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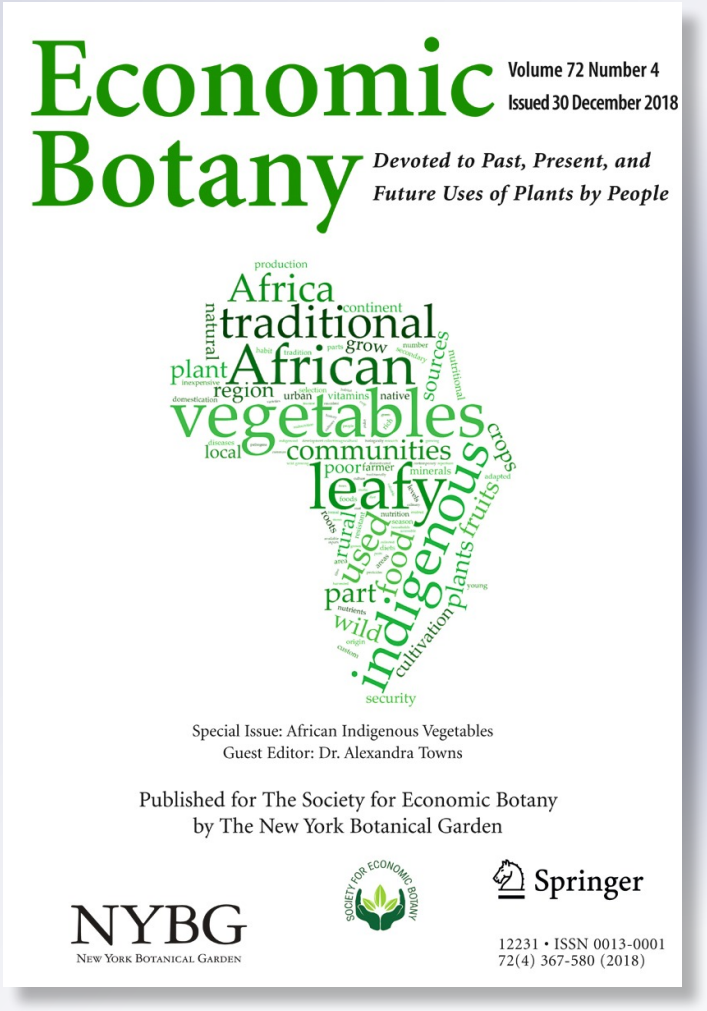

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Consumption of Wild-Growing Vegetables in the Honde Valley, Zimbabwe

Idah Manduna[1,2] and Heike Vibrans*[,2]

[1]Centre for Applied Food Security and Biotechnology (CAFSaB), Central University of Technology, Free State, Bloemfontein, South Africa
[2]Posgrado en Botánica, Colegio de Postgraduados, Campus Montecillo, Montecillo, Estado de México, Mexico
*Corresponding author; e-mail: heike@colpos.mx

This study evaluates the relevance of wild-growing vegetables in two villages of the Honde Valley, Zimbabwe, by documenting the use, knowledge of, and attitudes toward these plants. Information on plant use was gathered through 20 food diaries, 8 focus group discussions, and semi-structured interviews with 76 individuals (32 male) from the villages. Forty-two ethnospecies of wild vegetables were recorded and 26 identified to species. Wild leafy vegetables were consumed about twice a week by participating families; *Cleome gynandra* and *Bidens pilosa* were eaten most frequently. Preferred vegetables were dried and conserved for off-season use. Knowledge of wild food plants was transmitted orally within families, acquired in early childhood, and gradually increased with age. Gender differences were found in the quantity and type of knowledge. According to the villagers, the advantages of wild vegetables were their nutritional and economic value, as well as their accessibility. The perceived drawbacks were mainly related to quality issues, strong tastes, and lack of year-round availability. Despite preference for cultivated alternatives among younger people, there was renewed interest in wild plants due to recent health concerns such as diabetes and HIV.

Key Words: Ethnobotanical knowledge, nutrition, health, wild vegetables, AIVs.

Introduction

Wild and weedy plants are an important component in the diet of many rural societies of the world. They are relatively accessible and cheap (Gonzalez-Amaro et al. 2009; Srithi et al. 2017), and help to alleviate the vitamin, mineral, and fiber deficiencies of basic diets. Moreover, they add variety to otherwise monotonous diets, improve the quantity, and enhance the quality of food (Ong and Kim 2017). In addition to the dietary and nutritional benefits, wild-growing plants also can be used for animal feed, as a source of income through sales, and for medicinal purposes. They are considered an important component of the cultural and the phytogenetic heritage of local people (Guarrera and Savo 2013; Pinela et al. 2017).

Various investigations have recorded a trend toward a decrease in people's knowledge and use of wild plant resources, despite their proven importance for local communities (Dessalegn 2017). This has been attributed to the breakdown of traditional cultures, westernization, and modern agricultural methods. Bussmann et al. (2018) documented a dramatic decline of knowledge among the Maasai in Sekenani, Kenya, due to changes in lifestyle and unsustainable use of resources. Gwatirisa and Manderson (2012) observed that wild vegetables were foraged in times of food scarcity even in the urban areas of Zimbabwe. The social transformation of traditional societies has created a link between poverty and the use of wild edibles in the perceptions in some regions. In Zimbabwe, the

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reduction in people's use and knowledge of edible wild fruit has also been attributed to deforestation for cultivation and fuel wood as well as modern agricultural practices that promote commercial varieties of crops and marginalize indigenous food plants (Shava 2005).

However, the ethnobotanical literature shows that the loss of knowledge cannot be generalized. It may be uneven: a decrease in use is, at times, juxtaposed with high cultural appreciation (Kalle and Sõukand, 2016). There are several reports of continued use of wild plant resources (Melián et al. 2017; Shackleton 2003; Srithi et al. 2017). For example, wild vegetables are consumed by over 90% of households in some rural communities of South Africa (Shackleton 2003) and approximately 66% of vegetables used in Northern Thailand are weeds. Ong and Kim (2017) suggest a modification of knowledge rather than loss or erosion in a transitional community in the Philippines.

