

Advice for prospective mushroom growers

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This Technical Note gives only a brief introduction for those contemplating growing mushrooms commercially. It is *not* a complete guide to mushroom growing but outlines the major issues that must be considered before deciding on whether to seek further advice or to stop.

Before becoming involved consider the following questions:

- How do mushrooms grow?
- What is the mushroom industry?
- Why grow mushrooms?
- What finance is required?
- What knowledge and training are necessary?
- What problems may be encountered in growing and marketing?
- Where can you go for further information?

Until you are sure you know the answers that apply to you, you should not proceed.

How mushrooms grow

Production of mushrooms in the UK is, almost wholly concerned with cultivation of one species of fungus, *Agaricus bisporus*.

In nature, mushrooms appear infrequently. Fungi which can produce mushrooms do so only when nutritional and environmental conditions are right.

Mushrooms sold in supermarkets or from baskets in corner shops are only the 'fruiting body' of the fungus (*A bisporus*) which produces them. They are not the entire fungus and have relied on a network of filamentous strands which colonise compost to extract nutrients. The cultivation of the fungus in compost and the way in which nutrition and growing environments are manipulated to force mushrooms to emerge for harvesting is the key to success.

To achieve success, growers must harness the natural cycle of compost degradation which provides the given food source for the crop. Cultivation of mushrooms maximises the beneficial organisms found naturally in composts and minimises the incursion of other organisms which spoil the high quality crops that are the growers' target.

In the autumn, wild mushrooms naturally appear only after falling of leaves and senescence of field herbage provides a change in the physical soil environment. Organic material

breaks down, changing the microclimate and biological status of the soil surface. These changes contribute to reproductive growth of fungi and must be achieved artificially for mushroom crop production.

Mushroom cultivation requires firstly the manufacture of composts and secondly management of growing environments.

Mushroom compost was traditionally based on horse manure and a mix of other ingredients, particularly straw. Early research showed that to eliminate potentially harmful fungi, bacteria and pests material had to be pasteurised. Today, most growers use compost containing relatively little horse manure, in a balance with chicken litter, straw and gypsum. This is processed in a multistage composting procedure.

After rough mixing of materials Phase I composting begins. In this phase materials are stacked and watered to soften the straw and accelerate degradation. Material is stacked by machine and aerated by turning or forced-air ventilation, producing a partially degraded and biologically active material. This is transferred to specially designed rooms or 'tunnels' with sophisticated environment control for Phase II. The compost is allowed to heat for pasteurisation, usually to around 58–60°C for up to twelve hours. Further biological processes are controlled at a temperature of 48–53°C for about seven days allowing the compost to 'condition'. This period is one of intense microbial activity and leaves a compost with a nutritional and microbiological balance ideal for the crop.

The majority of newcomers now choose to buy in pre-prepared compost. This avoids the complexity, pollution potential and cost of compost manufacture.



Compost production: probably best avoided for small farms

In the early days of mushroom cultivation the next stage of 'spawning' was by transferring compost from an old crop to a new one. This carried great risk of spreading diseases and pests to the new crop.

Today *A bisporus* is introduced to compost as a culture bought from a small number of highly specialised biotechnology companies. Most such companies provide spawn as a fungal culture of *A bisporus* which has colonised sterilised grain. This gives an easily handled product readily broken into granules for distribution in the compost.



A bisporus growing into compost from commercial spawn

Inoculated compost is incubated in insulated buildings equipped with environment control. A modern mushroom farm with insulated houses is generally designed to blend in with the surrounding countryside and may not even be noticed by passers-by.

Within the growing environment compost is incubated to maximise the rate at which *A bisporus* colonises the compost.

Once the compost has been fully colonised an extra layer, usually of peat, is added to the surface. This so called 'casing' layer mimics the function of an autumn leaf-fall and provides conditions for transforming *A bisporus* to reproductive growth. With a combination of changes in the cropping environment as the grower reduces carbon dioxide levels and temperature, as would occur naturally in autumn, the crop changes to reproductive generation of mushrooms.



A modern farm blends with its environment.

There are a wide range of openings for disease-causing fungi, bacteria and viruses to enter the cropping cycle. Many of the most damaging diseases are related to species that *A bisporus* needs to complete its life cycle and so may never be eliminated. Constant effort is needed to ensure crops remain healthy.



Mushrooms produced from the casing layer overlaying compost. In this example compost has been compressed into large blocks.

The mushroom industry

There are around 280 commercial mushroom farms in England, Wales and Scotland. Farm-gate value of sales is approximately £200 million. Businesses are spread over the country. In Northern Ireland there are around 300 farms, from part-time to full-scale operations. Competition from imports to the UK is severe, particularly from Ireland, Holland, France and Belgium.

Advances in technology mean that it is easier to enter the industry than was the case up to the early 1980s. This means that production and markets can be cyclical with little prospect of major new opportunity. It is crucial that new businesses are based on sound market information.

There are a few very large farms (several owned by multinational companies) but the majority are small to medium-sized family businesses. Even the smallest have an annual turnover of £100,000.

Why grow mushrooms?

Only you can answer this but be sure you are entering the industry with a clear objective.

Typical reasons include the following:

- To provide full-time occupation and primary source of income.
- As a part-time occupation and secondary income.
- To utilise existing facilities such as buildings or cold stores not currently in use.
- To maximise labour efficiency in a complementary business.
- To utilise more fully existing marketing and distribution system.
- For life-style change, perhaps to 'get back to nature' growing a crop with strong natural rhythms.

