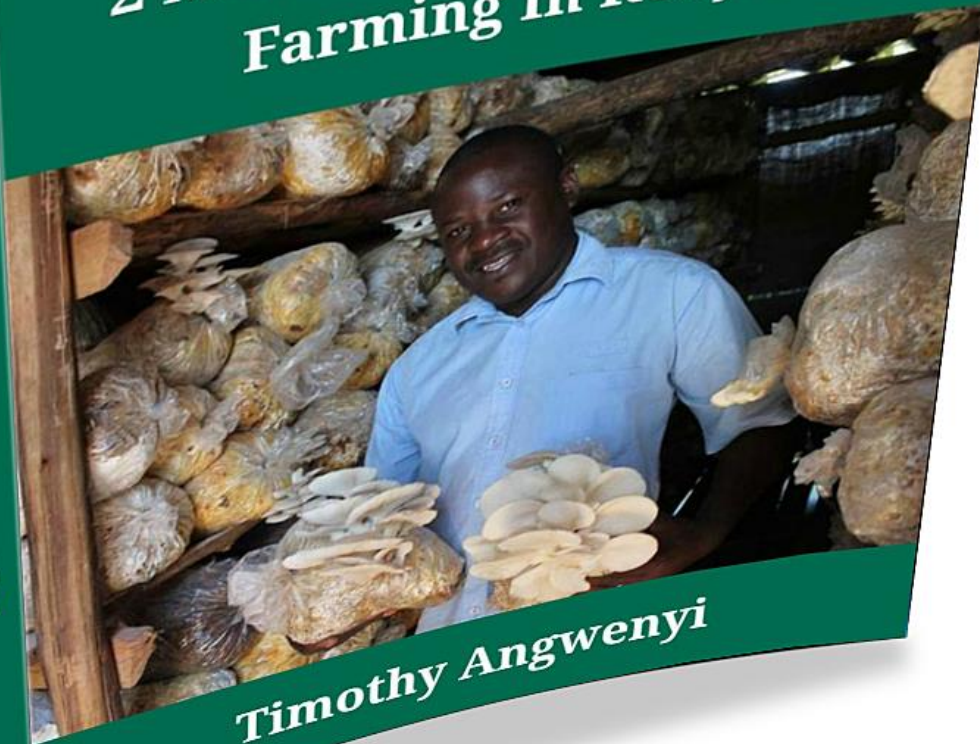


MUSHROOM FARMING

STEP BY STEP GUIDE

**How You Can Make Your
First Million In Just
2 Months With Mushroom
Farming In Kenya**



Profitable Farming In Kenya

Timothy Angwenyi

Mushroom Farming

Step-by-Step Guide

How You Can Make Your First Million In Just 2 Months With Mushroom Farming In Kenya



Now there is no more reason to claim that you lack capital to start a business. Mushroom farming has come to the rescue of all entrepreneurs who have the drive but lack the financial muscle to start big businesses. Mushroom farming in Kenya is probably the cheapest and easiest to start and it would be highly suitable to the youth who are most often cash strapped.

A mushroom is a macro fungus with a distinctive fruiting body. The fruiting body is large enough to be seen by the naked eye.

As indicated above, mushroom farming requires very little capital to start with. You can start with Ksh.10,000 or less. What is needed is a room, Substrate – which is the material

upon which mushroom grows and Spawn – which is the seed. Even though this is farming, you don't need a farm.



Mushroom grows on Substrate – just think of it as substitute for soil. Substrate is simply organic waste from the farms. This includes; wheat straw, rice straw, saw dust, cotton seed hulls, sugarcane burs, bean straw and Maize straw. You will need to learn how to prepare substrates as I shall be showing you in this ebook.

Alternatively, you can purchase it ready made. Jomo Kenyatta University at Juja sells ready-made sterilized substrate at about Ksh.80. You can explore the option of contacting them so that they can be sending them to you through courier delivery services or established public transport services to where you live. Moi University at Chepkoilel sell hybrid mushroom spawn.

You can add value by making mushroom-based porridge flour that is slowly gaining acceptance in the market. Some people who don't take fresh mushrooms prefer to take it in processed forms. In Kenya, farmers mostly grow the Shitake mushrooms which have medicinal properties and Oyster mushrooms that are rich in nutrients. When they are ground and mixed with amaranth and sorghum they make delicious porridge mix.

Mushrooms powder can also be extracted as active compounds for their medicinal value or used to make mushroom based products. Among the products that can be made is reishi coffee and tea. These are beverage products based on the reishi mushroom which is known to be medicinal. The health conscious consumers provide the market for these drinks and it serves as an alternative to herbal teas that are the rave currently. Processing mushroom

increases the shelf life as well. Drying for instance extends the shelf life of fresh mushrooms from three days to three months.



Delicious mushroom meal

There is some cultural perception and bias concerning mushrooms that have hindered the consumption in the local market. But this can be dealt with by integrating it in other products as noted above. The slow uptake of the business by farmers has led to a shortage in the market thus making the product expensive and bringing about the perception that it is a rich man's meal.

The demand for mushrooms in Kenya far outstrips the supply. The country has to import additional products from China just to satisfy the market. The growth potential in this business is big.

Market demand usually dictates a mushroom grower's choice of what variety to propagate. Oyster and shiitake mushrooms are usually recommended for beginners. They not only have an existing market, but can be raised in many substrates, on small scale with moderate investment. Volume is dictated in the same way by market demand. Before deciding on your production, survey volume demand, prices by talking to potential buyers and other producers

You don't have to worry about the Competition in this business. The demand for the product is there and there are few producers.

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Agribusiness Writer

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Profitable Farming Guide Series

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About The Writer

Hello! My name is Timothy Angwenyi Morebu. My phone number is **0714723004**. My email also is timohangwenyi@gmail.com. I am a Agribusiness writer, Agri-tourist & an Entrepreneur. Am currently writing *guides on various ways of earning a living in Kenya through Profitable Farming (Entrepreneurship)*, whereby i educate Kenyans on business ideas to venture in Agriculture sector.

Helping people start Agribusinesses and achieve the income they desire has become a huge part of my life. Being able to share the knowledge I have gained through visiting people's farms and attending Agriculture seminars and exhibitions has become extremely important to me.

I consider my readers my friends. I am always so appreciative that they take their time out to read my ebook guides and to learn about Agribusiness ideas from me. Once you have finished reading this guide, I have no doubt that you will have learned a great deal on how you can make your first million in just two months with mushroom farming in Kenya.



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Chapter 1

Introduction to Mushroom Farming Expertise



So, you want to start a mushroom business? If I had a dime for every time someone asked me one of this two questions:

- ❖ Can you teach me how to start a business growing mushrooms
- ❖ Can i make a lot of money with mushroom farming....

I get these and similar questions almost daily. I appreciate people's shared enthusiasm for the incredible edible mushroom but I feel it would be beneficial for me to write an ebook on this topic for two reasons:

- ❖ I can just tell people to read the ebook when they ask me one of those questions and,
- ❖ It really is good info for people to have especially those who are seriously considering starting a mushroom farm.

You wanna go into starting any business with “your eyes wide open”.

Mushroom farming is a lucrative enterprise that comprises other components like:

- ❖ making spawns,
- ❖ preparing the substrate,
- ❖ growing the mushrooms
- ❖ and or adding value to cultivated mushrooms for sale.

Mushroom farming is often driven by passion for exploring options in variety, quality and price.

An essential ingredient in mushroom farming is to create local market opportunities which demand good negotiation and excellent relationship building skills.

This ebook will show you the steps to start a profitable do it yourself mushroom farming business. You'll also find useful tips on how to stay in production and earn income all year round.

Growing mushrooms is very much like starting a small business that requires:

1. working out a budget,
2. writing out a clear straight forward plan for your business,
3. keeping records
4. and meeting required standards in the industry are critical to set you on the path of success.

Ideally, the budget should give you and the players on your team a fair idea of how much money you have and investment amount that is going into each component of your mushroom farm enterprise.

It makes good business sense to have a simple budget you can understand and figure out. The budget should state clearly the growing system, variety of mushroom and investments that will be channeled as well as returns expected.

A good business plan is another must have. It will help check that your values align to your business goals and dreams so you don't end up working hard against yourself, it should also help you define what products or services you want to offer, how you want to offer them, and generally strengthen your resolve to stay on course.

Getting Started with mushroom farming??



Decide on ... Variety of Mushroom to grow (stock)

This is determined by the area you want to invest in— either in the local market: for the grocery store, open market, or pharmaceutical companies: for medicinal mushrooms, or for export on the international market.

Since different types of mushrooms have different production costs, it is important to decide on a budget depending on amount of money available and the long term investment benefit.

A good variety to start mushroom farming with is the Oyster Mushroom. Other easy to grow varieties like, Shiitake, Lions Mane, White Button and the Portobello mushrooms are also highly recommended.

There are a lot more mushrooms that can be easily grown at home, but these few seem to be the most popular, due to the ease of growing and the general taste of the mushroom.

Additionally, the option of hunting from the wild still exists for varieties like: Morel Mushrooms and Truffle mushrooms as attempts at home growing them have not been successful.

After deciding on a variety, you will need to read up on its specific growing requirements; as each mushroom has its own unique growing requirements.

You will need to find a substrate on which the mushroom grows (bearing in mind that they grow best on wood and other agricultural waste resources).

The most common substrates for growing mushrooms at home are sawdust, paper, and other wood-based products.

Production system:



This is often determined by the space available and the growing system you are most conversant with. Most mushroom farms around the world use the ditch system. There is also the tray or shelves system but the oldest cultivation system however is the floor system.

Physical Location (space)



The right location coupled with favorable environmental conditions is the imperative first step to ensuring your mushrooms flush regularly and well all season round .

Old livestock or poultry farms are good places to start but the hygienic conditions should be given special attention to meet the right parameters otherwise simple structures built with durable materials that can keep out heat and sunlight are equally good.

Mushroom farms should be sited on low ground fields with a moist and damp atmosphere to encourage growth.

Market Opportunities



To establish a successful mushroom farming business, it is important to study your local market for prevailing prices, and be up to date on supply as well as demand trends in your locality as this informs where to sell your mushrooms.

Focus on winning customers through higher quality, better services, lower prices and exceeding customer expectation. Calculate costs involved in production and labor as these influence profit. I will talk more about market in chapter 11.

Labor

This is defined by whether a mushroom farm is geared towards continuous production and daily harvesting on commercial basis or on a very small scale.

In order to maximize your “mushroom farming” business potential it is important to consider hiring labor to take care of the technology aspects while you concern yourself with marketing especially as most of the harvesting work done in growing mushrooms is manual.

