

Traditional Uses of Wild Edible Plants in Arid Areas of South Africa

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ABSTRACT Using a participatory approach and purposive sampling procedure, the study examined the traditional uses of wild, edible plants among the Batswana in the arid areas of South Africa. The production and promotion of these plants, including their commercialization, contributed to sustainable community livelihood in terms of food-security, nutrition and income-generation. Community members expressed the opinion that government and other developmental agencies should give these plant resources the same priority and support as that accorded to exotic food crops. Their cultivation was less expensive, resistant to pests and were culturally accessible and acceptable. Community leaders in collaboration with government should devise strategies and mechanisms of promoting knowledge and awareness on the importance of production and utilization of these indigenous plant resources for food security, nutrition and income generation.

INTRODUCTION

The Food and Agricultural Organization (FAO 2009) maintains that around 30,000 plant species around the world are edible, but of these, only 7,000 are used as human food resources. Adenkule (1999) argues that, among gathering and hunting communities in the Congo forests, and among the Wasandawe in Tanzania, wild foods, especially leafy vegetables and wild animals, were used on a year-round basis. They contributed to diversity and flavour of the people's diet. In some African agricultural communities, these plants provide vitamins and minerals to characteristically grain-dominated diets (Ahmed 2006). Campton (2008) adds that some pastoralists in South Sudan do not store and carry food over long distances; hence they rely on the seasonal wild food resources from the forests.

However, Kassim (2009) states that information about the contribution of wild-food plant species to world nutrition is still very limited. This is despite their domestication being an important source of human food and nutrition in these times of climate change. Kalemba (2007) adds that the promotion of utilization and commercialization of indigenous wild-food plant species, especially in the arid and semi-arid areas of Africa including Southern Africa, could provide a viable alternative to sustainable livelihood and community food security. Campton (2008) indicates that the concept "wild" when applied to plants or plant species refers to those that grow spontaneously in self-maintaining populations in natural or semi-natural ecosystems; existing independently of direct human action. This is

contrasted with "cultivated" or "domesticated" plants or plant species that have arisen through human action, such as selection or breeding, and that depend on management for their continued existence. Amadara (2009) elaborates that in the African cultural context and practice the distinction is difficult to make, owing to there being a wide spectrum from completely wild to completely domesticated species, depending on the degree of human intervention or management involved.

There are also various definitions and conceptualization on what constitutes either an arid or a semi-arid area. For instance, Ogubu (2005) defines an arid area as land characterized by low (100-600 mm annually), erratic and highly inconsistent rainfall levels. According to this definition, the major feature of aridity is the negative balance between annual rainfall and evapotranspiration rates. Rainfall is scarce, unreliable, and concentrated during a short rainy season, with the remaining period tending to be relatively dry. The rainy season is characterized by high temperatures; much of the rainfall is lost through evaporation. As result, water tends to be scarce for natural and human uses.

FAO (2009) categorizes agro-climatic zones on the basis of the length of the growing period, i.e. the period during which both water and temperature permit crop growth. On the basis of this classification, arid and semi-arid areas have between 1-74 and 75-119 growing days, respectively. Others have adopted a working definition of aridity, as "anywhere that rainfall is a problem because of amount, distribution and unreliability" (Kamazora 2004).

In his discussion of the uses of African indigenous knowledge systems (AIKS) in arid areas of Eastern and Southern Africa, Katempa (2008) reveals that there is a considerable wealth of AIKS on wild-food resources among farmers and rural communities in the arid areas of these regions. This valuable knowledge has over the years been marginalized, and there is limited domestication of these plant species. Most of what is currently used is collected in the wild as in the olden days. Annually, a great many plant species, especially trees, are being destroyed through activities such as charcoal production, and agricultural expansion into arid and semi-arid woodlands. Adamara (2009) adds that in most African countries including South Africa, national and provincial seed-centres do not stock many indigenous wild-food plant species compared with the exotic species, there being limited demand for them. Balinga (2005) elaborates further on the marginalization of wild-food resources in Africa, arguing that wild-food resources, in general, are often ignored, receiving little recognition from the development community owing to lack of information on the extent of their use and importance in rural economies; statistics on the economic value of wild-food plants; reliable methods for measuring their contribution to farm households and the rural economy; lack of world markets, except in the case of small number of products; irregularity of supply of wild-plant products; quality standards; storage and processing technology for many of the products; availability of substitutes; and bias in favour of large-scale agriculture.

