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QUANTIFICATION OF CULTIVATED EDIBLE MUSHROOMS AND WILD EDIBLE MUSHROOMS TRADED AROUND VIRUNGA NATIONAL PARK, IN NORTH KIVU PROVINCE, DEMOCRATIC REPUBLIC OF CONGO

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ABSTRACT

The aim of this study was to estimate the quantities of cultivated edible mushrooms (CEM) and wild edible mushrooms (WEM) traded in the Virunga National Park (ViNP) in North Kivu in the Democratic Republic of Congo. Two hundred and sixteen (216) respondents were selected randomly as the sample size and they were divided evenly between growers and gatherers along each of the sites surveyed. The quantitative analysis was conducted using Statistical Package for the Social Sciences (SPSS) 26, at the 5% threshold. On the Beni-Mutwanga and Beni-Mangina axes, nine WEM species were identified in total. On the Goma-Rutshuru axis, there were six species, and on the Goma-Kitshanga-Mweso axis, there were five species. In all locations surveyed, only one species, *Pleurotus ostreatus*, was recognized by any of the growers. *Termitomyces microcarpus* had been chosen by fifty percent of respondents. The average yield that was acquired was 359 kg per crop cycle for all growers, while pickers got 78 kg during the short season (the rainy season from March to May) and 130 kg during the long season (the rainy season from September to January). Additionally, mushrooms provide essential nutrients, including selenium, potassium, riboflavin, niacin, vitamin D, proteins and fiber. Given their long history as a food source, mushrooms are of significant importance in traditional medicine due to their healing capacities and properties. It has been demonstrated that mushrooms have beneficial effects on human health and the treatment of certain diseases. A number of nutraceutical properties have been identified in mushrooms, including the prevention and treatment of Parkinson's disease, Alzheimer's disease, hypertension and high-risk stroke. Additionally, they are employed to diminish the probability of cancer invasion and metastasis due to their anti-tumoral characteristics. That is why, the introduction and training of farmers in the production of particular edible mushroom varieties may provide a new profitable annual income. These findings support the wild edible domestication (WED) (cultivation) of wild edible mushrooms in the surveyed areas, with the goal of increasing household income and thus contributing to in the conservation of the ViNP's ecosystems.

Key words: North Kivu, quantification, wild edible mushrooms, cultivated edible mushrooms

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INTRODUCTION

In Africa, Wild edible mushrooms (WEM) are an important food source [1, 2]. The particular importance of WEM lies in their use as a subsistence food in developing countries [3]. They make a significant contribution to maintaining the diet in Central and Southern Africa during the lean season. In some households, they are a valuable addition to the diets of rural populations. Some species have a value comparable to that of vegetables, while others have a high nutritional value [1].

Mushrooms are a source of income for the local population. However, profit margins for sales are higher for pickers and growers than for income from other activities [1, 4, 5, 6, 7]. Under certain conditions, the introduction of selected mushrooms at the origin of the plantation makes it possible to generate annual revenues that can rapidly exceed those from timber, as is the case in the South of France with the association of holm oak and Périgord truffle [8].

In Quebec, interest in mushrooms is finally only a decade old, thanks to a revival of foraging activity in the region and the culinary curiosity for wild edible mushrooms shown by Quebec chefs [9]. They state that species of the genera *Auricularia spp*, *Termitomyces spp* and *Schizophyllum spp* are of great economic importance on a national scale, and have great commercial potential. The harvesting economy, on which over 70% of the Congolese population depends, has never been taken into account as a spontaneous solution to poverty in Congo-Kinshasa. It is not through the success of any government program, nor through the dynamism of international cooperation, that the Congolese population maintains itself, but rather through the generosity of nature, which the foraging economy perfectly embodies [10]. A select group of species are of economic interest in terms of export [3].