Components of a Mushroom Farming Business

Spawn Production



Mushroom spawns are one most important ingredient to think of when starting a mushroom farm business. Spawns are granular substances specially impregnated with mycelium from which mushrooms grow – usually created by mycologist.

The good news is that you can make your own spawns using old stem butts as this enables you to reuse old mushrooms to start a new cultivation cycle-often termed re-spawning from the stem.

It is important to note however that most varieties do not have the stem growth capability apart from the Oyster, Morel and a few others.

Substrate Preparation for mushroom farming.



The medium in which mushrooms grow is called substrate or in more common terms, “soil”. There are several substrates including mediums prepared from a laboratory e.g. Agar.

Dry leaves or woody materials are however the most commonly used around the world.

Ingredients often included in making of the bags are; softwood sawdust, straw, quick lime, wheat or rice bran, and spawns for inoculation.

Bag Making for mushroom farming.



The bag making process usually involves; composting the substrate, filling the bags with composted material, spawning and then incubation till maturity stage.

If you are using sawdust, then each heap (1 ton) of sawdust should be mixed with; 4 sacks of wheat bran (or 8 sacks of rice bran), and 8 bottles of quick lime for neutralizing the saw dust. For every 1000th bag filled with substrate, you will need about 30 spawn bottles.

Steps involved:

- ❖ neutralize the sawdust with your quick lime and allow to dry
- ❖ mix sawdust with your or wheat bran
- ❖ fill into polybags and compact
- ❖ sterilize filled bags preferably in an aluminum barrel over a source of heat
- ❖ inoculate with spawns after sterilization
- ❖ allow the bags to mature

Making the substrate or compost yourself gives an added advantage for continuous production since you don't have to depend on external suppliers and efficiency of bags is better assured since you are entirely in charge of the process.

Additionally, after using your substrate or Compost bags it can still serve some useful purpose on your farm as a soil conditioner.

Young Farmers make money with Mushroom Farming



Mushrooms farming is often considered difficult by many. This has made many people shy away from it despite its profitability. We sought out to find farmers who had successfully done mushroom farming and that is when we met Nick and Daniel.

Before starting mushroom farming, the two had to battle challenges such as capital, lack of information among others but after planning and preparing for over five months, the two finally started the venture.

When we visited them, they were busy working in their mud walled mushroom house. This is where the magic happens. The 700 mushroom bag capacity house has its inner walls lined with black polythene with the floor covered with the same material. This is to preserve moisture as mushrooms require a certain amount of moisture to grow. Inside the house, are rows of wooden shelves where the mushroom bags are placed as shown in the image above. The sight is one to behold.

At the time of the visit, the two together with two other employees were busy harvesting as they had orders for their mushrooms in town among them a supermarket. We sought to find out how they sold their mushrooms as this is a major challenge for most farmers. As a matter of fact, more farmers quote marketing as a bigger challenge than even financing.

This is mostly attributed to the reluctance of farmers to go out in search of the market. “At the beginning we had decided to sell the mushrooms to a broker but it was not long before we realized that the prices he bought at were far less than what we deserved. At this point we decided to take matters into our own hands and source for market ourselves.” That decision, he explains was the best they ever made. They now sell a pallet for anywhere between ksh.200 - ksh.250 as compared to the ksh.140 they got from brokers.

The two encourage farmers to take an active role when it comes to marketing their products. They say most of their clients are restaurants with vegetarian dishes, supermarkets, and health conscious individuals. Mushrooms having 0 calories makes it extremely healthy and a great alternative to other unhealthy meals.

The two have since then mastered the art of mushroom farming and in a bid to encourage other farmers to practice mushroom farming, they are developing a complete curriculum that would help farmers understand every aspect of mushroom farming and be guided through the process.

The two in conjunction with Farming Afrika will be holding training seminars once a month where farmers will be taken through the theory and practical sections of mushroom farming. The sessions will be held in the farm so as the learning farmers get to see the entire process physically. This is to ensure farmers get value for their money and practical examples have been considered to be a more effective way of learning.

Soko Mushrooms – How Three Sisters Are Making A Mark in the Exotic Business of Mushroom Farming in Africa



Do you fancy mushroom farming in Africa? These sisters really do!

Mushrooms are an excellent food and delicacy in many cultures across the world. They are a good source of protein, low in calories, fat-free, cholesterol-free, gluten-free, and contain several important nutrients.

Three sisters found an opportunity in satisfying the growing demand for mushrooms in their home country and have built a thriving business that supplies fresh and dried mushrooms to supermarket chains, restaurants and hotels in Harare, Zimbabwe.

Raised on a farm, Kundai, Eleanor and Rumbidzai have combined their skills, experiences, passion and love for farming and entrepreneurship to create an enviable partnership.

This happens to be the very first guest post on smallstarter.com and I am super-excited to share it with you!

Agribusiness is creating a formidable breed of successful entrepreneurs across Africa. This is one success story that will surely leave you inspired...

Soko Mushrooms: How It All Started...

Hi readers! I am Eleanor. I co-founded *Soko Mushrooms* in Ruwa, Zimbabwe in February 2012 with my sisters and partners, Rumbidzai and Kundai.

‘Soko’ actually means ‘monkey’ (in Shona, our local language). It’s our family’s totem. Since we are a family business, we thought our cheeky totem would best represent our brand.

Farming and business are part of our DNA. Both our parents are entrepreneurs, as was our late paternal grandfather who was a commercial farmer and entrepreneur since the early 1950s.

Growing up on the family farm, our parents encouraged us to help out and instilled in us a deep sense of hard work and self-reliance. We grew up growing our own vegetable gardens, milking the cows and feeding the chickens and pigs.

When Kundai graduated from college in the USA at the end of 2011, she immediately got on a plane and returned home to Zimbabwe to begin work as an entrepreneur. She came armed with knowledge of organic farming and the desire to start her own farming business.

When she arrived, she found our family farm in disarray. It was overgrown with weeds and operating way below capacity.

She shared her business idea with Rumbidzai and I, and asked us to partner with her in the new venture. We all agreed and used the same roll-up-your-sleeves, can-do attitude we had fostered as young girls growing up on the family farm. We registered our company and got to work!



It took us some time to define our roles. I had worked in agricultural development and trade policy in the US and already started my own company in Mali. Given my experience, it made sense for me to focus on the strategy for Soko.

Rumbidzai had been working for our family convenience store retail business. Since she had a clear understanding of business regulations in Zimbabwe and had relationships with wholesalers, she naturally focused on finance and marketing.

Kundai was the most interested and skilled in mushroom farming so she focused on operations and outreach.

We knew early on that we needed to do some market research, and not just follow what most people were doing which was to grow whatever was popular at the time.

We visited research institutions, supermarkets, wholesalers and nurseries, and asked a lot of questions. Through our research we realized that most of the mushrooms available in Zimbabwe were being imported which gave us an opportunity to supply mushrooms locally.

Capitalizing on the fact that mushrooms are highly perishable, we found local buyers who were willing to buy from us.

To gain additional expertise in mushroom farming, Kundai enrolled in an intensive mushroom growing course. We also bought plenty of books, watched videos and hired a consultant to provide additional technical services.

We used our savings to purchase mushroom growing equipment; hire staff, build grow houses and a packing shed.



We faced some delays early on since we had limited capital to run the business, and we were also working on it part-time.

In December 2013, Kundai decided that the best way we were going to move forward was to have someone dedicated full time to the business. She quit her banking job to go full time into farming.

Over the last two years, we have transformed Soko Mushrooms from an idea to a thriving business.

We currently supply major supermarkets in Harare with fresh and dried button and oyster mushrooms, and recently added mushroom spices to our list of value-added mushroom products.

Following a number of requests from aspiring mushroom farmers, we recently launched a mushroom training school to provide training and support to new farmers. We want to continue to grow and sell mushrooms to the rest of the country.

“Our vision is to reignite the Zimbabwe agriculture sector by creating livelihoods and jobs.”

Why Are Mushrooms Such A Viable Business Opportunity?

There are a number of reasons why we believe mushrooms, particularly oyster and button mushrooms, are a viable business opportunity for new farmers.

And if you don't know anything about mushrooms, don't worry. Later in this chapter, I'll describe the two major types of mushrooms (oysters and buttons) and how to farm them.

So from our knowledge and hard-earned experience in the business, here are four reasons why we believe mushrooms are a very viable opportunity for African entrepreneurs.

#1 They grow on available waste



The beauty of mushrooms, particularly gourmet (oyster) mushrooms, is that they are grown on available agricultural waste such as wheat straw and chicken manure.

Agricultural waste is readily available in most places, and is usually burned or wasted. Mushrooms provide the option to recycle waste and create something valuable.

Also, we use the waste from growing our mushroom as compost for growing other crops such as our sweet potatoes.

#2 They do not require much space to grow

Mushrooms are an ideal specialty crop for small-scale farmers, because they can be grown indoors and do not require arable land to grow.

This means that farmers with limited land can grow them (even in urban areas), and farmers with land can grow them in addition to other crops.

#3 They produce a high return per square foot

Mushrooms produce a very high return per square foot. Oyster mushrooms are especially productive, and can produce up to 25 pounds per square foot of growing area every year.

#4. They provide an alternative source of income and nutrition.

Mushrooms provide an option to diversify and earn additional income for farmers who typically grow a single crop like maize (corn), cassava, rice etc. They also provide good alternative source of protein which does not require much land.

Where Do We Sell Our Mushrooms?

Good question!

We sell our button and oyster mushrooms to supermarket chains, restaurants and hotels in Harare (the capital). It is generally much easier to sell mushrooms in major cities and tourist resorts than in rural areas.

You get better prices from selling at retail. We have not focused on the export market yet, because we have yet to fully meet the local demand.

Want To Know How We Grow Our Mushrooms? Let's Teach You A Few Things!

There are primarily two types of mushrooms that are grown in Zimbabwe and most African countries; these are oyster and button mushrooms.

How to grow oyster mushrooms

Step 1: Oyster mushrooms grow on inexpensive and locally available materials such as straw, sugar cane bagasse, spent hops and cottonseed hulls. First the substrate (growing medium) is pasteurized.

Step 2: The pasteurized substrate is then inoculated (mixed) with the spawn (seed), packed into growing bags and incubated in growing rooms (mushroom houses).

Step 3: During the incubation and fruiting stages, the moisture and humidity is closely monitored. Strict hygiene must always be followed during the growing process.

