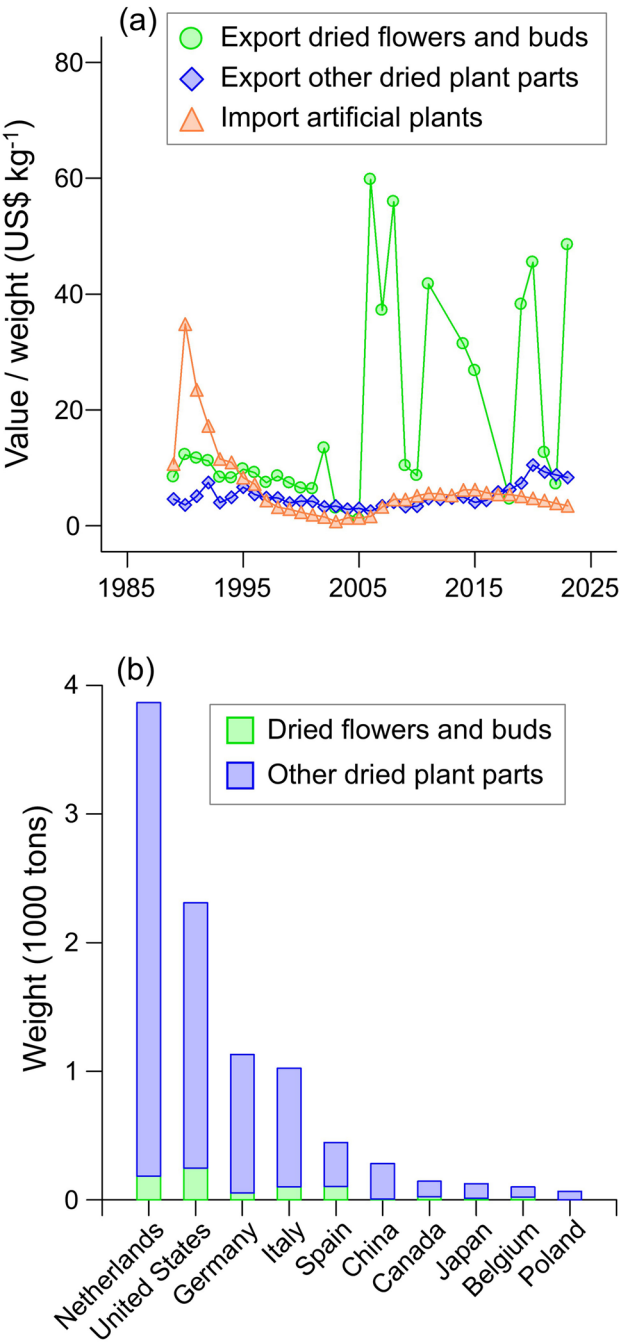


Fig. 7. Foreign trade in dried flowers and buds (green dots), other dried plant parts (blue squares) and artificial plants (red triangles). Value in millions of U.S. Dollars for imports (a) and exports (b), and in weight (thousand tons) for imports (c) and exports (d). Monetary values have been adjusted for inflation in the United States up to 2023

returns from the trade, physical demands and risks of gathering, and the decline in everlasting exports. In 1999, Instituto Terra Brasilis (1999) reported that low prices and educational opportunities discouraged young people in Diamantina from harvesting. Also, there was an increased pressure from environmental agencies between 2007 and 2010,

following the creation of the Sempre-Vivas National Park in the Meridional Espinhaço, which constrained the practices of local residents. Finally, the recent expansion of mining activities for blocks of quartzite rocks has also attracted the young rural population, a phenomenon that has been growing dramatically since 2017 (data from the National Mining

Fig. 8. Foreign trade in dried flowers and buds (green dots), other dried plant parts (blue squares) and artificial plants (red triangles). **a** Added value of the three categories of plants studied. **b** Main importing countries of dried plants from Brazil in terms of weight, from 1997 to 2023



Agency). On the other hand, increased online commerce, tourism boosting craft sales in Diamantina, and rising flower values are now attracting some young people back, often to supplement income. Furthermore, an example

of how young people are being encouraged to get involved in the activity is given by the First Youth Meeting, promoted by the Commission in Defense of the Rights of Extractive Communities (CODECEX), in 2025.

