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Farmers' perception of agromorphological traits and uses of cocoyam (*Xanthosoma sagittifolium* (L.) Schott) grown in Ethiopia

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Cocoyam (*Xanthosoma sagittifolium* (L.) Schott) is one of the tuberous root crops in the Araceae family that has been grown in Ethiopia. It has spread widely and has become an important part of the agriculture and food systems of indigenous communities in southern and southwestern Ethiopia. However, less research attention has been given to cocoyam. It is a neglected/underutilized or ignored crop. A survey was conducted to assess the state of cocoyam in Ethiopia based on the farmers' perception. A purposive sampling technique was used to select 50 farmers from five zones. During the survey, two distinct cocoyam landraces (green and purple leaf colored cocoyam landraces) were observed. Numerous local names were given to the crop; the most commonly encountered names were "Keni Zhang", "Cubi Zhang", "Sudan Kido" and "Samuna Boina". The naming systems were, in most cases, followed by the local name given to taro (*Colocasia esculenta* (L.) Schott), as seen in the cases of "Zhang" and "Boina". The local term "Godere" or taro was also used for both *X. sagittifolium* and *C. esculenta*. Cocoyam is locally used for food (100%), fodder (60%) and other purposes such as medicine and organic fertilizer. Farmers use the local method in the preparation of cormels for food and medicine. Corms were preferred planting materials for Ethiopian farmers. The farmers' preference to cocoyam was related to adaptability, edibility of its young leaves and it serving as food security crop whereas hardness texture, low market demand, sour taste and unpleasant smell of cocoyam were farmers disliked traits. In this study, useful knowledge about cocoyam in Ethiopia was demonstrated. The quality and productivity of cocoyam in Ethiopia need to be improved based on farmer preferred attributes to ensure dissemination of the useful aspects and enhance sustainable production of cocoyam in Ethiopia.

Key words: Cocoyam, Ethiopia, indigenous knowledge.

INTRODUCTION

Cocoyam (*Xanthosoma sagittifolium* (L.) Schott) is an herbaceous tuberous root crop that belongs to the monocotyledons in the Araceae family. It is grown in the humid tropics and sub-tropics. There are many associated names to *X. sagittifolium*, which includes *Xanthosoma violaceum* Schott, *Xanthosoma atrovirens* K. Koch and

C.D. Bouche, *Xanthosoma mafaffa* Schott, *Xanthosoma brasiliense* (Desf.) Engl. and *Xanthosoma caracu* K. Koch and C.D. Bouche, all closely related to *X. sagittifolium*, but much taxonomic confusion reigns in this group of taxa.

Thus, the name *X. sagittifolium* has usually been given to all cultivated *Xanthosoma* species (Mayo et al., 1997; Bradshaw, 2010; Quero-Garcia et al., 2010). Several common names including tannia, yautia, malanga, callalo, cocoyam and new cocoyam are used to refer to the domesticated species of *Xanthosoma,* and *X. sagittifolium* is most widely known as cocoyam (Morton, 1972; Giacometti and Leon, 1994; Mayo et al., 1997; Raemaekers, 2001; Lebot, 2009; Quero-Garcia et al., 2010).

Cocoyam is likely to have been domesticated in the northern part of South America where it was cultivated from very ancient times (Giacometti and Leon, 1994). It is widely cultivated in tropical America, Africa, Asia, Caribbean and other parts of the tropics mainly by small-scale farmers (Mayo et al., 1997; Bown, 2000). It was introduced into Eastern Africa through Western Africa from tropical America (Giacometti and Leon, 1994), but unknown to many people in the region (Raemaekers, 2001).

In Ethiopia, cocoyam is largely unknown or synonymous with taro (*Colocasia esculenta*), which is known to have been grown since immemorial times (Simone, 1992). In the Flora of Ethiopia and Eritrea, volume six, wherein the tribes of the Araceae are described, taro was described as cultivated or naturalized near streams and waterfalls (Reidl, 1997) but the existence of cocoyam was not mentioned.

Cocoyam has spread widely and has become an important part of the agriculture and food systems of indigenous communities in southern and southwestern Ethiopia, where root and tuber crops are part of the local food systems of the people. It was ranked by farmers second among the top 10 most preferred plants around Bonga City in Kefa based on the use values, adaptability, cultural significance and other reasons (Asfaw, 2001). It grows even in poor soils and under dry conditions that are too difficult for cultivation of other tuberous root crops. It diffused mainly into the lowest settlements (below 1000 m.a.s.l.), and has already totally replaced taro in homegarden patches (Fujimoto, 2009). It was, however, mentioned that the fast expansion of cocoyam aggressively expands in the garden and competes at the household level threatening to replace staple food role of indigenous food crops (Asfaw, 2001; Woldeyes et al., 2016). Cocoyam has become the main edible aroid in many tropical areas (Bradshaw, 2010).

It is an important food crop in many parts of the world, mainly for smallholder farmers in playing a major role in the lives of many as a food security crop and has socio-cultural implications. Both leaves and starch-rich tubers can be eaten after cooking (Towle, 1961; Mayo et al., 1997; Ramawat and Merillon, 2014).