Oyster mushrooms take about 4 weeks from incubation to harvest. It is important to get mushrooms to market as soon as possible since oyster mushrooms are highly perishable.

How to grow button mushrooms



Step 1: For button mushrooms, this is the composting/substrate production phase. It is usually the most time-consuming and also most important stage as it determines the rest of the growing cycle.

The ingredients, such as straw, maize (corn) cobs and chicken manure, are composted. This can be done either mechanically or manually depending on the available resources on the farm.

Step 2: This step involves spawning, a process where the spawn (seed) is mixed with the substrate (compost/manure).

The combination is then put into the climate-controlled growing houses (mushroom houses) where the substrate is cased with casing material and closely monitored for humidity and temperature.

Step 3: Small mushrooms start pinning and then grow into caps. The whole farming process takes about 12 weeks from composting to full maturity. After which the mushrooms are then hand harvested in about 3-4 flushes (breaks).

The 3 Biggest Lessons We Have Learned On Our Business Journey

Every business has its lessons and we have surely had some on our journey so far.

Because we now have the privilege to look back on our actions, we can see some of the things we did well and didn't do quite as well. If we had to start again, these are the three main things we would watch out for...

1. Start quickly

We wasted a lot of time trying to build all our grow rooms at once. We spent too much time waiting for the perfect time to get started.

In hindsight, I believe we should have started earlier with a minimum viable product get it in front of potential buyers. This would have helped us get to the next level faster.

2. Have a good team of people who love what they do

We learned the importance of having a good team that you love to work with. This has helped us weather the highs and lows of mushroom farming.

3. Stay focused and keep your head up

We learned that you need to stay focused and remember that you make your own luck. Starting a new business requires the willingness to take risks. You always have to stay positive in the face of adversity.



Our Top 7 Tips for starting in mushroom farming in Africa

Experience, as they say, is the best teacher. I totally agree.

If you're reading this and would like to venture into mushroom farming, these are our own top 7 tips and advice for you. By following them, you're very likely to increase the chances of succeeding in the mushroom farming business.

Here they are:

- Start small: this will help you address the challenges of growing a new crop, like mushrooms.
- Plan, but understand that things will take longer than you think; you have to be patient and love what you are doing.

- Identify your market before you get started, and secure contracts if that is an available option. Mushrooms are a highly perishable product so you need to know who you are going to sell to before you even get started.



- Use good, healthy spawn (seeds) and compost. You can ask other mushroom farmers for recommendations to avoid wasting money on poor quality inputs.
- Prepare for challenges like power outages (in our case) which will impact your business if you are growing button mushrooms.
- Network with other farmers, in-person and online: farming can be lonely at times, and meeting other farmers, even farmers that are not growing mushrooms will help you share ideas and discover new markets.
- Get quality training: while mushrooms are relatively easy to grow, they also require technical know-how. Investing in good training for your staff will help with limiting production challenges such as low production and contamination.

I hope you enjoyed this success story.

How I grow button mushrooms cheaply



Joseph Hinga shows some of the mushrooms he grows.

In Annex estate, three kilometres from the Eldoret Town centre, a man has taken up a unique challenge and started growing mushrooms in a house within his compound.

When we visited him, we find Mr Joseph Hinga busy inspecting his crop in the small, darkened room. The mushrooms grow in several sacks, appearing as tiny white protruding balls of various sizes. Joseph walks between the two stands that support the tens of sacks, constantly pausing to check on his crop.

He picks one mushroom from a sack and observes it. “This is a button mushroom. It is ready for consumption,” he says.

To grow the mushrooms, Joseph sources for wheat grain, wheat straw, cotton seed, mill cake and gypsum. He mixes them with chicken waste to make compost.

“The chicken waste contains plenty of nitrogen but one can use sorghum or millet instead of wheat grains. The waste from the poultry helps in the decomposition of the mixture, which might host several bacteria and viruses,” says Joseph.

The wheat hay acts as the food or substrate of the mycelia as it helps to colonise the whole compost with the mushroom spawns.

He says that the method is simple and makes a lot of economic sense.

“Most farmers use the expensive way of pasteurisation, which involves the use of a sterilising machines and a fan. It has also proven to be labour intensive,” says the farmer, who started mushroom farming with oyster species in 2013.

“I grew oyster mushrooms for a year, but I realized the production was low. I also had to do a lot of lobbying to persuade people to buy the mushrooms, unlike button mushrooms, which many people are familiar with.”

He explains that from his research, one needs not sterilise the compost since it would require one to build a house, purchase a motorised fan and a costly boiler to heat the compost under 600 degrees centigrade.

FOREST SOIL

The process of preparing compost is conducted in open air, and takes about two weeks before it is ready to be transferred into the dimly lit room with openings covered with nets. The nets keeps off insects from entering the room at same time allowing air to circulate.

“Outside you can sterilise up to 700c-750c, which is required to kill bacteria but with the other pasteurization, the burning of the grass goes to 600c, which may not kill all the small creatures.”

Once inside the room, he puts the casing soils on after another 14 days. The soil is preferably from deep inside forests.

“One needs to use disease-free soils, mainly from forests, to grow the mushrooms and to minimize disease.”

The next phase entails exposing the mushrooms to plenty of oxygen through aeration to facilitate growth.

The computer science graduate from the University of Nairobi explains that mushroom farming offers better returns than most agribusinesses.

“With this farming one needs to be patient. I remember trying four times before I succeeded. I had to learn to maintain good hygiene to keep diseases and pests such as pink, green, and grey moulds and mites at bay.”

From 141 bags, he says, he will harvest on average 1.5 kilograms of mushrooms per sack. A plastic food container which carries mushrooms weighing 165 grams goes for Sh.200 with a kilogramme fetching Sh800 in the local market.

“It takes two months for the mushrooms to mature. One harvests continually for another one month and several days, so long as you keep watering the crop,” says Joseph.

He sells most of his harvest to big supermarkets and hotels in Eldoret, Nairobi and even Mombasa.

As soon as he is done with harvesting session, he does not throw away the compost. Instead, the compost, rich in urea, is used to improve the soil fertility on his farm.

“A 50kg bale of the compost can fetch up to Sh.2,000 in the market,” he says.

Mr Ahoya Oindi, a microbiologist at the University of Eldoret, recommends button mushroom farming in the country as the mushrooms are considered nutritious and is on high demand.

“Button mushrooms are on high demand in the market. For instance, most mushrooms grown in Eldoret are taken to Nairobi. There are not enough mushrooms to satisfy the insatiable demand in the town like big supermarkets and hotels.”

He adds that the mushrooms contain vitamins and cancer reducing components.

Mushroom farming made easy!



Mushrooms are the spore-bearing fruiting body of Fungus. They are highly nutritious playing the ‘meat’ in the vegetable world. They have of late captured the attention of the Kenya’s farming community with most mushroom farmers boasting of amazing profits. They are land and rainfall independent hence making them the better option for the land-unblessed or those looking to maximize revenue from their land usage.

They only require a house and your attention to make you the happy farmer in the end. The demand in Kenya is unsatisfied with NAFIS data indicating that we are only producing 500 tons of these mushrooms against an annual demand of 1200 tons from homes and hotels.

Mushroom farming has been a very complicated venture requiring lots of chemistry, biology and attention. This has made it a no-go-zone for the small-scale farmers. However, with continuous seminars and studies, some farmers have learned how to improvise and they have successfully mastered how to make the very complicated procedures of the large scalars to one simple- carefully-executed-piece of cake procedure.

Peter Kibe, a mason from Molo, is one of those farmers. He is growing mushroom as a business with his focus being the oyster variety (the most common among small-scale farmers. Others include shiitake and button) and he is enjoying the benefits of this venture. He has been in mushroom farming since 2006. He started with only 2 kg of spawn (the planting material) per mushroom cycle but got disrupted by the post election violence a bit in 2007 to 2008. However, he resumed his agribusiness venture with his recent plans being to inoculate 4 kg of spawn every month. This is how he pulls it off.

The structure!

Mushrooms do not require huge tracts of land to grow. All you need is a house to keep them warm and humid and very happy. Using free material from his garden such as mud and wood, peter constructed a structure of 10 by 17 ft to house his new money-bleeding venture. He then bought a cover paper worth Ksh.5,000 to act as a roof for the structure.

Substrate (the growing medium)

Mushroom would require a special kind of medium to grow and Kibe was smart enough to improvise. Using maize and beans trash from his garden, crashed and packed in the 50 kg gunny bags (like those for packing sugar or rice) he was able to create the substrate required for growth. Here, soil is not necessary.

Sterilization

This venture is very sensitive to cleanliness. They require germ-free environment. This is why attention is very important when it comes to mushroom farming. Sterilization is usually done through steaming in large scale but for small-scale farmers like Kibe, one can improvise. He uses a drum to boil water. With the water boiling, he immerses the gunny bags with the substrate in it for about 1 hour so as to get rid of any germs. He then suspends the gunny bags in the structure overnight for them to cool off. With this procedure, his sterilization problems are solved.

Spawning

This is the most serious part. It's the part that scares away newbies in mushroom growing. This stage is all about getting the 'seeds' (spawns) from the experts and planting them (inoculation). In this stage, you become the chemical engineer with lots of mixing stuff. But, don't you worry, it's not rocket science. With Kibe, he only purchased the spawns (2 kg) from JKUAT at a cost of Ksh.600 per kg.

He then purchased the normal 9 by 15 nylon bags used for packing 2 kg sugar or rice among others. A bunch of them goes for around Ksh 80 and contains 200 pieces. These were to serve as his garden bags. He then outsourced for cotton wool and methylated spirit (you know the deal for these things, right? It's all about keeping your working tools very clean. Like you are operating on someone)

Using the spirit to sterilize his hand gloves, he then mixes the spawn with the sterilized substrate and packs the mixture in the small gunny papers. The 2 kg of spawn mixed with the substrate gives him about 50 small gunny bags (1 kg of spawn translates to about 25 small gunny bags). He then covers them with the top wrapped around small pipes (sterilized).

Just like drinking water from those nylon papers using a straw. Their external opening (of the pipes) is covered with cotton wool sterilized with the methylated spirit. Wow! Complicated stuff. But believe it or not, this is one is easier done than said.

Incubation

This is the part where Kibe takes the 70 gunny bags to the darkest corner of his structure, away from sunshine for about 21 days. After those 21 days, the gunny bags are now covered with whitish substance, mycelium. He transfers the gunny bags from darkness to lighter places of the structure to enable mushroom formation.