Ogubu (2005) elaborates that the information on the seasonal availability of these wild-food resources, and their contribution to climate-change adaptation, is poorly documented. In most African countries the ethno-botany of wild-food resources, especially in arid environments, tends to be patchy, consisting of lists of plant names, giving no details on their use and management. The situation is exacerbated by increased acculturation, mobility and displacement of indigenous communities, and diminishing biodiversity owing to population pressure and climate change. This has led to a decline in the use of these wild-food resources, and the conveyance of associated knowledge. The study takes the view that, under such circumstances, knowledge and skills of uses and nutritious, climatically adapted wild-food resources tend to be lost. However, given the impending climate

change, wild-food resources are expected to provide options for screening species likely to be best adapted to climate change and means of sustenance. More studies are therefore required to contribute new knowledge to science, hence increasing awareness on traditional uses and management of wild-food resources by local communities in arid and semi-arid areas. This study wished to contribute to these efforts by identifying the traditional Batswana uses of indigenous wild-food plant resources in the North-West Province (South Africa), as a predominantly arid and semi-arid area.

The North-west Province is one of the nine provinces of South Africa. Sixty-five per cent (65%) of the province is rural. The Batswana is the dominant African tribal group in the province. They constitute over 90% of the population of the province. Climatically, most of the province is either arid or semi-arid, with temperatures ranging from 17° to 31°C (62° to 88°F) in summer; and from 3° to 21°C (37° to 70°F) in winter. The average annual rainfall totals about 360 mm (about 14 in), most of it falling during the summer months, that is between October to April (North-West Provincial Government, Office of Premier 2012). The African indigenous cultivated food crops in the province are sorghum and millet: *mabele* in the local Setswana language. The province has a wide array of indigenous species, ecosystems and habitats. This is largely because of the diverse nature of its landscapes and variation in climate (Modise 2010).

Camden (2009) states that, despite the enormous richness in the indigenous bio-diversity in the province, relatively few of these natural resources, especially wild, edible plant species, are economically utilized. Although some local farmers grow wild trees and edible herbs on their farms, their utilization and commercialization is still limited. This has been exacerbated by increasing urbanization and westernization, which has led to a movement away from use of traditional African food crops to more Western eating habits. Camden (2009) and Itumeleng (2007) add that the utilization of South African indigenous wild-food flora and fauna can only be successfully explored and promoted if the existing uses of these food resources are documented, so as to inform research and development (R&D). The promotion of their commercialization could lead to the development of rural small, micro, and medium enterprises (SMMEs) as alternative sources of income and employment.

METHODOLOGY

Taking into consideration the community-based nature of African indigenous knowledge systems, the study followed a participatory method. Cornwall and Jewkes (2010) indicate that breaking the linear mould of conventional research, participatory research focuses on a process of sequential reflection and action, conducted with and by local people rather than on them. Local knowledge and perspectives are not only acknowledged; they form the basis for research and planning.

In this study, the research process drew inputs from a diversity of institutions and stakeholders, especially community knowledge-holders and practitioners, from the various Batswana tribal groups in the different parts of the province, i.e. Barolong (Mafikeng), Bafokeng (Phokeng), Bahurutse (Lehurutse), Bakgatla (Moruleng), Batlhako (Taung), etc. The knowledge-holders were purposively selected due to their experience and knowledge of the research problem; they were involved in the research process, including data-collection and interpretation. Their selection was achieved in cooperation with the community leaders of the respective study areas. Crossman (2012) explains a purposive sample, also commonly called a judgmental sample, as one that is selected based on the knowledge of a population and the purpose of the study. The subjects are selected because of some characteristic.

Purposive samples of 10 men and 12 women (35 years of age and above) from each study community were selected for interviews and focus-group discussions. These people were considered by the community leaders to have a wide local knowledge of the traditional food-plant resources used in the study communities. Women were given a high representation in the community samples because, according to the community leaders, they were the main knowledge-holders and custodians of the major activities of community life, such as agriculture, health care, food-security, indigenous natural resources, and soon. They were considered the most responsible for the harvesting, including domestication of some of the wild-food resources.

