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# Mushroom consumption habits of Wacha Kebele residents, southwestern Ethiopia

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The purpose of this study was to assess mushroom consumption habit of Wacha Kebele residents. In this study 164 adult individuals (96 males & 68 females) were selected and used as information source in the study area. Data were collected from October 2009 to July 2010 by using structured open and close ended questionnaire, interview as well as personal observation. The result of the study indicated that most (93.29%) of the Kebele residents have awareness about mushroom consumption and its various benefits. Mushroom collection was mainly from forest followed by uncultivated land and termite nests and almost all family members (children, women and men) were involved in collection. However, none of the inhabitants was found to cultivate mushrooms due to various reasons, of which lack of awareness on possibility of cultivation was indicated by the majority (66.45%). All the inhabitants have also stated that the status of wild mushroom distribution has been sharply decreasing from time to time since the past two decades. From the current study, it can be concluded that though the majority of inhabitants in the study area like eating mushrooms and well aware about the current decrease in wild edible mushrooms, they have neither cultivated nor are aware about the possibility of cultivating mushroom, implying that there is an urgent need to initiate and create awareness among the inhabitants to adopt cultivation and conservation of such very important non-timber forest product in order to protect the decreasing status of the mushroom. Furthermore, such awareness and cultivation process could also be important to use the mushrooms for serving to diversify agricultural activity and supplement diet as well as income generation in the long run for the local farming community.

**Keywords/phrases:** Ethiopia, Forest-product, Mushrooms, Natural resource management, Wild edible fungi, Wacha Kebele

## INTRODUCTION

It has been estimated that over 70,000 species of fungi are found and of which about 2000 species (31 genera) are regarded as prime edible mushrooms (Moore, 2005). Study by Boa (2004) has also revealed that wild edible fungi are collected for food and to earn money in more than 80 countries. However, the number of poisonous mushrooms are relatively small, approximately only about 10% of some 30 species are considered to be lethal (Moore, 2005) so far.

There is undoubtedly high diversity of wild mushroom in Africa (Abate, 1998). However, information about wild edible mushroom is scarce in many countries of the continent. Boa (2004) briefly reviewed lack of reports in many African countries and availability of only few reports in others. He has also revealed that there are better reports regarding wild edible mushrooms in some

countries of the continent such as South Africa, Zambia, Zimbabwe, Nigeria, Congo Democratic Republic, Cameroon, Morocco and Kenya. For instance, Yokabi, *et al.* (2004) reported that mushrooms play important social, economic, and ecological roles in Cameroon. The use of mushrooms as a meat substitutes (when meat becomes very scarce) by the Esan people of Nigeria has also been reported by Osagualekhor and Okhuoya (2005). Additionally, Wambua (2004) reported that there are about 42 different indigenous tribes in Kenya, each of which has different eating habits and mushroom dishes are also prepared and served to foreign visitors.

Mushroom cultivation is a very recent activity in Ethiopia. The first small scale mushroom farm was started in 1997 by the cultivation of the oyster (*Pleurotus ostreatus*)

mushroom later, the button (*Agaricus bisporus*) followed by the shiitake (*Lentinula edodes*) mushrooms have been introduced to the local market (Abate, 1998).

Small scale mushroom production represents an opportunity for farmers interested as an additional work, and is specially an option for farmers with no adequate farm lands (Beetz and Kustudia, 2004) especially in the current alarmingly increasing Ethiopian population.

The consumption of mushroom can make a valuable addition to the often unbalanced diets of people in developing countries and they are considered to provide a fair substitute for meat with at least a comparable nutritional value to many vegetables (Marshall and Nair, 2009).

Edible mushrooms provide high quality of protein that can be produced with greater biological efficiency than animal protein, rich in fiber, minerals and vitamins and have low fat content, with high proportion of polyunsaturated fatty acids relative to total content of fatty acids (Marshall and Nair, 2009). In general, the gross composition of mushrooms is water (90%), protein (2–40%), fat (2–8%), carbohydrates (1–55%), fiber (3–32%) and ash (8–10%) (Firenzuoli *et al.*, 2008).