It takes only 4 to 5 days before he notices the white heads beginning to appear on the sides of the gunny bags. Using a sterilized scalpel (sharp razor blade), he pricks the gunny papers at the area directly adjacent to the new mushroom about to pop out so as to allow easy germination. This time, a lot of humidity is highly required. You can use the knapsack to spray clean water in the structure. Just ensure that the jet is in mist form.

Harvesting

This is the happy moment for Kibe. This usually happens after 1 to almost 2 months of serious nurturing of these fungi. The 2 kg he inoculated less than 2 months ago have multiplied to 50 kg of fresh mushroom for sale. He sells a kilo of mushroom to his clients at a price of Ksh 320 meaning he just made Ksh 16,000 in less than 2 months using only Ksh 1600 of spawn. If he expands to growing 4 kg of spawn every month (half the full capacity for his 10 by 17 ft structure) then he will be getting a gross income of Ksh.64,000 every month.

Bottom line! This sounds too complicated. However, with practising high levels of hygiene and attending seminars organized by government and universities as suggested by Kibe, it becomes as easy as turning Ksh.2,000 of investments into Ksh.16,000 in less than 2 months.

The question to ask yourself will be, how many of those Ksh.2,000 do I need to multiply in those 2 months?

Mushrooms Lure Young Man away from the City



It tells how John Collins Muchiri, 28, left Nairobi to pursue farming at his rural Riamukurwe Wambugu farm in Nyeri, rather than stay in the city. John Muchiri left to grow mushrooms and has never looked back since.

“I have a passion for farming. I left my job as a sales person to do full time farming,” he said during an interview at his home. He received Sh.25,000 from his brother and used Sh.15,000 of it to pay for a mushroom growing course and Sh.10,000 to buy substrate, on which to grow the mushrooms.

He raised more money to study how to make substrate. “I raised Sh.75,000 from selling goats and went for another training. It was hard at first because there was no one to guide me on getting raw materials, equipment, and market,” he said.

After acquiring the necessary materials, John Muchiri built a darkroom for growing mushrooms. John Muchiri has since increased the number of darkrooms to five, following a rise in demand for his mushrooms. One darkroom costs between Sh.20,000 and Sh.30,000 to build, depending on the construction materials used and the size of the structure. A darkroom consists of wooden sections, on which the substrate is placed to allow the mushrooms to grow, walls are covered with polythene papers. A thermometer is placed in each room to monitor the temperature closely.

Medicinal value

With 30 regular clients, he makes at least Sh3.6 million per year through selling the substrate alone. “I get contracts from farmers to make substrate. Making one tonne of the substance costs Sh.55,000 and I can make as much as five tonnes for one farmer,” he said. He grows three types of mushrooms: button (*Agaricus*), oyster (*Pleurotus*), and shiitake .

One kilogramme of button is sold at between Sh.500 and Sh.900, while oyster costs between Sh.300 and Sh.500 per kilogramme. He incubates shiitake only on order as it is prized for its medicinal value. Mr Muchiri said he makes between Sh.15,000 and Sh.20, 000 per day during harvest time. “I want to increase the volume of substrate so that I can supply at least 200 kg of mushrooms per day,” he said. He supplies mushrooms to hotels in Nyeri, Nanyuki, Nairobi, and Mombasa as he looks forward to exporting the produce.

John Muchiri also teaches farmers how to grow mushrooms.

John Muchiri said that patience is the key to the success of any business. He attributed his success to support from his pastor and hotels.

Man discovers gold mine in mushroom farming



Mushrooms are highly nutritious and in high demand thus attracting more farmers in the venture. Mushrooms do not need plenty of land or rainfall as other crops. They can be grown even in huts as long as one can control lighting, temperatures and humidity. They are a better option for those with little or no land.

Thirty-year-old Zacharia Mwangi, of Juja, Kiambu county started growing mushrooms in 2012 and focuses on the button variety. “I started with oyster variety but later shifted to button because it fetches more profit compared to oyster,” says the farmer. Before, he was employed by Juja Community, an organisation dealing in mushroom farming.

When he was confident he had enough knowledge, he quit the job to start his own farm. Armed with Sh.30,000 he bought spawns (spawn is the carrier on which the mushroom species grow), ready to plunge into the business with 500 bags.

“After 40 days I harvested my first produce which was promising. Within six months I had Sh.50,000 profit and that is when I decided to shift to the button variety,” he says. He started off with 200 bags of button variety which he has since increased to 500.

When asked the difference between the two varieties, he says button mushroom is grown exclusively by large-scale farmers since its cultivation is sophisticated while oyster is favoured by small scale farmers but the trend is changing.

“I prefer button mushrooms because they fetch better price than oyster. A kilo retails at an average of Sh 500,” he said. He says that button mushroom, also known as champignon is a secondary decomposer i.e. it cannot feed on fresh substrate but instead the substrate (surface) must be decomposed first.

“The main substrates for button mushroom production are rice straw, wheat straw and sugarcane bagasse. Other types of substrates cannot be standardised for use,” he said. Double produce He has employed one assistant but on busy days he gets five workers. In a good month, he harvests up to 100kg and 50 kgs when production is low, making between Sh25,000 and 50,000.

“The good thing about this farming is that you get double what you used for production. Besides, the harvesting is done every other day to ensure that one does not go out of stock,” he says. However, Mwangi notes that, the biggest challenge facing the sector is lack of research and the mushrooms are perishable.

“There is need for research that focuses on feedback from farmers. Most of the challenges that Kenya is facing in mushroom production, are also elsewhere in mushroom growing regions.

He says the farming only needs good management to ensure high produce, in both small-scale and large-scale farming. The quality of spawn also determines the final product. “There is a huge demand market, hence a great potential for profitability,” he concludes.

Chapter 2

Mushroom Farming Business Plan



In Asia, Africa and other parts of the world the love for mushroom have continued to gain greater heights. The truth is that there are the types of mushrooms that aren't edible, and there are those that are highly edible and nutritious.

Dabbling into the mushroom business might not be a bad deal at all, especially if you have a penchant for farming and have taken the pain to draft a mushroom farming business plan. In fact, it is one business that is a silent money spinner.

The truth is that mushroom farming can yield loads of profit in just a matter of weeks if it is taken pretty seriously. One of its great benefits is that it has a low start up and doesn't require a herculean task to pull things off from the scratch. This is because mushroom farming have been in existence for over 25 years and better ways have emerged on how to manage a mushroom farm.

There are 6 stages to the production system of a mushroom. Some of the levels that you may need to scale through in the mushroom farm business are the following; composting, spawning, casing, pinning and cropping. All these are expedient hurdles that are needed to be scaled.

If you think you might be interested in starting a mushroom farm, then you may consider following some of these steps. Paying close attention to these tips is as important as anything else.

1. Gather a Lot of Information

The level of information that you may need to start your own mushroom farming business might be a lot. It is for that reason that you would be required to really garner plenty of knowledge. There are a thousand and one books that may be available to you when looking to pull this off.

You may consider visiting a local library, as well as buying some important books of mushroom farming. The internet is also a good medium available to you through which you can get things going. Information such as the steps to follow, as well as what it would cost you would be readily available.

2. See Things Physically For Yourself

Nothing pays like the first hand information that you are able to garner, therefore, you may consider going to a mushroom farmer and asking to be trained on the mushroom farm.

The farmer who is involved in this might charge you for a fee, whilst in some cases if you could be allowed to go see things for yourself for free. Be sure that usurp the opportunity to ask a whole lot of information about the various stages of production, and a host of other things.

3. Determine How to Start

You have got to determine on what scale you want to start your mushroom farming. Since this is one of the prolific businesses that you may ever venture into, you may either consider starting on a large scale, or opting to launch out big. If starting small is what you want, then you can look to grow fast as soon as you create a good customer base.

4. Determine a Good Location to Use

You have got to really look well before locating your mushroom farm in a place. This means that you would have to consider either an existing livestock farm or a poultry farm. This would also entail that the hygiene level at this location is top notch so that they can achieve the right technological parameters. You may also want to consider using a field that is devoid of other road networks. Also make sure that it isn't a sloppy land

5. Purchase Equipment

In making sure that your mushroom farm runs smoothly from the outset, and then it becomes expedient that you purchase all the necessary equipment that is needed. These equipment include; the mushroom comb, compost hopper, parking lorry, and a host of others. All these need to be got for maximum impact.

6. Hire Workers

Whether you would want to start small, or are looking to start big, you might not be able to pull things off all by yourself. For that reason you would need some helping hands. Be sure that you go for experienced workers who already have background knowledge on how things are run. You may also consider training some rookie if you are after saving some costs.

7. Adhere To the Cultivation Rules-:

It is very important that you adhere to the cultivation rules. For instance; as stated above earlier, it is important that the stages involved in the production of mushrooms must be adequately followed so as not to at a loss.

8. Advertise Your Mushroom Business

You may begin to tell those that might be interested in your mushrooms long before they are harvested. *Why is this so, you might wonder?* This is especially important because you do not want to have your mushrooms harvested without having a ready market to dispose them off at. You may consider telling individuals, hotels, as well as other organizations that might want to even export your mushroom.

9. Be Sure To Be Up and Doing

After you might have made your first harvest and have transacted your business, therefore it isn't a time to relent. Rather it is a time for harder work as you do not want your profit level to be a one off thing. So as soon as the first transaction occurs, keep looking at ways to get better at what you do and promote your business till it grows to a stage of great profitability.

A thousand and one persons have made it really big in the mushroom farming business. You too can take a cue and be a part of those who are telling successful stories about their mushroom farming business.

A Sample Mushroom Farming Business Plan Template

Are you about starting a mushroom farm? If YES, here is a complete sample mushroom farming business plan template & feasibility report you can use.

I have considered all the requirements for starting a mushroom farming business. I also took it further by analyzing and drafting a sample mushroom farm marketing plan template backed up by actionable guerrilla marketing ideas for mushroom farming businesses. So let's proceed to the business planning section.

Why Start a Mushroom Farming Business?

There are large varieties of mushrooms – over 2,000 – that can be eaten. However, out of these large numbers, only few – common button agaricus, criminis, portabellas, shiitake, oyster, wood ear, morels, chanterelles and enoki – are taken in the Kenya.

Kenyans like taking their mushrooms fresh, dried or canned. The good thing with growing mushrooms is the fact they grow so fast and if you are adept at selling your produce as soon as they are harvested, you are on your way to making tons of money.

However, like any other business, it would not do for you to rush into the business simply because others seem to be making tons of money from it. You would need to carry out a thorough research to determine if it would be worthwhile enough for you to go into the business. If you cannot carry out this research on your own, you might need to hire a business consultant familiar with this form of business to help you out.