According to Babbie (2004: 296), participatory research is important in an indigenous knowledge-systems investigation because of the community and culturally-based nature of IKS. The researcher is a mere resource in this pro-

cess. In a participatory research paradigm, conventional research is perceived to be an 'elitist model' which reduces the 'subjects' of research to 'objects' of research. In this study, the knowledge and uses of indigenous African wild-food resources found in the study communities were investigated from the perspective of the community members themselves, rather than from that of the researchers. Using focus-group discussions and in-depth interviews, the knowledge-holders were afforded the opportunity of expressing their views on the issues under investigation. Their opinions were also taken into account during the interpretation of the research findings. The indigenous knowledge-holders and practitioners included herbalists, farmers, hunters, and so on.

Focus-group discussions were conducted with randomly selected groups of 6-10 community members and other relevant stakeholders in the study communities. A focus-group discussion is a semi-structured interview in which the people to be included are known to have been involved in a particular situation/experience related to the research problem. Focus-groups discussions are different from other types of group interviews, in that they examine a particular topic, relying on group dynamics in order to generate data. The interaction was mainly between group members themselves and not between the members of the group and the interviewer (Lavrakas 2009).

Group interaction was used in this type of research in generating data, and as a source of data analysis. The assumption is that there is an interaction that is productive in widening the range of responses; in activating forgotten details of cultural experience/knowledge; and in releasing inhibitions that are part and parcel of interviews with individuals. The following section presents the results and discussion.

RESULTS AND DISCUSSION

Community Knowledge on Indigenous African Wild-Food Plant Species and Their Uses Among the Batswana in the Arid Areas of the North-West Province

The respondent community knowledge-holders and practitioners, both men and women, during interviews and focus group discussions, revealed a wide knowledge of the various indigenous African wild-food resources found

Table 1: Indigenous African knowledge of wild food plants species and uses in the North-West Province (South Africa)

Local name	English	Biological name	Local community	Traditional uses
Mooka	Sweet thorn	<i>Acacia karoo</i> Hayne	Lehurutshe Moruleng Disake	The plant had a variety of uses. The sweet gum from the bark was eaten by both humans and animals; it was used for making confectionery; the sweet thorn was used medicinally to produce a range of remedies for eye illnesses, wounds, and colds; the leaves and roots were eaten to relieve stomach pains; when the leaves or roots are boiled, the water is used as a gargle in treating throat infections. The leaves are fed to cattle as a treatment for tulip poisoning, an infection that results from the consumption of bulbous plants that belong to the genus <i>Hemerocallis</i> . In arid areas, the plant was used as indicator of availability of water; a strong rope was made from the inner bark; flowers produce a great deal of nectar and pollen for bee-farming.
Modutu	White Stinkwood	<i>Celtis africana</i> Burm.f.	Moruleng Disake Lehurutshe	Its tiny yellowish flowers produce round fruits that ripen yellow and are edible. It is believed that when the leaves or roots are eaten, they increase sexual desire. The plant was also used to increase the fertility of livestock.
Mothata	Jacket-plum	<i>Pappea capensis</i>	Lehurutshe Disake	Batswana women used the fruits to make jam, jelly, alcoholic beverage, and vinegar. Edible oil was extracted from the seeds and used to lubricate guns, to make soap for treating baldness and ringworms. The leaves were used for cleansing blood, especially for women who had miscarriages. It was believed that the roots or leaves, when eaten, increased libido.
Mogodiri	Firethorn Karee or Common Wild Currant	<i>Rhus pyroides</i>	Moruleng Disake Mabelskraal Phokeng	This plant had multiple uses. The edible fruits were dried for making tea. Traditionally, the plant was used for cleansing individuals who suffer from illnesses associated with sleeping with a widow
Mokgalo	or widower soon after the death of spouse. Buffalo-thorn	<i>Ziziphus mucronata</i>	Moruleng Disake Mabelskraal Phokeng	This plant had multiple uses. People ate the ripened fruits fresh or dried; they ground them to a meal and cooked this as a kind of porridge. During the Anglo-Boer War, ground and roasted seeds of the tree were used by soldiers as a coffee substitute. Young leaves and shoots could be added to salads, or cooked as spinach. Potent liquor was brewed from the fruits. Traditional remedies from leaves, bark, and roots, were made to treat dysentery, chest complaints, and lumbago.
Mosabele	Karee	<i>Rhus lancea</i>	Lehurutshe Mabelskraal	The edible fruit was either soaked in milk before it was eaten, or mixed with sour milk. The fruit could also be brewed for beer. A tea could be made from the dried fruits.
Mogotlho	Camel Thorn	<i>Acacia erioloba</i>	Mafikeng Lehurutshe	In some areas, cattle herders collect and feed the thorns to stock during drought. The gum was eaten by humans, animals, and

