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This project received co-funding from ITTO (010/23A). The study area has been revised and currently covers the entire territory of Togo, rather than being limited to the Guinean zone.

MID-TERM REPORT

Objective 1: Inventory endogenous uses of species of interest

The survey was conducted among 250 individuals (men and women) across 42 villages in the study area. The majority of respondents were aged between [30-60 years]. Of the four ecosystem types defined by the MEA in 2003, two were cited by the surveyed populations : provisioning and cultural services. These various goods and services can be classified into six distinct usage categories: food, artisanal, wood, fodder, magico-religious, and medicinal (Figure 1). Regardless of ecological zones, the medicinal category was the most frequently reported, while the magico-religious category was the least represented.

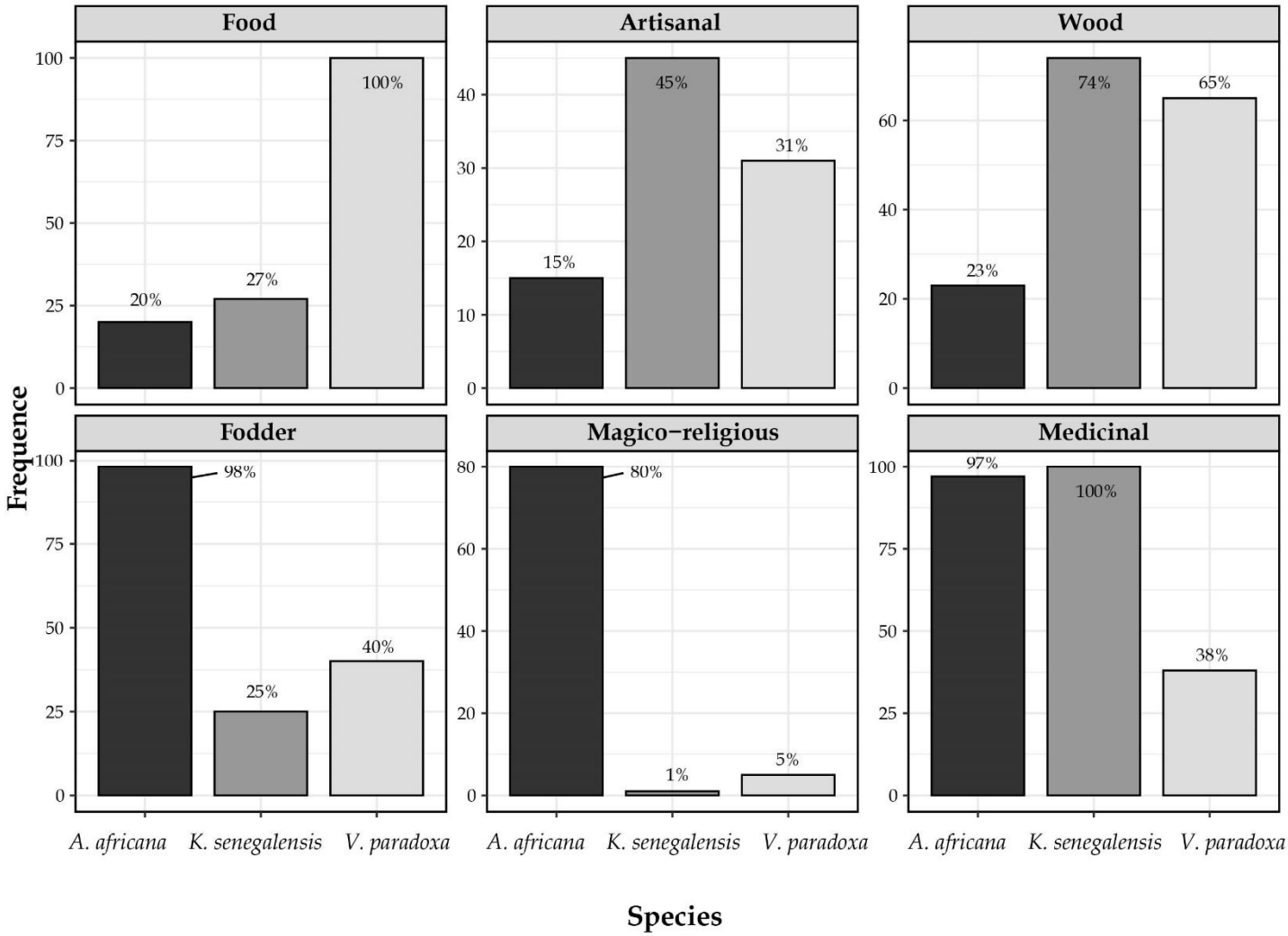

Figure 1 : Usage types of the three vulnerable plants

1. Food use

All surveyed individuals use the nuts of *V. paradoxa* for shea butter production. Shea butter is highly valued in cosmetology (skin hydration, UV protection), pharmacology (wound healing), and food industries (oil production, chocolate making), giving it significant international market potential. This explains the high production of shea in Togo. Indeed, Togo is the seventh-largest shea producer, accounting for 5% of West Africa's shea export market. However, shea butter production remains largely artisanal. The young leaves of *A. africana* are used in sauce preparation, while the bark of *K. senegalensis* is used in brewing local beverages.

2. Artisanal use

Artisanal practices provide a supplementary income source for African communities. The wood of *K. senegalensis* is used to make canoes and mortars. Its sap is used to produce local glue, highly valued by indigenous people. The seeds of *A. africana* are used to make the game awale. The wood is also used to craft hoe and daba handles.

3. Wood use

The branches (and sometimes the trunk) of *K. senegalensis* are used as firewood, for charcoal production (carbonization), and in house frame construction. This species is highly sought after because it is easy to saw and work into boards / beams and artisanal products. The wood of *K. senegalensis* is hard and termite-resistant, making it ideal for crafting artisanal tools. However, this practice represents a negative anthropogenic impact that undermines restoration efforts for this species. Alternative resources should be promoted to conserve vulnerable species.

4. Fodder use