One necessary document that is important for you in starting this business is a business plan. The aim of a business plan is not only for investors to see how well you intend to run the business, but it is also meant to act as a guide towards running your business with few hitches as possible. Below is a sample plan to aid you in writing and starting your own mushroom business;

A Sample Mushroom Farming Business Plan Template

- **Business Overview**

Mushrooms which are usually grouped as vegetables are spongy and part of a fungus fleshy. It is widely consumed due to its high medicinal and nutritional value especially as it is free from cholesterol, fat and gluten and very low in sodium. There are over 2,300 species of edible mushrooms grown and available globally.

There are basically several kinds of edible mushrooms – such as common button agaricus, criminis, portabellas, shiitake, oyster, wood ear, morels, chanterelles and enoki – in existence in Kenya. Mushrooms in Kenya are usually sold in two forms – fresh and processed (dried, canned, and frozen).

The most common mushrooms grown and consumed on a commercial scale in the Kenya are the button agaricus, which in 2015 contributed 36.1% towards the total mushroom market. Other mushrooms like the shiitake mushrooms are also popular mushrooms in Kenya but are regarded as specialty mushrooms.

Globally, button agaricus, shiitake mushrooms and oyster mushrooms are what dominate the production and consumption markets and as at 2015, these three kinds of mushrooms accounted for 76% of the global market.

As at 2014 and 2015, mushroom production decreased while the value increased. During this period, 896 million pounds of mushrooms were produced which slightly decreased from the previously produced mushrooms between 2013 and 2014. However, the value of the crop as at 2015 went up to \$1.11 billion. Also, the period saw an increase of commercial mushroom growers.

Major developing nations have begun to see an increase in the demand for mushrooms especially as income levels in countries such as Kenya, Naigeria, Thailand, and India. Countries

like China are nearly taking over the global marketplace as they are selling their mushrooms at rates lower than what can be obtained in the United States, Germany as well as France.

As at 2015, mushrooms globally were valued at over \$29 million, and were projected to grow at about 9.5% in 2019 to reach a value of \$50 million. The global market as at 2015 was dominated by Europe closely followed by the Asia-Pacific region.

Factors that drive the mushroom business globally are consumer shift towards nutritional foods, high demand for organic foods and development in high yield systems and the increasing power of the supermarkets.

Mushroom Farming Business Plan – Executive Summary

Mushy Forage Farms LLC is established and recognized as a major supplier of gourmet quality mushrooms in Nakuru and in the larger Kenya. We will grow and sell all the different kinds of mushrooms consumed in Kenya to our variety of customers.

Our aim as a business is not only to make profit but also become a leading company that can compete favorably with other mushroom business in Kenya and also in the whole of Eastern Africa. To be able to effectively compete against our competitors, we intend to ensure that we hire the best professionals in the industry so as to build the perfect business structure.

Due to the fact that mushrooms are edible products, we intend to ensure that our mushrooms are grown in an environment that is conducive and hygienic. We are also growing the mushrooms organically as we intend to ensure that our mushrooms pack a high dose of nutrition.

Because we know how important our employees are to the growth of the organization, we intend to ensure that we create a conducive environment for them to work and also provide welfare packages that are aimed at ensuring that their productivity rate is increased.

Because the demand for mushrooms is increasing as more people are recognizing its importance, we have carefully chosen our channels of distribution that would ensure that our mushrooms reach all our existing customers and open opportunities to reaching potential customers.

One of our strongest factors at Mushy Forage Farms LLC apart from producing and selling organic mushrooms is the excellent customer care we provide to our customers which has led to a high retention rate for us and an overall healthy bottom line for our business.

Our proficient uses of the internet to intensify awareness about our business and the products and services we offer are part of the sustainable practices that is obtainable at Mushy Forage Farms LLC.

Mushy Forage Farms LLC is owned and run by Lisa Wanjohi. Lisa has a B. Sc in Food Technology and started growing mushrooms as a hobby before turning it into a business. She is bringing in her wealth of experience into the business.

- **Our Products and Services**

We intend to grow and sell all the kinds of mushroom that is being consumed in Kenya. Mushy Forage Farms LLC is an establishment that will ensure that all our mushrooms are sold via our different outlets and even directly from the farm.

Because we know how important it is to ensure that our business remains afloat, we intend to ensure that we create multiple sources of income that is in line with our corporate culture as well as business' goals and objectives. We however would like to stress that all the routes we would take to make profit would be legal and within the permissible laws of Kenya.

Some of the products and services we intend to engage in are:

- ❖ Fresh mushrooms such as common button agaricus, criminis, portabellas, shiitake, oysters, medicinal reishi, lions mane, wood ear, enoki and maitake

- ❖ Processed mushrooms (dried, canned, frozen)
- ❖ Offer consultancy and advisory services
- ❖ Sell eBooks for intending new farmers
- ❖ Give trainings

Our Vision Statement

Our vision is to be a major supplier of quality gourmet mushrooms in Kenya and be recognized throughout Eastern Africa.

- **Our Mission Statement**

To achieve our set vision, we intend to practice sustainable farming practices by growing our edible gourmet mushrooms in a controlled environment and using organic substrates as much as we can.

- **Our Business Structure**

Having a business structure is very important as it will help the business follow the vision which it has determined for itself. At Mushy Mushrooms Forage, we have perfected the plans that will ensure that we get it right by employing only the best and competent hands to come and work in our firm to enable us attain the goals and objectives which we have set for ourselves.

Because we have a vision of ourselves becoming the brand leader in this industry, we knew we had to get all the right things done, from carrying out a feasibility study about the business, to writing a business plan that helped us determine the right capital that would be needed to start our business and creating roles and responsibilities so that we could employ just the right employees for our mushroom business.

Asides the fact that we intend to sell our mushrooms fresh and processed, there are other services that we would be offering as well to boost our earnings and so these services will need competent hands to ensure that all our operations run smoothly at Mushy Forage Farms.

Listed below is the business structure we intend to use in building our mushroom business;

- ❖ Chief Executive Officer
- ❖ Mushroom Farm Manager
- ❖ Purchasing Manager
- ❖ Administrative Manager
- ❖ Sales and Marketing Team
- ❖ Store Manager
- ❖ Front Desk Officer
- ❖ Accountant/cashier
- ❖ Delivery Driver
- ❖ Cleaner

Roles and Responsibilities

Chief Executive Officer

- ❖ Responsible for the overall direction of the company
- ❖ Networks with other mushroom businesses and high powered clients on behalf of the company
- ❖ Oversees the management staff so as to increase their effectiveness.

Mushroom Farm Manager

- ❖ Responsible for growing the mushrooms
- ❖ Checks the mushrooms daily for defective ones
- ❖ Harvests the mushrooms when it is time

Purchasing Manager

- ❖ Responsible for purchasing all the raw materials needed by the business
- ❖ Sources for reliable vendors and distributors for the company
- ❖ Keeps an accurate database of all purchases and vendors

Administrative Manager

- ❖ Ensures that the business runs smoothly with as less hitches as possible
- ❖ Ensures that employees have great welfare packages and better working environments
- ❖ Assigns and delegates tasks to employees and ensures that they are carried out accordingly

Sales and Marketing Team

- ❖ Responsible for drafting marketing strategies and policies that will bring in sales for the company
- ❖ Continually research on target markets so as to identify new market opportunities for the company
- ❖ Engages in mushroom retailing to customers

Store Manager

- ❖ Ensures that the store is kept clean and well ventilated at all times
- ❖ Checks level of inventory so as to know when to replenish stock
- ❖ Keeps accurate report of all stocks in the store

Front Desk Officer

- ❖ Is responsible for picking customer calls and taking down order requests or receiving complaints
- ❖ Receives customers on behalf of staff and direct them to the appropriate quarters
- ❖ Keeps an accurate database of customers for future profiling purposes

Accountant/cashier

- ❖ Is responsible for all accurate financial records carried out by the business
- ❖ Ensures availability of cash for running operations and ensures that proper records are kept
- ❖ Carry out end of month reconciliation between the cash book and bank statement

Delivery Driver

- ❖ Delivers mushrooms to various accurate destinations using reliable routes
- ❖ Carry out light repair on delivery vehicle as well as regular maintenance as well
- ❖ Keeps an accurate logbook of distances travelled and also obeys all state and traffic laws

Cleaner

- ❖ Ensure the farm and the entire premises are kept clean at all times
- ❖ Ensures that the restroom for customers and employees are kept neat at all times
- ❖ Ensures that cleaning supplies are always in stock

Mushroom Farming Business Plan – SWOT Analysis

Because we know that it takes serious work before a business can become a leader in the industry, we have conducted a SWOT (Strength, Weakness, Opportunities, Threat) analysis so that we could effectively draft a strategy that will not only allow us compete favorably with our competitors in the marketplace but also ensure that our business stands out and is unique from that of our competitors.

In carrying out a SWOT analysis on our mushroom business, we intend to look internally at our strengths and weaknesses and externally at the opportunities and threats that are available to us here in Kenya and the whole of Eastern Africa.

Due to the fact that we wanted to have the best analysis, we hired a reputable agribusiness consultant here in Nairobi, Kenya to help us determine if the odds were against us and if the business was worthwhile for us to go into. The results were favorable as the strengths and opportunities available to us far outweighed the threats and weaknesses we had or were likely to encounter.

Below is a preview of the SWOT analysis that was conducted on behalf of Mushy Forage Farms LLC;

- **Strengths**

The strength of our business lies in the fact that we would be growing various kinds of edible mushrooms to be able to reach a wide number of customers here in Kenya and also in the whole of Eastern Africa. We have a huge mushroom farm that is able to meet with the demands of our customers and have structures in place to meet with increasing demands.

Asides, offering fresh and processed mushrooms to our various customers, we will also offer training to intending mushroom farmers as well as consultancy services as well. Also, we have carefully chosen and perfected all our channels of distributions, so that our mushrooms can conveniently reach all our customers.

Because we know how important customers are to a business, we are offering an excellent customer service that will attend to the needs of our customers by attending to their requests, enquiries and orders and promptly resolving any complaints.

- **Weaknesses**

The mushroom business isn't new, which means that there are other established mushroom businesses in and around Kenya. While this might be termed a weakness, we have however put strategies in place to ensure that we create the right awareness with potential customers and also ensure that our mushrooms are of the highest quality, as this we believe will effectively combat the other competitors.

- **Opportunities**

Because mushrooms are a healthy meal for everyone, there are loads of opportunities that abound in this field, from those who are looking to start this business and need guidance. Also, because we are always on the lookout for new innovations and technologies in this field, we would be the perfect consultants for those who are new in the business and are looking for better ways to grow their business.