Most interviewees had at least 1st–4th grade elementary education (41.3%), with 15.9% illiterate. This is an improvement from 1999 (Instituto Terra Brasilis), which found 40% illiteracy among Diamantina flower gatherers and only 26% of literates finished 4th grade. The difference may reflect the inclusion of urban areas in our sample, where education levels are generally higher, and broader national socioeconomic changes (social policies, affirmative action). Currently, access to universities for flower gatherers' children is a source of family pride.

Monthly income in general was modest, especially for actors at the base (flower gatherers, processors) and those in rural areas (artisans). This echoes historical data from 1951, when flower gatherers earned slightly above minimum wage (Martins 2019). At that time, income from collecting decorative dried plants in the Diamantina region primarily supplemented family resources through women's work, allowing them to participate in small currency exchange circuits. Even for landowners, middlemen, and exporters, this wasn't their main activity, but complemented other businesses (selling hardware, appliances, footwear, clothing, and mining). Despite being modest, both in the past and the present, this income is crucial for low-income rural families with limited access to credit. Furthermore, added value through crafts and direct sales enable many stallholders/artisans to live solely from this work.

Interpreting international trade requires acknowledging data limitations: “dried flowers and buds” isn't only everlastings, and “other dried plant parts” isn't only wild Cerrado plants. This latter category includes species from other biomes, such as the highly sought-after inflorescences of *Cortaderia selloana* (Schult. & Schult.f.) Asch. & Graebn. (pampa grass) and cultivated exotics (e.g., *Eucalyptus* L'Hér.). While “grass fashion” (Poaceae and Cyperaceae species) is a global trend, we cannot definitively affirm that the “other parts” export peak is equivalent to the everlastings trade peak (1970s, widely reported by actors and newspapers). Nevertheless, the trade of other dried plant parts clearly serves as a safety net during periods when the demand for everlastings is low.

Nowadays, it should be noted that, despite the drop in exports of flowers and buds, the domestic market has evolved, partly driven by a

post-pandemic desire for nature-inspired home decor, prompting people to redefine their living spaces. A middleman indicates a significant shift from a historical export-to-domestic ratio of 90:10% or 80:20% to a near fifty-fifty split currently. This, combined with online sales tools, has reportedly improved flower prices at the base of the chain, benefiting multiple actors who previously depended on intermediaries to sell their products, including flower gatherers in rural areas.

Following the tendency of domestic market growth, cultivated artificially dried decorative plants emerged from large, tech-advanced verticalized productions (irrigation, greenhouses) mainly in Holambra, São Paulo. These include roses, chrysanthemums, and proteas, requiring extensive water, fertilizers, and pesticides. They are used in arrangements as alternatives to fresh flowers but lack characteristics of traditional decorative dried plants: traditional knowledge; Espinhaço identity; empowerment of women; multiethnic-racial dimension; organic production potential; mold resistance; durability; and a variety of shapes, colors, and textures typical of plants from the Cerrado.

A major reason for everlasting export decline may be the rise of artificial plants (Instituto Terra Brasilis 1999). Our study confirms Brazil's rapid artificial plant import growth since 1994. Increased artificial plant imports likely compete with everlastings domestically. Though fluctuating, dried flower and bud prices remained higher per kilogram than other dried plants and artificial plants. Also, cheaper competing products (such as other dried plants) partly explain the export decline.

There is an inverse relationship between Brazil's everlasting exports and artificial plant imports, and a slight inverse relationship between artificial plant imports and other dried plant parts exports. Lack of domestic market data prevents full verification, but extrapolation suggests foreign markets may show similar demand shifts. However, competition from artificial plants alone does not explain the decline in Brazil's dried bud and flower exports. Strong competition also comes from other countries, particularly India, which exports nearly 500 varieties to over 20 countries and represented approximately 5% of the global dried flower trade in 2023 (Singh 2025).