As in other parts of Africa (Kidane et al. 2015; Teklehaymanot and Giday 2010), studies in Zimbabwe have highlighted the seasonal consumption of edible wild plants, especially just before the harvest, when cultivated alternatives are scarce (Maroyi 2011a). However, few quantify the amount consumed, explore the opinions of the local people, or investigate the transmission of ethnobotanical knowledge. This study documents and quantifies local people's knowledge and consumption of wild vegetables in the Honde Valley of Zimbabwe. Use patterns of wild vegetables are based on a tetrahedral relationship between the resources available, knowledge, and perceptions that people have about these vegetable resources and their consumption (Fig. 1). So, the overarching questions for the study are the following: (1) What wild vegetable resources are known and used by the people of the Honde Valley in Zimbabwe? (2) What species and quantities of wild vegetables are consumed during a typical rainy season? (3) How is knowledge transmitted in the communities? (4) What motivates the continued use of these plant resources from the local peoples' perspective? We suggest that the answers to these questions will explain the persistence in the use of these plants in Zimbabwe. The study was part of a comparative study on the use of edible wild plants between Zimbabwe and Mexico (Madamombe-Manduna et al. 2009a; Madamombe-Manduna et al. 2009b; Manduna 2008). For the purposes of this study, the term "wild" refers to plants that grow spontaneously in woodlands, croplands, home gardens, and along waysides, without the direct intervention of humans, and includes weeds.

Methods

Study Area

The study was conducted during the November 2005 to April 2006 rainy season in two rural villages of the Honde Valley in the Manicaland Province of Zimbabwe. Chipupuri Village is located at 18° 33′ S and 32° 45′ E, at an elevation of 952 m, and Maradzika Village at 18° 30′ S and 32° 45′ E, at an elevation of 1200 m (Fig. 2).

The total precipitation during the study period was 1462 mm, and the average monthly temperature ranged from 11.6 °C (minimum) to 25.3 °C (maximum) at a weather station in Mukande near the Honde Valley (Department of Meteorological Services, Bulawayo, Zimbabwe). Average annual figures for the region fall between 750 and 1000 mm and 13 °C (Anderson et al. 1993). While specific data are unavailable, Maradzika receives more rainfall than Chipupuri due to its higher elevation and east-facing slopes (WWF 2018). Natural vegetation in the region is mainly of the *miombo* type: a closed deciduous non-spinescent woodland dominated by the genera *Brachystegia*, *Julbernardia*, and *Isoberlinia* (Fabaceae, subfamily Caesalpinioideae), which generally occur on geologically old, nutrient-poor soils (Campbell et al. 1996). However, much of the land has been cleared for agriculture.

The population consists mainly of subsistence farmers (or communal farmers in the Zimbabwean context) who speak the Chimanyika dialect of Shona. They grow a combination of maize–beans–squash, bananas, sweet potatoes, taro, coffee, cowpeas, Bambara groundnuts, finger millet, and mangos on 1- to 3-ha plots. Bananas, beans, maize, and onions have some economic value during good harvest years (Machila et al. 2015; researcher observations, 2005–2006). The people's diet is composed mainly of the staple *sadza* (a thick porridge made from maize meal, sorghum, or millet), accompanied by green vegetables (mainly *Brassica*, such as *B. juncea* (L.) Czern, *B. rapa* L., *B. carinata* A. Braun, and *B. oleracea* L.), beans, and occasionally, meat.

Although both villages had local health, education, religious, and other social services, Maradzika Village was relatively isolated, with poor roads due to rugged terrain. Villagers had to walk approximately 4 to 6 km to the business center where these services were located. Chipupuri was better

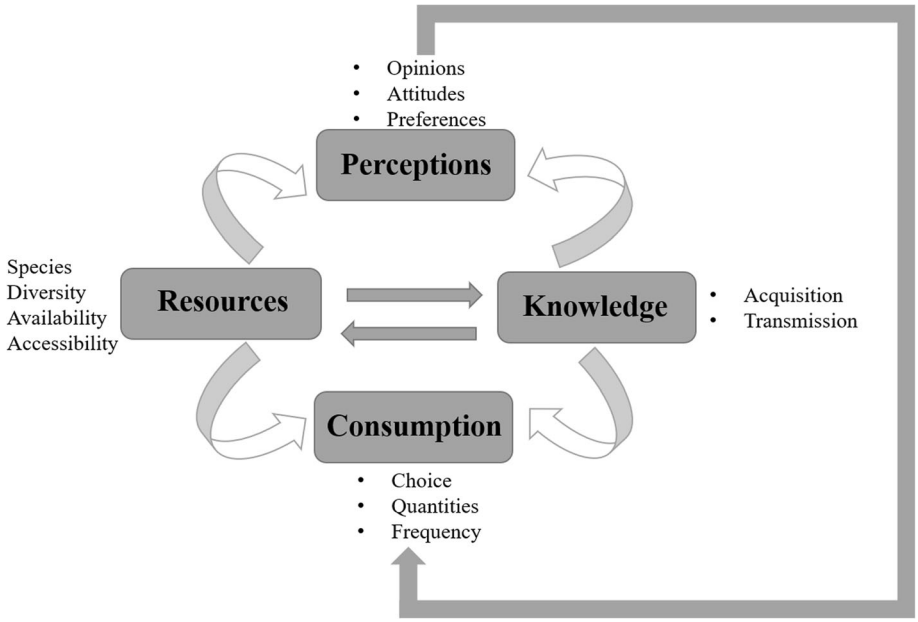

Fig. 1. Conceptual framework illustrating the tetrahedral relationship between factors that determine the use of wild vegetables.

connected, as it was located close to the main and secondary roads, making the transportation of goods and services easier.

Data Collection

The study protocol was approved according to the Regulations for Academic Activities by the Department of Education of the Colegio de Postgraduados. Permission to work with the villagers was granted after following the traditional protocol with the local headman (the traditional leader of the Samanga Clan in this case) and the respective village heads. Children were interviewed with the informed consent and in the presence of their parents or guardians.