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Local name	English	Biological name	Local community	Traditional uses
Mosu	Umbrella Thorn	<i>Acacia tortilis subsp. Heteracanth</i>	Taung Tlokweng	birds. Roasted seeds were used as a coffee substitute. Powder from the inner bark was used as a perfume. During famine, the pulp from the pods was eaten. A root decoction was used for coughs and nose-bleeding. A remedy prepared from dried, crushed pods treats ear infections. The leaves were rich in protein, and the ripe pods were a valuable source of nutritious fodder for grazing animals.
Monopudu	Transvaal Red Milkwood	<i>Minusopszeyheri</i>	Moruleng Disake Mabelskraal Phokeng	Ripe fruits (yellow to orange) were rich in vitamin C. These were eaten by humans, animals, and birds.
Morethwa	Velvet Brandybush or Velvet Raisin	<i>Grewia flava</i>	Lehurutshe Tlokweng Taung Ganyesa Tlokweng	The fruits (fresh or dried) were edible and used to make beer; Toothbrushes were made from frayed twigs. Ostrich egg yolk mixed with pounded roots was applied to burns; it was a valuable fodder plant stock in arid areas.
Matella, Motholo	African Wild Banana	<i>Ensete ventricoso-sum</i>	Mafikeng Mabeskraal Taung Moruleng	The young inflorescences (flower heads) are edible and palatable when cooked. The fermented leaves were used to make bread. The dry insipid flesh of the fruit was eaten only in times of famine.
Lethayu	Bluebush	<i>Diospyros lycioides</i>	Lehurutshe Taung Mabeskraal	The fruit with a sweetish taste was used to make traditional beer; roasted ground seeds were once used as a coffee substitute; roots were chewed and used as toothbrushes; the fruit taints cows' milk; roasted and powdered roots were mixed with mutton fat to ease body pains.
Mothlono	Kei Apple	<i>Dovyalis caffra</i>	Mafikeng Lehurutshe Taung	The fruit was tasty (slightly acidic), rich in Vitamin C, and could be eaten fresh or made into jam or jelly; young fruit was pickled; the fruit juice was mixed with porridge to make a kind of traditional pudding.
Motsotsojane	Crossberry	<i>Grewia occidentalis</i>	Taung Mafikeng Tlokweng	The sweet fruit was edible; it was often picked and stored for later use; when the fruit was boiled in milk, it tasted like milkshake; the fruit was made into juice which was drunk either fresh or fermented. Bruised bark soaked in hot water was used to dress wounds; roots or bark was used to treat bladder problems; a shampoo prepared from the crushed bark was used to prevent hair from turning grey.
Lerotse	Melon	<i>Citrillus lanatus</i>		Used as food for humans and animals; the seeds are fried and eaten as snacks or as a relish.
Lethayu	Bluebush	<i>Diospyros lycioides</i>	Lehurutshe Taung Mabeskraal	The fruit, of a sweetish taste, is used to make traditional beer; roasted ground seeds were once used as a coffee substitute; roots are chewed and used as a toothbrush; the fruit taints cows' milk; roasted and powdered roots are mixed with mutton fat to ease body pains.

