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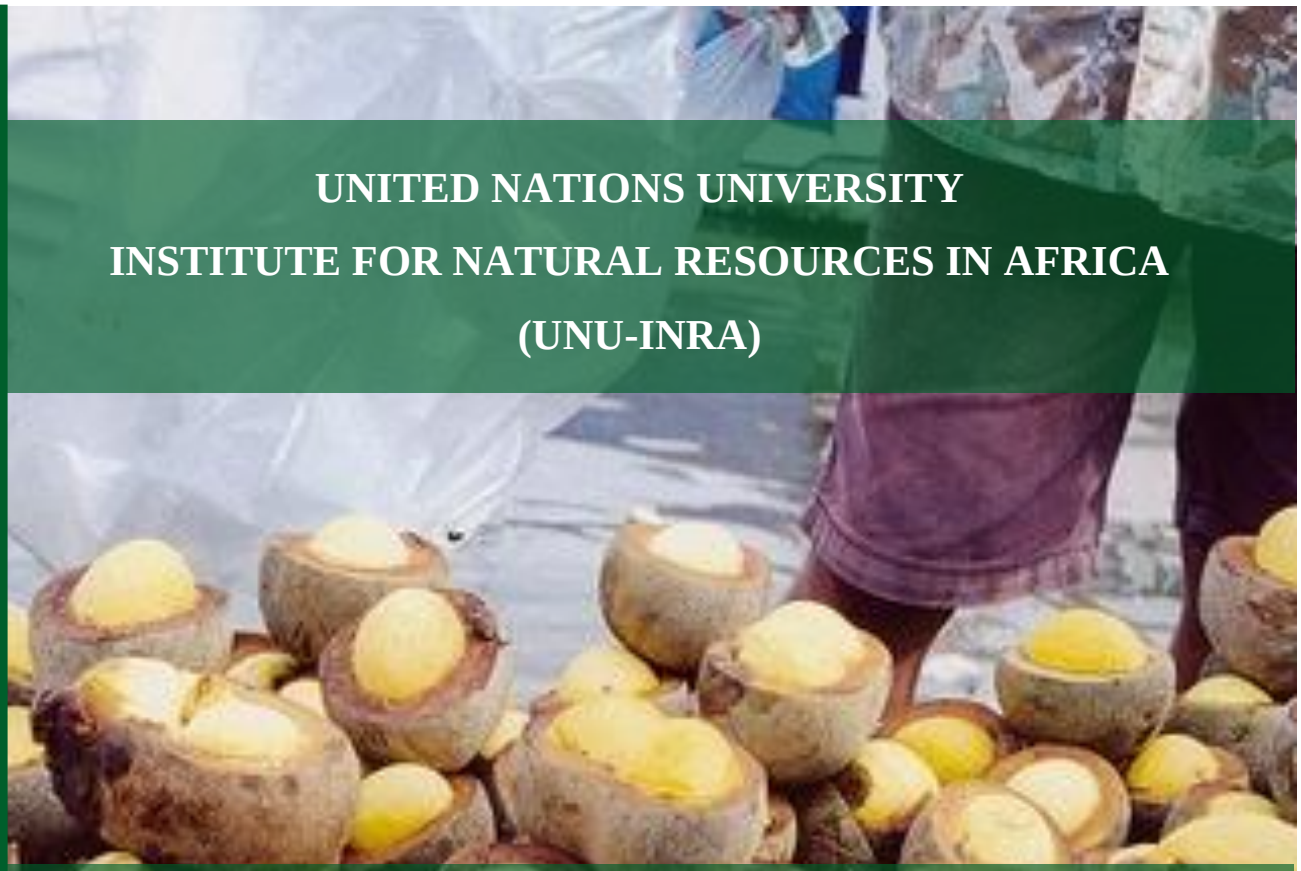

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EVALUATION OF THE CULTURAL FOOD SIGNIFICANCE OF NEGLECTED AND UNDERUTILIZED PLANT SPECIES IN SOUTHWEST OROMIA, ETHIOPIA

