


**Research Article**

## Indigenous Use and Commercialization of *Urtica dioica* L. from Local Communities of Kieni West Sub County, Nyeri County, Kenya

Joseph Wairimu Kamicha\*, Rebecca N. Karanja, and Grace W. Ngaruiya

### Abstract

Though the stinging nettle (*Urtica dioica* L.) is categorized globally as an invasive species and nuisance weed due to its stinging trichomes, the plant is a source of vital nutrition and an ingredient in many indigenous medicine practices. *Urtica dioica* has a dense rhizome that ensures its survival, enduring adverse climatic conditions throughout the year. Hence, this study sought to determine indigenous knowledge on the uses of *U. dioica* by the local communities in three parts of semi-arid Kieni Sub County namely Endarasha, Charity, and Watuka. Questionnaires were administered to 196 local informants on the diverse indigenous uses of *U. dioica*. Independent sample t-test showed no significant difference ( $P>0.05$ ) in the use of *U. dioica* as a medicinal plant across gender. 100% of the respondents rated *U. dioica* as among the most consumed vegetable. Thirdly, the study established the use of *U. dioica* in the food, medicine, and veterinary sector. Lastly, despite prolonged adverse climatic conditions in the Kieni region, there has been a general increasing trend of *U. dioica* invasiveness over the last 10 years. Such consumption, coupled with the resistance of *U. dioica* to harsh climatic changes could indicate the future economic potential of the plant species in the local cottage industries to support the government's food production and manufacturing agenda. This study recommends increasing public awareness of the benefits of *U. dioica* to boost its consumption.

**Keywords:** Indigenous knowledge; abundance; primary health care; biodiversity; invasiveness; *Urtica dioica*.

### Introduction

Stinging nettle (*Urtica dioica* L.), an indigenous perennial species with European origins, is primarily found in moist, fertile, disturbed habitats [1]. This plant is well-known for its stinging hairs, and when touched, it releases toxins like histamine which cause irritational discomfort, therefore cattle will occasionally eat *U. dioica* as a result [2]. As a food item, *U. dioica* leaves possess vitamins, fat, protein, carbohydrates, and minerals, also, besides trace elements, and are therefore used as vegetables and tea in India [3]. *Urtica dioica* is reported to have been used by Europeans and Native Americans for making linens and sailcloth back in the 17th century [4].

In Kenya, *U. dioica* is popular among the Kikuyu and Meru communities, commonly known as “thabai/Hatha” or “thaa,” respectively, and is used as a traditional vegetable. Dried leaves are ground into a powder used to make porridge flour [5]. Sometimes it is added to mashed food to enrich it with nutrients [6]. As a way of enhancing food sufficiency, there is, therefore, a

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need to boost the widespread cultivation of organic *U. dioica* [7].

A study on the use of stinging nettle in Nyeri County by both urban and local communities found that 52.9% use the species to treat diabetes as an indigenous medicinal herb, with over 25% using the plant to treat high blood pressure, arthritis, rheumatism, and allergies. Such uses necessitate the need for research on the cultural knowledge guiding this valuable species' food and medical use in Kenya [8].

Globally, *U. dioica* has been categorized among the invasive species belonging to the family Urticaceae [9]. Though *U. dioica* cultivation has often been neglected due to its irritant stinging hairs and reduction of yield to other agriculturally vital food plants, it is a source of vital nutrition and an ingredient in many indigenous medicine practices [10]. With an urgent need to embrace drought-resistant food crops, *U. dioica* remains a vital herbaceous species, due to its dense rhizome that ensures its survival, enduring adverse climatic conditions throughout the year [11]. If the cultivation of *U. dioica* is well managed, its ability to persevere adverse climatic conditions can ensure sustainable food production, especially in semi-arid areas such as the Kieni sub-county in Kenya. Studies have also shown that the establishment of *U. dioica* along riverbanks, fence rows, and roadsides neighboring croplands, outcompetes cultivated crops and often becomes a problematic weed in residential areas [12]. Due to its stinging trichomes, the plant creates nuisance environments, especially in urban and residential areas. Such global studies reveal the need for indigenous knowledge on uses of *U. dioica* by local communities of Nyeri County and Central Kenya in general which can be applied in the exploitation of this species aimed at more consumption as a way of managing its invasiveness. The objective of this study was intended to produce data on the uses of *U. dioica* locally which could potentially shed light on commercial and value addition to the plant which can help in exploiting the plant hence reducing invasive impacts to biodiversity and problems associated with agriculture.