Cocoyam mainly grows as annual crop harvested after 8 to 12 months of growth. The senescence of the plant is used by farmers as a harvest index (Lebot, 2009). It is the best practice to regenerate this crop after 9 to 12 months when the central or mother plant begins to die down (Jackson, 2008).

Despite their increasing importance, less research efforts have been given to aroids. The preservation and use of aroids are far less unlike other major root crop genetic resources (Matthews, 2002). The major challenge of aroids production is the loss of a large pool of germplasm which is mostly held in farmers' fields and in the wild. These losses pose a threat to aroids germplasm conservation (Onwueme, 1999).

Many developing countries experience difficulty in sustaining, conservation and genetic improvement of aroids. Most of these crops are being conserved by the elder and/or are being left to grow on their own. Hence, these neglected root and tuber crops are being lost due to lack of knowledge on the importance of such crops (Matthews, 2002).

Ethnobotanical study can be important in genetic resource conservation and application in crop improvement. Early advances in ethnobotany provided us with utilitarian benefit of plants and on that basis plants were classified. Today, such documentation is essential for the conservation of earth's vast biological resources (Osawaru and Ogwu, 2015). Knowledge on different qualities that affect the use, preparation and consumption is important to plant breeders because it is critical for the acceptance of new cultivars by consumers (Matthews, 2002).

In Ethiopia, the indigenous knowledge of farmers on cocoyam has remained largely within the domain of farmers' knowledge in the rural areas. Research on cocoyam has been scarce in Ethiopia except a few attempts initiated at Agricultural Research Centers and Ethiopian Biodiversity Institute to collect and maintain its germplasm. No concrete work to date has looked at the cocoyam landraces of Ethiopia in the extent that cocoyam has been known by smallholder farmers.

Thus, Ethiopian farmers who cultivate the crop hold enormous indigenous knowledge of the local clones. They are the main owners of knowledge about the uses, cultivation practices and management of the crop. The main aim of this study was, therefore, collect the

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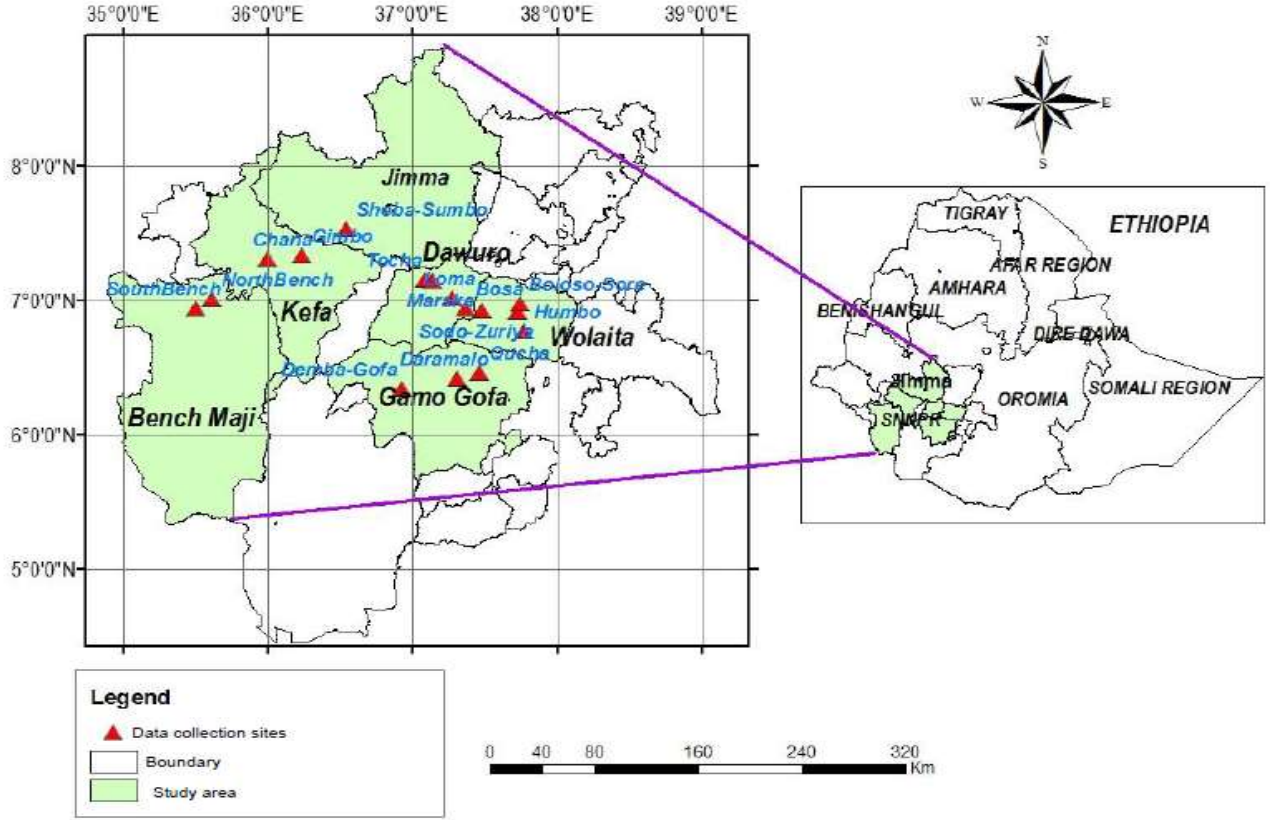

Figure 1. Map showing the location of the study area.

knowledge that is available in the farmers on cocoyam to retrieve the knowledge held by the farming communities who cared to manage and use this neglected crop species.