As the first step, local social structures (schools, churches, and clubs) were approached for group interviews with villagers, organized by age and gender. Four age categories were used for each gender: children (5–12 years), adolescents (13–19 years), adults (20–50 years), and elders (51+ years). Therefore, eight focus groups with approximately 10 people each were interviewed in each village. An open-ended, semi-structured interview guide was used to provide a preliminary list of edible wild plants in the area and their preparation methods. Local names (ethnospecies) were used as field names. Plants were collected with the help of individual informants from within a radius of approximately 5 km around the villages, and 31 voucher specimens were deposited in the National Herbarium of Zimbabwe (SRGH).

In a second phase, 10 households from each village were randomly selected via a lottery and for willingness to participate from lists of about 100 "working kitchens" kept by the village heads. A kitchen represents a household that usually comprises grandparents, parents, and children. Households composed only of grandparents and grandchildren were also common.

After an orientation meeting, the 10 households received a notebook (food diary). They were requested to record the date, plant name, and quantities eaten between December 2005 and April 2006. The quantities eaten were recorded according to local measurement units and were weighed several times for quantification purposes. For example, quantities recorded as *dishi* or *sosi* for leafy greens weighed approximately 150 g and 75 g, respectively. Records were generally kept by the cook (women), but in two households, the male head of the family kept them. The food diaries were revised during fortnightly visits. One case of over-reporting (mentioning species that were out of season) was ignored. Under-reporting was detected in three instances when asking each member of the household if they had eaten anything

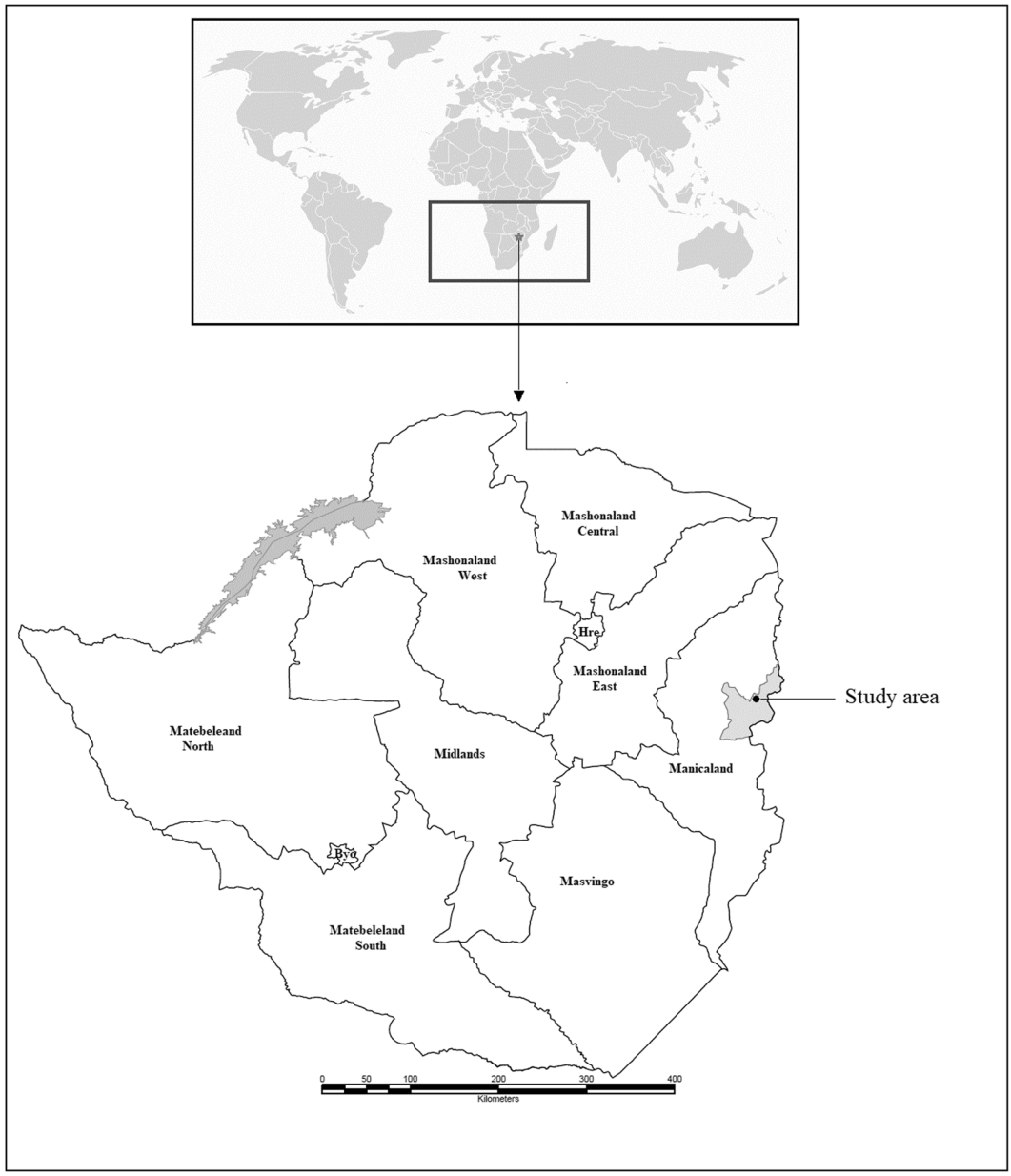

Fig. 2. Map of Zimbabwe and location of the study area in Mutasa District, Manicaland Province.

away from home and had forgotten to mention it to the person responsible for the food diary. The results coincided with direct observation during fieldwork. Later, during semi-structured interviews, 76 individuals (Table 1) from the households listed edible wild plants and general information about their availability and location. They were also asked about their perceptions on the use of wild plants as food, and how and when they learned about new plants. Data on the knowledge and use of wild vegetables were extracted from, and is discussed, in the context of all the wild food plants of the study area that included fruit (Manduna 2008).

TABLE 1. DEMOGRAPHIC PROFILE OF THE 10 FAMILIES SELECTED FOR THE FOOD DIARY COMPONENT OF THE STUDY.