- **Threats**

Every business faces threats every now and then and we acknowledge that we are going to face threats likely in the arrival of new competitors to our same location. The threat brought by this action can be curbed as we have strategies in place to combat any new strong competitor's arrival.

Mushroom Farming Business Plan – MARKET ANALYSIS

- **Market Trends**

The mushroom market which has grown tremendously and is expected to continue is majorly drive by Kenyans love for consuming food that is healthy. Also, other trends include, increase in the processed food consumption and the ease of growing mushrooms.

This does not however mean that it is all rosy for the mushroom farmers as the limited shelf life of mushrooms is a serious hindrance to the business. The mushroom market is filled with intense competitors – small, medium and large scale – who apply various strategies to attract potential customers while also aiming to retain their own customers as well.

Another trend is the fact that mushrooms have multi-functional benefits especially as they are rich in proteins and have low or no fat and cholesterol. These nutritional values have nearly equated mushrooms as super foods. Also, mushrooms have been widely adopted by most growers in Kenya, with most selling their products in the farmer's market.

The major challenge to the mushroom business has always been the limited shelf life but even that would soon change as there are several improving technologies, innovations as well as researches being constantly carried out to ensure that more people can have their mushrooms stay in their homes longer as well as more farmers storing their harvested mushrooms without worrying due to spoilage.

- **Our Target Market**

Mushrooms are a favorite of many homes in Kenya, and so we know that we have a huge target market available to buy our mushrooms. However, because we do not want to be limited by our idea of target market, we have also decided to carry out an in depth research into what to expect from our target market.

This would also help us to be able to draft effective strategies to conquer these target markets in and around Kenya and also in all other locations where we intend for our mushrooms to be sold at. The market research was done with the aid of a farm business consultant who has vast experience in the mushroom market, leading us to identify the markets that would patronize our products.

Asides selling mushrooms in retail, we also intend to sell them wholesale to the following groups of people;

- ❖ Local health food stores
- ❖ Households
- ❖ Farmers' markets
- ❖ Supermarkets
- ❖ Restaurants (Regular and oriental)
- ❖ Hotels
- ❖ Factory cafeterias
- ❖ College cafeterias
- ❖ Produce places
- ❖ Caterers and catering services
- ❖ Food coops
- ❖ Health spas

Our Competitive Advantage

Our vision of establishing Mushy Forage Farms LLC is so as to meet the needs of mushroom loving customers by growing all the different mushrooms consumed in Kenya and

also to become the leading mushroom business not only in Kenya but in the whole of Eastern Africa as well.

However to attain our vision we would need to have competitive advantage so as to compete favorably with already established mushroom farms while remaining proactive in competing against new mushroom farms that would spring up.

Our major competitive advantage is in ensuring that we have hired competent hands on board to ensure that work on our farm goes on smoothly. Our hired employees will work in an environment that is conducive so as to ensure that they attain a high level of productivity. Also, we intend to have welfare packages in place that will show our employees that we care about their welfare.

Customers are the most important reasons a business succeeds, especially loyal customers. We intend to have an excellent customer service where all the enquiries, complaints and orders will be promptly attended to. We also intend to have an incentive referral program for our loyal customers and even our first timers, this will ensure that our customers retain their loyalty to our brand, thereby giving us the competitive advantage we would need to become industry leaders.

Because we know how internet has inclined the world, we intend to push our business via the internet as well, by ensuring we build a user friendly website where all our products and services will be displayed. We will ensure we hire the best web consultant to deploy Search Engine Optimization (SEO) for our website so that our website will appear amongst top leads, for users searching for mushroom businesses. Also, we intend to remain active through our social media platforms such as Facebook, Instagram and Twitter.

Mushroom Farming Business Plan – SALES AND MARKETING STRATEGY

- **Sources of Income**

Mushy Forage Farms LLC has been established with the intention of making profit through growing and selling of mushrooms in Kenya and in Eastern Africa. We intend to grow and sell different kinds of mushrooms, such as Shiitake, Oysters, Medicinal Reishi, Lions mane and maitake, so as to be able to take a large share of the market.

We at Mushy Forage Farms LLC intend to generate income for our business from different sources such as;

- ❖ Different kinds of fresh mushrooms such as common button agaricus, criminis, portabellas, shiitake, oysters, medicinal reishi, lions mane, wood ear, enoki and maitake
- ❖ Processed mushrooms (frozen, dried, canned)
- ❖ Offer consultancy and advisory services
- ❖ Sell eBooks for intending new farmers
- ❖ Give trainings

Sales Forecast

Due to the fact that mushrooms have zero cholesterol or fat in it, most people have incorporated into their diets, which means there will always be a demand for mushrooms in Kenya and even globally.

Our intention of growing all the kinds of mushroom consumed in Kenya is enough to not only solidify our position as a leading brand in the business but also means that we would meet our sales target within a year of growing and running the business.

We carried out a critical evaluation of our target market via the help of a hired business consultant and we were able to effectively gather facts in the industry that not only analyzed our chances of success but also showed how we intend to make our revenue and profit generation possible in Kenya and in Eastern Africa.

The data below shows the sales projection for Mushy Forage Farms LLC conducted on our behalf by our sales consultant, which took various factors such as location and type of business into cognizance:

- ❖ **First Fiscal Year-:** Ksh.6,000,000
- ❖ **Second Fiscal Year-:** Ksh.15,000,000
- ❖ **Third Fiscal Year-:** Ksh.30,000,000

N.B: It should be noted that the sales projection were conducted with several other factors in mind such as that the demand for mushrooms remains stable or increases, and also that there was no downturn in the economy, and that our strategic location would remain the same. This means that if conditions change, the sales projection might increase or decrease.

- **Marketing Strategy and Sales Strategy**

Marketing ensures that your business, its products and services gets noticed by existing and potential customers. No matter how wonderful a business idea is, without plans and strategies set to successfully market the business, it is likely to fail. Marketing involves going out and spreading the word about your products and services.

In successfully marketing your product, you would need to ensure that your products and or services are well packaged, branded and of the highest quality. This would then determine what price you would set for the product and or service after considering all the costs incurred to produce and deliver.

This is where the purchasing, accounting, producing and marketing team all work together to ensure that the appropriate prices are set so that it becomes affordable to the customer whilst also not causing the company any loss.

In ensuring that our products and services reach as many of our target market as possible, we will ensure that we sell our products directly to the public via farmers' market and special food festivals. Our products can also be sold via wholesalers and through our official website

online. All our channels of distribution will be carefully chosen so that we can effectively penetrate the market.

Our marketing and sales team has been fully empowered to ensure that our corporate sales and marketing goals are fully achieved. Most of the strategies that would be used by our marketing team are those that will take cognizance of our overall organizational objectives.

Mushy Forage Farms LLC will ensure that they use the following strategies below to effectively market our different kinds of mushrooms to our different customers;

- ❖ Creating a website and ensuring that our products and services offered are prominently displayed
- ❖ Using social media platforms such as Facebook, Instagram to effectively market our goods
- ❖ Sending out weekly or monthly newsletters to existing and potential customers about mushrooms and its benefits
- ❖ Networking with other mushroom farmers to ensure that Mushy Forage Farms LLC is well known
- ❖ Distribute flyers in strategic locations
- ❖ Advertise our mushroom business via television, radio and newspapers
- ❖ Engage in word of mouth marketing
- ❖ Reward our customers with incentives if they refer customers to us
- ❖ Sponsor relevant activities and events in the local community
- ❖ Use letter drops and mail outs to effectively promote our mushroom business

Mushroom Farming Business Plan – Publicity and Advertising Strategy

Every business needs a bit of publicity and advertising to survive, and the mushroom business is no different. Our aim at Mushy Forage Farms LLC as a standard company is to ensure that we can favorably compete with other leading mushroom farms in Kenya and Eastern Africa by ensuring that we draft strategies that will publicize and advertise our mushroom business.

Because we know how beneficial it would be for our mushroom business when we publicize and advertise rightly, we have hired an online publicity consultant to help draft publicity and advertising strategies that we ensure that we sell our mushrooms to all nooks and crannies in other cities and towns in Eastern Africa.

It would be noteworthy to state that not only are we carrying out publicity to increase our brand awareness and encourage more patronage from our customers but also to ensure that we communicate the message of our brand effectively. Some of the platforms we intend to use in publicizing and advertising our mushroom farm business include;

- ❖ Creating a unique website and making sure that we engage our customers vigorously through our webpage
- ❖ Participating in all food festivals and trade fairs for networking purposes
- ❖ Placing adverts in local newspapers, food and lifestyle magazines as well as on radio and television stations
- ❖ Distribute our unique fliers in various strategic locations
- ❖ Make use of our social media platforms like Instagram and Facebook to promote our different kinds of mushrooms and the business in overall.
- ❖ Participate in community programs and relevant events
- ❖ Install billboards in various strategic and conspicuous locations all around Eastern Africa.

Our Pricing Strategy

Setting a price for any product depends on what was used in procuring and packaging the product, and also what was spent to make the product including the labour used. While it might not be so easy to set a price on services, physical goods are usually easy to set a price for. Pricing is very important as you must ensure that it will be affordable to your customers but not also make your company worse off, profits wise.

The prices for our mushrooms will totally depend on the kind of mushrooms as some breed demand more attention than others. We would also cut down costs where necessary so that we do not fix an unnecessary cost into our final price. This means that we would be fair to our customers and ourselves as regarding the price we would set for our mushrooms.

- **Payment Options**

We at Mushy Forage Farm LLC know how important it is for our customers to have an easy payment option and not be unduly stressed when intending to make payments. We are also aware that because people are different, there are preferences for different payment options that would suit their tastes and lifestyle.

In view of this, here are the payment options available to our customers;

- ❖ Cash payment
- ❖ Payment via credit card
- ❖ Payment via Point of Sale (POS) Machine
- ❖ Payment via check
- ❖ Payment via online transfer

The above available payment options were carefully selected and in collaboration with our bank which have a trusted platform where we are sure of as few hitches as possible during transactions.

- **Start – Up Expenditure (Budget)**

Starting a mushroom farm business requires capital just like any other business. In all start-ups, the bulk of the capital is always used on mostly the overhead costs and partly the operating costs. The bulk of capital generated for our mushroom business will be used to buy the spawn and substrate we will need to start the business as well as pay salaries of employees and utility bills as well.