MATERIALS AND METHODS

Study area description

The Federal Democratic Republic of Ethiopia is composed of 9 Regions and 2 administrative Cities. The Regions are organized into Zones which are clustered into *Woredas* (Districts). *Kebeles* (Villages) are the smallest administrative units within the *Woredas*. The study area covered the cocoyam belt between latitudes 06°20.301′N and 07°25.213′ N and longitudes 035°29.829′E and 037°47.173′ E. Farms were located at altitudes from 1030 to 2319 m.a.s.l. (Figure 1 and Table 1) covered in for this study.

Ethical consideration

Before collecting farmers' indigenous knowledge and plant materials, informants were informed about the purpose of the research and its benefits clearly underlining the fact that the results will be used for academic purposes to improve the crop and that no commercial interest will be attached to it. Then, farmers were interviewed when they assertively said that this research is useful and agreed to provide the required information on their own.

Sampling frame and data collection

Data were collected from 10 Woredas (Districts) of five Zones (Bench-Maji, Kefa, Dawuro, Wolaita and Gamo-Gofa), which are located in the southern and southwestern parts of Ethiopia. A semi-structured interview guide was used to conduct individual interviews with 50 farmers by purposely sampling five best cocoyam cultivating farmers in each Woreda. During data collection, farmers were encouraged to express information in the way they perceived cocoyam by their own eyes through experience. The farmers were told to be free to tell all what they know about cocoyam on their own accord using their native languages. The general distribution of cocoyam in the study areas was observed during the survey. While recording the ethnobotanical data, the following factors were considered:

1. The cocoyam farming experience of farmers;
2. The introduction time of cocoyam to the farmers' locality and its origin in the garden;
3. The local name given to cocoyam and its meaning;
4. Whether Ethiopian farmers distinguish cocoyam from taro and if they do, how;
5. The general distribution of cocoyam and its present acreage status in the areas;
6. Local uses and preparation of cocoyam;
7. The staple food of the localities, how much land was allotted for cocoyam cultivation;
8. Farmers' preferred and/or disliked traits of cocoyam;
9. The farmers' planting material and cultivation methods;
10. The time course of planting and harvesting and

Table 1. Study areas and number of respondents.

Zone	No. of respondents		Woreda	No. of respondents		Altitude range (m.a.s.l.)
	M	F		M	F	
Bench-Maji	6	4	South-Bench	3	2	1312-1594
			North-Bench	3	2	1288-2070
Kefa	7	3	Chena	4	1	1800-2136
			Gimbo	3	2	1405-1745
Dawuro	8	2	Tocha	4	1	1245-1535
			Loma	4	1	1910-2319
Wolaita	5	5	Kindo-Koysha	2	3	1132-1315
			Humbo	3	2	1746-1925
Gamo-Gofa	8	2	Qucha	4	1	1204-1692
			Demba-Gofa	4	1	1189-1816
Zone total	34 (68%)	16 (32%)	Woreda total	34 (68%)	16 (32%)	

Table 2. Age of respondents and their experience of cocoyam cultivation (N = 50).

Zone	Age of respondents (year)					Experience of cocoyam cultivation (year)			
	20-30	31-40	41-50	51-60	≥61	1-10	11-20	21-30	≥31
Bench-Maji	4	6	-	-	-	3	4	3	-
Kefa	1	5	2	2	-	2	4	3	1
Dawuro	-	5	2	1	2	2	2	6	-
Wolaita	-	3	3	1	3	4	3	2	1
Gamo-Gofa	2	2	2	1	3	2	2	4	2
Total	7 (14)*	21 (42)	9 (18)	5 (10)	8 (16)	13 (26)	15 (30)	18 (36)	4 (8)

N, Number of respondents; *Numbers in parenthesis indicate the percentages.

11. Methods that farmer have adopted for conservation of cocoyam.

Data analysis

Data were entered into excel spreadsheet, and descriptive statistical analysis was made. From the interview data, free lists and informant consensus were calculated and the resulting values expressed as percentage. Voucher specimens (leaf) were prepared and deposited at the National Herbarium of Addis University for reference purpose.

RESULTS

Age of farmers and cocoyam farming experience of farmers

The respondents whose age ranged from 20 to 83 years were responded to the interview. They lived in their area for at least for 15 years. A total of 26, 30, 36 and 8% of the respondents cultivated cocoyam for ≤10, 11 to 20, 21 to 30 and >30 years, respectively. 74% of the respondents have cultivated cocoyam for more than 10 years (Table 2).

Distribution and cultivation of cocoyam in the study area

During this study, only the green cocoyam (green leaf) was observed in Benchi-Maji, Kefa and zones while the green and purple (purple leaf) were observed in Dawuro, Wolaita and Gamo-Gofa Zones (Figure 2).