	Gender		Age			
	Male (M)	Female (F)	5–12 years (1)	13–19 years (2)	20–50 years (3)	51+ years (4)
Chipupuri	16	25	7	13	10	11
Maradzika	16	19	3	9	13	10

DATA ANALYSIS

Descriptive statistics (mean, percentages, and frequency of mention and use) were used to describe knowledge of wild vegetables and use patterns in the study area. Shannon's diversity and evenness indices were employed to compare knowledge between the villages. The relationship between the age of the informants and the number of plants known was analyzed through the Spearman correlation coefficient, and differences by gender were subjected to the Kruskal–Wallis test. The importance factor (IF), modified from the importance consensus factor (Canales et al. 2005), estimated the relative importance of the plants consumed during the study period with the application of the following formula: $IF = (F - n_h) / (F - 1)$ where F is the frequency or number of use reports and n_h is the number of households. The IF ranges from 0 to 1, with 0 indicating low consumption frequencies and 1 indicating more important vegetables with high consumption frequencies by many households.

Results

GENERAL USE OF WILD FOOD PLANTS

The villagers of Chipupuri and Maradzika reported 89 ethnospecies of edible wild plants consumed as fruit (47%), vegetables (44%), beverages (9%), snacks (8%), and seed oils (1 plant) known to be found in the area. Taxonomic details, local names, and preparation methods are presented in detail in the underlying thesis (Manduna 2008). Some plants were used in multiple categories. For example, the fruit of *Physalis peruviana* L. was considered both as fruit and vegetable. Table 2 shows the wild vegetables used in Honde Valley (42 ethnotaxa). Twenty-six botanical species were identified from 15 families; another four were identified to the genus level. One local name was given to two different species on three occasions, and two ethnospecies were two plant parts of one botanical species (*Typhonodorum lindleyanum* Schott). The rest of the ethnospecies was not identified to species level due to the absence of flowers and fruit to allow for botanical identification, or unavailability during the study period. Solanaceae, Malvaceae, and Amaranthaceae contributed most vegetable species. The wild food plants recorded were found around the villages in crop fields, gardens, river banks, and, mainly fruit, in the natural vegetation.

CULINARY USE AND PREPARATION OF VEGETABLES

The vegetables were used mostly as leafy greens (32 species). The leaves were cooked as spinach and served as a relish with the main staple, *sadza*. Tomatoes, onions, and peanut butter would be added to make a sauce. The vegetables were frequently combined with other wild species or with indigenous cowpea and pumpkin leaves to neutralize the bitter taste and to increase quantities. Bicarbonate of soda was also used to soften the leaves. Bitter vegetables such as *Bidens pilosa* and *Cleome monophylla* were not stirred while cooking to lessen their bitterness.

Derere is a Shona term used to refer to all vegetables that have a mucilaginous or viscous texture when cooked, e.g., okra. The leaves were cooked in water with bicarbonate of soda or *muteka* (potash made from the ashes of burnt maize cobs). The vegetables were then beaten lightly until they reached the desired consistency. They were served with *sadza*, and it was common to sprinkle some chili pepper over them for taste. These were usually mixed with other cultivated or wild *derere* species but eaten alone in times of scarcity.

The leaves of *Typhonodorum lindleyanum* were boiled and washed several times to reduce toxicity. This vegetable was considered a famine food. *Commelina* and *Triumfetta* were also considered as famine foods and only eaten by very poor families. Tubers were eaten as a substitute for *sadza* or with tea for breakfast. The tubers could be scraped and eaten fresh or boiled. Although additional flavoring of food was not common in the area, the fruit of some

TABLE 2. WILD VEGETABLES OF HONDE VALLEY, ZIMBABWE.

Ethnospecies	Scientific name	Family	Voucher number	Plant part	Culinary use
Tapa[C; M]	*Justicia* sp.	Acanthaceae	ITM019	Leaves	Relish*
Bowa sena	*Amaranthus hybridus* L.	Amaranthaceae	ITM010	Leaves	Relish
Mowa[C; M]	*Amaranthus spinosus* L.	Amaranthaceae	ITM069	Leaves	Relish
Mowa[C; M]	*Amaranthus thunbergii* Moq.	Amaranthaceae	ITM055	Leaves	Relish
Dowe remumvura	*Typhonodorum lindleyanum* Schott.	Araceae	ITM035	Leaves	Relish
Majo[M]	*Typhonodorum lindleyanum* Schott.	Araceae	ITM035	Tuber	Carbohydrate
Nhunginira[C; M]	*Bidens pilosa* L.	Asteraceae	ITM030	Leaves	Relish
Teketera[C; M]	*Galinsoga parviflora* Cav.	Asteraceae	ITM031	Leaves	Relish
Rurimirwemombe	*Sonchus oleraceus* (L.) L.	Asteraceae	ITM016	Leaves	Relish
Hoto	*Nasturtium officinale* R. Br.	Brassicaceae	ITM021	Leaves	Relish
Runi[C; M]	*Cleome gynandra* L.	Capparaceae	ITM044	Leaves	Relish
Mutsemwatsemwa[C; M]	*Cleome monophylla* L.	Capparaceae	ITM032	Leaves	Relish
Goche[M]	*Commelina africana* L.	Commelinaceae	ITM038	Leaves	Relish (derere**)
Goche[M]	*Commelina zambesica* C.B. Clarke	Commelinaceae	ITM048	Leaves	Relish (derere)
Muromoweshiri	*Ipomoea biflora* (L.) Pers.	Convolvulaceae	ITM109	Leaves	Relish
Mukakashangwe[M]	*Cucumis anguria* L.	Cucurbitaceae	ITM005	Leaves	Relish
Pfende	*Cyperus esculentus* L.	Cyperaceae	ITM080	Tubers	Carbohydrate
Zumbu[C; M]	*Acalypha villicaulis* A. Rich. ex Müll. Arg.	Euphorbiaceae	ITM030	Leaves	Relish
Minti/Minsi	*Mentha* sp.	Lamiaceae	ITM020	Leaves	Condiment
Mabvumbe	*Plectranthus esculentus* N.E. Br.	Lamiaceae	ITM079	Tubers	Carbohydrate
Nyenje[C; M]	*Corchorus olitorius* L.	Malvaceae	ITM068	Leaves	Relish (derere)
Bupwe[C; M]	*Corchorus tridens* L.	Malvaceae	ITM069	Leaves	Relish (derere)
Bvumvu	*Triumfetta pilosa* Roth	Malvaceae	ITM067	Leaves	Relish (derere)
Bvumvu	*Triumfetta rhomboidea* Jacq.	Malvaceae	ITM066	Leaves	Relish (derere)
Seso/Feso[M]	*Dicerocaryum senecioides* (Klotzsch) Abels	Pedaliaceae	ITM007	Leaves	Relish (derere)
Utwiro	*Sesamum* sp.	Pedaliaceae	ITM075	Leaves	Condiment
Makuzungu	–	Solanaceae	ITM018	Fruit	Condiment
Maguzubheri	*Physalis peruviana* L.	Solanaceae	ITM034	Fruit	Condiment
Masagaraga	*Solanum betaceum* Cav.	Solanaceae	ITM047	Fruit	Condiment
Musungusungu	*Solanum nigrum* L.	Solanaceae	ITM022	Leaves	Relish
Mharupwa	*Solanum* sp.	Solanaceae	ITM022	Fruit	Condiment
Unidentified species				Leaves	Relish
Chinyowere, Darangande[M], Duruni, Juliwai[M], Mubhanzimana[M], Nhonhonho, Nyakajonga, Samwenda Tswarinzwa, Werera[M]					
Nzanya	–			Fruit	Condiment