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Mmilo, mothwanyê	Wild Medlar	<i>Vangueria infausta</i>	Moruleng Lehurutshe Taung Disake	The fruit can be eaten raw, or fermented to make an alcoholic beer. Medicinally, an infusion of the roots and leaves may be used as a treatment for ringworm, pneumonia, or as a purgative. An infusion of the leaves is used for the relief of toothache.
Mmopoudu	Transvaal Red Milkwood	<i>Mimusops zeyheri</i>	Moruleng Disake Mabelskraal Phokeng Lehurutshe Tlokweneng	Ripe fruit (yellow to orange) are rich in vitamin C eaten by humans, animals and birds.
Modutu	White Stinkwood	<i>Celtis africana</i> .	Moruleng Disake Lehurutshe	Its tiny yellowish flowers produce round fruits that ripen yellow and are edible. It is believed that when the leaves or roots are eaten, they increase sexual desire. The plant is also used for increasing the fertility of livestock.
Mogakangwaga	Pumpkin Family	<i>Kedrostis hirtella</i>	Lehurutshe Taung Disake	The tubers of this tree are used to make khadi and alcoholic beer; the raw red fruit is edible.
Senkampapana	Fat-hen	<i>Chenopodium album</i>	Taung, Mafikeng, Makapanstadt, Jericho, Gaga-bedi, Seutelong	The leaves and young shoots could be eaten as a leaf vegetable, either steamed in its entirety, or cooked like spinach. Each plant produces tens of thousands of black seeds. These are high in protein, vitamin A, calcium, phosphorus, and potassium. As the common names suggest, this was also used as food (both the leaves and the seeds) for chickens.
Thepe	Amaranth or	<i>Amaranthus</i>	Makapanstadt Mafikeng Jericho Lehurutshe (Dinokane) Seutelong	This was one of the most common wild leafy vegetables in most study areas. It is mostly harvested during the rainy season, in summer. Some women grew these vegetables in their home gardens in summer.
Tlaba-dilebanye	pigweed ClimbingNum-num	<i>Carissa edulis</i>	Taung Tlokweneng Disake	A traditional type of tea was prepared from the leaves; a root decoction was prepared for treating coughs and colic; a leaf infusion served as an eye lotion; and flower decoctions were used for washing sores.
Xukutsi	Shepherd's tree	<i>Boscia albitrunca</i>	Lehurutshe Taung Disake	This was a source of food: the roots were pounded to make porridge; the ground root was used as substitute for coffee or chicory; roots were used in making beer; leaves are nutritious; fruit was used in traditional dishes. Flower buds were used as caper substitutes in pickles; belief that if fruit withers before millet crop was ripe, this was a sign of a poor harvest; the leaves could be used to treat eye infections in cattle, and the roots were used in the treatment of haemorrhoids.

in the local communities, including their multiple uses in community life. The information in Table 1 demonstrates this indigenous knowledge of wild-food plant resources in the various Batswana localities of the North-West Province.

According to the respondent women knowledge-holders, amaranths were preferred because they could grow both in light and heavy soils. It does not need a long, cold season to produce flowers and seeds as with cabbages and spinach. The taste was highly appreciated and hence commonly used. Respondents indicated that selected amaranth leaves and stems make boiled vegetables of a soft texture, having a mild flavour, and no trace of bitterness. The knowledge-holders indicated that, although much of the pigment leaches out on boiling, the leaves retained a pleasant green colour. They soften up readily, requiring only a few minutes cooking, which helps avoid excessive nutrient loss. Once established, frequent harvesting of leaves or shoots may take place. More frequent and intense picking of leaves tends to prolong the vegetative phase.

Those who domesticated the plant indicated that amaranths are a shade-loving crop which could be planted around various taller plants such as corn or fruit trees. Women were the prime producers. One woman knowledge-holder and social worker in Mafikeng stated that most wild vegetables are collected from the wild in summer. Occasionally, there may be deliberate planting by broadcasting, near homes. Examination of secondary sources revealed that amaranths are known for their 'strength'-giving properties. The respondent social worker revealed that these were used in the control of malnutrition in local communities.

Focus group discussion revealed that indigenous vegetables were also commercialized as fresh leaves, in dried or powdered form and as enriched food flavours. There was some trade in the various species in both rural and urban areas of the province, but this was very limited. This was partly explained as due to the lack of public awareness of their nutritive quality. However, in some urban areas such as Rustenburg and Vryburg, they fetched higher prices than exotic vegetables on the markets. This implies that they had potential to entrepreneurs in the informal sector who could engage in this trade. The other limitations which were identified on their uses, included experiences in Lekopung

and Ganyesa villages that the vegetables were sometimes eaten for their bitterness, just as pepper is taken for its 'hot' taste. But some people find the bitter taste unpleasant. They try to reduce it by blending with other, blander vegetables such as carrots or cabbages. Another constraint was that production and consumption of indigenous vegetables was still confined to the rural areas, where small-scale farmers, especially women, grow them in kitchen gardens or harvest them from the bush. Production is not sufficient to fulfil even the limited demand in urban areas.