BALCHA ABERA ERENA

EVALUATION OF THE CULTURAL FOOD SIGNIFICANCE OF NEGLECTED AND UNDERUTILIZED PLANT SPECIES IN SOUTHWEST OROMIA, ETHIOPIA

BY

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TABLE OF CONTENTS PAGE

LIST OF TABLES PAGE

LIST OF FIGURES PAGE

LIST OFACRONYME

NUPs Neglected and underutilized plant species

CFSI Cultural food Significance Index

Al Availability Index

PUI Part Used Index

FUI Frequency Use Index

FPUI Food Preparation Use Index

FAl Food Appreciation Index

NRI Nutraceutical Role Index

VHSI Very High Significance Value

HIS High Significance Value

MSI Moderate Significance Value

LSI Low Significance Value

VLSI Very Low Significance Value

ABSTRACT

For centuries, plants have been used as a source of food, medicine and material culture. The focus of modern research and technology developments on crop plants, however, has narrowed the number of utilizable crop plants. This study was on the cultural food significance of neglected and underutilized crop plants (NUPs) in southwest Oromia, Ethiopia. A total of 180 rural elders above the 40 year age group were interviewed concerning the cultural significance of neglected and underutilized plant species. A quantitative method was used to calculate the cultural significance of individual plants in traditional contexts. A special index – the Cultural Food Significance Index (CFSI) – was used in the evaluation of the cultural significance of individual plants using six variables: availability index, frequency of use index, parts used index, feeding appreciation index, food preparation index and nutraceutical role index. These indexes help to calculate and compare the ethnobotanical data of NUPs for the development of agro-biodiversity, which plays a major role in the alleviation of food insecurity especially in developing countries. A total of 71 neglected and underutilized crop plant species were reported by informants of the study area. Of these, 13 (18%) plant species were domesticated under home garden while the remaining species were under wild life. Of the plant species, 6 (8.5%) were recorded with very high significance value ($\geq$300 and above) followed by 7 (9.8%) with high (200-299), 34 (47.8%) with moderate (100-199), 14 (21%) with low (50-99) and 9 (12.7%) with very low (> 49). [(*Coccinia abyssinica* (Anchote) *Plectranthus edulis (*Dinnicha Oromoo), *Phaseolus lunatus* L. (Abbaa Coomaa) and *Vigna unguiculata* (L.) Walp. (Heppoo) were identified in the study area as "most appreciated" in cultural feeding of the rural community at large. [*Colacaceae esculenta* L. (Schott), Godarree)] and *(Dioscorea alata (*Qoccoo Oromoo) were the most common and drought resistant tuber crop plants identified with very high significance values. The application of this index makes it possible to identify the most important but neglected and underutilized crop plant species for the extension of agro-biodiversity to feed the increasing world population. The findings of this study recommend the establishment of small and medium enterprises to increase the value of NUPs in the region.

KEYWORDS:

Cultural Food Significance Index (CFSI), Neglected and Underutilized plant species (NUPs), Index value, Ethiopia

1.0 INTRODUCTION

Neglected and underutilized crop plant species (NUPs) are plant species whose use is localized, and which generally receive little or no attention from researchers and policymakers. Alternatively, neglected and underutilized crop plants can be defined from three angles: by whom they are used, where they are used, and their current market status (IPGAR, 1999; FAO, 2009). NUPs are wild or domesticated varieties and non-timber forest species adapted to particular, often quite local, environments. Many of these varieties and species, along with a wealth of traditional knowledge about their cultivation and use, are being lost at an alarming rate. NUPs present tremendous opportunities for fighting poverty, hunger and malnutrition, and they can help make agricultural production systems more resilient to climate change (Engles, 1995; Bala et al., 2010). There is a growing realization that NUPs have an important role to play in advancing agricultural development beyond the Green Revolution model of improving and raising the yields of staple crops (FAO, 2009). In Eastern Africa and Southeast Asia selected traditional vegetables are becoming an increasingly attractive food group for the wealthier segments of the population and are slowly moving out of the underutilized category into the commercial mainstream. Attracted by the strong market demand, seed companies are beginning to explore and develop these popular crops, thus strengthening the formal seed sector (FAO, 2009).

Historically, the study of wild food plants depended on qualitative methods or listing of the plant species. However, the study concerning the evaluation of the cultural significance of botanical taxa (the important role that a plant plays within a particular culture) in general has been reported by a few previous works using different scales and values (Pieroni, 2011) on wild edible plants. These measures are largely subjective and complicate comparison of findings from different studies (Pieroni, 2001). Berlin (1973) and Lee (1979) in their study used a scale of four ("cultivated," ‘’protected," "wild but useful," "culturally insignificant) and six values ("primary," "major," "minor," "supplementary," "rare," and "problematic), respectively. Moreover, Turner (1988) developed the evaluation of cultural food significance (CFS) of wild plants and used three criteria including the quality, intensity and exclusivity of uses. Soffle et al. (1990) modified Turners Index and developed Ethnic Index of Cultural Significance (EICS). According to Pieroni (2001) these scales represented a first simple attempt to measure the cultural significance of plants without considering any special variables involved in the complex issue of the evaluation of cultural meanings of biological resources (Pieroni, 2001). Both systems were developed to evaluate plant usage in a given ethnic context but failed to include the “taste of food appreciation” and “food medicinal multifunctional values” (Pieroni, 2001).

Most of the ethnobotanical studies in Ethiopia have focused mainly on the traditional use of botanicals in folk medical practices while few studies have reported on wild plants among particular ethnic groups (Asfew and Tadesse, 2001; Gemedo-Dalle et al., 2005; Belamie and Kibebew, 2006; Feyessa et al., 2012; Matthew et al., 2013). The evaluation of food plants used in different geographical and cultural contexts has two advantages: 1) to facilitate an intercultural comparative

analysis of quantitative ethnobotanical data, and 2) to argue on the cultural components of food acceptance and investigate phytochemical constituents (Pieroni, 2001; Bala et al., 2010). Many food plants in different cultural ethnic groups have often been used in traditional systems multi-contextually and are commonly consumed as food-medicines. Moreover, the physiological aspects of nutrition are similar with the bio-pharmacology of non-nutritional plant metabolites (Ross et al., 1996; Chapman et al., 1997; Pieroni, 2000).