The key areas where we will expect to spend our start-up capital on are;

- ❖ Total Fees for registering the business in Kenya – **Ksh.70,000**
- ❖ Fees for obtaining several licenses and permits required to run the business – **Ksh.50,000**
- ❖ Cost of hiring business consultants and marketing analysts – **Ksh.200,000**

- ❖ Cost of start-up inventory (spawn, substrate, growing bags, packaging materials) – **Ksh.500,000**
- ❖ Cost of store equipment (racks, bin, shelves) – **Ksh.200,000**
- ❖ Insurance coverage (produce insurance, general liability, workers’ compensation) – **Ksh.150,000**
- ❖ Operational costs for the first three months (utility bills, employees salaries) – **Ksh.1,000,000**
- ❖ Purchase of fairly used vehicle – **Ksh.500,000**
- ❖ Other start-up expenses (stationeries, furniture, computer, phone, printer) – **Ksh.150,000**
- ❖ Marketing expenses for at least six months including promotion expenses for opening ceremony of Mushy Forage Farms LLC – **Ksh.200,000**
- ❖ Cost of launching an official website – **Ksh.30,000**
- ❖ Cost of hosting the opening party – **Ksh.200,000**
- ❖ Miscellaneous – **Ksh.300,000**

From the accurate estimation above, we would need an amount of Ksh.3,550,000 to be able to successfully start a mushroom business that would not only become profitable but compete favorably with other established mushroom businesses out there.

Generating Funding / Startup Capital for Mushy Forage Mushroom LLC Farming Business

Mushy Forage Farms LLC is a business owned by Lisa Wanjohi – a married woman and a mother of one. Growing mushrooms and farming in general has always been Lisa’s passion till she decided to turn it into a full-time business. Due to her passion for mushrooms, she doesn’t intend to bring in any external investors whilst generating funds for her mushroom business. Due to this fact she is just sticking to three sources of generating capital.

Listed below are the three options she is using to generate her start-up capital:

- Generate part of the capital from personal savings
- Seek for soft loan from family members and friends
- Apply to the bank for a loan

N.B: From personal savings we were able to generate **Ksh.1,000,000**. From family members and friends, we were able to generate **Ksh.550,000**. We sought for a loan of **Ksh.2,000,000** from the bank, and after fulfilling all requirements, we are due to get the money into our account within the week, which would then ensure we start the business in earnest.

Mushroom Farming Business Plan – Sustainability and Expansion Strategy

The major aim of any business is to make profit. However, the aim of this profit making for most companies is to ensure that the life cycle of the business is sustained for a long time to come. For a business to make profit, several factors have to be in place and this includes; competence of the employees, increase in customer retention, excellent customer care and intensive publicity and advertisement.

One of our major goals is to hire competent employees that will not only have vast experience in the field needed to grow the company, but will also believe in the vision of the company and aim to actualize this vision by carrying out their various roles and responsibilities perfectly.

We also intend to ensure that our employees work in a conducive environment, and our strategic location has ensure that there is ease in accessing the farm. Our employees should also be able to effectively communicate the brand for all our customers – existing and potential.

Knowing how important it is for our employees to remain happy thereby increasing their productivity, we intend to have enviable welfare packages in place for all our employees and also have fringe benefits and promotion structures in place to reward all our hardworking employees.

We will also ensure that our management staff benefit from our profits. We also intend to constantly train our employees so that they will remain updated on new innovations and technologies needed to make growing and selling mushrooms easier.

All these put in place will ensure that we attain our sustainability and expansion dreams while also achieving our goals and objectives of becoming industry leaders.

Check List / Milestone

- ❖ Business Name Availability Check: **Completed**
- ❖ Business Registration: **Completed**
- ❖ Opening of Corporate Bank Accounts: **Completed**
- ❖ Securing Point of Sales (POS) Machines: **Completed**
- ❖ Opening Mobile Money Accounts: **Completed**
- ❖ Opening Online Payment Platforms: **Completed**
- ❖ Application and Obtaining Tax Payer's ID: **In Progress**
- ❖ Application for business license and permit: **Completed**
- ❖ Purchase of Insurance for the Business: **Completed**
- ❖ Conducting Feasibility Studies: **Completed**
- ❖ Generating capital from family members: **Completed**
- ❖ Applications for Loan from the bank: **In Progress**
- ❖ Writing of Business Plan: **Completed**
- ❖ Drafting of Employee's Handbook: **Completed**
- ❖ Drafting of Contract Documents and other relevant Legal Documents: **In Progress**
- ❖ Design of The Company's Logo: **Completed**
- ❖ Graphic Designs and Printing of Packaging Marketing / Promotional Materials: **In Progress**
- ❖ Recruitment of employees: **In Progress**
- ❖ Creating Official Website for the Company: **In Progress**
- ❖ Creating Awareness for the business both online and around the community: **In Progress**
- ❖ Health and Safety and Fire Safety Arrangement (License): **Secured**
- ❖ Opening party / launching party planning: **In Progress**
- ❖ Establishing business relationship with vendors – wholesale suppliers / merchants: **In Progress**
- ❖ Purchase of trucks: **Completed**

Chapter 3

Choosing Variety for Mushroom Farming



Different types of mushroom have different production cost and it is important to decide on a budget depending on amount of money available and the long term investment benefit. A good variety to start mushroom farming with is the Oyster mushroom. Other profitable and easy to grow varieties are Shiitake, Lions Mane, White Button and Portobello.

Currently there are over 10,000 known types of mushrooms. That may seem like a large number, but mycologists suspect that this is only a fraction of what's out there! We can put these various species in one of 4 categories: saprotrophic, mycorrhizal, parasitic, and endophytic. These categories describe how the the organism feeds itself.

Saprotrophs - Thriving on Decay

Saprotrophic mushrooms are decomposers. They release acids and enzymes that break down dead tissue into smaller molecules they can absorb. Thus decaying wood, plants, and even animals can become food for a saprotroph.

Think of all the dead matter on the ground. Now imagine what would become of it if there were fewer organisms to recycle it into compost or soil. You can easily see how important saprotrophs are to the food chain! It's no wonder this category includes so many gourmet and medicinal types of mushrooms. Some examples are below:

- ❖ **Morels** (*Morchella angusticeps*, *Morchella esculenta*, etc) - These elusive, delicious species are very popular with mushroom hunters. Known to be mycorrhizal as well.



- ❖ **Reishi** (*Ganoderma lucidum*) - Highly prized in Chinese medicine, this mushroom is now the subject of many medical studies.



- ❖ **Shiitake** (*Lentinula edodes*) - Famous for both its great taste and medicinal properties.



- ❖ **White Button** (*Agaricus bisporus*) - Common in supermarkets all over the world. The average mushroom-loving Kenyan eats about 1Kg of these a year!



- ❖ **Cremini (*Agaricus bisporus*)** - Another *Agaricus bisporus* strain that's a great edible. Come learn the real difference between a cremini and a portobello.



- ❖ **Oyster (*Pleurotus ostreatus*)** - Another popular edible, also known for its cholesterol-reducing effects.



- ❖ **Maitake (*Grifola frondosa*)** - Edible, known anti-tumor properties, and it looks like a brain!



- ❖ **Turkey Tail (*Trametes versicolor*)** - Although too tough to be edible in any manner other than a tea, this is one of the most well-studied medicinal mushrooms.



- ❖ **Giant Puffball (*Calvatia gigantea*)** - These large mushrooms are only edible when young.



- ❖ **Chicken of the Woods (*Laetiporus sulphureus*)** - Younger specimens are known to taste similar to chicken. Also known to be parasitic.



- ❖ **Enokitake** (*Flammulina velutipes*) - Easy to cultivate and often used in soups.



- ❖ **Shaggy Mane** (*Coprinus comatus*) - This unique looking mushroom melts mere hours after being picked.



- ❖ **Black Trumpet** (*Craterellus cornucopioides*) - The best tasting edible mushroom out there!



- ❖ **Yellow Houseplant Mushroom (*Leucocoprinus birnbaumii*)** - Famous for popping up in potted houseplants.



Mycorrhizae

Mycorrhizal mushrooms have a fascinating relationship with trees and other plants. The mycelia of these fungi enter into a beneficial union with the roots of plants by either weaving into the root cells (endomycorrhizal) or wrapping around the roots themselves (ectomycorrhizal).

How is this beneficial? The mycelia bring in additional moisture, phosphorous, and other nutrients to their hosts. In return they gain access to sugars (such as glucose) that the hosts produce. This allows plants to grow bigger, faster, and stronger than their nonmycorrhizal counterparts. Many farmers and gardeners will inoculate their crops with a mycorrhizal fungus for better growth.

An estimated 95% of plants form mycorrhizal partnerships with fungi. The types of mushrooms these fungi produce are difficult to cultivate and are often found only in nature. The ones below make a delicious treat if you can find them:

- ❖ **Porcini (*Boletus edulis*)** - Often used in soups and sauces, this mushroom can grow quite large.



- ❖ **Truffles (*Tuber melanosporum*, *Tuber magnatum*, etc)** - These gourmet delights are very expensive.



- ❖ **Chanterelles (*Cantharellus cibarius*, *Cantharellus formosus*, etc)** - Another prized edible found on many continents.



- ❖ **Matsutake (*Tricholoma matsutake*)** - Highly sought after for their flavor and aroma in cooking.



- ❖ **Caesar's Mushroom (*Amanita caesarea*)** - One of the few edible *Amanitas*. This stately mushroom is popular in Italy.



Parasites - Feeding on the Weak

Parasitic types of mushrooms also take plant hosts. Although in this case the relationship is one-sided. These fungi will infect the host and eventually kill it.

Sometimes the line between parasitic and saprotrophic is not so clear. The honey mushroom is a known parasite yet it will also continue to live saprotrophically on the dead wood of its host. Most true parasitic fungi do not produce mushrooms and are too small to be noticed on a tree until it's too late. Some notable types of mushroom producing parasites are:

- ❖ **Honey Fungus (*Armillaria mellea*, *Armillaria ostoyae*, etc)** - Some species in the *Armillaria* genus are edible, some are bioluminescent, and one colony is suspected to be the largest organism on the planet!



- ❖ **Caterpillar Fungus (*Cordyceps sinensis*)** - A true parasite that preys on insects. This interesting mushroom may just be my favorite.



- ❖ **Lion's Mane** (*Hericium erinaceus*) - This strange specimen possesses spiny teeth instead of the traditional cap. In addition to being edible, it's also suspected to help heal nerve tissue!



- ❖ **Chaga** (*Inonotus obliquus*) - While it looks like an unassuming black mass on the side of a birch tree, this fungus has gained a huge reputation as a medicinal mushroom over the past few decades.