Many households own livestock, which contributes to food security. These vulnerable plants are used as fodder and for treating symptoms and diseases. The leaflets of *K. senegalensis* are used to feed domestic livestock (primarily sheep and goats). They are also used to treat coccidiosis (12.14%), foot-and-mouth disease (7.02%), and Gumboro disease (2.09%). *A. africana* is used as fodder in the northern part of the country during the dry season by transhumant herders. Branches are pruned to make leaves accessible to livestock. *A. africana* is palatable to ruminants and rich in digestible nitrogenous matter. It is widely used in the sub-region as fodder, especially during the dry season. As for *V. paradoxa*, the butter extracted from its nuts is used to treat bone fractures in cattle.

5. Magico-Religious use

Despite the advent of new religions, many households remain tied to ancestral religions involving phytogenetic species. In this study, all three plants are used in mystical practices involving the supernatural. *K. senegalensis* and *V. paradoxa* are rarely cited for this usage category. For initiates, the leaves of *V. paradoxa* are used in ancestral rituals (0.01%) to disperse rain. Similarly, the leaves of *K.*

senegalensis are used in rituals to protect families against spells, curses, and evil spirits. Most respondents (80%) reported that *A. africana* is a sacred tree, as it harbors invisible forces and serves as a worship site for animists. It is believed to have the power to destroy families, induce madness, and inflict punishment by spirits. The misunderstood knowledge and fear of malevolent invisible forces justify its protection and conservation, particularly in northern Togo, where animism remains prevalent. Rural populations use plant organs as traps on protected fruit trees in fields or near dwellings to prevent unauthorized fruit harvesting. These practices, though lacking scientific basis, contribute to the protection of these vulnerable resources in the study area.

6. Medicinal use

The three vulnerable plants are used in traditional medicine. This can be attributed to local knowledge of these plants for self-treatment, the high cost of conventional medicine, and the lack of medical infrastructure and personnel in rural areas. Additionally, many ailments remain untreated by conventional medicine but find remedies in traditional medicine. This reinforces the advantage of using these plants in traditional medicine.

K. senegalensis is used to treat 24 diseases and symptoms, including abscesses (12.38%), anemia (15.84%), worms (4.46%), constipation (0.99%), diabetes (1.49%), diarrhea (1.98%), sprains (1.49%), fever (8.42%), gonorrhea (4.46%), hemorrhoids (23.76%), hernias (12.87%), hypertension (2.97%), loss of appetite (2.97%), infections (5.45%), headaches (2.97%), stomachaches (74.75%), edema (5.94%), malaria (53.47%), abdominal wounds (5.94%), intestinal wounds (18.32%), painful menstruation (17.33%), sinusitis (1.98%), anal wounds (6.93%), and oral wounds (37.13%).