It is estimated that there are around 140,000 species of mushroom in the world. Of these, 14,000 have been identified and 7,000 are considered to have varying levels of edibility [1]. According to César *et al.* [11], 1154 species of WEM have been recorded in 85 countries. In Benin, nineteen (19) species of WEM, are dominated by *Termitomyces*, and are mostly exploited by local populations for food purposes [12]. However, in Togo, 23 species have been identified as edible [5]. Nevertheless, according to Nikuze *et al.* [13] in Burundi, 20 WEM species have been identified and the most consumed are *Russula cellulata* (Siha), *Cantharellus platyphyllus* (Peri) and *Amanita loosii* (Rerya). According to De kesel *et al.* [2], the quantification of WEM in Haut-Katanga over three years provided precise information on the natural production, seasonality and habitat preferences of over (50) species. In addition, 74 mushroom species included in the diet of consumers in Kikwit (Kwilu Province) were identified by Madamo *et al.* [4].

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These authors revealed that the predominance of *Marasmiaceae, Cantharellaceae, Lyophyllaceae* and *Polyporaceae,* of the genera *Marasmius*, *Termitomyces*, *Cantharellus*, *Lentinus* and *Auricularia* are the most frequent mushrooms on the markets. On the other hand, 76 species of WEM have been inventoried by Rizinde [14]. This author highlights the basidiomycetes inventoried, which belong to 16 families including *Agaricaceae* (12 species), *Polyporaceae* (11 species), *Physalacriaceae* (9 species), *Marasmiaceae* (8 species) and *Lyophyllaceae* (5 species). These are the species most commonly found in and around the Parc National des Virunga (ViNP). Among the aforementioned inventories of WEM, it is observed that Congo-Kinshasa has more inventoried species compared to other countries [4, 14].

This interesting finding makes it more likely to have a large quantity of wild edible mushrooms in terms of production. However, apart from De kesel *et al.* [2] who quantified the WEM of Haut-Katanga over three years, estimating production at 20,000 tonnes per year, no other author has yet addressed this issue. In other countries, this parameter of quantifying WEM in their parks and protected areas at national level has already been addressed. By way of example, Belarus could produce 53,000 tonnes of WEM in 1981-1985, Canada 220-450 tonnes in 1995, 1,000 tonnes in 1999, China 308,000 tonnes in 1998, Estonia 2,200 tonnes over the period 1929-1938, Poland 3,500 tonnes in 1958, the Russian Federation 2,040 tonnes in 1930 and the USA 1,776 tonnes in 1992 [1]. Based on data provided by De kesel *et al.* [2] , Haut-Katanga could produce 20,000 tonnes of WEM over three years. It is estimated that, given its status as a single province, the Democratic Republic of Congo could potentially produce significantly more than it currently does at the national scale. Indeed, there is even the possibility of surpassing China, which produced 308,000 tonnes in 1998. This production can be increased if, and only if, the DRC combines the harvesting of wild edible mushrooms with the cultivation of edible mushrooms. African interest in the study of mushrooms has been steadily declining, but the number of specialized researchers in this field remains insignificant [15]. The aim of this study was to estimate the quantity of WEM traded within and around the ViNP.

MATERIALS AND METHODS

Description of the study area

The surveys took place in three territories: Masisi, Rutshuru and Beni (Figure 1). The main languages spoken by pickers and farmers in these three territories are Kinyarwanda, Kiswahili, Kinande and Kihunde. Kinande is spoken more in Beni and Rutshuru. Kinyarwanda is spoken mainly in Masisi and Rutshuru. Kiswahili is spoken by 50% of the population in the three territories. Kihunde is spoken mainly by the indigenous people of Masisi. The Beni territory has been subdivided into two axes,

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not only because of its potential for WEM, but also for CEM. The other territories were divided into a single axis (see Table 1). Beni site is located to the north-west of the ViNP.

The average altitude of Beni site is 1132 m. Its vegetation consists of wooded savannah and grassy savannah. The soil is clayey-sandy and suitable for agriculture. The average temperature is 25°C. The Masisi territory lies to the south-west of the ViNP in the mountainous part of eastern DRC. The average altitude is 1,754 m. The heterogeneity of the terrain means that climates vary. It is made up of many hills. Generally speaking, there is a close correlation between altitude and average temperature [16]. At low altitudes of 1000 m, the temperature varies from 22° to 28°C. At 1500 m altitude, the temperature varies from 19° to 22°C. Around 1900 m altitude, the temperature is below 15°C. This is the case in places like Ngungu, on the border between the Mupfuni Karuba group and the Ufamandul group. The climate is characterized by four seasons such as two dry seasons and two rainy seasons. The area is characterized by volcanic, sandy-humus and sandy-clay soils.