*Relishes in the Zimbabwean context are side dishes served with the staple maize meal porridge called *sadza*

**Derere relishes are vegetables that have the mucilaginous (viscous) texture of okra

[C; M] Vegetables consumed and documented in the food diaries in Chipupuri and Maradzika, respectively, during the study period. The rest was only mentioned in the interviews

Solanaceae were used for flavoring in stews and vegetables.

ACTUAL CONSUMPTION OF WILD VEGETABLES

Participating households from Chipupuri documented the consumption of nine vegetables in their food diaries during the study period while Maradzika households ate 17 (Table 2); they also consumed leafy vegetables more frequently. The vegetable species most frequently reported in the food diaries are shown in Table 3; *Bidens pilosa* was used most frequently overall, but the IF values showed that the important species for household

TABLE 3. MOST FREQUENTLY CONSUMED WILD VEGETABLE SPECIES AND THE QUANTITIES USED BETWEEN JANUARY AND MARCH 2006.

Plant	Chipupuri				Maradzika			
	Frequency (village totals)	Number of households	Quantity per family (kg)	IF	Frequency (village totals)	Number of households	Quantity per family (kg)	IF
Cleome gynandra	19	8	2.32 ± 0.3	0.61	Not frequently consumed			
Corchorus olitorius	9	4	0.75 ± 0.19	0.63	9	3	0.53 ± 0.18	0.75
Amaranthus thunbergii/ *A. spinosus*	6	5	0.75 ± 0.15	0.20	13	5	1.05 ± 0.21	0.67
Bidens pilosa	6	6	0.85 ± 0.17	0	22	9	1.84 ± 0.23	0.62
Galinsoga parviflora	5	5	0.83 ± 0.21	0	8	5	0.90 ± 0.18	0.43
Justicia sp.	Not frequently consumed				14	4	1.35 ± 0.34	0.77
Cleome monophylla	Not frequently consumed				10	7	975 ± 0.12	0.33

IF importance factor

consumption were *Corchorus olitorius* for Chipupuri and *Justicia* sp. for Maradzika.

Families consumed wild food plants about twice per week in season. These vegetables were important during the first 3 months of the year; the consumption frequency was highest in January and declined toward March. When consumed, the average quantities per meal and per family were 721.6 ± 121.1 g in Chipupuri and 493.7 ± 213.9 in Maradzika. The use of wild vegetables during this period was due to their availability during times when the cultivated *Brassica* species were scarce and more expensive to buy. Cultivated alternatives for leafy vegetables, such as cowpea, pumpkin, and cassava leaves, became available in February, while the wild plants became too mature for use. Consumption of wild vegetables declined after the fourth week of January because of the availability of the leaves of cultivated *Cucurbita* sp. and *Vigna unguiculata* (L.) Walp.

In January, the young, tender leaves of wild plants were eaten as relish, while the surplus was blanched and sun-dried for storage. These dried vegetables (*mufushwa*) were used from late February onwards. Popular species for *mufushwa* include *Cleome gynandra*, *Amaranthus thunbergii*, and *Amaranthus spinosus*.

KNOWLEDGE AND COLLECTION OF WILD EDIBLE PLANTS

Group and individual interviews indicated that the older people (51 years and older) were reservoirs of knowledge on edible wild plants in the area (Figs. 3 and 4). They listed more plants than the other age groups, and the age of the informant and the number of wild plants known were correlated, according to the Spearman correlation coefficient ($r = 0.423$, $p = 0.006$, in Chipupuri and $r = 0.581$, $p = 0.0003$, for Maradzika). Some vegetable species, such as *Acalypha villicaulis* and *Triumfetta* spp., were only mentioned by the older people.

The general patterns of knowledge were comparable in the two villages. Individuals listed approximately a dozen edible species in total, and an average of 3.7 (± 2.2) wild vegetables in Chipupuri and 4.2 (± 2.4) in Maradzika. Shannon's indices for diversity and evenness were 3.46 and 0.87 for Chipupuri and 3.61 and 0.89 for Maradzika, respectively, indicating that people generally knew and used the same species within both villages.

The ethnospecies that were common knowledge for most of the participants are indicated in Table 4. These were usually species that were available closer to the homesteads or were more abundant in each village, mostly agricultural weeds. They were also among the most used species during the study period.