According to Tuno (2001), mushroom is a seasonal organism characterized by the alternation of rainy season, from May/June to September /October and a dry

season for the rest of the year mostly grows in the climate of Ethiopian plateau, particularly, in the south-western part of the country. The mushroom consumption habit and cultivation practice of people in Ethiopia and Wacha Kebele inhabitants in particular has not been well-documented so far though it is believed that many part of the country is suitable for mushroom cultivation. Hence, assessing people's awareness about importance of mushroom as well as their mushroom consumption habit will help for proper management of this natural resource in addition to serving as primary information for further research. The proper management and utilization of this resource would increase contribution of mushroom to food security in the country. Therefore, the objectives of this study are: first assessing mushroom consumption habits of Wacha Kebele inhabitants; second assessing indigenous knowledge about mushroom consumption, and finally identifying the major barriers on mushroom usage and consumption

## MATERIALS AND METHODS

### Study area and design

The study was conducted in Kaffa zone, Chena Woreda, Wacha Kebele, about 520 km away from Addis Ababa (Capital City of Ethiopia) towards southwestern Ethiopia. The woreda is mainly characterized by grazing, cultivated and semi-forest vegetation. The residents' main economic activities are dominated by subsistence agriculture. Wacha is located at 7°09' N latitude, 35°49' E longitude and it has area coverage of about 7.5 km<sup>2</sup> (Fig.1). A cross-sectional study was conducted on mushroom feeding habits of people Wacha Kebele from October 2009 to July 2010.

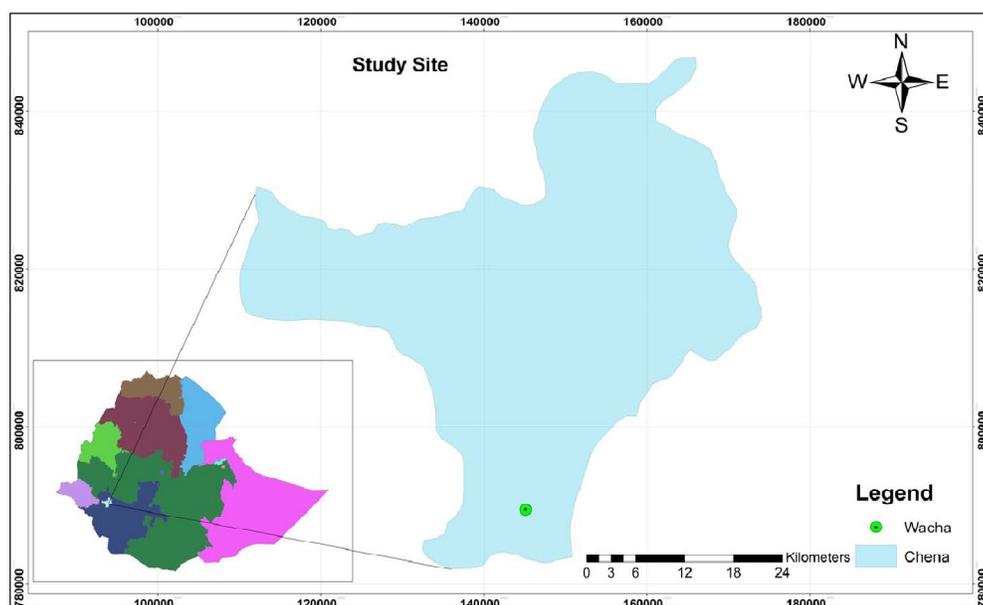


Figure1 Map of the study site

### Data Collection, sample size and sampling techniques

Prior to collecting data, a preliminary survey was conducted regarding the practice of the inhabitants in the study area in relation to mushroom eating habit and general information. Elders (whose age is 30 and above) were purposively used in the study and their names and ages were listed with the help of kebele leaders and local guiders. Then a structured and semi-structured open and close ended questionnaire was designed to collect information across the 1563 listed elder informants. Both interviews in the village and field visit were made together. The questionnaires mainly focused on informants background and experience, their knowledge and use of wild mushrooms, period of mushroom consumption and frequency of collection, role of different media in creating awareness about mushrooms, status of mushroom population in the past years, ability to distinguish edible from poisonous mushrooms, habitats and locations of mushroom sites, attitude and practice of mushroom cultivation (if any) and factors that initiate and hinder mushroom consumption/cultivation. Accordingly, about 10% (164) of elderly traditional resourceful inhabitants (96 males & 68 females) of the kebele/village were identified and interviewed to solicit their local knowledge and attitude towards edible mushrooms. The sample size was determined by following Daniel (1995) procedure, and then a simple random sampling was used to select and interview the target 164 adult individuals from the purposively selected 1563 total elder house hold heads:

$$n = \frac{NZ^2 PQ}{D^2(N-1)+2PQ}$$

Where, n= number of the sample size  
 N= total adult population (age ≥30)  
 P= prevalence of the problem  
 Z= confidence interval  
 D= Margin of the error  
 P=15%=0.15

Z= 95% from table of degree of freedom, value of 95% is 1.96 from the formula  $p+Q=1$

$$Q=1-p$$

$$= 1-0.15 = 0.85$$

$$n = \frac{(1563) (1.96)^2 (0.15)(0.85)}{(0.05)^2 (1563-1)+2(0.15)(0.85)}$$

$$n = \frac{765.563652}{3.905+0.255}$$

$$n = \frac{765.563652}{4.16}$$

$$n=184$$

$$\text{Final sample size (nf)} = \frac{n}{1+\frac{n}{N}}$$

$$nf = \frac{184}{1+\frac{184}{1563}}$$

$$nf = \frac{184}{1.11708}$$

$$nf=164$$

Finally, data was collected using field observation, close and open ended questions, and then analyzed using descriptive statistics.

## RESULTS AND DISCUSSION

The study covered 164 adult individuals of Wacha Kebele. The maximum annual income (> 4500 ETB) was earned by only few (45.73%) of the residents, indicating that the remaining majority earn very minimal, less than 375 ETB per month (Table 1). More than 54% of the population involved in the study was over 41 years old, while the rest were between the ages of 30-40 years old. It was also confirmed during the study that the residents hunt mushroom during rainy season (mainly June-September). Accordingly, women mostly hunt mushrooms around village while men usually collect from forest and distant areas (data not shown).

Table 1 Socio-demographic characteristics of the study population

No	Variables	Response	No	Percentage
1	Sex	Male	96	58.54
		Female	68	41.46
		Total	164	100
2	Age	30-40	75	45.73
		41-50	47	28.66
		51-60	24	14.63
		>60	18	10.98
		Total	164	100

3	Marital status	Single	26	15.85
		Married	134	81.71
		Divorced	4	2.44
		Total	164	100
4	Religion	Orthodox	108	65.85
		Protestant	42	25.61
		Muslim	9	5.49
		Catholic	5	3.05
		Total	164	100
5	Ethnicity	Kaffa	134	79.87
		Bench	13	7.93
		Amhara	12	7.32
		Oromo	6	3.66
		Guraghe	2	1.22
		Total	164	100
6	Annual income (ETB)	>4500	75	45.73
		1000-2000	52	31.71
		<1000	22	13.41
		2500-3000	9	5.49
		3500-4000	6	3.65
		Total	164	100

#### Awareness of residents about mushroom consumption

Most of the residents 153 (93.29%) have awareness about mushroom consumption and usage in the study area but few respondents (6.71%) did not have information about mushroom consumption in their area even if they are aware about possibility/availability of edible mushrooms elsewhere.

Those who had information about mushroom confirmed that the main source of information about use of mushroom for consumption was from school (70.59%) followed by friends (12.42%) and agricultural centers (7.19%), respectively. On the other hand, the contribution of health centers in serving as information dissemination about mushroom accounts only 4.58%. Similarly, media such as radio and other institutions like religious places account only about 3.26% and 1.96%, respectively (Figure 2).