Four types of innovation following OECD methodology (Kotsemir et al. 2013), applied to NTFPs by Afonso (2022), are observed in the decorative dried plant value chain over recent decades, regarding product, process, marketing and organizational.

That way, product innovations include hand-crafted items, arrangements, potpourri, lamps, wreaths, and other decorative objects with higher value than raw materials. Market products referencing everlasting plants without using the plants also appeared (framed pictures, embroidery, stationery, clothing, etc.). Cosmetics potentially using plant extracts exist, though documented examples are scarce. Community-based tourism is another potential area, where communities lead visits for collective benefit, intercultural exchange, and highlighting local history and culture.

Cultivation is the most notable process innovation. While wild gathering dominates, cultivation exists, particularly nearby Diamantina, practiced by a large middleman/exporter and on a smaller scale by Galheiros flower gatherers/artisans (Moreira et al. 2017). Cultivation of other Cerrado dried plants is less known and lacks environmental agency regulation, hindering transparency. Cultivation should be encouraged, especially for endemic/threatened species like everlasting plants. Also, knowledge of dried plant cultivation is strategically relevant for restoration ecology, as saplings/seeds are not market-available (Fernandes et al. 2016) and many of these species are structurally important in Espinhaço communities (e.g., Cunha-Blum et al. 2025).

From a marketing innovation view, traceability is key for identifying origin and monitoring production, ensuring quality (de la Torre Dávila et al. 2021). The Galheiros Artisans Association brand is an example, letting consumers trace origin and learn about the community, ecosystem, and flower gatherer culture, adding indirect value.

Organizational innovation, though modest, includes cooperation initiatives like the Galheiros Artisans Association and the Association of Artisans Exhibitors from the Torre de TV Fair (Brasília). The first unites flower gatherers and

artisans, and members produce individually but sell collectively to meet demand. Cooperative work in associative groups in the Cerrado should be encouraged as a key factor in consolidating these activities for sustainable land use (Mello et al. 2023). In fact, flower gatherers often complain about field competition, theft, and land invasions hindering ecological management. Some collect immature everlasting plants at night, fetching lower prices, instead of waiting. Association among community members can facilitate resource management, ensuring plants mature and some inflorescences remain for seed dispersal, aiding population maintenance. Group association also facilitates buyer partnerships, enabling larger volumes or steady supply (as dried plants can be stored). It allows associations participation in national/international programs, access to credit/events, and enhanced traceability via certification labels (origin, ethical/environmental standards). Strengthening community sense is crucial for fostering collaborative projects among NTFP chain actors.

Implementing innovations in the decorative dried plant value chain has potential to promote sustainable Cerrado use. This is particularly true when considering the land-use changes widely introduced in this biome, such as monoculture crops, large-scale livestock farming, and urban expansion (e.g., Colman et al. 2024; MapBiomass 2024). In the Espinhaço region, the spread of *Eucalyptus* plantations and large-scale diamond and quartzite ornamental stone mining are also significant factors. Moreover, traditional human populations of the Cerrado have been increasingly involved in various political actions aimed at recognizing their identities and communities, as well as confronting the expansion of economic activities that threaten the biome (Lopes et al. 2021; Monteiro 2022). Finally, it would contribute to stabilizing local populations by generating new job opportunities, while also helping to reduce the need for migration to larger urban centers. On the other hand, governance and conservation actions are mandatory to secure the survival of these plant species, associated with their cultural aspects, safeguarding the human communities that depend on this longstanding activity for their survival.

Conclusion

The Cerrado decorative dried plant value chain remains active, involving diverse actors, products, and international importers. However, dried flower/bud exports (including everlasting) represent now a small fraction of what they once were decades ago. Despite this, the value chain provides income, preserves traditions, reaffirms cultural identities, and offers artistic expression for many people in rural and urban areas, particularly for individuals over the age of 21, the majority of whom have been working in this sector for decades.