Although there are studies on wild food plants (Addis et al., 2005; Belamie and Kibebew, 2006; Asfew, 2009; Lulekal et al., 2011; Hunde et al., 2012; Matthew et al., 2013) based on qualitative methods from Ethiopia, these studies did not focus on the evaluation of NUPs using quantitative methods from the concept of underutilization and neglect of the diversity of plant species in the region. In addition, there is not yet any reported study focusing on domesticated but underutilized crop plant species elsewhere. The current study reports the cultural food significance (CFS) of NUPs (both domesticated and wild edible plants) in the cultural context of the community of Southwest Oromia, Ethiopia.

2.0 OBJECTIVE OF THE STUDY

2.1 General objective

The general objective of this study was to evaluate the cultural significance of neglected and underutilized plant species (NUPs) in the region of southwest Oromia, Ethiopia.

2.2 Specific objectives

The specific objectives of this study are to document the: 1) local and scientific names, 2) growth habit, 3) source of plant availability (wild, semi-cultivated or domesticated one) and 4) local knowledge using cultural food significance Index; availability, frequency of use, typology of the used parts, taste appreciation, quotation frequency, perceived role as a food-medicine, kind and number of the food uses**.**

2.3 Research questions

What are the NUPs in the research areas? What is the indigenous/local knowledge associated with the use of NUPs in the area? How do underutilized crops contribute to food consumption and what are the associated socio-economic benefits? What are the threats to plant genetic resources and what are the effects on livelihoods of ethnic groups? How can these constraints be overcome?