There were also significant differences between the number of plants known by males and females according to the Kruskal–Wallis test with $H = 0.758$ ($p = 0.384$). The male population generally listed and identified more plants than the female population. However, men knew more about wild fruit, whereas women knew more about wild vegetables (Fig. 3). In Honde Valley, more men than women worked in the natural vegetation where fruit is found, and men occasionally ate wild fruit while hunting or during other activities in the bush.

It was not common for the men to bring home any collected food plants, except fruit in families with very young children. None of the

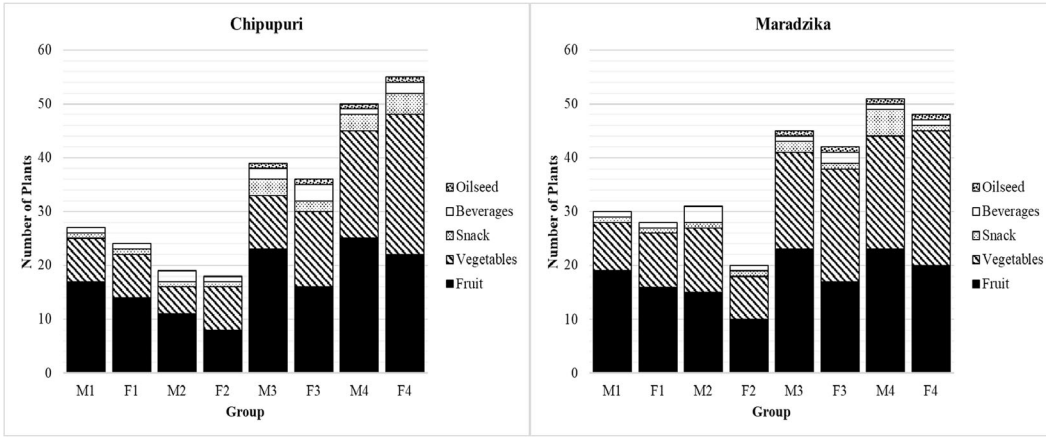

Fig. 3. Knowledge of edible wild plants by participants during focus group interviews. Age and gender divided the groups. Fruit and vegetables had higher numbers of ethnotaxa than the other categories.

men who were interviewed brought home any vegetables. It was not considered their responsibility. Women and adolescent girls of the Honde Valley considered the collection of green leafy vegetables an important task, because they provided and cooked food for the family. Young boys (5–12 years old) knew various ethnospecies and provided detailed information on their preparation methods, although none reported actually having prepared them.

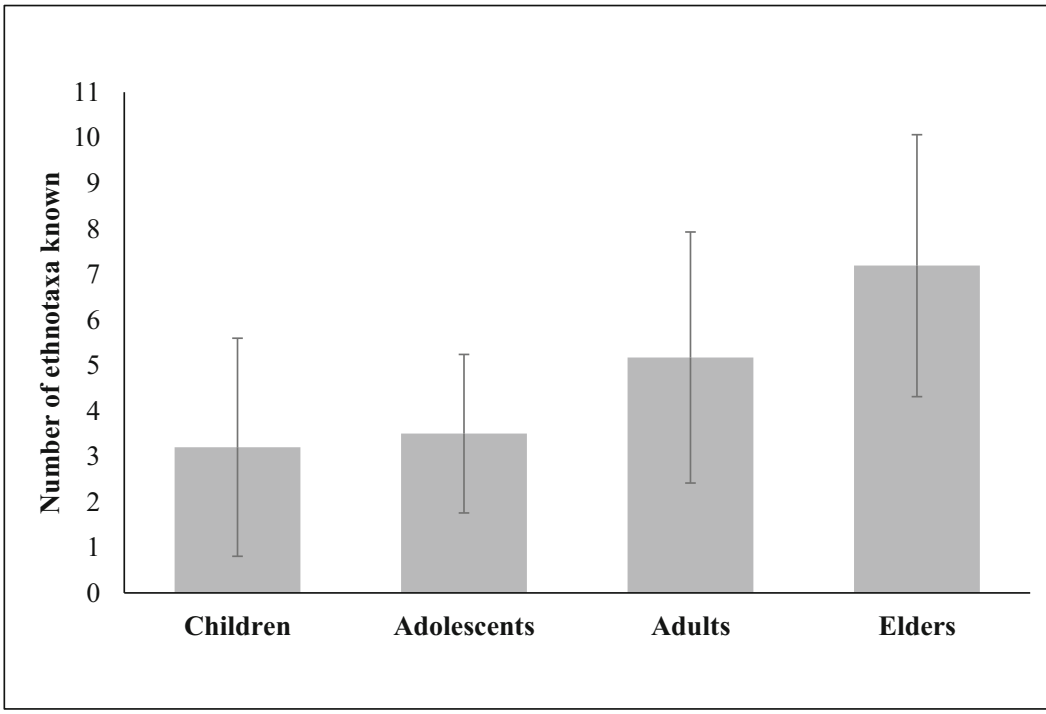

Fig. 4. Knowledge of wild vegetables (mean number of ethnotaxa mentioned per individual ± standard deviation).

Table 4.. Vegetable species known to most participants (proportion of individuals in percent).

Plant name	Chipupuri (n = 41)	Maradzika (n = 35)	Total (n = 76)
Bidens pilosa	93	91	92
Galinsoga parviflora	71	60	66
Cleome gynandra	59	31	46
Amaranthus spinosus/*A. thunbergii*	54	60	57
Cleome monophylla	41	60	50

Knowledge Transmission and Attitudes Toward Wild Edible Plants

Information was mainly passed on from parents to children. The majority (57.5%) of the respondents (n = 76) indicated that their parents taught them about the plants, while 25% were taught by their grandparents, 7.5% learned from their friends, 5% from church organizations, and another 5% were taught at school. People generally learned before or during early adulthood. Thereafter, it was rare to learn to use new plants. The only people who had recently (in the previous 3 years) learned of new plants were young wives who were originally from other regions. For example, one of the interviewees reported that she had only cooked *Bidens pilosa* once in her life, and only because her husband had particularly requested her to do so.