Significant innovations have occurred over five decades in products, processes, marketing, and organization, though often modest. There is high potential for further innovation: improving extractive management based on ecology and the flower gatherer's knowledge; developing cultivation (especially for threatened species); promoting associativism; increasing product awareness via government/market initiatives; highlighting social-cultural values; encouraging NTFP research (including threatened species recovery on a sound base); and implementing public policies supporting chain stakeholders.

Innovative approaches and adequate financing are essential to stimulate the development of Brazil's dried plant value chain. With targeted investment in research, technology, and sustainable production practices, this sector could expand its capacity to produce eco-friendly, biodegradable, and durable decorative items that support both rural and urban livelihoods. In doing so, it offers an ecologically sound, socially just, and culturally valuable alternative that strengthens Cerrado conservation and restoration efforts. This potential is especially relevant in a context of increasing pressure from competing land uses—such as large-scale agriculture, urban expansion, mining, and *Eucalyptus* plantations—and aligns directly with Brazil's commitments under international initiatives such as the Kunming–Montreal Global Biodiversity Framework (KMGBF), while also contributing to local and national economic development.

Acknowledgements

We thank all interviewees who took part in this work and two anonymous reviewers for their comments on earlier versions of the manuscript. We are also grateful

to Rosana Rocha and Leandra Bordignon for their help in conducting the interviews, to Kleber Felipe for preparing the maps, and to Instituto Biotrópicos for logistical support in Diamantina.

Author Contribution

ACON conceived the work with advice from GWF. ACON, KHS and LS carried out field work. ACON processed the data. DN performed the statistical analyses and prepared figures. ACON wrote the paper with contributions by DN, RR, LS, DF, SRS, RD and GWF. GWF supervised the work. All authors have read and approved the final manuscript.

Funding

The Article Processing Charge (APC) for the publication of this research was funded by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) (ROR identifier: 00x0ma614).

Data Availability

No datasets were generated or analysed during the current study.

Declarations

Ethics Approval and Consent to Participate The study was conducted in accordance with the legal requirements of Brazilian Law nº 13.123 of May 20, 2015. Participants were invited to take part in the study and were informed about its objectives, justification, risks, benefits and procedures. The interviews were conducted after the participants had agreed to take part in the study and signed a consent form. The study is registered with the National System for the Management of Genetic Heritage and Associated Traditional Knowledge (SISGen) under no A821A7C.

Competing interests The authors declare no competing interests.