The vegetation consists of grassy savannahs with a mild climate, ideal for cattle and sheep rearing. Over 90% of the population of Masisi territory lives from agriculture [16]. The Rutshuru territory lies to the south-east of the ViNP, at an average altitude of 1,400m. Its eastern part is bordered by the Ugandan-Congolese border mountain range. Other high mountains are located on the shores of Lake Edouard, forming the Mot Bleue mountain range at an average altitude of 2,000 m. The soil is clayey and sandy-clayey. Its northeastern part is dominated by Lake Edouard. Temperatures range from 28° to 29°C. The area is distinguished by a microclimate resulting from the presence of the Virunga National Park forest at Rugari [17]. All these favorable characteristics for WEM and CEM in these three territories favored their choice as study areas in the vicinity of the ViNP.

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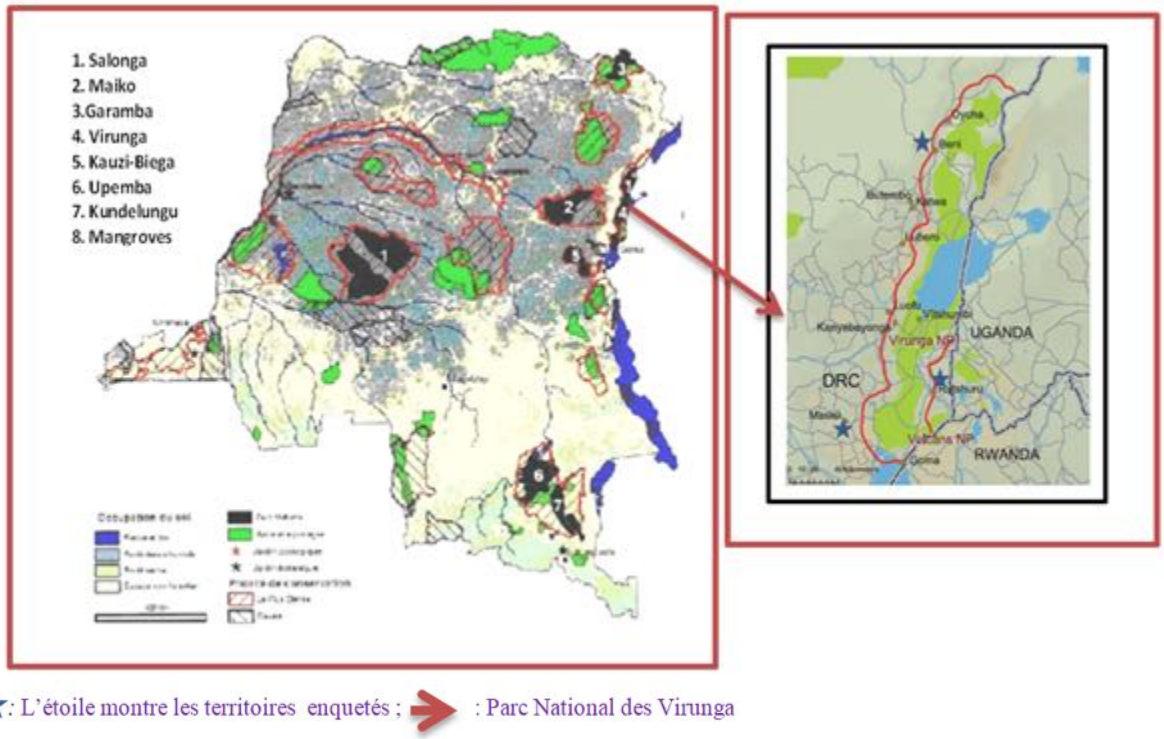

Figure 1: Description of the study area

Source: https://www.researchgate.net/figure/1A-Parcs-et-Reserves-Naturelles-de-la-RDC-La-carte-Numero-5-indique-le-PNKB_fig1_268809974
https://www.consoglobe.com/sos-virunga-wwf-mobilise-pour-sauver-le-plus-ancien-parc-africain-cg

Sampling and data collection

Wild edible mushrooms are classified as Non-Timber Forest Products (NTFP). They are discovered on a regular basis and in often ambiguous locales. With this in mind, the current study's sample was drawn at random. The sample size was two hundred and sixteen (216) people. It was divided into 108 farmers and 108 pickers, who were distributed along four axes, for a total of 27 growers and pickers per site. Goma-Kitshanga-Mweso, Goma-Rutshuru, Beni-Mutwanga, and Beni-Mangina are the four sites. The 108 pickers were reached using the targeted sampling strategy, which entails recruiting subjects in locations where they have a high possibility of encountering them [18].