Comments, particularly by elders and women, during group and individual interviews indicated a trend toward a revival in the use of traditional and wild plants, because of the prevailing economic and health environment; several people mentioned diabetes and HIV. The use of wild plants was also being encouraged by campaigns from various organizations such as churches, primary health care centers, and non-governmental organizations.

Younger people (5–19 years old) preferred cultivated plants, especially the green leafy vegetables, because they preferred the blander taste. Older community members reported an explicit preference for wild food plants, citing their nutritive and medicinal properties. The bitter taste was thought an indicator of medicinal properties. Specifically, both *Cleome gynandra* and *Cleome monophylla* were considered to treat stomach problems, while *Bidens pilosa* was reported for the treatment of hypertension. Elders did not detail any disadvantages of the use of wild plants for food. They only mentioned that some fruits and vegetables had become more difficult to find recently because of the increase in the human population. They also regretted that the modern vegetables (*Brassica juncea* and *B. napus*) were replacing the traditional and healthier wild ones. Most disadvantages in the use of wild plants were cited by the younger people.

The perceived advantages and disadvantages associated with the consumption of wild food plants mentioned during the interviews, with the proportion of participants, are summarized in Fig. 5. The advantages mentioned included easy access, lack of cost, and no work involved to plant, weed, or water them. Furthermore, villagers mentioned that wild plants were not prone to pests and diseases compared to cultivated ones. Participants also appreciated the therapeutic value of the wild plants in treating and preventing illness as well as their perceived nutritional properties. Their contribution to diversifying the diet and mitigating the food insecurity before crop harvests together with simple cooking methods was also mentioned as benefits. Young people considered the strong taste, seasonal availability, the need for adequate knowledge to avoid poisoning, gathering from unhygienic places (around cattle pens and rubbish pits), lengthy time required to harvest wild plants, and their weediness (aggressive nature) as disadvantages and deterrents for their use.

Discussion

General Use of Wild Food Plants

While some plants (such as *Cleome* spp., *Corchorus* spp., and *Amaranthus* spp.) reported for Honde Valley are commonly used in other parts of Africa (High and Shackleton 2000; Msuya et al. 2010), the total number of edible plants (89) and wild vegetables (42) in the Honde Valley was relatively high. Seventy-six edible wild species were recorded for a drier region in the Midlands, Zimbabwe (Maroyi 2011a). Maroyi (2011b) listed 32 traditional vegetables used in parts of eight provinces of Zimbabwe, but 10 were cultivated.

Crop fields were a good source of wild vegetables in Honde Valley, a feature explained by edible weed

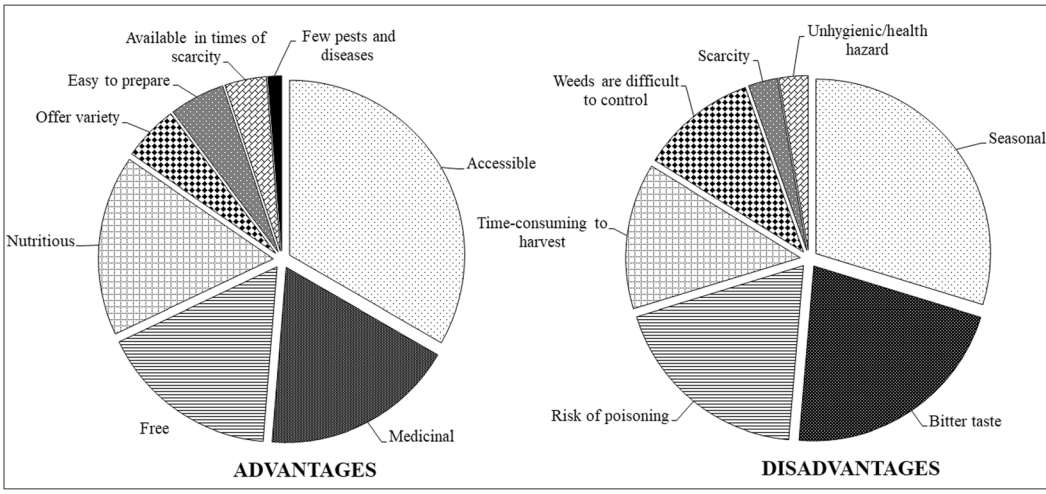

Fig. 5. Perceived advantages and disadvantages of the consumption of wild food plants. Only 49% of the participants ($n = 76$) cited drawbacks while 79% could cite the benefits of consuming wild food plants.

diversity and abundance. Vegetation analysis of maize fields in the study area (Madamombe-Manduna et al. 2009b) showed the presence of three to four edible species in 25-m^2 quadrants. For example, *B. pilosa* was found in 90% of the maize fields sampled ($n = 20$). A study in Shurugwi, Zimbabwe (Maroyi 2013), reports 11 weed species (out of 21) that were also found in Honde Valley. The practice of relaxed (Altieri et al. 1987) or selective weeding (Jensen van Rensburg et al. 2007) is consistent with traditional agriculturalists worldwide.

The literature has shown that many farmers also benefit economically (Maroyi 2011a) from the sale of edible and medicinal weeds, and from the use of weeds as fodder (Gonzalez-Amaro et al. 2009). Even though the participants in Honde Valley did not sell any wild vegetables during the study period, they recognized economic benefits in terms of not having to buy vegetables from others rather than in terms of income generation (i.e., replacement costs). The rationale behind this is that wild plants are free for all. Comparable observations have been documented by Ncube et al. (2016) where the use of wild vegetables helped to save money.