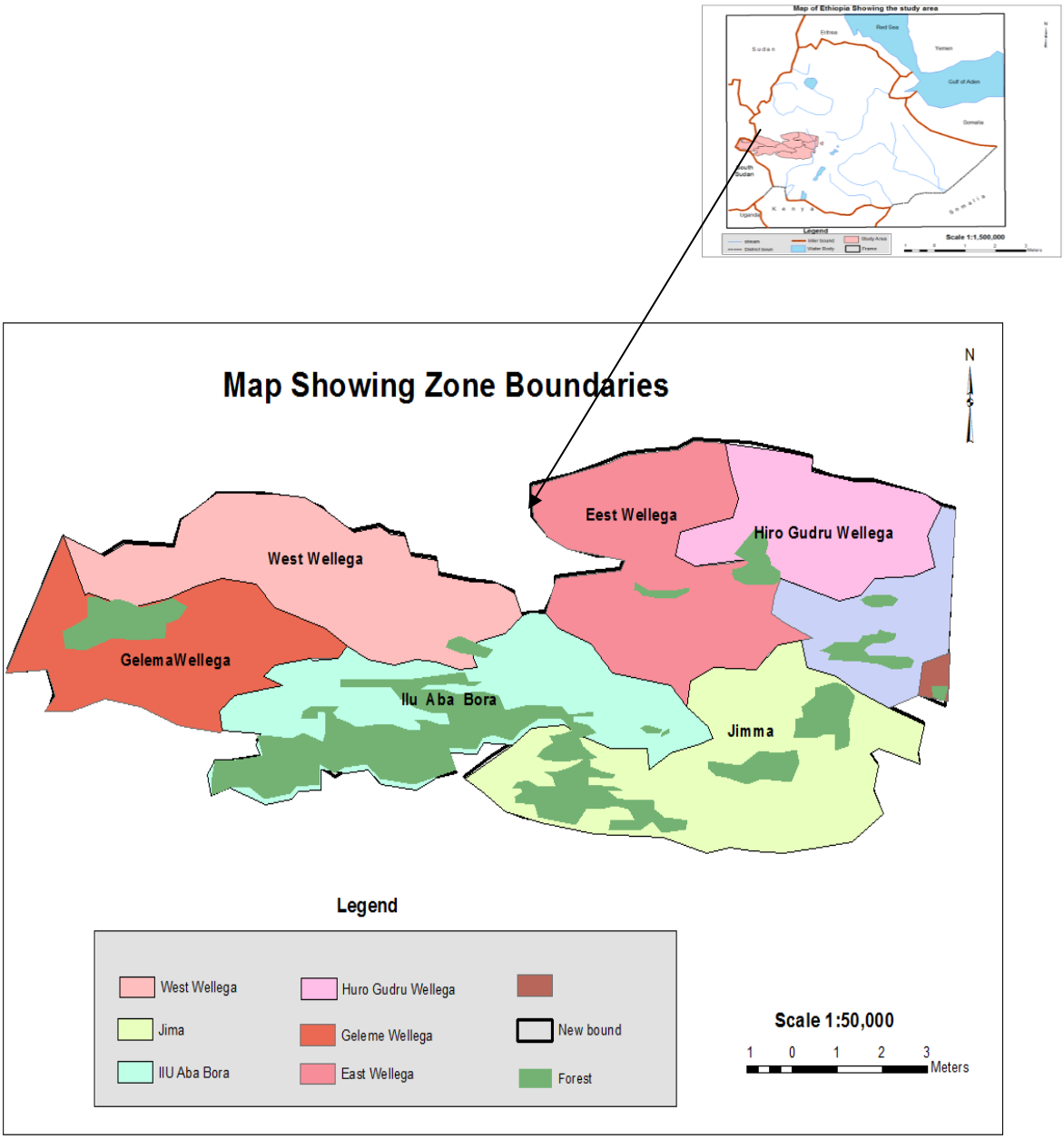
3.0 METHODOLOGY

3.1 Study area

The study was conducted in six zones of Oromia state in Ethiopia. The regional state of Oromia in Ethiopia sprawls over the largest part of the country and at present consists of 12 administrative Zones and 180 Districts. Of the 12 zones, Jimma, Ilubabor and four Wollega Zones (West, East, Qellem, Horo Guduru) are neighbouring zones accounting for 25% of the State's total area and 7% of the state's population. The southwest Oromia regional zones border, Amhara regional state in the north, the Republic of the Sudan and the regional state of Benishangul in the west, the State of Southern Nations, Nationalities and Peoples' and the regional state of Gambella in the south (Figure 1). Based on the 2007 Census conducted by the CSA, the total population of the six Zones of southwest Oromia was estimated to be 7,789,228, of whom 3,952,650 were men and 3,836,578 were women, with an area of 50,579.77 square kilometres. The major ethnic groups within the state include 93% Oromo, 5% Amhara and the remaining 2% constitute other ethnic groups. Afaan Oromo (Oromo language) is the official language of Oromia regional state in Ethiopia (CSA, 2007).

The area of Southwest Oromia is a remnant part of the high and extensive Afro-Arabian plateau formed from continued uplift, rifting and subsequent volcanic piles. High relief of over 1500m is the dominant geophysical feature. The climatic types prevailing in the study area may be grouped into 3 major categories: the dry climate, tropical rainy climate and temperate rainy climate.

Figure 1: Map of the study zones in southwest Oromia, Ethiopia



The dry climate is characterized by poor sparse vegetation with annual mean temperature of 27°Cto 39°C, and mean annual rainfall of less than 450 mm. The hot semi-arid climate mean annual temperature varies between 18°Cand 27°C. It has a mean annual rainfall of 410-820 mm with noticeable variability from year to year. Highlands of Oromia experience temperate climate of moderate temperature, (mean temperature of the coolest month is less than 18 ^{0}c) and ample precipitation (1200-2000mm). The main agricultural crops in Southwest Oromia include teff, maize,

wheat, barley, peas, bean and various types of oil seeds. Coffee is the main cash crop in Southwest Oromia region of Ethiopia (CSA, 2007).

3.2 Study methods

A preliminary survey was conducted throughout 6 Zones of the study area to select both study sites and informants through sample and quota survey methods, respectively. Prior to this, reconnaissance survey approval was received from Jimma University Ethical Review Committee (ERC) while verbal informed consent was obtained from each informant who was participating in the study. The study was conducted in 3 selected sites (Kebeles, the least hierarchical administration in Ethiopia) of each Zone. Informants were identified with the help of Kebele leaders, Developmental Agents (DAs) and knowledgeable elders. A total of 180 participants, 10 from each study site aged 40 and above, were included as informants to obtain pertinient information.

Ethnobotanical information was obtained through structured interviews with informants having knowledge of the food culture. Informants were asked to spontaneously mention the local names of NUPs that were gathered and consumed that day. Furthermore, they were asked to specify the following information for each quoted taxa including: the availability status, the types and number of plant parts used, how the plant part was used, preparation methods, frequency of use of when it is available, feeding appreciation, and an eventual medicinal purpose attributed to its ingestion. Conversations were carried out in the local dialect, Afaan Oromoo (Language of Oromo nation).

3.3 Data analysis

Data was analyzed using the Cultural Food Significance Index (CFSI), modified from Pieroni (2001) in the context of Ethiopia, which focused on the evaluation of individual plants using 6 factors: Availability Index (AI), Part Used Index (PUI), Frequency of Use Index (FUI, when available), Food preparation Use Index (FPUI), Feeding Appreciation Index (FAI), and Nutraceutical Role Index (NRI). These Indexes were multiplied and the sum was used to compare the CFSI of NUPs of individual plants.

CFSI= Al x PUI X FUI x FPUI x FAl x NRI

*Availability Index (*AI): AI refers to the availability of the plants, as perceived by local informants, and if the plant is localized and available in the study area (Pieroni, 2001). In this index analysis, the perception of the availability of individual taxa given by informants was summed up. The question and index values/scores for AI is as follows: Is the plant very common =5, common =4, moderate = 3, rare =2),

Part Used Index (PUl) - This value refers to the multiple uses of diverse parts of the same plant. It takes into account whether multiple morphological plant parts are collected and eaten instead of

single parts (Pieroni, 2001). The question for PUI is as follows: Part (s) Used Index (whole parts =4, 3 parts =3, 2 parts = 2, single part = 1),

Frequency of Use Index (FUI) - This index refers to the frequency of the utilization of each plant during its availability. The following variables were used to analyze the frequency of utilization: For instance, > once/week, once/week, twice/week, three times/week. The question for FUI is as follows: utilization frequencey Index (2-3 times/week= 5, once/week =4, only sometimes =3, suddenly= 2, no longer used= 1.