A. africana is used to treat 20 diseases and symptoms. Its various organs are used for psychosis (32.18%), toothaches (22.28%), rheumatism (12.87%), neonatal pathologies (11%), as a galactagogic (10.4%), malaria (10%), fatigue (9.9%), paralysis (6.89%), dysmenorrhea (5.94%), edema (5.94%), mental disorders (5.17%), as a diuretic (3.96%), hemorrhoids (2.87%), epilepsy (2.48%), skin wounds (2.29%), convulsions (1.98%), fever (1.49%), leprosy (0.99%), migraines (0.99%), and lower back pain (0.5%).

V. paradoxa is used in medicinal preparations to treat 31 diseases and symptoms, including burns (37.62%), convulsions (31.68%), sore throat (30.2%), galactic (22.77%), dysentery (19.8%), fever (15.84%), abscesses (15.35%), boils (14.85%), diarrhea (14.36%), scabies (13.86%), gastritis (13.37%), jaundice (12.38%), as a cicatrizing (11.88%), for sexual impotence (11.39%), kwashiorkor (10.89%), headaches (10.4%), back pain (9.9%), dermatosis (9.41%), hip pain (8.91%), earaches (7.92%), edema (7.43%), malaria (6.44%), whitlow (5.45%), wounds (4.95%), pneumonia (3.96%), psychosis (2.97%), rheumatism (1.98%), female sterility (1.49%), cough (0.5%), ulcers (0.5%), and as an anthelmintic (0.99%).

7. Therapeutic intervention domains

Of the 16 major disease categories defined by the International Classification of Primary Care—2nd Edition (ICPC-2), the three vulnerable species (*A. africana, K. senegalensis*, and *V. paradoxa*) are used in 13 categories (Figure 2). The most treated diseases are skin-related (14), followed by general and unspecified disorders (13) and those related to blood, hematopoietic, and immunological systems (10).