Concerning the nutritional value of the indigenous vegetables, Modise (2010) indicates that a large proportion (>50%) of the rural people in the North-West Province are undernourished, especially children being weaned and pregnant and lactating mothers. The study suggests that to counter the nutritional problems, it is important that the most commonly consumed foods should be nutritious. Since vegetables are consumed frequently and in large quantities due to high prices of meat, those which provide most of the required nutrients should be favoured and promoted by government and other development agencies.

Community Members' Perceptions on Wild-food Plant Resources

Focus-group discussions with community knowledge-holders on the advantages of wild-food resources revealed the following: indigenous and traditional African wild-food resources are a rarity in modern times, people relying mostly on domesticated foods. Wild foods are fully produced by nature, without any human, artificial intervention. One woman knowledge-holder in Disake village stated that in the wilderness, it is the survival of the fittest and the strongest. Therefore, those plants and other creatures that do not have the strength to survive the sun exposure, strong winds, or other environmental challenges, may not live. The weaker ones typically do not survive. Therefore, the wild foods harvested represent the strongest of the species and the finest nutrition available.

The respondent community knowledge-holders stated that wild-food plants could make a positive contribution to food-security in arid and semi-arid areas of South Africa, because they are well adapted to harsh environmental

conditions and are generally resistant to pests and pathogens. They also needed little or no input for growth. Exotic and cultivated food plants such as cabbages, carrots, and so on, were expensive to produce, requiring chemicals, owing to their being very susceptible to pathogens and pests.

The focus-group discussions revealed that most of the wild-plant species were only available during the summer rains. Their cultivation was not common. One of the women knowledge-holders lamented that the utilization of traditional wild-food plants was declining, and dietary diversity in rural communities was growing narrower over time. This was attributed to a number of factors: many introduced exotic and cultivated food plants were high-yielding, and had become popular because of their production and convenient processing, or the prestige attached to their use, especially among young people; they were often high on the agenda of breeding programmes and commercial seed producers, and their market value was often high. On the other hand, indigenous plant species, especially those obtained in the wild, did not receive such official attention from government agricultural extension work, in spite of their environmental adaptability, nutritional value, and cultural importance in the traditional diet.

CONCLUSION

The findings showed that there was a wide indigenous knowledge among the Batswana in the arid areas of the North-West Province (South Africa) on the traditional uses of wild-food plants. The community members expressed the view that the promotion of the traditional uses of these food plants including their commercialization would contribute greatly to sustainable community livelihood in terms of food-security, nutrition, and income generation.

Wild-food resources were preferred for food security because they are produced by nature, without any human, artificial intervention. It was stated that they could make a positive contribution to food-security in arid and semi-arid areas of South Africa, because they are well adapted to harsh environmental conditions and are generally resistant to pests and pathogens; they needed little or no input for growth compared to exotic and cultivated food plants. The latter were expensive to produce, requiring chemicals, owing

to their being very susceptible to pathogens and pests. However, most of the wild-plant species were only available during the summer rains. Their cultivation was not common; knowledge-holders lamented that the utilization of traditional wild-food plants was declining, and dietary diversity in rural communities was growing narrower over time. This was attributed to a number of factors: many introduced exotic and cultivated food plants were high-yielding, and had become popular because of their production and convenient processing, or the prestige attached to their use, especially among young people; they were often high on the agenda of breeding programmes and commercial seed producers, and their market value was often high. On the other hand, indigenous plant species, especially those obtained in the wild, did not receive such official attention from government agricultural extension work, in spite of their environmental adaptability, nutritional value, and cultural importance in the traditional diet.

RECOMMENDATIONS

The study recommends that the government and other development agencies should give these plant resources the same priority and support accorded to exotic food crops. Their cultivation was less expensive; they required few inputs, were resistant to pests, were easily accessible and culturally acceptable. The government, in collaboration with community leaders and community knowledge-holders, should devise strategies and mechanisms of promoting knowledge and awareness among the community members, especially the youth and agricultural extension workers, on the importance of production and utilization of indigenous wild, edible plant resources for food-security, nutrition, and income generation.

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