Food preparation Use Index (FPUI) - This index considers the possible food preparation methods and steps of each single vernacular taxa. Values were assigned to traditional food preparations. In the case of species which are boiled and then further processed (stewed, stuffing for diverse preparations) the value attributed to the boiling process is increased by a half unit. If the plant is generally used in mixtures of more than three species, the index value is diminished by a half unit (Pieroni, 2001). The question, variables and index values for FPUI are as follows; Raw = 1, Clean = 2, Boil, Roast, Whip = 3, chop-4, Stew =5.

Feeding Appreciation Index (FAI) - The index given for this evaluation represents the scores by which locals expressed their feeding appreciation for each plant product. Scores were based on feeding appreciation. The question, index categories and index values for FAI are as follows: Best = 5, Very Good = 4, Good = 3, Fair = 2, Poor = 1.

*Nutraceutical Role Index (*NRI) - A few species had "special" significance because of their supposed health properties (Pieroni, 2001). This index reflects the perceived properties as food-medicine for each quoted species. Supposed ritual or magical "health" aspects related to the ingestion of particular species were be considered in the evaluation of these values. Higher values are attributed where well-defined medicinal properties are ascribed to the ingested plants. For the more general assessment of a plant as "healthy," without any specifications, minor NRI values were assigned. The question, variables and Index values for NRI are given as follows: Very high=5, High=4, Middle=3, no specifiation=2, not recognized=1.

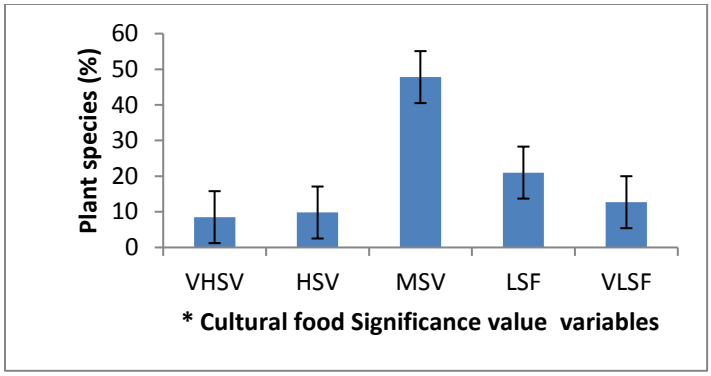
4.0 RESULTS AND DISCUSSION

4.1 Results

Cultural food significance values

In this study, the cultural food significance index (CFSI) of the 71 NUPs was calculated following the aforementioned formula in the methodology. The index cultural significance (ICS) values were classified into six groups: plant species with very high significance value (VHSV = ≥ 300 and above), with high significance value (HSV=200-299), with moderate significance (MSV=100-199), with low significance (LSV= 50-99), with very low significance (VLSV= ≤ 49) (Fig. 2). Of the plant species identified, 6 (8.5%) were recorded with very high significance value (≥300 and above) followed by 7 (9.8%) with high (200-299), 34 (47.8%) with moderate (100-199), 15 (21%) with low (50-99) and 9 (12.7%) with very low (≤ 49).

Figure 2 Plant species with different levels of cultural significance values.



Bars represent *VHSV-very high significance, HSV- high significance value, MSV-moderate significance, LSV-low significance, VLSV-very low significance

*Food plant species with very high significance values (*VHSV)*:* The food plant species grouped within very high significance values (≥ 300 and above) in this study were mainly comprised of domesticated tuber and seed plants. Of these, *Cocconia abyssinica* and *Plectranthus edulis* were two tuber crops, which were "very common'' and "most appreciated'' in cultural feeding in four Wollega Zones, but rarely found in Jimma and Ilubabor areas. The remaining herbaceous seed plants of very high significance values include *Phaseolus lunatus, Phaseolus vulgaris, and Vignia ungalculata* – commom crop plants that are boiled and stewed to make sauce and relish as porridge.These plants played a centeral role in the dailly traditional diet of the rural communities at large. Despite their importance in alleviating the food shortage in the region, their occurence and utilization was mostly limited to Oromo community of the study area. Moreover, the cultivation of these crop plants is detriorating among young farmer generations, who are focusing on the farming of genetically modified seeds exported and distributed by the governmment. [(*Colacaceae esculenta* L. (Schott), Godarree)], *and [(Dioscorea alata* L. (qoccoo oromoo)]

Food plant species with high cultural significance values (HSV)*:* In this study, nine plant species were identified within high significance values, including 3 tuber, 2 seed, and 4 vegetable and fruit species (Table 3). *Dioscorea schempriana, Moringa steriopetala, Syzygium guinense* were the most common leafy vegetables and wild fruits used by the rural communities. *Moringa stenopetala* (Baker f.) Cufod is also a wild nutraceutical plant used as food medicine especially in the traditional treatment of diabetes and other several ailments. Similarly, Takile Heymenot and Giday (2010) reported the use of *M. stenopetala* for the traditional treatment of similar diseases in Kara and Kwego area, located in the Lower Omo River Valley, Debub Omo Zone, Southern Nations, Nationalities and Peoples Regional State (SNNPR), in Ethiopia.