This approach was applied on the outskirts of the ViNP and its environs for this study. It was also used to represent the 108 farmers. Questioning participants about their willingness to fill out surveys is a common practice in convenience sampling. When interviewing respondents, this strategy was utilized to obtain their permission to complete questionnaire.

Assessment of quantities of wild edible mushrooms and cultivated mushrooms

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Figures 2 and 3 shows the keys for WEM and CEM, respectively. These keys were used as identification tools for the above-mentioned species during the surveys. To assess the quantities of WEM and CEM, the following tools were used: two types of scales, one digital for measuring small quantities up to 1 kg, the other for larger quantities. The camera was very useful for taking pictures to facilitate the knowledge and classification of the many species of WEM around ViNP. Keeping a register minimized the risk of omitting certain data. Observations and testimonies were recorded. Color photos of 10 species of WEM and 2 CEM were given to the interviewers so that they could clearly identify the species encountered by pickers and growers. The questionnaire was the main survey tool. All the questions asked were entered into a data collection tool (tablet) and parameterized in the KOBO collect application.

Figure 2: Identification key for edible wild mushrooms (1) *Termitomyces microcarpus* (2) *Termitomyces robustus* (3) *Tricholopsisaurea* (4) *Schizophyllum commune* (5) *Paxillus brunneotomentosus* (6) *Termitomyces schimperi* (7) *Laetiporus discolor* (8) *Auricularia aurea* (9) *Hypholoma subviride* (10) *Auricularia delicata*
Source: www.efta-online.org

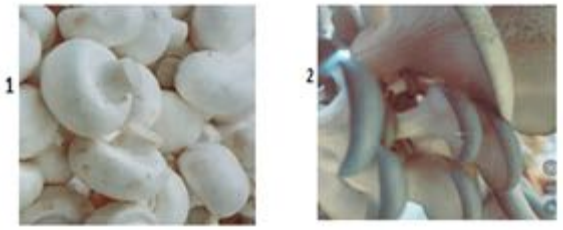

Figure 3: Identification key for cultivated mushrooms (1) *Agaricus bisporus* (2) *Pleurotus ostreatus*
Source: www.efta-online.org

Data analysis

Data were processed using SPSS 26. Descriptive statistics were presented, and means comparison tests using t-student tests at the 5% significance level were performed. Qualitative values were expressed as percentages, and differences were tested using Chi2 tests.

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RESULTS AND DISCUSSION

The results presented in Table 2 show that, there is a strong disparity in the distribution of respondents according to age, and this could significantly influence the gathering of WEM and domestication of CEM at the 1% probability level, p = 0.001, χ^2 = 114.037. However, mushroom picking was carried out by players with an average age of 34 years, as opposed to cultivation players with an average age of 36 years. The observation found that, neither the gathering nor the cultivation of edible mushrooms was carried out by a young population. This result corroborates those obtained by Chelela *et al.* [19], who reported that the age of gatherers was 34 years. However, Kamou *et al.* [6] and Imanishimwe [20] state that the average age of an edible mushroom picker or grower is 45.

In terms of gender, there were no disparities between pickers and growers. Among farmers, men accounted for around 46% compared with 54% for women. Among pickers, men were in first place with 51% compared with 49% for women. The civil status of farmers and gatherers showed significant differences at the 1% probability level, p = 0.001, χ^2 = 234.083. Married people were in first place, with 83% of farmers compared with 82% of pickers, followed by single people (17% of farmers and pickers).