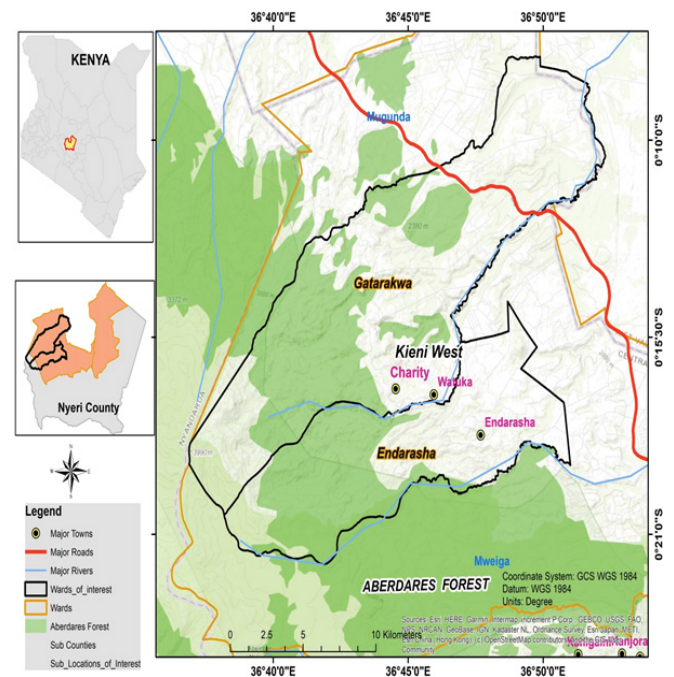
## Methods

### The Study Area

The study area was composed of three sub-locations namely; Endarasha, Charity, and Watuka from Kieni Sub-County in Nyeri County (Figure 1). Kieni Sub-County is located between latitude 360 47' 25.665" E and longitude 10 16' 46.111" N. (Figure 2.1). There are about 198,901 people living in the area which has an area of about 817.1 km<sup>2</sup> [13]. The Kieni region is categorized as semi-arid since it receives only 500 mm of precipitation annually. The region also has a hot, dry climate with little, erratic rainfall that varies frequently across time and distance [14]. In the Kieni region,

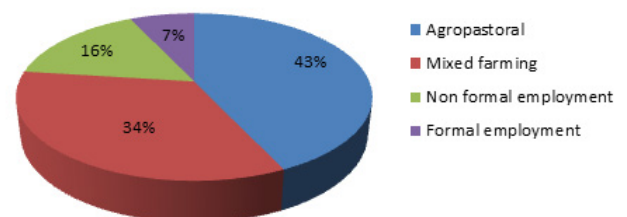
the seasons of brief rains (about October or November) and long rains (around March or April) are bimodal [15].

Kieni East and West together occupy 52 percent of Nyeri County's total land area. Agro-pastoralism, mixed farming, and formal and informal employment represent the majority of people's occupations (Figure 2) [16]. The rivers Mwiyo and Ngarung'iro are among the principal waterways in this area. In Endarasha, where black cotton soils predominate, farmers mostly cultivate maize, Irish potatoes, and onions as a cash crop, while in Watuka and Charity, where red soils predominate, farmers primarily grow cabbage and carrots in addition to maize [17]. The Kieni sub county's soil pH ranges from slightly alkaline (8.1) to slightly acidic (5.2). [17]. Because Endarasha experiences more rainfall than Watuka and Charity due to their proximity to the Aberdare hills, the latter was chosen to serve as a control [18].



**Figure 1:** Map of the Study Area (source; Nyeri Kieni County LRA 2019 Report)

### Proportion of Population by Livelihood



**Figure 2:** Proportion of the population by livelihood (Source: IEBC, 2013)

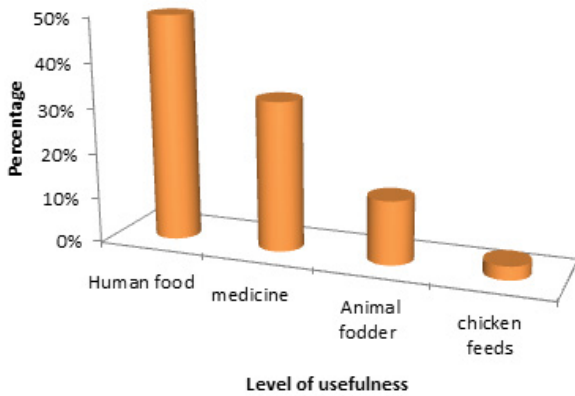


Figure 3: Level of the usefulness of *U. dioica*

### General trend on the abundance of *U. dioica*

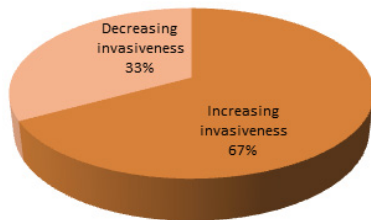


Figure 4: General trend on the abundance of *U. dioica*

### Sampling method

The survey was conducted in the three sub-locations of the Kieni west sub-county, Endarasha, Charity, and Watuka, from April 2021 to December 2021 aimed at documenting local people’s indigenous knowledge of the uses of *U. dioica*.