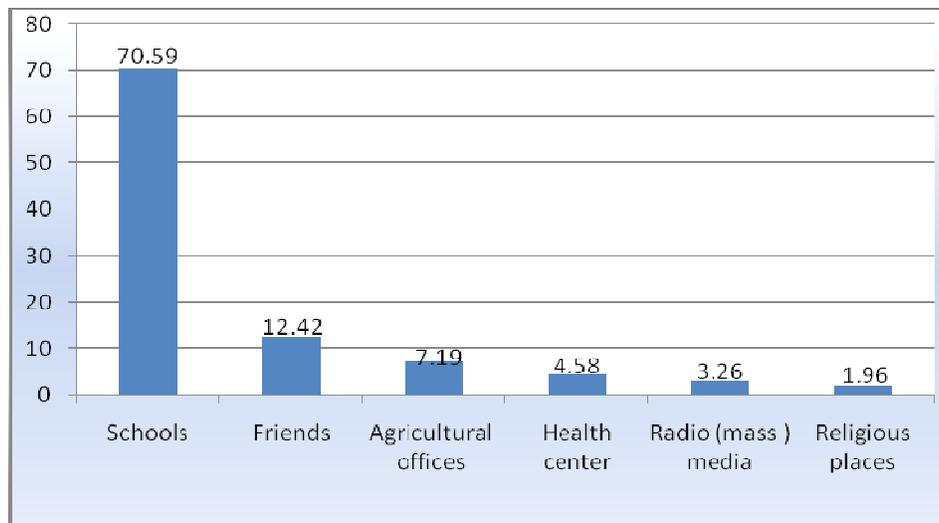


Figure 2 Contribution of various sources of information about mushroom consumption

It was also learned during the study that the majority (95.73%) of the respondents who knew about mushroom consumption like to consume mushroom (data not

shown) either by collecting themselves (92%) or other means when chance permits them (8%).

Among those respondents who had reasons for eating mushroom (Figure 3), 32.93% of them responded that mushrooms are substitute to meat and fish, (30.49%) eat mushroom because of its high nutritional value and also

(22.56%) of them said that they eat mushroom because of its good taste. Others (14.02%) of the inhabitants responded that mushrooms may be used for medicinal purpose.

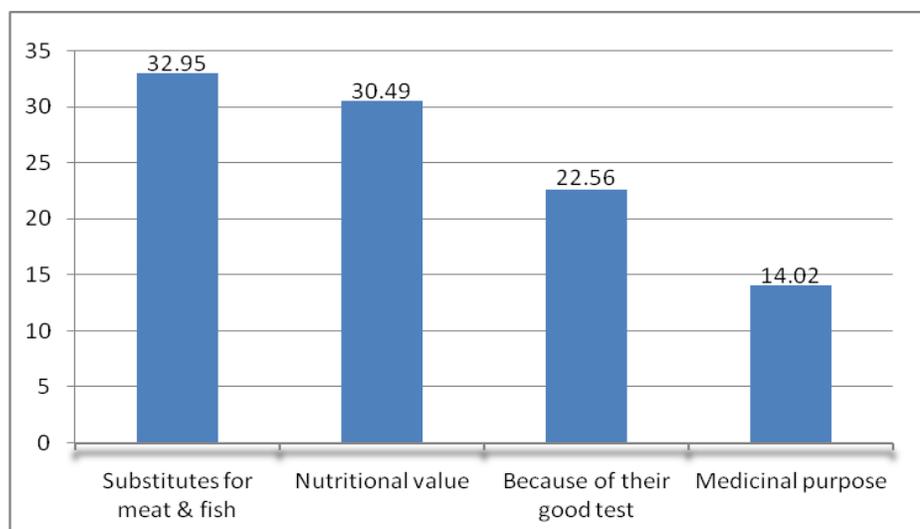


Figure 3: Respondents reasons (%) for eating mushrooms

From the total 164 respondents, 61.59% of them responded that mushrooms were collected sometimes, 43.41% of the respondents indicated that mushroom can be gathered when needed and the remaining (6.71%) of them reported that mushrooms gathered every day (Table 2). Other respondents (18.29%) mentioned that the collection of mushroom depends on seasonal variation. The seasonality of mushroom growth has been

reported in south western part of Ethiopia (Tuno, 2001). As clearly revealed from this study, the wild edible mushroom was mainly (80.48%) collected from forest while some collection was also from termite nest and uncultivated farm land (Table 2). If the collection was nearby to residence, usually women and children frequently involved to collect while men mostly involved in collecting from a distant and forest area.