As for divorced people, they represent 0% of farmers compared with 0.7% of pickers. The representation of farmers and gatherers in the territories showed a significant difference at the 0.05% probability threshold, p = 0.034, χ^2 = 8.640. Farmers and gatherers represented 25% each in the Masisi and Rutshuru territories compared with 50% each in the Beni territory. This disparity is due to the vast expanse of gathering fields or forests in Beni territory compared with Rutshuru and Masisi territory. The difference for growers in the different territories is also explained by a greater number of growers who were interested in mushroom cultivation in Beni territory than in Masisi and Rutshuru. This result corroborates those of Rizinde *et al.* [21] who found many species in the Semliki valley at low and medium altitude in the Ruwenzori massif during their surveys of WEM, which targeted different types of habitat. A wide disparity was observed in the languages spoken by both gatherers and farmers at the probability threshold of 0.01%, p<0.001, χ^2 = 51.010. Fifty- five percent (55%) of pickers spoke Kinande compared with 53% of farmers. This majority of pickers and farmers who spoke Kinande can be explained by the fact that this language is spoken in two territories (Rutshuru and Beni) where there are many farmers and pickers. Farmers and gatherers who spoke Kinyarwanda represented 33% each, while those who spoke Kiswahili represented only 14% for farmers and 12% for gatherers. These results show that the majority of pickers and farmers were indigenous to the areas surveyed. These results are reinforced by those of Madamo *et al.* [4] , who stated that the majority of indigenous respondents in their study were

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mycophiles. A significant difference was observed in the level of education for growers and gatherers at the 0.01% probability threshold, $p<0.001$, $\chi^2 = 65.477$. Pickers who had not finished secondary school represented 33% compared with around 30% of growers. Those who had not studied represented 27% of pickers compared with 6% of growers.

This situation is fairly easy to explain, as most pickers are local people who often live in remote areas where there are few or no schools. For this reason, school attendance is random. These results contradict those of Mattia *et al.* [22], who consider that an increase in the level of education in Europe increases the probability of being a recreational picker. Pickers who did not have the chance to finish primary school represented 21% compared with 4% of growers. Eight (8%) of pickers had a primary school certificate, compared with 4% of farmers. However, 36% of growers had a state diploma compared with 9% of pickers. Fifteen percent of WEM growers had a degree (higher education) compared with 1% of pickers. This phenomenon can be attributed to the fact that those who express an interest in mushroom cultivation are respondents who have attained a certain level of education, thereby enabling them to enhance the value of their activities.

Diversity of cultivated and wild edible mushrooms

Nine edible wild mushroom species were found in Beni territory, six in Rutshuru region, and five in Masisi territory, as shown in Table 3. In the three territories (Beni, Rutshuru and Masisi) surveyed, growers recognized only one species of *Pleurotus ostreatus*. In Kiswahili, all of these species are referred to as Buyoga. In the native languages of Kinyarwanda and Kinande, Table 3 also lists the colloquial names for these species that were discovered in the field.

The results in Table 4 show that a grower could sow a minimum of 0.032 kg, a maximum of 0.041 kg and an average of 0.037 kg of CEM seed per boot. These data are supported by those of Kiyuku *et al.* [23] , who reported that, in the African Great Lakes region, the yield of *Pleurotus ostreatus* is between 30 and 40% for unenriched substrates, with a sowing rate of 2%, and grown in large bags. Given that the weight of the boots for the growers surveyed was 2 kg, then 2% of 2 kg is equal to 0.040 kg. According to De kesel *et al.* [24] and Demers [25], a quantity of 2 kg of mushroom seed is required for 100 kg of sterilized substrate (straw) and 5 kg of seed when stumps or logs (wet substrate) are inoculated.

Farmers grew a minimum of 4 boots and a maximum of 1,786 boots, with an average of 263.5 boots per growing cycle. Production per boot was 0.5 kg minimum, 3 kg maximum and 1.8 kg average. Expressing the production in terms of yield per boot, knowing that the boot sown was 2 kg, then it's possible to get the average of 90%. These results are reinforced by those of Nieuwenhijzen [26], Mpulusu *et al.* [27],

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Kiyuku *et al.* [23], and Souzane and Hafide [28], who estimated that, for mineral-rich substrates, yields can vary between 60 and 80% of the weight of seeded boots. Total production was a minimum of 3 kg, a maximum of 3572 kg and an average of 359 kg per production cycle. Converting this into tonnes, results are showing that a grower can produce a maximum of 3.5 tonnes and an average of 0.35 tonnes per production cycle. However, the fruiting of cultivated mushrooms can have consecutive phases of 3 to 4 months with breaks of 3 to 5 weeks between each harvest [29]. It should be noted that the aforementioned production in tonnes per sown boot was estimated over a cultivated mushroom production cycle that can range from 3 to more than 4 fruiting months, according on the respondents. According to Sénéchal [30] , production per log or log of wood 1 m long and 33 CEM in diameter is 118 kg/log/year and its production cycle can last up to 5 years, with a production of 590 kg, or 0.59 tonnes. This production is not too far off the average of 0.35 tonnes per production cycle quoted by the respondents.