In these zones, the purple cocoyam was observed more frequently than the green cocoyam. According to the farmers, the acreage allocated to cocoyam cultivation has been increasing in their localities since they have known the crop. Adaptability (fast expanding ability) and re-emerging ability from under buried corm whenever it

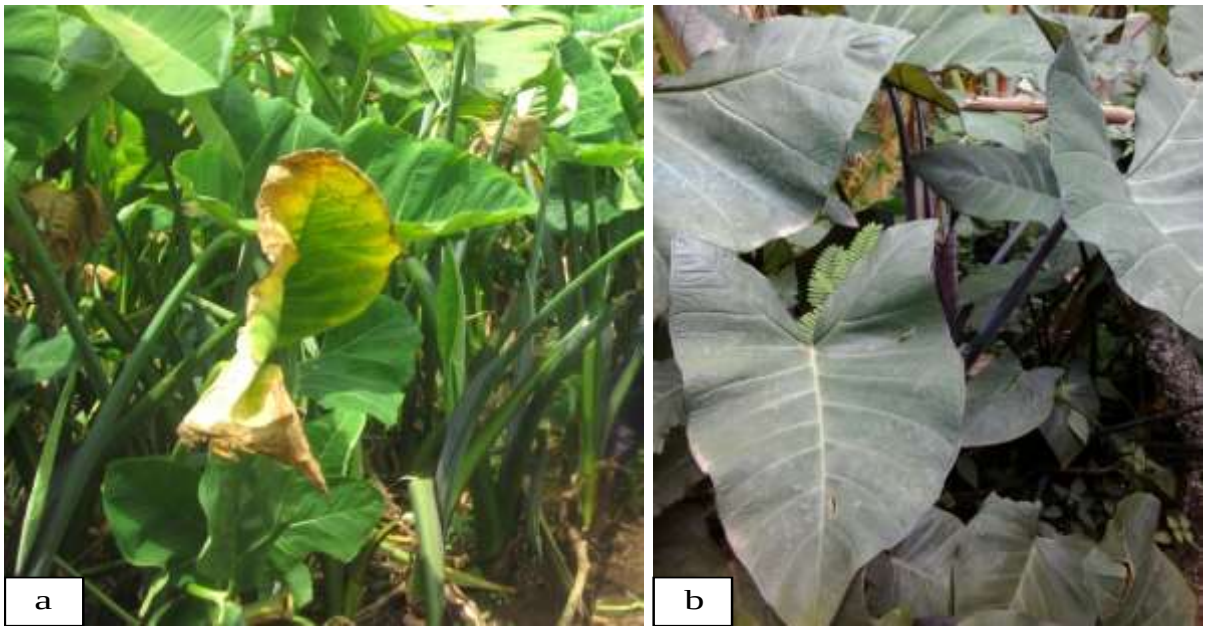

Figure 2. Cocoyam plants: Green cocoyam, “Cubi Zhang”, from Bench-Maji Zone, South-Bench Woreda (a) and purple cocoyam, “Samuna Boina” from Wolaita Zone, Humbo Woreda (b). Source: Eyasu Wada (2016).

gets rain were mentioned by all respondents’ farmers for the present acreage increment of cocoyam in their localities.

Farmers mainly rely on rainfall for cocoyam cultivation. In surveyed areas, the cocoyam cultivation is in smallholder farm. The low palatability due to hardness (not being soft enough to eat with ease), sour taste, unpleasant smell and the low market demand are farmers’ reasons for allocating a narrow plot of land for cocoyam cultivation.

Most farmers (94%), cultivate cocoyam at home garden patches as a backyard garden crop that grows closely associated with the living houses. Cocoyam is also found at distant farms (outfield farm) mixed with taro or alone in Bench-Maji and Kefa zones and in the natural ecosystem and around road sides, as a weed in the shade of other plants or as an ornamental plant in urban centers.

Local names of cocoyam and meanings

In different ethno-linguistic communities of Ethiopia, various local names are used for cocoyam. The naming systems are, in most cases, followed by the local name given to taro (*C. esculenta*).

Respondents (70%) consider cocoyam as a variety of taro, but they distinguish it from taro mainly by leaf pigmentation and size, shape of cormels and size of corms. The local names “Keni Zhang” and “Cubi Zhang” were used for cocoyam in the Bench-Maji Zone. The majority (80%) of the respondents from Bench-Maji relate the terms “Keni” and “Cubi” as the crop was introduced from Kenya and Cuba, respectively.

The term “Zhang” is used for taro in “Bench” language. Local terms such as “Gocheli” Kido” and “Sudan Kido” were used to refer to cocoyam by farmers of the Kefa Zone. According to the respondents, the term” Sudan” was used to indicate that cocoyam was introduced into Kefa area from Sudan.

The local names “Tepiya Boina”, “Samuna Boina”, “Gudeta” and “Agarfa” were used for cocoyam in the Dawuro Zone. Farmers use the term “Tepiya Boina” for green leaf cocoyam, and consider that green cocoyam had been introduced into their areas from Tepi area of Bench-Maji Zone. The term “Samuna” means soap in “Dawuroto” language is given to purple cocoyam due to its cormel having a smell of soap when cooked.