Although *Sida schemperiana* Hochst. Ex A. Rich. (Kottee harree) is rare in all zones, it is seen in local markets. The remaining two species (*Zea mays* L. and *Sorgum vulgare* Pers) of seed plants are common and known for their sweetness, when their elongated stems are ingested by members of the community. This study recommends these two species for sucrose production through the identification and development of appropriate varieties.

Food plant species with moderate cultural significance values (L&VLSV)*:* A large number of plant species (31, 43.7%) included in this category were mostly edible wild fruits, collected when ripened and consumed raw at different times of the year mainly by herdsmen and children in the field, and sometimes by older people and poor families when there is a severe food shortage. The most known wild edible fruits in this category were *Rubus steudneri* schweinf, Goraa, *Rubus volkensii* , Goraa arbaa, and several *Ficus species* (Table 2, 3).

Food plant species with low and very low cultural significance values (VLSV): A total of 24 (34%) wild edible plants with low and very low food usage was reported under these categories. For many of these species, their availability is common, with moderate feeding appreciation in taste sometimes reported. However plant parts used and frequency of use was generally low and very low, respectively. *Acanthus polystachius* Delile (Kosorruu) and *Dovyalis caffra* (Hook. f. & Harv.) – species very rarely used as food is grouped in this class. For the majority of these species, the taste appreciation score is high and underlines the "exceptional character" of their use (Preioni, 2011).

Table 1: Example of the CFSI values for three NUPs in the study area

Botanical taxa	Vernacular Taxa	Values of the individual plant indexes	Calculation of the CFSI	CFSI
Cocconia abyssinica L.Yam	Ancootee	AI=Very common= 5, PUI=Parts used= 2 FUI=2-3 times/week =4 FPI= Boiled-----stewed=5, FAI= Best=5 NRI=middle= 3	5 x 2 x 4 x 5 x 5 x 3	**3000**
Sida schemperiana Hochst. ex A. Rich. Malvacae	Kottee harree	AI= Common = 4 PUI = single part = 1 FUI = sometimes = 3 FPI = Boiled or Roasted = 3 FAI = Good = 3 NRI = No specification = 2	4 x 1 x 3 x 3 x 3 x 2	**216**
Syzygium guineense subsp.guineense (Willd.) DC., Myrtaceae	Goosuu	AI = Common = 4 PUI= single part = 1 FUI = Sometimes = 2 FPI = Raw = 1 FAI = Good = 3 NRI = No specification = 2	4 x 1 x 2 x 1 x 3 x 2	**48**

Table 2 Cultural food significance values of domesticated food plant species in Southwest Oromia, Ethiopia

Scientific names	Botanical family	Vernacular names	Availability Index	Part Use Index	Frequency Use Index	Food Preparation	Food Appreciation	Nutriceutical Role Index	CFSI
Aframomum corrorima (Braun) Jansen	Zingerbraceae	Oogiyoo	2	2	3	3	2	2	**144**
Brassica carinata A.Braun	Brassicaceae	Raafuu	2	2	3	3	3	2	**216**
Cocconia abyssinica (Lam.) Cogn.	Curcubitaceae	Ancootee	4	2	4	5	5	3	**1600**
Colacaceae esculenta L. (Schott)	Araceae	Goodarree	4	1	4	3	4	2	**384**
Cucurbita pepo L. Buqqee	Cucurbitaceae	Buqqee	4	1	3	5	2	3	**360**
Dioscorea schimperi-ana Hochst. Ex A.Rich	Dioscoreaceae	Qocinee	2	2	3	3	3	2	**216**
Dioscorea alata L.	Dioscoreaceae	Qoccoo Oromoo	4	1	4	3	4	2	**384**
Eleusine coracana Gaertin.	Poaceae	Daagujjaa	4	1	4	4	3	2	**382**
*Glycine max (*L.) Merr.	Fabaceae	Atara	3	1	3	3	3	2	**162**
Morus alba L.	Moraceae	Goraa Kellaa	4	1	3	1	2	2	**48**

Phaseolus lunatus L.	Fabaceae	Abbaa -coo-maa	4	1	5	5	5	2	**1000**
Vigna unguiculata (L.) Walp.	Fabaceae	Hippoo	4	1	5	5	5	2	**1000**
Zea mays L.	Poaceae	Boqolloo	5	2	2	1	2	3	**216**

Table 3 Cultural food significance values of wild food plant species in Southwest Oromia, Ethiopia

Scientific names	**Botanical family**	**Vernacular names**	**Availa-bility Index**	**Part Use In-dex**	**Fre-quency Use In-dex**	**Food Prepa-ration Index**	**Food Appre-ciation Index**	**Nutriceu-tical Role Index**	**CFSI**
Acacia tortolis (Forssk.)	Fabaceae	Xaddacha	3	1	2	4	2	2	**96**
Acanthus polystachius Delile	Acanthaceae	Sokorruu	5	1	2	1	4	1	**40**
Aframomum corrorima (Braun) Jansen	Zingerbraceae	Oogiyoo	3	1	2	2	1	2	**24**
Amorphophallus abys-sinicus (A. Rich.) N.E. Br.	Araceae	Qicuu	4	1	3	1	2	2	**48**
Arisaema flavum Florssk.	Araceae	Bareeraa	2	2	3	3	3	2	**216**