Given that cultivated mushrooms play an important role in the Congolese population's diet, it is vitally important that the government and non-governmental organisations raise awareness so that people can take this rare commodity into consideration and produce large quantities of it, not only to increase household consumption but also to add value to their income.

As for the pickers, the total quantity picked was a minimum of 1 kg, a maximum of 30 kg and an average of 5 kg per day. Evenly, the picker can pick also a minimum of 0.5 m^2, a maximum of 1,000 m^2 and an average of 51.6 m^2 per day. They can pick a minimum of 0.5 kg, a maximum of 15 kg and an average of 3.6 kg per day. These results are not far off those of Nikuze et al. [13], who reported that in the Rumonge reserve in Burundi, the picker can harvest 4 kg per day. The frequency of harvesting per week is a minimum of once, a maximum of 7 times and an average of 1.7 times. Given that the average frequency per week is 1.7 times, or about 2 days per week, and that the average harvest per day is 3.6 kg, then a picker can harvest 6.5 kg in 2 days. Multiplying 6.5 kg by 4 weeks, the picker can pick 26 kg per month. And considering the fruit-bearing months (March to May) for the short season, the picker can have 26 kg x 3 months, giving 78 kg for the short season. In the peak picking season (September to January) Anses [31], showed that the picker can produce an average of 26 kg x 5 months = 130 kg during the peak season. Note that this production depends on the extrapolations in relation to the survey results.

These results are supported by those of De kesel *et al.* [2] , who stated that during their three-year study at the Mikembo sanctuary, none of the Miombo produced less than 50 kg of edible mushrooms ha^{-1} $year^{-1}$ and, all formations taken together, the Miombo produced an average of 150 kg of edible mushrooms ha^{-1} $year^{-1}$. According to Food and Agriculture Organization (FAO) [1], Ndoy [15] and Yorou et al. [32], they

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mentioned that a picker in China and other countries in the world that produce WEM can easily harvest 60-100 kg of mushrooms per season. The quantity picked per species and per day is a minimum of 1 kg, a maximum of 6 kg and an average of 3 kg. The picker can pick a minimum of one species, a maximum of 3 species and an average of 1.22 species. The number of times a container can be filled per day is 1 minimum, 6 maximum and 1.9 on average.

Species selection by respondents

Termitomyces microcarpus was selected by 50% of respondents, followed by *Auricularia cornea* (18%), *Termitomyces robustus* and Termitomyces microcarpus (12%), Termitomyces microcarpus (10%), *common Schizophyllum* (4%), and *Hypholoma subviride* (2%) (Figure 4). Merely 1% of the participants selected two or three species. Termitomyces microcarpus was the most common species (Figure 2). These findings corroborate those of Loumeto [32], Akaibe [33], Habiyaremye *et al.* [34] and De kesel [2], who stated that the *Termitomyces microcarpus* species is highly valued in tropical Africa due to its taste, frequent picking locations, and potential for large quantities, despite its economic size and tendency to rot rather quickly. *Termitomyces microcarpus* is frequently sold in Haut-Katanga at roadside stands and small markets. During the field surveys, it has been observed the same things (Figure 5).