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References

- Afonso, S. R. 2022. Innovation perspectives for the bioeconomy of non-timber forest products in Brazil. *Forests* 13: 2046. <https://doi.org/10.3390/f13122046>
- Almeida, S. P., C. E. B. Proença, S. M. Sano, and J. F. Ribeiro. 1998. *Cerrado: espécies vegetais úteis*. Planaltina, Brasil: Embrapa-CPAC.
- Banco Central do Brasil. 2024a. Calculadora do cidadão. <https://www3.bcb.gov.br/CALCI/DADAO/publico/exibirFormCorrecaoValores.do?method=exibirFormCorrecaoValores&aba=1>. (30 November 2024).
- Banco Central do Brasil. 2024b. Conversor de moedas. <https://www.bcb.gov.br/conversao>. (30 November 2024).
- BFG [Brazil Flora Group]. 2022. Brazilian Flora 2020: leveraging the power of a collaborative scientific network. *Taxon* 71(1): 178-198. <https://doi.org/10.1002/tax.12640>
- Colman, C. B., A. Guerra, A. Almagro, F. de Oliveira Roque, I. M. Rosa, G. W. Fernandes, and P. T. Oliveira. 2024. Modeling the Brazilian Cerrado land use change highlights the need to account for private property sizes for biodiversity conservation. *Scientific Reports* 14(1): 4559. <https://doi.org/10.1038/s41598-024-55207-1>
- Cook, F. E., C. J. Leon, and M. Nesbitt. 2015. Potpourri as a sustainable plant product: Identity, origin, and conservation status. *Economic Botany* 69: 330-344. <https://doi.org/10.1007/s12231-015-9325-8>
- COPAM [Conselho Estadual de Política Ambiental de Minas Gerais]. 1997. Deliberação COPAM n. 85, de 21 de outubro de 1997. Aprova a lista das espécies ameaçadas de extinção da flora do Estado de Minas Gerais, Diário Oficial do Estado de Minas Gerais, Diário do Executivo, Belo Horizonte, MG.
- COPAM [Conselho Estadual de Política Ambiental de Minas Gerais]. 2008. Deliberação COPAM n° 367, de 15 de dezembro de 2008 (revogada). Aprova a Lista das Espécies Ameaçadas de Extinção da Flora do Estado de Minas Gerais, Belo Horizonte, MG.
- Cunha-Blum, J., L. Ramos, D. Negreiros, D. C. Paiva, V. M. Gomes, L. M. Borges, A. M. Teles, and G. W. Fernandes. 2025. Towards the reference ecosystems for quartzitic campo rupestre: floristic composition and soil relationships. *Ecological Engineering* 211: 107463. <https://doi.org/10.1016/j.ecoleng.2024.107463>
- de la Torre Dávila, A. Y., F. J. Haro Navejas, and C. Prado Meza. 2021. Understanding traceability: its relevance in the adoption of quality and safety measures across the supply chain. *Vinculatégica EFAN* 7(2): 1102-1113. <https://doi.org/10.29105/vtga7.1-167>
- Fernandes, G. W. 2016. *Ecology and conservation of mountaintop grasslands in Brazil*. Switzerland: Springer International Publishing.
- Fernandes, G. W., F. Pedroni, M. Sanchez, A. Scariot, L. M. S. Aguiar, G. Ferreira, R. Machado, M. E. Ferreira, S. Diniz, R. Pinheiro, J. A. S. Costa, R. Dirzo, and F. Muniz. 2016. *Cerrado: em busca de soluções sustentáveis*. Rio de Janeiro: Vertente Produções Artísticas, 212.
- Flora e Funga do Brasil. 2025. Flora e Funga do Brasil project - Projeto Flora e Funga do Brasil. Instituto de Pesquisas Jardim Botânico do Rio de Janeiro. Dataset/Checklist. <https://doi.org/10.15468/1mtkw>
- Food and Agriculture Organization of the United Nations. 2020. Traditional agricultural system in the Southern Espinhaço Range, Minas Gerais, Brazil. <https://www.fao.org/giahs/around-the-world/detail/brazil-minas-traditional-agricultural-system/en>. (09 February 2025).
- Friendly, M., and D. Meyer. 2016. *Discrete data analysis with R: visualization and modeling techniques for categorical and count data*. Boca Raton, FL: CRC Press.
- Giulietti, N., A. M. Giulietti, J. R. Pirani, and N. L. Menezes. 1987. Estudos em sempre-vivas: importância econômica do extrativismo em Minas Gerais, Brasil. *Acta Botanica Brasilica* 1: 179-193.
- Giulietti, A. M., M. G. L. Wanderley, H. M. Longhi-Wagner, J. R. Pirani, and L. R. Parra. 1996. Estudos em "sempre-vivas": taxonomia com ênfase nas espécies de Minas Gerais, Brasil. *Acta Botanica Brasilica* 10(2): 329-377. <https://doi.org/10.1590/S0102-33061996000200007>