Actual Consumption of Wild Vegetables

Consumption frequencies similar to those found in this study were reported for weedy greens in South Africa during the summer months (Shackleton 2003). In our study, the importance factor complemented the general frequency data, indicating that the preferred species were abundant, easily accessed, and better known; the vegetables that were best known were the ones most frequently consumed (with the exception of *Corchorus olitorius*, *Justicia* sp., and *Cleome monophylla*) during the study period. This demonstrated the knowledge-consumption nexus (Fig. 1). The quantity of wild vegetables consumed in the Honde Valley was lower than in rural South Africa, where Shackleton et al. (2002) reported the consumption of 8.6 kg per month of herbs/spinaches. It is important to note that the lower quantities of wild vegetables consumed (607.66 ± 161 g per meal per family of five to six people) were compensated for by combining the wild plants with other vegetables, such as pumpkin and cowpea leaves, a practice common in other parts of Africa (Jansen van Rensburg et al. 2007) and in our study area. Moreover, in our study, only the trimmed, edible parts (usually leaves) were weighed just before cooking. The stems and other plant parts were left out, and this may contribute to the lower quantities recorded. However, and taking into consideration the recommended daily consumption of fruits and vegetables of 400 g (Agudo 2005) and the fact that wild vegetables supplement cultivated ones, the average consumption of 121 g observed in the Honde Valley of wild green vegetables per person about twice a week is a considerable contribution to a healthy diet.

Despite the "discouraging" taste cited to explain the low consumption of *Bidens pilosa* in other regions of Zimbabwe (Maroyi 2011b), it was the

plant most frequently consumed in Maradzika. Accessibility and abundance (Madamombe-Manduna et al. 2009b) in the study area explains the frequency in use during the rainy season.

The drying of products to compensate for seasonal unavailability is also reported from other parts of Southern Africa—from Shurugwi (Maroyi 2013) and Nhema (Maroyi 2011a) in Zimbabwe, as well as South Africa (Jansen van Rensburg et al. 2007; Shackleton 2003) and Botswana (Flyman and Afolayan 2006).

Knowledge and Collection of Wild Edible Plants: Gender Roles

Gender differences in edible plant collection are global, corresponding to the well-defined social roles assigned to the genders. Men and women tend to occupy different spaces in their surroundings and thus gain differentiated information about local environmental diversity (Momsen 2007; Narayanan and Kumar 2007). In most cases, women know more about the environment around the home. This also occurs in the Midlands, Zimbabwe (Maroyi 2011a; Maroyi 2011b) and South Africa, where the collection and knowledge of leafy vegetables are considered a female domain, except when a species becomes domesticated and commercialized (Jansen van Rensburg et al. 2007). The role of women in supplying food plants for the home has also been documented for communities such as the *Adi* community of the Eastern Indian Himalayas where the collection of foods and ethnomedicines is included as part of the primary role of women (Singh et al. 2017).

Knowledge Transmission and Attitudes Toward Wild Edible Plants

The results of this study indicate that information was still being passed on from generation to generation by oral tradition. This is comparable to the preservation of knowledge of wild food plants in Western Ethiopia through similar means (Dessalegn 2017). However, transmission of traditional knowledge by oral tradition puts this knowledge at risk of loss and distortion, which also justifies ethnobotanical studies. On the other hand, the involvement of social organizations such as churches and schools in the dissemination of ethnobotanical knowledge is to be commended as this could assist in conserving and adapting the knowledge. Despite the concerns of the elders in this study about the decrease in consumption due to diminishing availability, it is more likely that loss of information in the Honde Valley would be due to changing preferences. The consumption of wild vegetables depends on several factors including sensory acceptability (Bvenura and Sivakumar 2017), which explains the preferences of the youth for cultivated vegetables. McGregor (1994) observed in Shurugwi, Zimbabwe, that younger people also prefer cultivated vegetables. However, the contrary trend in the use of wild plants, especially vegetables, has also been documented in the urban areas of Zimbabwe. Dhewa (2003) reported an increase in the consumption of wild and indigenous vegetables in urban settings.

The use of wild foods as medicine has been well documented in the ethnobotanical literature (Abbasi et al. 2015; Maroyi 2013; Pieroni et al. 2017). The people of the Honde Valley were well aware of these properties and made comments alluding to a renewed interest in wild vegetables specifically for their medicinal properties during group and individual interviews. People in other areas of Zimbabwe also stated similar use of *B. pilosa* for blood pressure ailments, stomach ache, oral thrush, and enhancement of the immune system as well as for rheumatism (Maroyi 2011b). In vitro studies have validated some medicinal claims about wild vegetables. For example, Chipurura et al. (2009) found high phenolic content and antioxidant activities for *Cleome gynandra*, *Corchorus olitorius*, *Galinsoga parviflora*, and *Amaranthus hybridus*. Nutritionally, *Bidens pilosa* has higher vitamin C, iron, and zinc content than cabbage. *B. pilosa* is also reported to have rejuvenating properties in the Ghats region of India (Narayanan and Kumar 2007). Flyman and Afolayan (2006) report the preference of wild vegetables over exotic cultivated ones because of their role as food and medicine in Botswana.

Unfavorable government policies implemented from the early 2000s onwards, together with drought and the HIV/AIDS epidemic, resulted in the political and economic instability (Gwatirisa and Manderson 2012) that was characterized by a myriad of problems including, but not limited to, food shortages/famine, unemployment, poverty/destitution, and deterioration in the health and education sector (Makumbe 2009). People are aware that wild vegetables are therefore an important resource. They are accessible for people in Zimbabwe where, in 2016, the number of people living with HIV was estimated at 1.3 million out of

16.2 million (World Health Organization 2017) and the prevalence of diabetes was 4.6% (World Health Organization 2016). Evidence from other studies such as Kaschula (2008) and Ncube et al. (2016) indicates that using wild foods is an important coping strategy in times of food insecurity in AIDS-afflicted households.

Conclusions

Wild edible plants, especially wild greens, are important for the people of the Samanga area in the Honde Valley, Zimbabwe, during several months of the year. They are consumed while in season and are dried for use later when out of season. Though there is less preference for wild vegetables by the younger population, people are well aware of the benefits associated with the consumption of wild plants, and there were indications of renewed interest in their use.

The knowledge and consumption of wild vegetables in the Honde Valley demonstrates the four-pronged connection between resource availability and accessibility (weedy vegetables), knowledge (gained not only through oral transmission but also from other social structures), perceptions (preferences and perceived benefits and drawbacks), and use (consumption frequency). The results form a baseline that can be used to evaluate the current and future state of knowledge and resource usage.

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