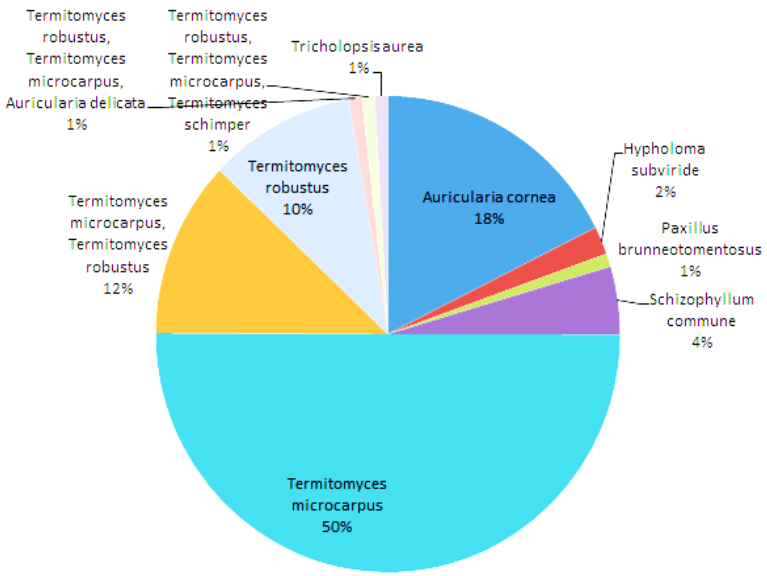

Figure 4: Selection of species by respondents

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Figure 5: (1) *Termitomyces microcarpus* (2) *Termitomyces robustus* (3) *Auricularia cornea* (4) *Auricularia delicata* (5) *Schizophyllum commun*

CONCLUSION AND RECOMMENDATIONS FOR DEVELOPMENT

Based on this study, an average amount of spawn (mushroom seed) of 0.037 kg per 2 kg bunch of *Pleurotus ostreatus* can be administered. About 263.5 kg of bunches are grown on average per producer. Also this study discussed the 1.8 kg average yield per bundle. Information on the average daily quantity picked by each picker was 5 kg. That being said, 3.6 kg is the average amount picked per 1000 m^2. During the WEM fruiting period, picking occurs on average two days per week, or 1.7 times per week. Furthermore, 3 kg is the average amount chosen per species. The picker is still only able to harvest about one species each day. A container can be filled two times on average each day. All growers in the three territories recognized the same species of *Pleurotus ostreatus*. Growers generated much more than pickers (with 50% of respondents selecting *Termitomyces microcarpus*), suggesting that growers might potentially earn significantly more than pickers. Therefore, a lot of effort needs to go into domesticating wild edible mushrooms so that these pickers may produce enough of them to make a substantial difference in their family's income. As part of ongoing study, a co-benefit analysis will be performed at a later date.

Declaration of competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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AUTHORSHIP CONTRIBUTION STATEMENT

The author of this work is **Jean Pierre Habineza Mpunga.** I was responsible for the collection of data, the preparation of the initial draft, the investigation, and the formal analysis. **Edson Niyonsaba Sebigunda:** Supervised the project, conducted the investigation, and performed the formal analysis. **Chantal Shalukoma:** Revised the paper. **Philippe Lebailly:** Revised the manuscript. **Fabio Berti:** Revised the manuscript. **Constantin Dushimimana:** Performed the formal analysis and paper revision. **Philippe Burny:** Served as the primary supervisor, conducted the investigation, performed the formal analysis, and revised the paper. **Baudouin Michel:** conducted the investigation, and performed the formal analysis.

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Table 1: Sampling of respondents

Territories	Axis	Pickers	Growers	Total
Rutshuru	Goma-Rutshuru	27	27	54
Masisi	Goma-Kitshanga-Mweso	27	27	54
Beni	-Beni-Mutwanga	27	27	54
	-Beni-Mangina	27	27	54
Total		**108**	**108**	**216**

Source: Survey, April 2022

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Table 2: Demographic and socio-economic characteristics of respondents

Variables	Modality	Cultivator n=108 % or Average	Picker n=108 % or Average	χ^2	P-Value
Age	Average age	36	34	114.**037****	0.001
Gender	Male	46.3	50.9	2.241	0.134
	Female	53.7	49.1		
Civil status	Single	16.7	17.3	234,**083****	0.001
	Married	83.3	82.0		
	Divorced	0.0	0.7		
Territory	Rutshuru	25.0	41.7	8.**640****	0.034
	Masisi	25.0	19.4		
	Beni	50.0	38.9		
Languages spoken	Kinande	52.8	54.6	51.**010****	<0.001
	Kinyarwanda	33.3	33.3		
	Kiswahili	13,9	12		
Study level	No studies	5.6	26.6	65.**477****	<0.001
	Primary unfinished	3.7	20.9		
	Cerificate of primary studies	3.7	7.9		
	Secondary unfinished	29.6	33.1		
	State diploma	36.1	9.4		
	Degree	6.5	0.7		
	Licence	14.8	1.4		

Source: Survey, April 2022; *** = significant at 1%; ** = significant at 5%.