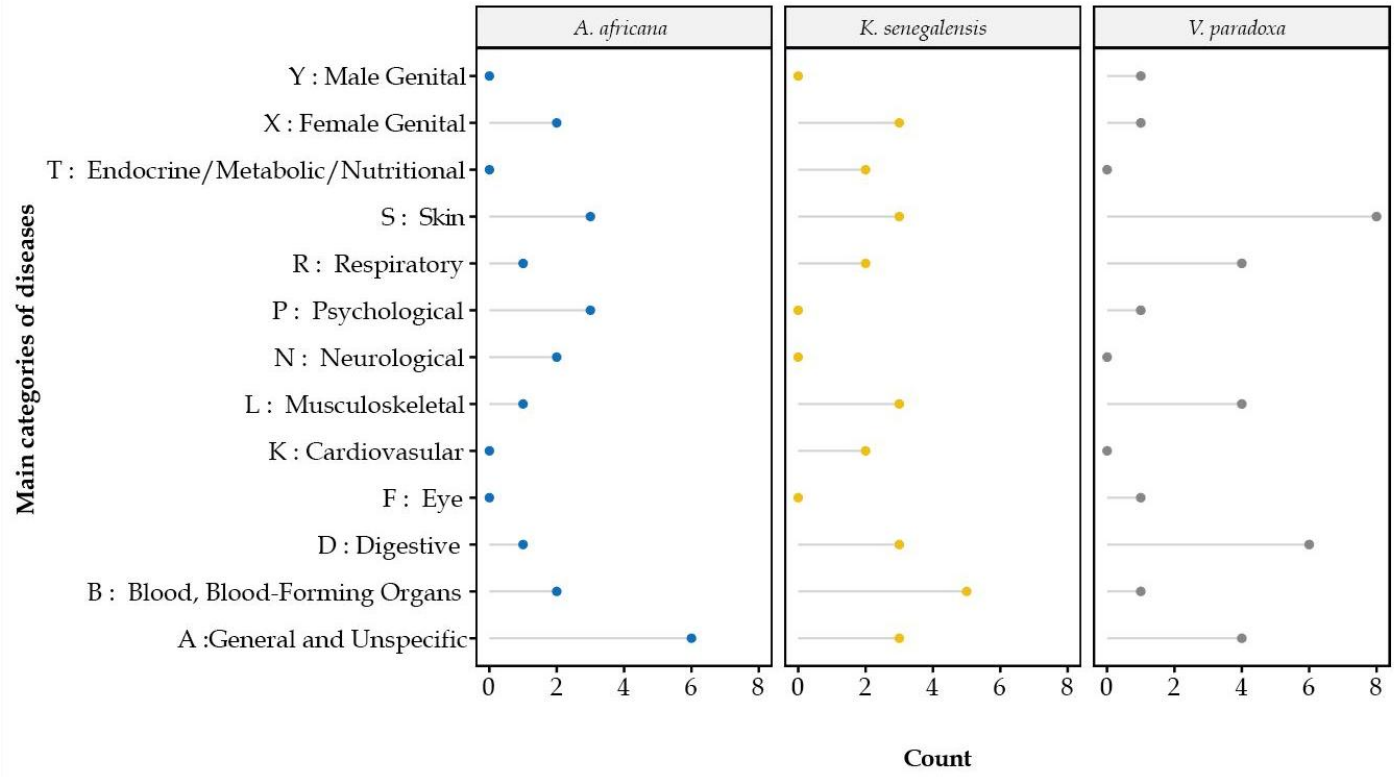

Figure 2 : Medicinal contributions of three vulnerable plant species by disease category

Substantial variations are observed among species depending on the disease category. Eye diseases and male genital system disorders are rarely treated by these plants. Diseases related to pregnancy, childbirth, and family planning, as well as circulatory problems, are not treated by any of the three studied plants.

8. Plant parts used in medicinal preparation

Surveyed individuals use various plant parts, alone or in combination, to prepare medicinal recipes. Leaves are the most commonly used, followed by bark, trunk/stem, fruits/seeds, and roots. Figure 3 shows the proportion of plant parts used for each species. Variability is observed in the most utilized organs for each plant. For *A. africana*, leaves are the most used, while bark is the most sought-after part of *K. senegalensis*. The fruits of *V. paradoxa* are highly utilized (100%) in preparing herbal drugs.

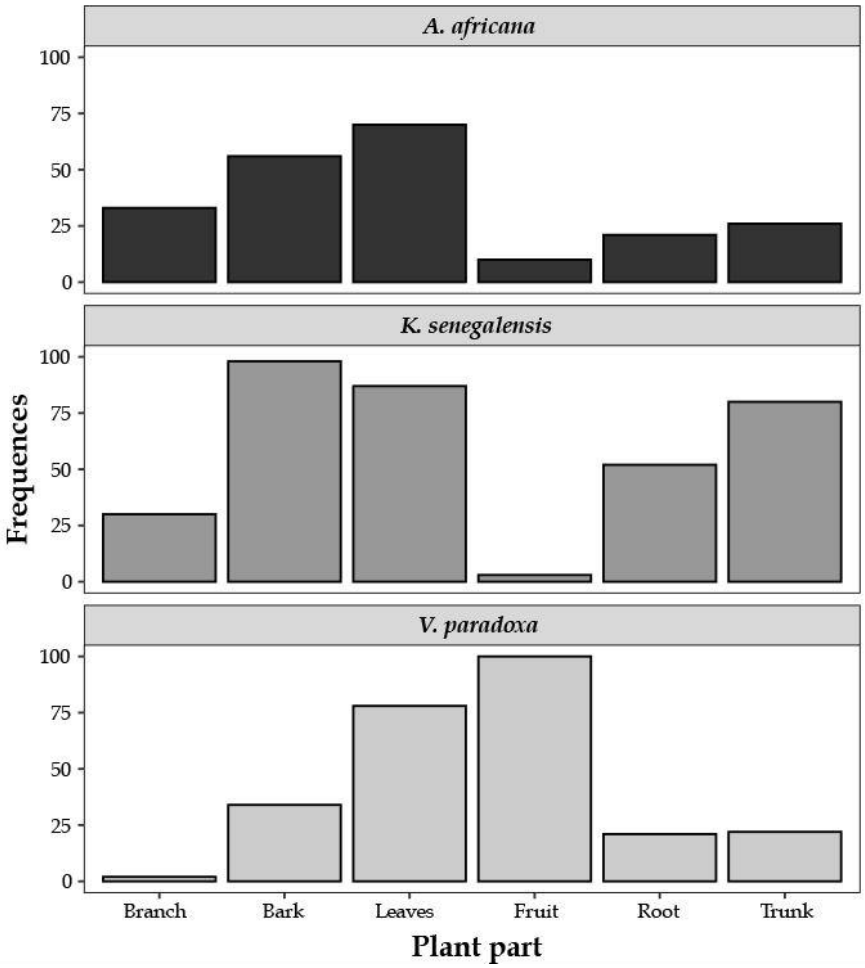

Figure 3 : Plant parts used in herbal medicine

Some recipes require combinations of multiple organs from the same plant with other products like sugar, alcohol, milk, red oil, and palm wine. These combinations and solvent variations aim to reduce toxicity, enhance molecular synergy, or improve extraction efficiency. Leaves are the most used for medicinal preparation due to their accessibility and role as reliable plant identifiers. Additionally, leaves, as primary sites of photosynthesis, are key producers of secondary metabolites, which explain their use in traditional medicine.