Table 2 Frequency and sites of mushroom collection in Wacha Kebele

Frequency of collection by inhabitants (when mushrooms are available)	Respondents	
	No	%
Gather some times	101	61.59
Gather when needed	22	43.41
Gather every day	11	6.71
Others	30	18.29
<b>Total</b>	<b>164</b>	<b>100</b>
Where do people collect mushroom?		
Forest in the vicinity	132	80.48
Uncultivated land	16	9.75
Termite nest	12	7.31
Others (wood, soil etc)	4	2.44
<b>Total</b>	<b>164</b>	<b>100</b>

Concerning to the wild edible mushroom distribution in the study area, the dominant groups of mushroom types collected in the area were found to be *Termitomyces* spp.

and polypores (Fig 4) as confirmed during field observation while conducting this study.



a. *Termitomyces clypeatus*



b. *Termitomyces microcarpus*



c. *Laetiporus sulphureus* (polypore)

Figure 4 Some of representative wild edible mushrooms in Wacha Kebele

Regarding mushroom consumption as food, elderly people play significant role in initiating the consumption

followed by agricultural experts as can be observed from Figure 5.

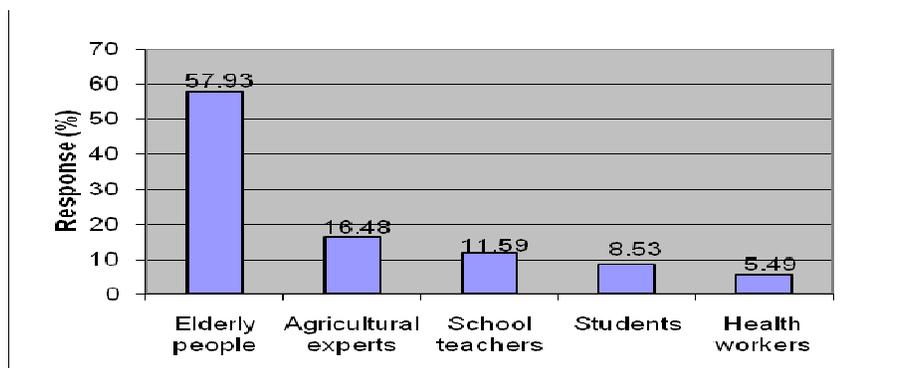


Figure 5 Mushroom consumption initiators

Among those respondents who used mushroom as a food source, the majority (67.07%) of them cooked as 'wot' while preparing and 29.88% of them fried/roasted whereas only about 3.05% respondents indicated that they utilize fresh (raw) mushroom.

A significant number of respondents (38.41%) mentioned that there is no obstacle that discourages to consume mushroom (Figure 6). However, others (37.19%) mentioned culture as a discouraging factor for mushroom

consumption. In addition, about 10.37% of respondents indicated that poor economic status could be a reason for discouraging mushroom consumption (in case mushrooms were sold in very few local open markets) and similarly, (20.37%) of respondents also felt that poor education/knowledge level negatively contributes. On the other hand, few (3.66%) of respondents mentioned that religion was a reason to be considered as obstacle to constraint mushroom consumption.