- IEPHA. 2023. Sistema Agrícola Tradicional de Apanhadoras e Apanhadores de Flores Sempre-Vivas em Minas Gerais. <https://www.iepha.mg.gov.br/index.php/programas-e-aco-es/patrimonio-cultural-protetido/bens-registrados/details/2/9/bens-registrados-sistema-agr%C3%ADcola-tradicional-de-apanhadoras-e-apanhadores-de-flores-sempre-vivas-em-minas-gerais>. (17 September 2024).
- Instituto Terra Brasilis. 1999. Projeto sempre-vivas: subsídios para seu uso sustentado. Relatório Técnico. Belo Horizonte, Brasil: Instituto Terra Brasilis.
- Kotsemir, M., A. Abroskin, and M. Dirk. 2013. Innovation concepts and typology – an evolutionary discussion. Higher School of Economics Research Paper No. WP BRP 05/STI/2013. <https://doi.org/10.2139/ssrn.2221299>.
- Lopes, G. R., M. G. B. Lima, and T. N. P. Reis. 2021. Maldevelopment revisited: inclusiveness and social impacts of soy expansion over Brazil's Cerrado in Matopiba. World Development 139: 05316. <https://doi.org/10.1016/j.worlddev.2020.105316>.
- MapBiomass. 2024. Collection 9 of the annual series of land use and coverage maps of Brazil, MapBiomass Data. https://code.earthengine.google.com/?accept_repo=users/mapbiomas/user-toolkit (09 September 2024).
- Martins, M. L. 2019. A economia da “sempreviva” em São João da Chapada (Diamantina, MG), meados do século XX. Revista Brasileira de História & Ciências Sociais – RBHCS 11: 235–262.
- Mello, N. G. R., H. Gulinck, P. Broeck, and C. Parra. 2023. A qualitative analysis of non-timber forest products activities as a strategy to promote sustainable land use in the Brazilian Cerrado. Land Use Policy 132: 106797. <https://doi.org/10.1016/j.landusepol.2023.106797>.
- Mendonça, M. P., and V. L. Lins. 2000. Lista vermelha das espécies ameaçadas de extinção de Minas Gerais. Belo Horizonte, Brasil: Fundação Biodiversitas/Fundação Zoológica de Belo Horizonte.
- Mendonça, R. C., J. M. Felfili, B. M. T. Walter, M. C. Silva Junior, T. S. Filgueiras, P. E. Nogueira, and C. W. Fagg. 2008. Flora vascular do bioma Cerrado: checklist com 12.356 espécies. In: Cerrado: Ecologia e Flora, eds. S. M. Sano, S. P. Almedida, and J. F. Ribeiro, 423–442. Brasília, Brasil: Embrapa Informação e Tecnologia.
- Meyer, D., A. Zeileis, and K. Hornik. 2006. The strucplot framework: visualizing multi-way contingency tables with vcd. Journal of Statistical Software 17: 1–48. <https://doi.org/10.18637/jss.v017.i03>
- Ministério da Economia. 2024. Exportações e importações gerais. Comex Stat. Base de Dados. Brasília, Brasil: Ministério da Economia. <https://comexstat.mdic.gov.br/pt/geral>. (22 November 2024)
- Ministério do Desenvolvimento Indústria Comércio e Serviços. 2013. Dados do comércio exterior. Rio de Janeiro: Ministério do Desenvolvimento, Indústria Comércio e Serviços, dezembro de 2013. Anual. <http://aliceweb.mdic.gov.br/>. (18 December 2013).
- Ministério do Meio Ambiente. 2008. Portaria MMA Nº 445, de 22 de setembro de 2008. https://servicos.ibama.gov.br/phocadownload/legislacao/in_06_lista_flora_ameacada_extincao.pdf. (15 September 2024).
- Ministério do Meio Ambiente. 2014. Portaria Nº 443, de 17 de dezembro 2014. <https://pesquisa.in.gov.br/imprensa/jsp/visualiza/index.jsp?data=18/12/2014&jornal=1&pagina=110&totalArquivos=144>. (15 September 2024).
- Ministério do Meio Ambiente. 2022. Portaria MMA Nº 148, de 7 de junho de 2022. https://www.icmbio.gov.br/cepsul/images/stories/legislacao/Portaria/2020/P_mma_148_2022_altera_anexos_P_mma_443_444_445_2014_atualiza_especies_ameacadas_extincao.pdf. (15 September 2024).
- Monteiro, F. T. 2022. As(os) apanhadoras(es) de flores sempre-vivas: reprodução social, identidades territoriais e ação política. Revista do Departamento de Ciências Sociais – PUC Minas 4: 58–80. <https://doi.org/10.5752/P.2595-7716.2022v4n1p58-80>
- Moreira F. C., M. N. S. Oliveira, and M. K. Tanaka. 2017. Development of everlasting flowers (*Comanthera elegans* (Bong.) LR Parra & Giul.) in three cultivation systems. Ornamental Horticulture 23: 117–126. <https://doi.org/10.14295/oh.v23i2.979>
- Myers, N., R. A. Mittermeier, C. G. Mittermeier, G. A. B. Fonseca, and J. Kent. 2000. Biodiversity hotspots for conservation priorities.