9. Preparation methods for medicinal recipes

Various preparation methods are employed by respondents, depending on the disease being treated. The different methods are summarized in Figure 4. Decoction of plant organs is the most commonly used method across all three plants.

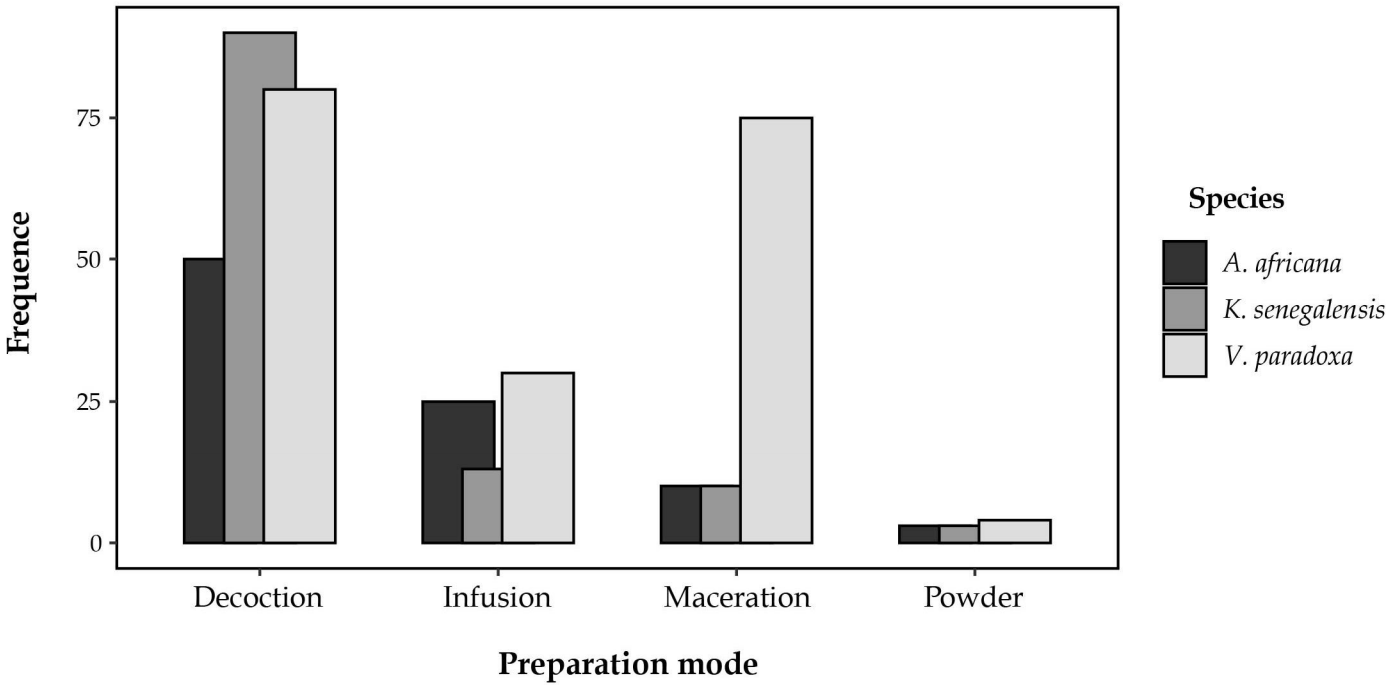

Figure 4 : Plant parts used in herbal medicine preparations

The extraction method (with different solvents) is chosen based on the disease. These techniques explain the use of a single plant to treat multiple pathologies or symptoms. In this study, decoction with water as the solvent is the most frequently used method for preparing medicinal recipes. Decoction remains the most widely used extraction method globally because it ensures complete extraction of active compounds (e.g., tannins) from plant organs and mitigates or neutralizes the toxic effects of certain molecules.

10. Causes of disappearance of vulnerable species

The vulnerability of these species is increasingly observed by local populations, with the key indicator being the distance traveled to procure plant parts. Several causes are cited by locals to explain the decline of the three vulnerable species. The main factors are wood cutting (80.76%), population growth (70.8%), bushfires (32.84%), poor harvesting practices (25.13%), climate change (15.56%), and overgrazing (10.76%). Poor harvesting practices for *K. senegalensis* lead to excrescences on most debarked trees, deforming trunks and rendering them unsuitable for timber.