Balanites aegyptiaca (L.)Delile	Zygophyllaceae	Badanaa	3	1	2	4	2	2	**96**
Bidens pachyloma (Oliv. & Hiern.) Cuf.	Compositae	Chuqii	3	1	2	4	2	2	**96**
Caralluma sprengeri Schweinf.	Ascellepiadaceae	Bakbakaa	3	1	2	4	2	2	**96**
Carissa spinarum L.	Apocynaceae	Agamsa	4	1	3	2	2	2	**84**

Table 3 continued-----

Caylusea abyssinica (Heim.) Robynns	Resedaceae	Reencii	2	2	3	3	3	2	**216**
Clausena anisata (Willd.) Benth.	Rutaceae	Ulumaayii	4	1	3	1	2	2	**48**
Cordia africana Lam.	Boraginaceae	Waddeessa	4	1	3	1	2	1	**24**
Dovyalis caffra (Hook. f. & Harv.) Hook. f.	Flacourtaceae	Koshommii	3	1	2	4	2	2	**96**
Dracaena steudneri Engl.	Dracaenaceae	Afarfattuu	4	1	3	1	3	2	**72**
Embelia schimperi Vatke	Myrsinaceae	Haanquu	3	1	3	3	2	4	**216**
Ficus sur Forssk	Moraceae	Arbuu	4	1	3	1	3	2	**72**
Ficus sycomorus L.	Moraceae	Odaa	4	1	3	1	3	2	**72**
Ficus thonningii Blume.	Moraceae	Dambii	4	1	3	1	3	2	**72**
Ficus vasta Forssk	Moraceae	Qilxuu	4	1	3	1	3	2	**72**
Flacourtia indica (Burm.f) Merr.	Flacourtaceae	Akuukkuu	4	1	3	2	3	2	**144**
Gardenia ternifolia Schumach. and Thonn.	Rubiaceae	Gambeelloo	4	1	3	1	2	2	**48**

Table 3 continued----

Grewia ferrugi-nea Hochst.ex. A.Rich	Tiliaceae	Dhoqonu	3	1	2	1	2	2	**24**
Guizotia scabra[1](Vis.) Chiov	Compositae	hadaa	3	1	3	3	3	2	**162**
Helianthus annuus L	Asteraceae	Abaaboo	3	1	3	3	3	2	**162**
Landolphia buchananii (Hall.f.) Stapf.	Apocynaceae	Leeboo	4	1	3	2	3	2	**144**
Lantana camara L.	Verbenaceae	Midhaan dubara	4	1	3	2	3	2	**144**
Meriandra benega-lensis Benth.	Lamiiaceae	Haadha tokkee	3	1	3	3	3	2	**162**
Millettiia ferrugineae (Hoscht.) Bak.	Fabaceae	Sootalloo	4	1	3	1	2	2	**48**
Moringa stenopetala (Baker f.) Cufod	Moringaceae	Moriingaa	3	1	3	3	2	4	**216**
Nicandra physaloides (L.) Gaeten.	Solanaceae	Asaangira	5	1	2	4	2	2	**160**
Ocimum basilicum L	Lamiaceae	Bassobilaa	5	1	2	4	2	2	**160**
Opuntia ficus- indica	Cactaceae	Adaamii	5	1	2	4	2	2	**160**

Table 3 continued----

Phoenix reclinata Jacq	Arecaceae	Meexxii	4	1	3	1	3	2	**72**
Permna resinosa (schimperi)(Hochest) Schauer.	Lamiaceae	Urgeessa	5	1	2	4	2	2	**160**
Piper capense L. f.	Piperaceae	Tunjoo	4	1	3	1	3	2	**72**
Rhus ruspolii Engl.	Anacardiaceae	Xaaxessaa	4	1	3	2	3	2	**144**
Ritchiea albersii Gilg.	Capparaceae	Doqqoo	4	1	3	2	3	2	**144**
Rothmannia ur-celiiformis (Heim.) Robyns	Rubitaceae	Bururi	4	1	3	3	3	2	**216**
Rubus apetalas Poir	Rosaceae	Goraa gur-raacha	4	1	3	2	3	2	**144**
Rubus apetalus Poir	Rosaceae	Goraa	4	1	3	2	3	2	**144**
Rubus steudneri Schweinf	Rosaceae	Goraa arbaa	4	1	3	2	3	2	**144**
Rubus volkensii Engl.	Rosceae	Goraa loonii	4	1	3	2	3	2	**144**
Rumex abyssinicus Jacq	Polygonaceae		5	1	2	4	2	2	**160**

