

KENYA

Growing Mushrooms on the Equator

Good mushroom prices, low labour costs and high demand from retailers in Nairobi and other cities means there is increasing interest in mushroom cultivation in Kenya. However, major challenges remain in achieving long-term sustainability and viability

Kenya's agriculture industry is best known for producing tea and coffee and growing flowers and vegetables such as peas, beans and mini sweetcorn for the export market. With increasing incomes in a population of 55 million, a booming tourist industry, and a switch from meat consumption, there is now more focus on supplying the home market with high quality produce including mushrooms. Current button mushroom production is dominated by a single producer, Majestic Mushrooms in Naivasha. They grow mushrooms mainly on imported Phase III compost and peat casing, which is affected by disruption to global shipping. About a third of the fresh mushrooms consumed in Kenya are imported from Kigali Farms in neighbouring Rwanda. This article describes the production on some of the smaller Kenyan farms that grow mushrooms on locally sourced materials.

Agaricus compost

There are about 250 button mushroom growers in Kenya. Growers produce their own compost according to individual formulations and there is no centralised production of substrates. Wheat or maize straw, chicken manure and gypsum are standard ingredients. Urea or ammonium sulphate are often added because the chicken manure is usually below 2.5% N. Wheat straw costs around KES 17,000-30,000 (100-193 Euros) per tonne, a significant cost component. Various other organic supplements such as brans and inorganic fertilisers are often added, although their function is unclear other than increasing cost. Composts are usually produced in 1-5 tonne batches which are too small to achieve compost temperatures above 70°C. The compost is wetted, and hand turned over three to four weeks. Makuno Farm near Nairobi has recently constructed an aerated bunker for 25 tonne batches of compost.

Some farms have pasteurisation chambers into which compost is filled and steamed from a rudimentary steam supply (for safety reasons, I won't describe how!). The aim is to reach 60°C in the compost for several hours but often it reaches higher temperatures. Farms without pasteurisation facilities split the stack into smaller batches to clear the ammonia and use chemical agents for control of moulds (e.g. carbendazim) and mites (miticides). Raw materials and composts are rarely analysed and the appearance of ink caps (*Coprinus* spp.) is often the first sign that ammonia has not been fully cleared from the compost. The compost is spawned at about 9 litres per tonne and filled into 5-10 kg plastic bags. Spawn

is imported via Sylvan in South Africa or from Lambert via Kigali Farms and is a major production cost – around 30% of the total. White strains such as Sylvan A15 and Lambert 901 predominate and the market for browns is about 12%.

Casing and cropping

There are no available peat deposits in Kenya and casing is usually made from a high organic matter virgin soil collected from forests. Coco peat (coir dust) is added about 10% by volume as well as agricultural lime and sometimes gypsum (why?). The soil casing is pastuerised in a steaming pit or chamber as mentioned above. Cyka Mushroom Farm north-west of Nairobi also uses milled Baltic peat mixed with coir. Trials have shown that mushroom yields from the local soil casing are 40% lower than those obtained from a European wet-dug peat casing.

Cropping rooms are usually constructed of mud bricks or breeze blocks and 500-1000 plastic cropping bags are placed on wooden or metal shelves, usually in three layers. Few farms have environmental control which makes cultivation challenging or impossible during the hotter months (January to March and August to October) of the year. Although Nairobi is cooler than the Kenyan lowlands, ambient temperatures can remain above 20°C for long periods. Cyka Mushroom Farm is better situated, close to the foothills of Aberdare Mountain Range where average temperature is 13°C and humidity is high.

No CACing is added to the casing so it usually takes around four weeks to pick the first mushrooms. Average mushroom yields are poor by international standards, less than 200 kg/tonne of spawned compost in three or four flushes. Most mushrooms are sold in overwrapped 250 g punnets. Prices are typically KES 850 (about 5 Euros) per kg. Mushrooms are mainly marketed through the three major retailers, Carrefour, Naivas and Quickmart, and through wholesalers for use in hotels and restaurants. The last estimate from the Kenyan National Farmers Information Services puts mushroom production at 500 tonnes per year, but we think that the current button mushroom production in Kenya is about half of that figure.

Pests and diseases

Mushroom cropping tunnels are close to compost and casing production, facilitating infestation of new crops with flies and diseases. Sciarids, bacterial blotch, dry bubble and cobweb are all major causes of crop loss. Crops are not cooked-out and spent compost is often discarded locally, also contributing to reinfestation. However, some farms are now recycling spent mushroom compost for crops such as potatoes, making a disposal waste into a useful soil amendment for Kenyan soils, which are generally low in organic matter.

Oyster mushrooms

There are about 80 oyster mushroom growers in Kenya, mainly growing grey oyster (*Pleurotus ostreatus*) but also pale oyster (*P. pulmonarius*) and king oyster (*P. eryngii*) mushrooms. Total Kenyan

production is still very small, around 15 tonnes per year. The main substrates used are wheat straw, cotton seed husks and hardwood sawdust with or without supplementation. Spawn is supplied by institutions of higher learning like Jomo Kenyatta University of Agriculture and Technology, the National Museums of Kenya and several small spawn producers. Prices for grey oyster mushrooms are typically KES 700 (about 5 Euros) per kg.

Future prospects

If mushroom production is to meet the growing demand in Kenya, the industry must become more specialised. Producers of substrates need to concentrate on producing better quality materials in facilities that are separated from the mushroom growers, leading to improved yields and crop hygiene. Environmental control, particularly cooling and air-circulation, powered by solar energy is costly but will lead to better yields. The alternative is to transport fully case-run bags to farms in the cooler uplands, 70 km away from Nairobi.

Trials at the Makuno Organic Farm near Nairobi have shown a 40% cost saving in compost by replacing wheat straw with sugarcane bagasse without loss in mushroom yield. Promising results have been obtained using matured sugar mill mud, another organic by-product from the sugar industry, as a casing material. Kenya also has abundant by-products from other agricultural sectors that could be used as raw materials in substrate production for button and oyster mushrooms. The spent mushroom substrates can then be recycled as organic soil amendments to local farmers in a Kenyan circular economy.

Ralph Noble, Microbiotech (UK) and Collins Mutai, Mycelia & Foods (Kenya) would like to thank the Innovate UK Knowledge Transfer Network for the GCRF Agrifoods Africa Innovations Award that funded this study.

Figures

- A Mixing compost by hand at Agape Growers Farm in Ngurunga, Kiambu County
- B Aerated bunker under construction at Makuno Farm in Banana, Kiambu County
- C General Manager Chris Mugendi at Cyka Estates Farm, Nyandarua County
- D Sugarcane bagasse compost and sugar mill mud and coir casing
- E Manager Vera Nkirote Mburugu with Ralph Noble at Kaganki Ventures Oyster Mushroom Farm in Kiserian, Kajiado County
- F Attendees at the Mushroom Seminar at Makuno Farm in January 2024
- G Collins Mutai and Ralph Noble presenting at the Mushroom Seminar
- H Pre-packed mushrooms in a Nairobi retailer