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Table 3: Diversity of cultivated and wild edible mushrooms in Beni, Rutshuru and Masisi territory, North Kivu

Territories	Families	Species	Common names		
		Scientific names	Kiswahili	Kinyarwanda	Kinande
Beni	Schyzophyllaceae (Dikarya *et al.* 2007)	*Schizophyllum commune*	Buyoga	-	Vithuli
	Lyophyllaceae (Ebika *et al.* 2018)	*Termitomyces microcarpus*	Buyoga	-	Obuswa
	Lyophyllaceae (Ebika *et al.* 2018)	*Termitomyces robustus*	Buyoga	-	Bhudo
	Auriculariaceae (Ebika *et al.* 2018)	*Auricularia delicata*	Buyoga	-	Malayambene
	Lyophyllaceae (Ebika *et al.* 2018)	*Termitomyces schimper*	Buyoga	-	Obokokati
	Auriculariaceae (Ebika *et al.* 2018)	*Auricularia cornea*	Buyoga	-	Bhunyamusingiri
	Strophariaceae (Hudson, 1871)	*Hypholoma subviride*	Buyoga	-	-
	Paxillaceae (Ruena,1927)	*Paxillus brunneotomentosus*	Buyoga	-	-
	Tricholomataceae	*Tricholomopsis aurea*	Buyoga	-	-
Rutshuru	Schyzophyllaceae (Dikarya *et al.* 2007)	*Schizophyllum commune*	Buyoga	Ibihumyo	-
	Lyophyllaceae (Ebika *et al.* 2018)	*Termitomyces microcarpus*	Buyoga	Imegeri	-
	Lyophyllaceae (Ebika *et al.* 2018)	*Termitomyces robustus*	Buyoga	Ibinyentabire	-
	Auriculariaceae (Ebika *et al.* 2018)	*Auricularia delicata*	Buyoga	Ubunyentusi	-
	Lyophyllaceae (Ebika *et al.* 2018)	*Termitomyces schimper*	Buyoga	Inshabire	-

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	Auriculariaceae (Ebika *et al.* 2018)	*Auricularia cornea*	Buyoga	Ubunyamatwi	-
Masisi	Schyzophyllaceae (Dikarya *et al.* 2007)	*Schizophyllum commune*	Buyoga	Ibihumyo	-
	Lyophyllaceae (Ebika *et al.* 2018)	*Termitomyces microcarpus*	Buyoga	Imegeri	-
	Lyophyllaceae (Ebika *et al.* 2018)	*Termitomyces robustus*	Buyoga	Ibinyentabire	-
	Auriculariaceae (Ebika *et al.* 2018)	*Auricularia delicata*	Buyoga	Ubunyentusi	-
	Lyophyllaceae (Ebika *et al.* 2018)	*Termitomyces schimper*	Buyoga	Inshabire	-

Source: Survey, April 2022

Table 4: Quantification of cultivated and picked mushrooms

Production for growers					
Variables	**Abbreviations**	**N**	**Min**	**Max**	**Average**
Quantity sown per bundle in kg	Q/B	108	0,032	0,041	0,036
Number of bunches sown	NBS	108	4	1786	263,48
Quantity harvested per bundle in Kg	QHB	108	0,5	3,0	1,8
Total production in Kg	TP	108	3,0	3572,0	358,9
Production for pickers					
Quantity harvested in Kg	QH	108	1,0	30,0	5,21
Area harvested in m^2	AH/m^2	108	0,5	1000,0	51,60
Quantity picked per m^2 in kg	QP/1m^2	108	0,5	15,0	3,59
Picking frequency per week in days	PF/W	108	1	7	1,74
Quantity picked per day and per species in Kg	QP/D/SP	108	1	6	3,25
Number of species picked	NSPP	108	1	3	1,22
Number of times the container can be filled per day	NTCF/D	108	1	6	1,88

Source: Survey, April 2022

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