Single-stage cluster sampling was used to identify households from villages in Watuka, Endarasha, and Charity for the study. This was guided by visual observation from a reconnaissance survey on villages that had encountered an invasion of *U. dioica*. The data on local people’s indigenous knowledge about *U. dioica* was obtained from household heads comprising 98 men and 98 women through questionnaires. Research assistants were used to interpret research questions for the respondents. Cluster sampling has high external validity since the sample selected reflects the characteristics of the entire population [19].

### Data management and analysis

#### Indigenous knowledge on the uses of *U. dioica* in local communities.

Based on the age and gender of members of different households, local communities were surveyed using the questionnaire forms to obtain information on the uses of *U. dioica* as food, feed supplements, herbal medicine, abundance, rainfall requirements, and phenology. Based on the population of the study area (110,376), single-stage cluster

sampling was used to identify households from villages in Watuka, Endarasha, and Charity for the study. The data on local people’s indigenous knowledge about *U. dioica* was obtained from household heads comprising 98 men and 98 women through questionnaires. During the sampling process, different age groups were included to accommodate the views of both youths and older members of the society since they may have different perceptions of the use of indigenous plants such as *U. dioica*. Where possible household heads were interviewed since they are known to make key decisions concerning the use of indigenous plants such as *U. dioica* for various purposes. Their presence in the study area based on their age makes their experience become acknowledged often by the other members.

The sample size was calculated using fisher's equation;

$$N = \frac{t^2 \times p(1-p)}{m^2}$$

Where; n=sample size

t=confidence level of 95%

p= proportion of the target population with the desired characteristics.

m= margin of error at 5%

Calculation;

$$= \frac{1.962 \times 0.85(1-0.85)}{0.05}$$

$$N=196$$

Qualitative data from indigenous knowledge on the uses of *U. dioica* in local communities were analyzed using International Business Machine Statistical Package for Social Sciences (IBMSPPSS) version 20. The results were summarized using descriptive and inferential statistics.

### Results

#### Indigenous knowledge of the uses of *U. dioica* in local communities.

##### Use of *Urtica dioica* for medicinal purposes

All the respondents (100%) reported having used *U. dioica* for medicinal purposes. It was noted that water from boiled leaves is locally used to manage arthritis and treat diabetes in human beings. Products obtained from leaves were found to be used locally as herbal tea. Water from boiled leaves and roots is given to a cow that has recently calved and lacks the strength to stand upright to act as an alternative source of minerals such as calcium. Likewise, dried leaves were noted to be given to laying chickens to induce the yellowing of egg yolk aimed at enhancing their marketability.

##### Preparation methods

All the respondents (100%) indicated that they used



decoction and infusion as methods of locally extracting medicinal value from *U. dioica* roots, leaves, and stems.

### Level of the usefulness of *U. dioica*

The figure below shows the uses of *U. dioica* and the level of importance attached by the respondents.

From the study, it was concluded that 50% of the respondents reported using *U. dioica* as human food mainly as vegetables and food additives, and 33% of the respondents noted that the use of *U. dioica* as medicine is very useful mainly in the management of diabetes, 14% of the respondents noted that dried leaves of *U. dioica* are useful when used as cattle feeds especially during droughts to substitute reduced animal fodder while only 3% of the respondents considered use of *U. dioica* as chicken feeds aimed at increasing nutritional quality of eggs to be very useful

### General trend on the abundance of *U. dioica* over the past ten years

#### Within the study area

From the study, 67% of the respondents indicated that there has been an increasing trend in the level of invasiveness of *U. dioica* while only 33% reported a decreasing trend in the level of invasiveness of *U. dioica* in the study area (Figure 4). Resistance to weather changes and its invasive nature were noted as the reasons for its increasing trends while increased cultivation and construction due to increased settlement were cited as the reasons for the reduced abundance of *U. dioica*.

### Consumption of *U. dioica* in comparison to other vegetables

The study found that 100% of the respondents rate *U. dioica* as among the most consumed vegetable in the study area because it is readily available in its natural habitats as an invasive species. Furthermore, it was noted that the plant products are readily available in the local markets.

### Source of *U. dioica* by local communities

The results indicated that 61% of the respondents obtain *U. dioica* from the nearby Aberdare forest. While 39% had set aside an area within their farms for the growth of *U. dioica*.