Table 3 continued----

Rytigynia neglecta (Heim.) Robyns	Rubitaceae	Mixoo	4	1	3	2	3	2	**144**
Senna accidentalis (L.) Link	Fabaceae	Ataraqalme	4	1	3	2	3	2	**144**
Senna petersiana (Bolle) Lock	Fabaceeae	Laamsoo	4	1	3	2	3	2	**144**
Solanum nigrum L.	Solanaceae	Shayee	4	1	3	1	3	2	**72**
Sporobolus indicus (L.) R.Br.	Poaceae	Harataa	4	1	3	1	3	2	**72**
Sterculia afri-cana(Lour.)Fiori	Sterculiaceae	Qararu	4	1	3	2	3	2	**144**
Stereospermum kunthi-anum Cham.	Bignoniaceae	Botoroo	5	1	2	4	2	2	**160**
Strychnos mitis S. Moore	Loganiaceae	Mulqaa	4	1	3	2	3	2	**144**
Syzigium guineense (Willd) DC	Myrtaceae	Baddeessaa	5	1	2	4	2	2	**260**
Syzygium guineense subsp.macrocarpa (Engl) White	Myrtaceae	Goosuu	5	1	2	4	2	2	**260**
Teclea nobilis L.	Rutaceae	Hadheessa	4	1	3	2	3	2	**144**

Table 3 continued----

Vangueria apiculata K. schum	Rubiaceae	Burii	4	1	3	2	3	2	**144**
Vepris dainellii (Pic. Serm.) Kokwaro	Rutaceae	Kutaa	5	1	2	4	2	2	**160**
Vitex doniana sweet	Verbenaceae	Qupuraa	4	1	3	2	3	2	**144**
Ximenia americana L.	Olaceae	Hudhaa gammoojjii	4	1	3	2	3	2	**144**

4.2 Discussion

The evaluation of NUPs through quantitative method was used to identify the "most appreciated'' traditional crop plants for the diversification of agro-biodiversity, particularly in developing countries. The large number of NUPs (both wild and domesticated species), whose availability was limited to a specific climatic condition and culture, were not considered and evaluated for possible agricultural extension under their own microflora (Mwangi and Kimathi, 2006; Hughes, 2009). Most of these species are only known to certain ethnic groups while neighboring communities living under the same topography and climatic conditions are unaware of the existence of these economically important species.

Thus, the adaptation of these NUPs through knowledge transfer and applied research is mandatory for the intensification of agrobiodiversity, and consequently reduction of food shortage, malnutrition and poverty in developing countries (Frison et al., 2006; Hawtin, 2007; Feyissa et al., 2012).

The application of cultural food significance index (CFSI) makes it possible to quantify the role that a given botanical taxa plays within a particular community or culture (Pieroni, 2001). The current study, focused on ''Neglected and Underutilized Plant species (NUPs), has allowed for the identification of the most "culturally" appreciated and valuable plant species that are in the wild, domesticated, and consumed by the Oromo community in southwest Oromia, Ethiopia. According to this study, very high and high CFSI values generally occurred for many domesticated but underutilized tuber crop plant species (e.g., such as *Coccinia abyssinica* L.Yam.), *Colacaceae esculenta* L. (Schott) while wild fruits seem to have played a subordinate role. Pieroni (2001) reported "wild greens" with very high CFSI from Northwestern Tuscany, Italy.

Most of the previous ethnobotanical studies conducted in Ethiopia focused on the quantification of medicinal plants through consensus factor, preference ranking, amongst others, to determine the potential effect of individual plant species for the treatment of specific ailments. The studies reported on wild edible plants, (Gemedo-Dalle et al., 2005; Tolassa, 2007; Yirga,2010, Lulekal et al., 2011; Tibkew et al., 2004) focused on the identification of plant species and their usage by specific societies. Plant species with moderate, low and very low CFSI values can be explained largely by their relatively high availability and the minor frequency of use by the rural community. In this study area, most of the wild fruits are matured and ripened when major edible and commercial crops are in season, different to other arid and semi-arid regions of Ethiopia.

The wide application of this evaluation method in research, especially in developing countries could lead to the diversification of most potential crop plants through cultivation, where major selected crops are not yet sufficiently produced, due to a range of factors including topography and climatic conditions. In addition, as Pieroni (2001) pointed out, such a quantitative approach

could clarify relations between food consumption behavior of the old times and the present, and even provide insights for the study of the mechanisms which regulate the acceptance or rejection of foods by humans (Fallon et al., 1983). CFSI values could also be successfully evaluated in intercultural and interethnic quantitative ethnobiological studies (Barik, and Lykke 1999; Pieroni, 2001).

5.0 CONCLUSION

The region of southwest Oromia in Ethiopia is rich in both plant resources and the associated cultural knowledge. A large number of NUPs identified in this study can be domesticated, cultivated and promoted to commercial status to alleviate the regular food shortage, malnutrition and poverty in the region. For example, among the tuber crop plants [(*Cocconia abyssinica (*L).yam)], *Plectranthus edulis* Vatke), *Dioscorea alata* (L.) studied, yams were found to be the most appreciated but underutilized. This tuber crop can, however, be promoted at national and continenental levels.

This study recommends further knowledge transfer and extensive research on the adoption of these crop plants in neighbouring districts, zones and regional states with favouable climatic conditions.

In addition, the findings of this study recommend the establishment of small and medium enterprises to increase the value of NUPs in the region.

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