In Dawuro area, prefix “Zo’o” meaning red is used for purple cocoyam to distinguish it from the green cocoyam. The term “Boina” is local term used for taro. The local names “Samuna Boina”, “Dawuro Boina”, “Faranja Boina”, “Tonneka” and “Badadiya” are used for cocoyam in Wolaita Zone.

The meaning of the term “Samuna” is similar to that given in Dawuro Zone. The term “Dawuro Boina” is used for cocoyam in Kindo Koysha Woreda of Wolaita Zone, which is bounded by Dawuro Zone indicating that cocoyam was introduced into Kindo Koysha Woreda of Wolaita Zone from Dawuro Zone.

Farmers’ use the term “Faranja Boina”, which is to mean ‘*foreign taro’*, for cocoyam to indicate that it is an introduced crop.

According to respondents, the term “Tonneka” is used for purple cocoyam landraces of Ethiopia because it has

Table 3. Source of cocoyam clones for planting in gardens.

Zone	Woreda	Number of respondents				
		Market	Nearby area	Neighbor	Family and relative	Do not remember
Bench-Maji	South-Bench	-	-	2	1	2
	North-Bench	-	-	2	1	2
Kefa	Chena	-	-	2	1	2
	Gimbo	-	-	2	2	1
Dawuro	Tocha	-	2	-	-	3
	Loma	-	1	1	-	3
Wolaita	Kindo-Koysha	2	2	1	-	-
	Humbo	1	-	1	-	1
Gamo-Gofa	Qucha	-	-	2	2	1
	Demba-Gofa	1	-	2	1	1
Total		4 (8%)	5 (10%)	15 (30%)	10 (20%)	16 (32%)
		34 (68%)				

a sour nature when eaten. The term “Badadiya” is used for green cocoyam to indicate its giant size. “Samuna Boina”, “Tonneka” and “Badadiya” are local terms given to cocoyam in Gamo-Gofa Zone. The meanings of these terms are similar to those explained in Dawuro or Wolaita Zones, due to all languages belonging to *Omotic* language family.

Cocoyam introduction and tuber sources for garden cultivation

Majority (84%) of the farmers could not remember the year when cocoyam was introduced into their areas. Some farmers in South-Bench Woreda of the Bench-Maji Zone remembered that the crop was introduced into their areas in mid 1970s by Cubans, who came to Ethiopia to build micro dams after the 1974/1975 major drought. Some farmers of Kefa Zone recall that cocoyam was introduced into their area two to three years before the fall of the Durg regime (previous governance) in 1991. According to some respondents from Tocha and Loma Woredas of Dawuro Zone, cocoyam was introduced during the settlement program (1986). Cocoyam tubers for garden cultivation comes from market, nearby area, neighbor, family and relatives but 16 (32%) did not remember the origin of cocoyam in the garden (Table 3).

The farmers’ planting material and cropping system

50% of farmers use the corm and the shoot bud cutting that contains some corm tissue for cocoyam propagation. The remaining half use corm and cormels for planting material. Farmers prefer using corms and shoots cuttings for propagation because cormels are used for consumption while the corms have no food value. In the study areas, cocoyam is cultivated in a mono and mixed cropping system. 30, 30 and 40% of the respondents’ crop cocoyam by mono, mixed and both cropping systems, respectively. When it is grown in mixed cropping system, it grows mainly mixed with taro (*C. esculenta* (L.) Schott), enset (*Ensete ventricosum* (Welw.) Cheesman), banana (*Musa* spp.) or coffee (*Coffea arabica* L.). Farmers prefer to cultivate cocoyam mixed with coffee due to its shade tolerance, and its leaves serve as organic fertilizer for coffee when they detach from the plant.

Land preparation, planting and harvesting

The time of seed bed preparation and planting time of cocoyam varies in different zones. In Bench-Maji Zone, the land is prepared in May and planting is mainly from June to July. In Dawuro, Wolaita and Gamo-Gofa zones, land preparation is from late November to January and planting takes place from February to March at the onset of rain. According to all respondents, harvesting cormels leaving the mother plant in the place as a perennial crop was commonly used methods for harvesting cocoyam cormels. The crop can also be harvested 9 to 12 months from the date of planting. During harvesting, farmers use local methods which involve digging around the plant and applying force to uproot the crop.

