The baseline data on Cantharellus lutescens are particularly relevant in the perspective of the likely future commercial harvest of this excellent edible species, comparable to the well-known and much appreciated C. cibarius.

With our sampling design, the thinning regime had no discernable effect on mushroom productivity, although nonthinned plots presented higher values. Ongoing field work will provide more data and enable to clarify this result.

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Macrofungi associated with sweet chestnut: a source of income for rural populations in Northeast of Portugal

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European chestnut tree (*Castanea sativa* Mill.) has a great economic interest for wood and fruit production in northeast of Portugal. Over the last decade another important income associated with this culture has emerged - the collection and commercialization of wild edible mushrooms growing in chestnut orchards. Actually, despite the low knowledge of their biodiversity, ecology or sustainable management in those regions, mushrooms harvesting have been increasing, mainly due to their economic importance to local populations. In order to define the sustainability of this mycological resource, the study of diversity and production of macrofungi associated with chestnut tree was carried out. Com-

mercial harvesting of edible mushrooms as a complementary income to local populations, was also evaluated, through chestnut associated mushroom production.

The study was carried out from 2002 to 2005, in a non-tilled *C. sativa* orchard located in Oleiros – Bragança (Northeast of Portugal) (29T PG 80 9 36 UTM, 915 m above sea level), at Natural Park of Montesinho. Five quadrate plots of 100 m^2 each were selected in the chestnut orchard, and all the sporocarps were weekly (autumn and spring) or biweekly (winter and summer) collected. No assessments were undertaken during January, February, March and August, since in this period few macrofungi produce sporocarps in Bragança. Sporocarps were identified by genera or species following standard procedures for taxonomic identification. For determining production, sporocarps were dried at 30°C, for 72 h, and weighed (dw). Meteorological data was obtained from the weather station at *Campus* of *Escola Superior Agrária de Bragança*, located approximately 6 km of the studied *C. sativa* orchard. The diversity of macrofungi species was expressed by species richness (S), *Simpson´s* diversity index (D), total abundance (N) and relative abundance. The production of macrofungi (dry weight per hectare) was expressed for *i)* total species; *ii)* mycorrhizal and non-mycorrhizal species; *iii)* and edible and non-edible species. The economic income was only evaluated for the edible species sold in the local markets, namely *Amanita caesarea, Boletus edulis, Boletus aereus, Cantharellus cibarius, Hydnum rufescens* and *Calocybe gambosa* (Garcia *et al.*, 2006). The value of mushrooms production was estimated taking into account the average current price of these species in the region in 2003.

During the period of studies, 73 macrofungal species belonging to 16 family and 23 genera were identified. The greatest number of species belonged to the genera *Russula* (12), *Inocybe* (9), *Lactarius* (7), *Tricholoma* (6), *Boletus* (5), *Cortinarius* (5) and *Amanita* (5). The cumulative number of species, over the four successive years, revealed that 80.5% of macrofungal species that probably exist in this habitat were surveyed. The harvestings from 2002 and 2003 has contributed mostly to the number of species collected. Actually, the number of macrofungal species attained a maximum (56 species) in 2002 and a minimum (12 species) in 2005. Also, *Simpson´s* diversity index was significantly higher in 2002 (8.1 ± 0.98) than in the other years (3.9 ± 0.51 in 2003; 1.5 ± 0.15 in 2004; 1.1 ± 0.06 in 2005). About 46% of the macrofungal species has occurred in a single year. Only about 4% of the species has occurred in all de 4-years study, 25% in two years and 25% in three years.

Fruiting phenology of macrofungal species and number of carpophores showed a bimodal pattern in each year, with one peak from late May to June (Spring season) and a more intense peak from September to early December (Autumn season). The greatest number of species (85% of the total registered) has occurred during Autumn season and only 11 species have occurred in both fruiting seasons (Spring and Autumn).

A total of 2677 carpophores were harvested during the time course of this study. The higher number of carpophores was from the species *Laccaria laccata* (324), *Hebeloma crustuliniforme* (308) and *Inocybe geophylla* (303), which were also the most frequent species over the 4-year study period besides *Russula lutea* and *Cortinarius helobius*. The maximum number of carpophores was observed in 2003 (1514 carpophores) and the minimum in 2005 (138 carpophores). Also, the species richness and abundance were much lower in 2004 and especially in 2005, than in 2002 and 2003. These results were probably the effect from a severe drought period observed during all 2004 and 2005 in the Northeast of Portugal.

The distribution of species by trophy groups revealed a dominance of mycorrhizal species (82%). About 49% of the identified species were edible and 29% were non-edible, the remaining being of unknown edibility. From the 36 identified edible species, only six are currently available in local markets. The total carpophores yield during the 4-year study period attained 67.6 kg dw/ha, from which 64.0 kg dw/ha were mycorrhizal species and 50.7 kg dw/ha were edible species. *Lactarius piperatuts, Russula delica* and *Boletus edulis* were the species that contributed most to the total yield (11.0 kg dw/ha, 8.0 kg dw/ha and 6.2 kg dw/ha, respectively). As observed for species richness and abundance, also the macrofungi yield reached a maximum (44.0 kg dw/ha) in 2002 and a minimum (2.3 kg dw/ha) in 2005.

Only 20% of the total dry weight production of edible species refers to current available mushroom in local markets. Assuming the average current price of these species in the region in 2003, the total income associated with these species was 134 €/ha and per year: *A. caesarea* (3.5 €/ha), *B. edulis* (59.4 €/ha), *B. aereus* (18.2 €/ha), *C. cibarius* (39.8 €/ha), *H. rufescens* (3.7 €/ha) and *C. gambosa* (9.0 €/ha). These results suggest that commercial harvesting of these edible mushrooms could be an additional source of income for chestnut producers with significant contribution to regional economies. However, over picking has to be avoided, as conservation and management strategies are required. In fact, it is important that these habitats will be managed under an ecosystem management philosophy that entails multiple-use. For this purpose it is still necessary to study mushroom harvesting effects in the ecosystem and the effects of management practices (namely tillage or non tillage) on the occurrence, production

and reproduction of mushrooms. To improve mushroom management it will also necessary to understand their biology and ecology, and perform mushrooms surveys over multiple fruiting seasons.

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Wild Genetic Useful Mushroom Resources of Central Luzon, Philippines as Sources of Nutriceuticals

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SUMMARY

With our intention of harnessing the economic potential of wild useful mushroom resources in Central Luzon, Philippines as sources of nutriceuticals, wild useful mushrooms were rescued and pure cultures were obtained. The rescued mycelia of *Ganoderma lucidum* and *Auricularia polytricha* were deposited at the Mushroom Gene Bank of the Center for Tropical Mushroom Research and Development in the Philippines. Their mycelial growth performances and their antibacterial properties were evaluated. Tissue culture technique was adopted in rescuing the mycelia of the above mentioned mushrooms. The rescued mycelia of each strain were evaluated and compared for their ability to grow efficiently on indigenous culture media. Also, their ability to inhibit the growth of both gram positive and negative bacteria was tested using their immobilized mycelial discs against *Escherichia coli* and *Staphylococcus aureus*. Eight strains each of *G. lucidum* and *A. poly-*