**Table 1:** Use of *U. dioica* as a medicinal plant for primary health care across gender

Use of <i>U. dioica</i> as a medicinal plant for primary health care across gender	
Pearson correlation	0.8062
Sig. (two-tailed)	0.076
N	198
CI	95%

### Use of *U. dioica* as a medicinal plant for primary health care

Results analysis of the indigenous knowledge on the use of *U. dioica* as a medicinal plant across gender is presented in table 1. Independent sample t-test was performed to compare the use of *U. dioica* as a medicinal plant for primary health care across gender. There was no significant difference ( $P > 0.05$ ) in the use of *U. dioica* as a medicinal plant across gender. It was noted that the use of *U. dioica* as a medicinal plant increased with an increase in age. Individuals aged 60 years and above had a high preference for using medicinal plants (65%) for primary healthcare as compared to younger members of the community.

## Discussion

### Indigenous knowledge of the uses of *U. dioica* in local communities.

From the study, it was noted that significant consumption of *U. dioica* products ranges from food to medicine. One of the distinguishing reasons for the high consumption of *U. dioica* as food and herbal tea is its widespread in many countries, especially in the Morocco, and its high digestibility together with the high mineral contents of *U. dioica* leaves [20].

The study also found that there has been a general increasing trend of *U. dioica* invasiveness over the last 10 years. This was attributed due to its resistance to weather changes, in addition to its good adaptation for dispersal. *Urtica dioica* dense rhizome has been noted to ensure its survival enduring adverse weather changes throughout the year [21].

All respondents in the study agreed to have used *U. dioica* as vegetables. It has also been noted that high consumption of *U. dioica*, is primarily in form of fresh vegetables whereby it is added to soups, cooked as a potherb, or used as a vegetable complement in dishes [22]. The study found the invasive nature of *U. dioica* as the main reason for the failure of farmers to cultivate the plant on their farms. It was also noted that farmers who had attempted to cultivate the plant for commercial and domestic consumption later found it difficult to control it due to its fast growth rate and its ability to suppress other food crops. It has also been noted that, despite its promising potential as a food crop and its low input requirements, *U. dioica* has been underestimated and often considered a difficult weed to control in the agricultural sector due to its invasiveness [23]. The majority of members of the community, therefore, are noted to rely on naturally growing *U. dioica* in the Aberdare forest and on their farms where it grows as a weed. This study was found to agree with the findings of Tarus *et al.* [8] that members of the Nyeri community extract stinging nettle for domestic and commercial purposes from the Aberdare forest. The study

established that older members of the community above sixty years of age have a high preference for using *U. dioica* for medicinal purposes as compared to younger members. This was found to concur with the study conducted in Nigeria by Adebo *et al.* that older women had more experience in the use of herbal medicinal plants [24]. Roots, leaves, and stems were noted as the parts that have medicinal value in *U. dioica*. Locally water boiled from the leaves of *U. dioica* is used to treat arthritis and diabetes in human beings. *Urtica dioica* has been noted as an alternative drug by local communities for diabetes [25]. Decoctions from roots, leaves, and stems are used locally to boost blood levels in human beings. Through infusion, it was noted that *U. dioica* is used as an herbal tea by soaking leaves of *U. dioica* in boiled water and allowing it to cool. There has been high administration of nettle products such as nettle tea compared to nettle soup [26]. Locally water from boiled roots and leaves is given to cows that lack the strength to stand upright after calving to act as an alternative source of minerals such as calcium. Stinging nettle leaves have been reported to contain a wide range of nutritional values including the source of energy, protein, fiber, and minerals including iron, manganese, potassium, and calcium [27].

## Conclusion

Poor methods of preparation and processing by local vendors consequently lower the quality of the *U. dioica* products. Locally, members from Endarasha, Charity, and Watuka suffering from arthritis, blood pressure, and diabetes self-medicate themselves using extracts from *U. dioica*. The study established that during drought, water from boiled leaves and roots is given to a cow that has recently calved and lacks the strength to stand upright to act as an alternative source of minerals such as calcium. Locally, laying chicken is fed with dried *U. dioica* powder to induce the yellowing of egg yolk aimed at enhancing their quality and marketability. Due to the invasive and stinging nature of *U. dioica*, it has not been fully cultivated. It is also evident that control of its spread by farmers through weeding and the use of herbicides in the agricultural sector has increased the cost of production. There is therefore a need to increase public awareness of the benefits of *U. dioica* to boost its consumption hence reducing its invasiveness.

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## Conflict of interest:

No conflict of interest

## List of Abbreviations and Acronyms

IBMSPSS: International Business Machine Statistical Package for Social Sciences

KPHC: Kenya Population and Housing Census

NAAIAP: National Accelerated Agricultural Inputs Access Programme

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