The local uses of cocoyam

All respondents (100%) use cocoyam for food although

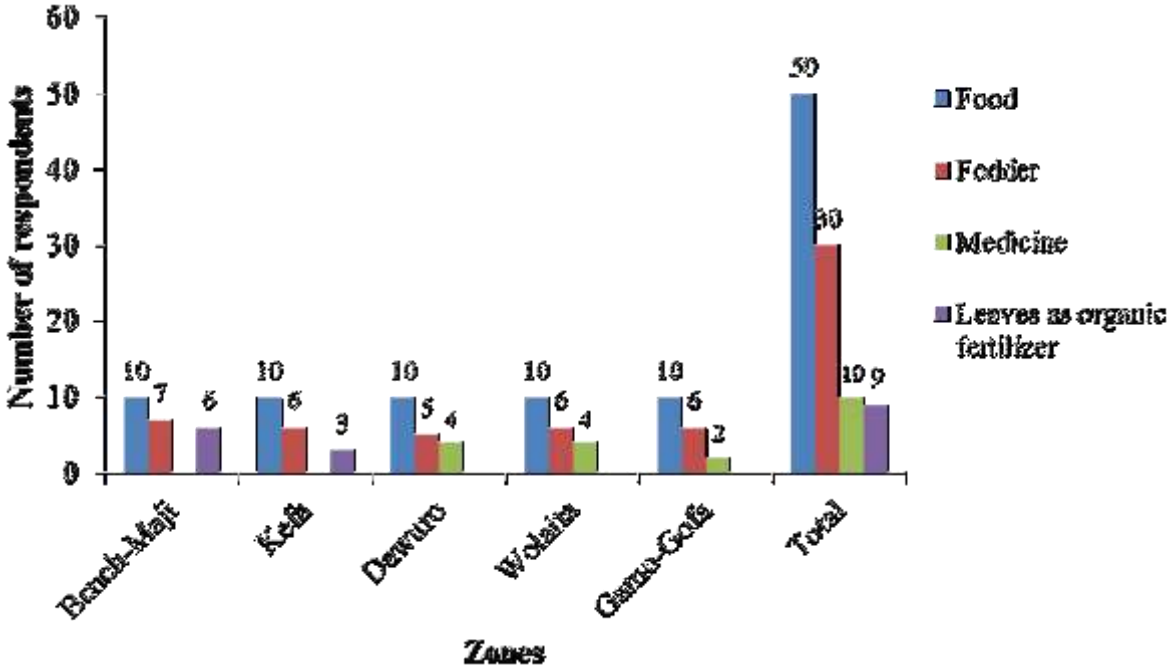

Figure 3. Local uses of cocoyam: In each Zone, 10 farmers were interviewed.

the status in which the cocoyam used for food, the part of cocoyam used for food and the mode of preparation is different from one zone to another. 6 and 3 respondents from Bench-Maji and Kefa zones, respectively, responded that leaves of cocoyam serve as organic fertilizer for coffee when leaves are detached from the plant (Figure 3). Farmers of Dawuro, Wolaita and Gamo-Gofa zones, where the purple cocoyam was observed, responded that the purple cocoyam has less food value when other crops are available. According to farmers of these zones, purple cocoyam serves only as emergency food and is mainly eaten by those people who are at low economic status and are food deficient. The purple cocoyam is classified by the respondents to be a non-preferred food crop because of its sour taste and unpleasant smell.

Mode of preparation when used for food

After cooking, cormels are eaten with milk, “Berbere” (chili pepper) or “Chemo” (local hot drink prepared from the leaves of coffee, ground in mortar and pestle and boiled after mixing with spices). All 20 farmers interviewed from Bench-Maji and Kefa zones responded that cocoyam can be prepared for food by roasting on hot stones. In Dawuro Zone, 6 respondents out of 10 farmers responded that in addition to being eaten by cooking, cocoyam is prepared as “Dinich” sauce which is prepared as potato sauce and eaten with “Enjera” (Ethiopian thin spongy bread). The young leaves of cocoyam are used for food by preparing as cabbage (cooked leafy vegetable), mixing with cabbage and eaten with “Kita” in Bench-Maji Zone. Respondents from Dawuro Zone indicated that only those people who are traditionally considered belonging to the lower social stratum eat the leaves of cocoyam as cooked leafy vegetable.

Cocoyam as a medicinal plant

A total of 10 farmers from Dawuro, Wolaita and Gamo-Gofa zones responded that purple cocoyam is considered to have medicinal value (Figure 3). According to these farmers, the purple cocoyam crop is used to treat “Wulawushiya”, “Barqa” and “Gergeda”. “Wulawushiya” (*Omotic* language) is a general term for yellow eye, from liver disease or from any disease that affects liver or disease that burns urinary tract and symptomized by the presence of blood in urine. In medical term, it is related to hepatitis virus infection. “Barqa” (Omotic language) or postpartum depression or is a kind of pain women feel due to contraction of uterus after delivery. To relieve from pain, a woman who gave birth use the purple cocoyam cormels. According to respondents, the purple cocoyam cormels, cooked using pot, peeled, grinded, mixed with butter and spices such as garlic (*Allium sativum* L.), black cumin seeds (*Nigella sativa* L.) and onion (*Allium cepa* L.) to treat “Wulawushiya” relieve from pain. All respondents from Kindo Koysha Woreda of Wolaita zone also mentioned that the leaf of purple cocoyam is used to treat

Table 4. Traits of cocoyam and farmers' preference.