- Nature 403: 853–858. <https://doi.org/10.1038/35002501>
- Novato, T. D. S., U. P. D. Albuquerque, J. L. D. A. Campos, and G. T. Soldati. 2025. Assessment of demographic sustainability of *Comanthera elegans* under traditional management in the Brazilian savanna. *Conservation Biology* 39(3): e70028. <https://doi.org/10.1111/cobi.70028>
- Parra, L. R., A. M. Giulietti, M. J. G. Andrade, and C. Berg. 2010. Reestablishment and new circumscription of *Comanthera* (Eriocaulaceae). *Taxon* 59: 1135–1146. <https://doi.org/10.1002/tax.594013>
- Parra, L. R. 2000. Redelimitação e revisão de *Syngonanthus* sect. *Eulepis* (Bong. ex Koern.) Ruhland. Unpublished PhD Thesis. São Paulo, Brasil: Universidade de São Paulo.
- Pereira, C. C., S. Fernandes, W. Kenedy-Siqueira, D. Negreiros, G. W. Fernandes, and P. M. Fearnside. 2024. Brazil's Cerrado cannot be a sacrifice zone for the Amazon: financial assistance and stricter laws are needed. *BioScience* 74: 584–585. <https://doi.org/10.1093/biosci/biae063>
- SECEX [Secretaria de Comércio Exterior]. 2012. Sistema de Análise das Informações de Comércio Exterior Via Internet – AliceWeb. Ministério do Desenvolvimento, Indústria e Comércio Exterior. <http://aliceweb.desenvolvimento.gov.br>. (18 May 2012).
- Silva, R. R., and P. T. Sano. 2025. Catálogo de plantas secas decorativas comercializadas no Espinhaço Mineiro. Belo Horizonte, Brasil: IEF (Instituto Estadual de Florestas). <https://drive.google.com/file/d/1cMykVZ1S5IggICHXxU5v08bArabYfBnp/view>
- Singh, B. 2025. Everlasting blooms: unlocking India's potential in the global dry flower market. *Indian Farmer* 12: 408–417.
- Strassburg, B. B., T. Brooks, R. Feltran-Barbieri, A. Iribarrem, R. Crouzeilles, R. Loyola, A. E. Latawiec, F. J. B. Oliveira Filho, C. A. M. Scaramuzza, F. R. Scarano, B. Soares-Filho, and A. Balmford. 2017. Moment of truth for the Cerrado hotspot. *Nature Ecology & Evolution* 1: 0099. <https://doi.org/10.1038/s41559-017-0099>.
- Tucker, A. O., A. J. Redford, J. Scher, and M. D. Trice. 2010. Dried Botanical ID. Fort Collins, Colorado: Delaware State University, Identification Technology Program, CPHST, PPQ, APHIS, USDA. http://idtools.org/id/dried_botanical (16 January 2020).
- United States Bureau of Labor Statistics. 2024. CPI inflation calculator. <https://data.bls.gov/cgi-bin/cpicalc.pl>. (04 October 2024).

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