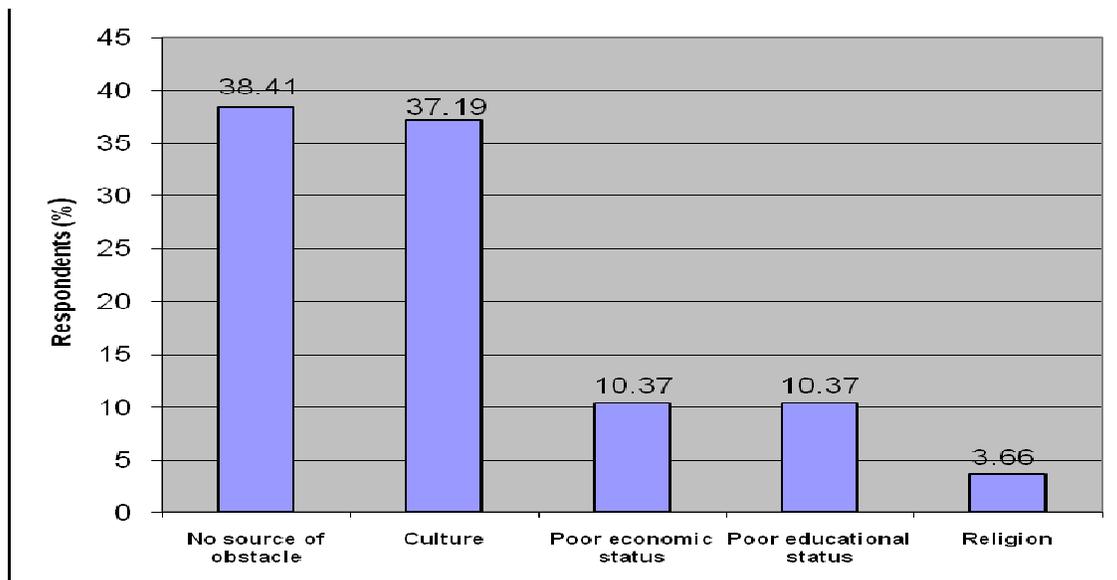


Figure 6 Factors that discourage mushroom consumption

All the respondents (100%) did not cultivate mushroom (data not shown) in Wacha kebele due to various

reasons (Table 3).

Table 3 Factors that hinder cultivation of mushroom in Wacha Kebele

Reasons for not cultivating	Respondents	
	No	%
Lack of awareness	109	66.46
Lack of facilities	39	23.78
Non-availability of the species/mushroom	14	8.54
Religion pressure	2	1.22
Total	164	100

Regarding knowledge of inhabitants about wild edible mushroom, a significant number of respondents (59.76%) mentioned they know about availability of wild edible mushroom in their locality/immediate vicinity (Table 4). The other impressive point about the inhabitants of

Wacha Kebele was that they clearly able to distinguish between edible and non-edible wild mushrooms and they gave different reasons such as mushrooms could be poisonous, may have bad smell and other reasons for not consuming those non-edible mushrooms (table 4).

Table 4 Knowledge of respondents about wild edible mushroom at Wacha Kebele

No	Variable	Response	No	%
1.	Are there wild edible mushroom in your locality?	Yes	98	59.76
		No	66	40.24
		Total	164	100
2.	Are there wild mushroom which you do not eat?	Yes	140	85.37
		No	24	14.63
		Total	164	100
3.	Reasons for not consuming non-edible mushrooms	Poisonous	48	34.29
		People do not eat them	41	29.29
		No good smell	36	25.71
		Visited by many insects	15	10.71
		Total	140	100

Among the respondents, 58.52% stated that they eat wild mushroom when they encounter by chance, 26.22% of them when they face shortage of food at home (Table 5),

others (8.54%) ate wild edible mushroom when they are attracted by good smell. However, none of the inhabitants answered that they eat wild mushroom always.

Table 5 Conditions under which people eat wild edible mushroom

Season or frequency and/or condition under which people eat wild edible mushroom	Respondents	
	No.	%
They eat always	-	-
During shortage of food at home	43	26.22
They eat when encountered by chance	96	58.54
They eat when they are attracted by good smell	14	8.54%
Do not eat at all	11	6.70%
Total	164	100

Regarding the current status of wild mushroom (both edible & non-edible) at Wacha Kebele, all of the 164 of the inhabitants indicated that there is a sharp decrease in mushroom as compared to previous years (particularly in the past two decades).

The main reasons for decreasing mushroom distribution in the current study were attributed to deforestation (66.62%) followed by chemical pollution (13.51%), urbanization (12.16%) and over harvesting of mushroom (8.11%) (Figure 7) as reported by the inhabitants.