If you are seeking a primary income, or to integrate your growing or marketing business, there are good precedents for you to follow. If, however, you only wish to utilise existing buildings or provide a 'life-style' change, good advice would certainly be to look at more enjoyable ways of losing money!

Economic feasibility

Capital requirement

Mushroom production requires considerable capital outlay. This is usually site-specific and so generalisations concerning investment costs are not likely to be helpful. You will have to consider whether to convert radically existing buildings from other uses or develop a greenfield site.

There is then the question of the production system to be adopted. The choice may be of three or four systems but with a multiplicity of ways of approaching each. Some involve very high capital sums indeed, especially where there is a desire to produce compost in-house. The entry level of investment to produce compost is around £250k depending on final requirements. Most advisers will discourage this for small and medium-sized farms. **Only where a major farm development is envisaged should compost production be contemplated.**

Some production methods involve movement of a great deal of compost which needs further expenditure. If money has to be borrowed, interest is another cost that the business must stand, and for new businesses interest rates will be much higher than minimum lending rates.

Variable costs

Buying ready-spawned (Phase II) compost bypasses expensive capital investment in machinery and buildings necessary for the skilled Phase I and Phase II composting processes. Bought-in compost can then be grown on in bags, on shelves or as compressed blocks. Some growers buy in fully prepared compost which is ready for casing. So called 'Phase III' compost is more expensive but can yield particularly well, increasing cash flow and retained income. However, it will also require a higher level of working capital. The choice of system will ultimately reflect availability of capital, facilities and site restrictions and can be decided only in the course of a detailed financial analysis.



Mushrooms grown using bought-in bags of compost

In all cases some working capital will be needed to grow the mushrooms. It is often assumed that 'family' (unpaid) labour can carry out some of the production and harvesting operations. While this may be true on a small scale, the crop is relatively labour intensive and additional labour will almost certainly be required.

Knowledge and training

Even if an economic appraisal of a proposed mushroom enterprise looks good, there are other issues about which you will need to satisfy yourself. You must plan to gain knowledge and skill to grow high quality, disease-free and pest-free mushrooms in quantities large enough to be economically viable. Your business plan must take into account the relatively low output, and therefore income, you will achieve as you learn.

Problems

Which production system will you choose? Some require high investment, others less, but you must exceed a break-even yield to be profitable.

Pests and diseases can be devastating and their control in mushrooms is a constant cost which is involved and complicated. Growers cannot depend on chemical pesticides as the crop is extremely sensitive.

A start-up programme and training is essential before any new production unit will achieve economic yields.

Market outlets must be assured before beginning. These require a continuous supply which involves accurate crop programming. Having grown a crop, it needs to be harvested 'seven days a week' - and harvesting is one of the highest costs.

In some areas there can be difficulties with public authorities, especially where the composting process takes place on the farm. Compliance with environmental legislation may be difficult, particularly in relation to odour, and is essential. Compliance with pesticide legislation is mandatory and training may be necessary, depending on your level of knowledge.

At the end of cropping you will have significant quantities of spent compost to dispose of away from the farm. Sale of spent compost may provide a useful addition to income but is dependent on local markets.

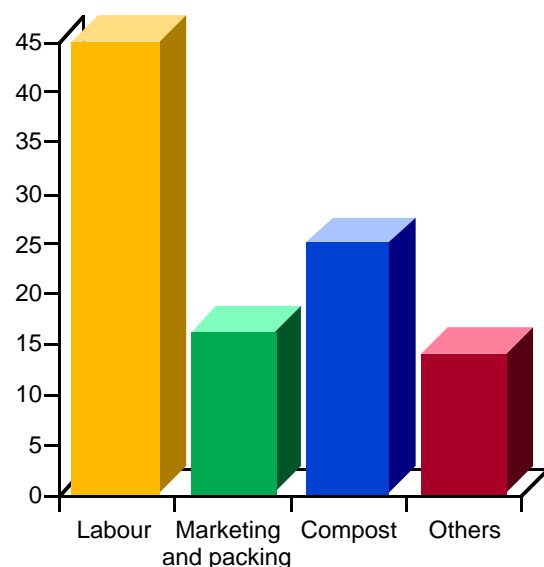


Figure 1. Approximate variable costs of production (purchasing Phase II compost)

Marketing

There is room only for top-quality mushrooms. A new producer may firstly rely on wholesale markets. Initially, due to lack of continuity, variable quality and low volume, marketing to supermarkets and high quality direct outlets cannot be contemplated.

Slowly, as reputations are established, some product may go to some of the higher-value, local outlets or be bulked with other growers' produce to meet the stringent demands of supermarkets. **Never underestimate the time that must be devoted to developing and servicing market outlets.**

Where can you go for help?

SAC has specialist mushroom advisers who can answer any questions you may have after reading this Technical Note. Advisers have detailed knowledge of the latest research and experimental work. They constantly advise commercial mushroom growers. Whoever you choose to provide advice they must be competent to work in this highly specialised industry. You should only seek crop-related advice from a BASIS/FACTS qualified adviser.

Through SAC you can purchase:

- Specialist financial advice for your proposals
- Advice on buildings and environment control
- Crop advice, both on-site and by telephone

- Up-to-date recommendations for pest and disease problems
- Environmental management and pollution control advice
- Help in many other areas relevant to mushroom production

Mushroom growing is widely regarded as one of the most science-based branches of agriculture and horticulture. It is a large, sophisticated, competitive and capital-intensive industry. It is also a satisfying and rewarding opportunity for those with the commitment to get it right!

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