Preferred trait	No. of respondent from each Zone					Total (%)
	Bench-Maji	Kefa	Dawuro	Wolaita	Gamo-Gofa	
Edible	10	10	10	10	10	100
Emergency food	10	10	10	10	10	100
Serve as fodder	7	6	5	4	6	56
Leaves serve as fertilizer	9	6	2	2	4	46
Short cooking time	10	8	-	-	-	36
Harvesting cormels leaving the plant in place	9	4	4	-	-	34
Young leaves being edible	10	-	-	-	-	20
Medicinal	-	-	4	4	2	20
High yield	4	3	-	-	2	18
Disliked trait						
Sour taste, unpleasant smell and continuously eating could be irritable	6	5	8	10	8	74
Corm inedibility	10	10	4	5	5	68
Hard texture to eat	6	5	6	8	7	64
Not appetizing	2	1	4	-	-	14

"Gerigeda" (Omotic language) or "Qurtimati" (Amharic term) or rheumatoid arthritis which is generalized pain in joints by scrubbing leaves on the pain feeling areas of the body.

Cocoyam traits and farmers' perception

Edibility and cocoyam serving as a food security crop (emergency food) are traits of cocoyam that all of the farmers prefer (Table 4). Other traits of cocoyam such as the palatability of leaves in addition to cormels, adaptability and possibility of detaching cormels by leaving mother plant in place, short cooking time, and possibility of cormels to be roasted on hot stone were raised by farmers as a preferred trait of cocoyam. However, there are farmers dislike traits of cocoyam including, low market demand, sour taste, unpleasant smell (purple cocoyam), and inedibility of the huge corm. Sour taste, unpleasant smell and irritating nature of cocoyam when eaten continuously are traits of cocoyam that most (74%) of the farmers dislike (Table 4).

DISCUSSION

In Ethiopia, there are numerous highly localized local names used for *Xanthosoma.* The meanings of the local names were linked either with the area of collection or the crop's particular trait such as the growth condition.

Similar study conducted in Edo State, Nigeria indicated that the local people distinguish cocoyam local types by area of collection (Osawaru and Ogwu, 2015). Various local names have also been used for *X. sagittifolium* worldwide (Morton, 1972; Giacometti and Leon, 1994; Mayo et al., 1997; Raemaekers, 2001; Maundu et al., 2009; Lebot, 2009; Quero-Garcia et al., 2010*).*

In this study, it is identified that the majority of local names were followed by local names given to taro (*C. esculenta*), and the Ethiopian farmers consider cocoyam as a variety of taro. According to Maundu et al. (2009), *Xanthosoma* related to *Colocasia* frequently share the local names taro and cocoyam.

It was recognized that the term taro or "Godere" (Amharic term) is used for both aroids (*Colocasia* and *Xanthosoma*) although the local farmers distinguish the two crops and gave different local names. In most literature, cocoyam was discussed jointly with the taro, and this practice

obscured the distinction between the two crops (Onwueme, 1999). Morton (1972) noticed that the familiarity of *Xanthosoma* had been burdened by highly localized vernacular names hence she proposed the general adoption of the euphonious and appetizing term, cocoyam, as a collective trade name for *Xanthosoma* species. However, the term cocoyam has been used not only for *Xanthosoma* rather it has been used for both *Xanthosoma* and *Colocasia* (Lebot, 2009; Owusu-Darko et al., 2014; Osawaru and Ogwu, 2015).

In many parts of Asia and Pacific, the term tannia which is a modification or qualification of the term taro has been used for *Xanthosoma*. Onwueme (1999) wrote in her book *Cocoyam Cultivation in Asia* and *Pacific* that taro (*C. esculenta*) should not be confused with the related aroid *Xanthosoma* species. Recently, molecular markers based studies have been applied to resolve cocoyam and taro (Doungous et al., 2015; Osawaru and Ogwu, 2015).

Cocoyam was introduced into the surveyed areas later than taro, as recalled by farmers who grow both crops. Nebiyu et al. (2008) reported that taro and cocoyam accessions were collected from Ethiopia and introduced from abroad, since 1978. Another report mentioned that cocoyam entered the Malo area of Gamo-Gofa zone in the southwestern Ethiopia in the 1980s (Fujimoto, 2009).

Some farmers from Benchi-Maji and Kefa Zones responded that the introduction time of cocoyam was mid-1970s. Circumstantial evidence, however, forces us to believe that this crop has much longer history in Ethiopia perhaps having been introduced across the borders but this needs to be confirmed.

During this study farmers responded that the acreage of cocoyam has been increasing in their areas since they have known the crop. Cocoyam has expanded into new areas in western Africa since its introduction in the 16th or 17th century, and its importance is increasing since then (Maundu et al., 2009).

Previous studies in Ethiopia also indicated that cocoyam grows even in poor soils and under dry conditions (Asfaw, 2001; Fujimoto, 2009). Due to the related factors such as better yield, more robust and drought tolerance, cocoyam has become an important food for over 400 million people and has become the main edible aroid in many tropical areas (Giacometti and Leon, 1994; Matthews, 2002; Lebot, 2009; Maundu et al., 2009). This indicates that cocoyam has a potential to be produced in larger quantities.

Farmers also mentioned that the acreage increase of cocoyam is related to its adaptability (fast expansion ability) and re-emerging ability whenever it gets rain from under buried corm. Similar study conducted in Uganda revealed that most respondents believed that cocoyam cannot get extinct. They believed that even a small peeling of the crop can get established into a full plant. Due to this belief, it was mentioned that there are no concerted efforts to conserve cocoyam within the farming communities in Uganda (Muhumuza et al., 2016).