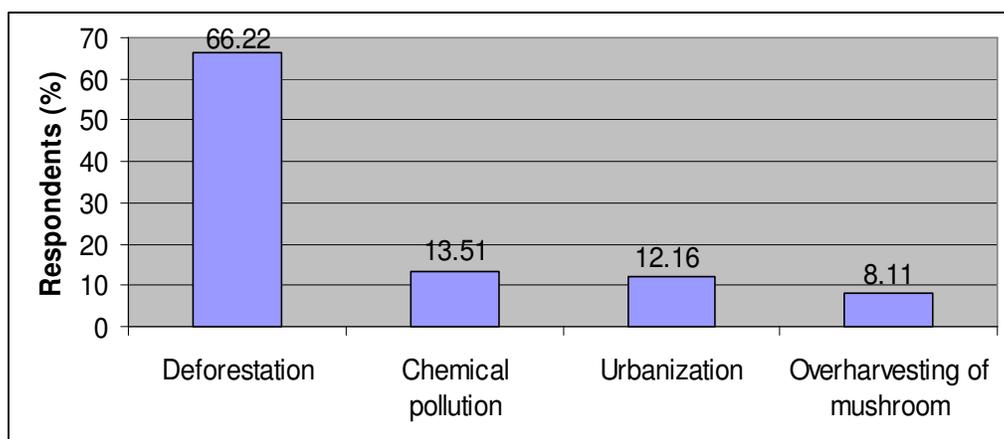


Figure 7 Reasons for decreasing trend of wild edible mushrooms distribution

Regarding whether the inhabitants support mushroom adoption/cultivation or not, most of the respondents (80.49%) supported adoption of mushroom cultivation in the study area.

Mushroom cultivation was not supported by some inhabitants (19.51%) because it takes a plot of land which is suitable for other cereals, (12.08%) and others stated that cultivating mushroom has no benefit economically because it is a seasonal food (7.43%).

## DISCUSSION

In this study, there is less involvement of various information sources such as religious places as well as radio, which is relatively the most available medium particularly among the rural communities and could have played major role in disseminating messages about the importance of mushroom. The little use of such means of information dissemination is a clear indication to work more in promotion and creating awareness among the inhabitants in the future. Mayett *et al.*, (2006) reported media and traditional recipes have important roles in increasing demand among consumers by creating awareness.

Wild edible mushrooms are important food sources for rural communities such as Wacha inhabitants particularly during the rainy season as observed during this study like in many regions of the world.

With Ethiopian growing population coupled with increase in demand for food, cultivation of mushroom can be one of the alternatives to address nutritional security in relatively small farm space and cheap substrates such as agricultural wastes which can also be recycled, thereby leading to conservation of natural resources. In Wacha Kebele, many people consume mushrooms with the understanding of their protein value (substitute of meat and fish), medicinal value as well as good flavor. Firenzuoli *et al.* (2008) has also reported mushrooms to be sources of water (90%), protein (2–40%), fat (2–8%), carbohydrates (1–55%), fiber (3–32%) and ash (8–10%). Furthermore, there is a large body of report that reveals various uses of mushrooms (functional food, and as natural therapy in the form of a medicinal extract mostly for prevention and treatment of cancer as well as other diseases) in countries like China and Japan as stated by Firenzuoli (2007). High fiber content, proteins, microelements and lower caloric content are found almost ideal for a nutrition program aimed to the prevention of hypercholesterolemia and cardiovascular diseases (Daba *et al.*, 2008). Similarly, the use of mushroom for anti-cancer activities (Mizuno, 1999; Gue *et al.*, 2006), reduction of total blood cholesterol and lipoprotein cholesterol (Chi *et al.*, 2005), antioxidant activities, the regulation of blood lipid levels and reduction of blood glucose levels (Gue *et al.*, 2006) have been

reported. Studies also revealed that the United Nations Food and Agriculture Organization (FAO) strongly advises the consumption of mushroom due to their high nutritional and medicinal values (Marshall and Nair, 2009).

The fact that elderly people contribute more in initiating mushroom consumption indicates that they are well aware about the nutritional and/or medicinal values of mushroom. In addition, experience of using wild edible mushroom in the area for a long time by the local people may also help to easily adopt the cultivation activity if supported by concerned body in the future.