Similarly, most of the Ethiopia farmers adopted harvesting cormels leaving the plant in place as perennial crop for germplasm conservation. When farmers need to expand the areas of cultivation, corms are halved and re-planted. Most respondents (68%) mentioned that they had introduced cocoyam into their home garden either from relatives, market or from nearby areas. It was also noticed that the traditional seed supply systems are the major way of seed supply in the surveyed areas.

In the study areas, cocoyam is cultivated in a mono and mixed cropping system. Farmers who cultivate cocoyam in mixed cropping system indicated that cocoyam is shade tolerant and it could serve as organic fertilizer when the leaves fall off. The farmers' response is in line with the research reports. Lebot (2009) pointed out that cocoyam could tolerate a certain level of shade. Mazhar (2000) noted that mixed cropping of cocoyam with other crops is crucial to improve soil fertility.

In this study, the respondents mentioned that cocoyam cormels are used for human consumption after cooking or roasting and the cocoyam corm is not used for human consumption. In concordant with farmers response, it was also reported in literature that domestication history of cocoyam was based on processes such as roasting and cooking tubers, the usable parts in cocoyam are the subterranean tuberous off shoots known as cormels and the main corm is usually acrid and is not eaten (Giacometti and Leon, 1994) or it is only eaten when no other food is available, during and after cyclones in some Pacific Islands (Lebot, 2009).

This might indicate that the knowledge of the traditional way of preparing cocoyam for food was transferred to Ethiopia with the crop. If it is according to farmers' response, cormels of purple cocoyam could be eaten only at the time of food emergency. Farmers in Dawuro, Wolaita and Gamo-Gofa Zones responded that purple cultivar provides medicinal values such as to treat "Wulawushiya" (hepatitis), "Barqa" (postpartum depression) and "Gergeda" (Rheumatoid arthritis).

According to Nzietchueng (1988), some of the genus *Xanthosoma* spp. such as *Xanthosoma auriculatum*, *Xanthosoma helleborifolium*, *Xanthosoma mexicanum*, *Xanthosoma pentaphyllum* and *Xanthosoma robustum*, are used as medicinal plants. Thus, since there is dearth of information on the taxonomy of species, the purple cocoyam landraces of Ethiopia may be related to either of these species which are used as medicinal plant or the purple cocoyam growing in the surveyed areas which may be related to *X. sagittifolium* variety growing in Pacific Islands, which are only eaten when no other food is available (Lebot, 2009).

Farmers from Bench-Maji Zone who responded to the interview explained that the young leaves of cocoyam are eaten after cooking in addition to cormels. In literature, it was mentioned that young leaves of some cocoyam cultivars can be used as a vegetable, and can be an important source of proteins and vitamins (Giacometti

and Leon, 1994; Lebot, 2009). The young leaves must be well cooked because they contain calcium oxalate crystals, which irritate the throat and other internal body lining if half cooked. Cocoyam was originally introduced to Africa for their cormels, but their leaves are now also used as a vegetable (Maundu et al., 2009).

Traits of cocoyam that farmers prefer include adaptability, young leaves edibility (Benchi-Maji Zone), short cooking time, and importance for the time when there is a shortage of other foods (serving as food security crop). Most of the farmers' preferred traits of the study survey are the traits of preference by Nigerian farmers (Osawaru and Ogwu, 2015). In another way round, in Ethiopia, farmers disliked traits such as low palatability, corm inedibility, hardness and acridity hinder its potential to be a major crop.

Conclusion

This study presents different aspects of cocoyam in the study area. There are a lot of local knowledge on agromorphological traits and uses of cocoyam. The crop is known by different local names. The majority of local names were followed by the local names given for taro. This could be related to the consideration of cocoyam landraces of Ethiopia as a variety of taro. Farmers identified cocoyam by different traits such as leaf color, corm size, corm and cormels shape and size.

In Ethiopia, cocoyam is not popular as other root and tuber crops such as potato (*Solanum tuberosum* L., sweet potato (*Ipomoea batatas* (L.) Lam.), taro (*C. esculenta* (L.) Schott) and cassava (*Manihot esculenta* Crantz). It is jointly considered with taro. So far, little effort had been given to collect, characterize and conserve cocoyam germplasm from its growing areas in the country and to document the farmers' indigenous knowledge. As a neglected crop, there are negligible efforts to popularize and diversify cocoyam in Ethiopia.

This is the first attempt to assess the state of cocoyam local types in Ethiopia based on the farmers' perception of agromorphological traits and uses of the crop through ethnobotanical documentation. Useful knowledge about the crop is demonstrated from the respondents. There is a need for more research to evaluate, improve and conserve the existing germplasm materials because the improvement and dissemination practices are important to promote the valuable aspect of the crop.

A thorough collection should be done by consulting farmers for guidance and taking the farmers indigenous knowledge into consideration. The crop should also be characterized at the molecular level to present the extent of genetic variability and to select the elite genotypes for improvement.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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