In the present study, most of Wacha kebele people are very keen in differencing between the wild edible mushrooms from non-edible ones, experiences that came through oral communications from their elders. This is very interesting in that coupling such traditional knowledge with scientific description and identification of the edible fungi will have paramount advantage in sustainable utilization of the resource for various obvious purposes in the area as well as elsewhere in the region. Furthermore, such local knowledge could be even more important for people who are not familiar to the area as one should eat mushrooms only if one knows their names and their properties with considerable precision. On the other hand, Olfati *et al.* (2009) have reported that only some people in Guilan province of Iran know and identify wild edible mushrooms.

There has been significant trend of decreasing mushroom in the past years as confirmed from the residents of Wacha kebele mainly due to decline in forest coverage in the area. Since there has been expansion of agricultural land around the study area in the past years due to human population pressure, it was clear that deforestation is the main factor to reduce such essential non-timber forest product. It is also logical that chemicals (particularly agrochemicals) were additional factors to seriously affect the mushroom distribution as farmers use the chemicals to boost crop production. Similarly, alarming decline in wild edible mushroom populations has been reported from central part of Burkina Faso which was closely linked to disappearing forest habitats (Guissou *et al.*, 2008). On the other hand, in countries like Japan, the Republic of Korea, China, and the Russian Federation, the tradition of eating wild edible fungi is much stronger and appears to have withstood the changes experienced elsewhere as stated by Boa (2004). Hence, the population of wild edible mushroom is increasing in some of the developed countries probably due to better management of natural forests in contrast to the trend seen in developing countries.

Regardless of remarkable knowledge and interest of the local residents about mushroom consumption and its

importance in the study area, it is evident that there are severe weaknesses to initiate mushroom cultivation. For instance, there are little efforts by schools, agricultural experts and health workers to create awareness among consumers about importance of mushroom consumption and cultivation. Existence of apparent discrepancy between mushroom knowledge and infrequent mushroom consumption probably due to social valuation of mushrooms has been reported (Dijk *et al.*, 2003) among local people by a study made in Cameroon. However, in contrast to the current study, cultivation activities of mushrooms have been observed to serve various purposes in different countries. For instance, in Japan mushroom cultivation is an income generating activity both in rural and urban areas (Daba *et al.*, 2008). Similarly, in some African countries such as Benin and Cameroon, mushroom cultivation generates income, particularly for women thereby contributing to their economic independence (Dijk *et al.*, 2003).

Though none of the residents in the study area were involved in mushroom cultivation due to various reasons, the majority have remarkable interest of mushroom adoption. Such interest of the people to adopt mushroom is in agreement with investigation made in countries like Japan and China, in which the people strongly accept mushrooms cultivation for their obvious nutritional and medicinal values (Marshall and Nair, 2009). However, concerning some respondents who did not support mushroom cultivation explaining that it takes farmland, it looks that the farmers may not be well aware about productivity of mushrooms in relatively small area. On the other hand, Suman and Sharma (2007) have reported 1000 times higher production of mushroom protein and good amino acid content per unit area. Furthermore, contribution of mushrooms to make valuable addition to the often unbalanced diets of people in developing countries (Marshall and Nair, 2009) as well as their potential as substitutes to muscle protein and digestibility (89%) have already been documented (Marshall and Nair, 2009).

## CONCLUSION

Majority of inhabitants in Wacha kebele of southwestern Ethiopia have awareness about mushroom consumption and they like to eat mushroom (mycophilic) because they believe that eating mushroom substitutes meat and fish. However, as there is no intentional mushroom cultivation, there is a need to support the local people and establish at least small-scale mushroom farms, that could enable the farmers to produce not only for own consumption but it may also serve as additional income as they may supply to local hotels and restaurants in addition to creating job opportunity. The fact that there is a decreasing trend in distribution of edible mushrooms in

the study area due to deforestation, chemical pollution, and urbanization and over harvesting of mushroom calls for the need for environmental protection and awareness creation as well as technical support to enable the local inhabitants adopt mushroom cultivation. Moreover, detail diversity and distribution of mushrooms in the area and the region at large should be encouraged for better utilization of such environmentally friendly non-timber forest product.

## ACKNOWLEDGEMENT

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