Endophytes - Unique Types of Mushrooms, Mysterious Symbiosis

Endophytic fungi deserve their own category due to their behavior. Endophytes partner with plants by invading the host tissue. However, unlike with parasitic fungi, the host remains healthy and seem to benefit with increased nutrient absorption and resistance to pathogens. Unlike mycorrhizal fungi, most endophytes can be easily cultivated in a lab without their host present.

Successful cultivation aside, much is still unknown about this category of fungi. Many species do not produce mushrooms and their partnership with plants is not fully understood. Some mycologists suspect that certain parasitic and saprophytic fungi will reveal themselves as endophytes as the field expands. Time will tell what discoveries will emerge as this group is studied further.

Now lets look deep into each of the most edible mushrooms in Kenya and their growing environment in the next chapter:

Chapter 4

Environment For Mushroom Farming



Mushrooms are a type of fungus that grows by feeding off of decaying tree bark or other materials. Unlike plants, mushrooms do not contain chlorophyll and do not require sunlight to grow. Whether mushrooms grow indoors or in the wild, they have certain light, water, heat and growing-medium requirements to thrive and produce their fruit. Some mushroom varieties are safe for human consumption, while others are not. Commercially grown mushrooms are a safe choice for those who do not know how to identify edible mushrooms in the wild.

Light

Since mushrooms do not contain chlorophyll they do not require light or photosynthesis to grow. While the environment needs to be as dark as possible to for mushrooms to spawn, some light does not harm their growth. Mushrooms do need a dim light to form fruit bodies, but only requires a few hours a day for successful fruiting. When growing indoors, indirect sunlight

or a florescent lamp can suffice. Wild mushrooms often grow in shady, wooded areas where they receive filtered light.

Water and Humidity

Mushrooms require moisture to produce their fruit; however, they have no skin, so moisture is easily lost. For this reason, mushrooms need an environment that has a high humidity to avoid water loss. Mushrooms breathe and exchange gases with the atmosphere, so it is possible to "drown" mushrooms. When growing mushrooms indoors the soil needs to be moist, not wet. Wild mushrooms growing outdoors disappear during dry weather, and may reappear when moisture levels and humidity improve.

Growing Medium

Some mushrooms may grow on trees, decomposing leaves, dung, mulch, soil or compost, feeding off the dead or decaying matter in those substances. Commercially grown mushrooms are often grown in a combination of manure and straw. The growing medium for wild mushrooms may not be easily visible, such as a dead vegetation under the ground. Many wild mushrooms, like morels (*Morchella*) are found at the base of trees and among dead leaves on the forest floor.

Temperature

Mushroom prefer a cool environment with temperatures around 70 degrees Fahrenheit. Wild mushrooms are less finicky when it comes to temperatures, as they can form mycelia, which are the threads of the fungus body, in temperatures that range from 40 to 90 degrees Fahrenheit. The mushrooms form the fruit or visible parts when temperatures reach between 50 and 70 degrees Fahrenheit. Commercially grown mushrooms prefer temperatures about 55 degrees and not much above 60 degrees Fahrenheit.

Unlike green plants that, through the process of photosynthesis, convert sunlight, water, and carbon dioxide into food, mushrooms receive their energy and nutrients wholly from metabolizing dead or decaying organic matter or by absorbing nutrients from the roots of a living plant.

The life cycle of the typical mushroom begins with the mycelium, a fungal colony that consists of white spider web-like fibers that can be found in soil and other substrates. It spreads in search of water and nutrients and, once an adequate environment is sourced, above ground a small button the size of a pinhead emerges.

Growing to resemble an egg and usually swathed a temporary layer of mycelium – also called the “universal veil” – as the mushroom expands it will eventually break free of its veil to reveal a hardy stalk and a rounded cap with gills on the underside. When a mushroom matures, the gills release millions of spores that are carried with the wind to germinate and form a new mycelium.

Growing the Decomposers

Mycorrhizal fungi, like truffle, morel, porcini, and chanterelle, obtain their nutrients from the living roots of trees and other plants, and can be difficult to cultivate at home. Saprotrophic mushrooms, on the other hand, feed on decaying organic substances and can be easily grown indoors and out. To maximize the chances of success, it’s important to match the mushroom spawn with the right substrate:

Wood Logs

Inoculating hardwood logs with mushroom spawn will yield a bountiful harvest for many years. Here are a few of the more popular wood mushroom varieties:

- ❖ **Shiitake** (*Lentinula edodes*) – The caps of the shiitake mushroom are meaty and filling with a distinctive smoky flavor. The recommended woods to grow shiitake are oak, sugar maple, alder, American beech, sweetgum, and ironwood. Preferring temperatures

between 50⁰ -80⁰ F, shiitake can take anywhere from six months to two years to produce edibles.

- ❖ **Oyster** (*Pleurotus ostreatus*) – With thin, delicate caps, oyster mushrooms get their name because they look a little like molluscs. Subtle and sweet with a velvety texture, oysters are best grown in basswood, willows, elm, balsam poplar, cottonwood, and aspen. Easy to grow and quick to fruit, oyster should be kept at 50⁰ to 70⁰ F.
- ❖ **Lion’s Mane** (*Hericium erinaceus*) – In lieu of caps, lion’s mane mushrooms have clusters of spine-like “combs” that grow a few millimeters in length. With a taste that hints of seafood, recent studies suggest it may boost memory and mood. They grow well in sugar maple, oak, aspen, and walnut and prefer temperatures between 60⁰ and 75⁰ F.
- ❖ **Reishi** (*Ganoderma lucidum*) – Used in Chinese medicine for more than 2,000 years, reishi mushrooms are said to be an elixir for vitality. Though it is a bit bitter in taste, it can be steeped in hot water to make reishi tea. These grow well in oak and sugar maple when kept at 70⁰ to 80⁰ F.
- ❖ **Maitake** (*Grifola frondosa*) – Also known as hen-of-the-wood due to its ruffled feathers look, maitake are nutty and crisp. It will thrive in any species of oak at 55⁰ to 70⁰ F. Patience with maitake is key since they can take two to three years to begin fruiting.

Wood logs should be freshly cut from healthy trees during the dormant season. The cutting should be at least 4 inches in diameter and 2 to 4 feet in length. Allow the wood logs to age for a minimum of two weeks but don’t allow the wood to dry out; it should still be moist by the time you inoculate it with mushroom spawn.

The decaying log will feed wood mushrooms for about four to six years and need only be inoculated once. Start by drilling holes six inches apart down the length of the log, a ¼ inch deeper than the size of the dowel or peg spawn. Make another row of holes, two to three inches apart from the first row and stagger them slightly in a zigzag pattern.

Keep drilling holes in this fashion until the entire log is complete. As soon as you’re finished drilling, hammer the spawn plugs into the holes until they are flush with the log’s surface. To prevent contamination, all inoculation holes should be covered in a thin layer of very hot cheese wax. Melt the wax on the stove to a temperature of 300⁰ F and apply it to the holes with a foam brush.

Because these types of mushrooms typically prefer moderate temperatures and normal to high humidity, you can store your logs outdoors during the warmer months and indoors during winter. While logs should be placed upright in a shaded or wooded area, they do benefit from day/night cycles so position them in a site that does get some indirect light. Keep them moist by placing logs where rainfall will reach them, or when kept indoors, water them occasionally.

Compost, Wood Chips, and Other Organic Substrates

Ideal for indoor container cultivation or for an outdoor mushroom patch, these types of decomposers can be grown in trays, bags, jars, terrariums, boxes, or directly on the ground:

- ❖ **White Button** (*Agaricus bisporus*) – Easy to grow and very versatile, the white button mushroom is actually harvested before it is fully mature. When this mushroom is brown but still unripe, it goes by the names of cremini, Italian brown, and chestnut. When mature, they become portobello mushrooms. White buttons prefer compost as a growing medium in temperatures between 50⁰ and 70⁰ F.
- ❖ **Wine Cap** (*Stropharia rugosoannulata*) – With purple-brown caps and firm white stems, these “garden giants” are similar in taste and texture to portobellos and grow well on straw or wood chips in temperatures between 60⁰ to 80⁰ F.
- ❖ **Almond** (*Agaricus subrufescens*) – Smelling and tasting of almonds, this variety is slightly sweet. Almond mushrooms can be grown on finished compost and thrive in temperatures between 60⁰ and 75⁰ F.
- ❖ **Enoki** (*Flammulina velutipes*) – Growing in clumps of long, white stems topped with tiny delicate pinheads, enoki mushrooms are mild and fruity in flavor. They can be cultivated on hardwood sawdust and are best kept at 45⁰ to 75⁰ F.
- ❖ **Shaggy Mane** (*Coprinus comatus*) – Commonly seen popping up on lawns, shaggy mane has elongated bell-shaped caps with white and grey scales. Once picked, it will dissolve a few hours later and are best eaten before they reach maturity. Compost is a good growing medium for this variety, kept at 60⁰ to 70⁰ F.

Before inoculating the substrate with mushroom spawn, it must be pasteurized or sterilized first. This step – which involves heating the medium to 160⁰ to 180⁰ F – is crucial since it will reduce the amount of microorganisms that would normally compete with the

mycelium, allowing the mushrooms to grow faster. Do not heat beyond 180⁰ F, as this will certainly kill off beneficial organisms.

Here are some general tips for pasteurizing commonly used mushroom substrates. This list is not definitive, as you can grow mushrooms in other waste materials like cardboard, junk mail, and spent coffee grounds.

Straw – You can purchase pasteurized straw or make your own. Using a lawnmower or wood chipper, cut woody straw (rye, wheat, or cotton seed) into 1 to 3 inch lengths. In lieu of equipment like an autoclave or pressure cooker, you can heat up the straw in your oven. Place the straw in an oven bag and add water so that the straw is damp. Heat the oven to 300⁰ F, place the straw bag inside, and use a meat thermometer check the temperature regularly for the first hour. Once the straw is heated to 170⁰ to 180⁰ F, turn the oven down to 180⁰ F and allow it to continue cooking for a total of 3 hours. When it's finished, let it completely cool for 6 to 10 hours.

Wood Chips / Sawdust – Using wood chips or sawdust from hardwood trees, you can sterilize these using the above oven method.

Compost – If you don't have any finished composted lying around, you can make your own in about five weeks. Blend together a mixture of straw and nitrogen-rich manure in equal parts. Soak the straw in water before mixing in the manure, tossing it together with a pitchfork. Allow the compost to rest but be sure to keep it moist. Use a thermometer to check the temperature of the pile; every time it reaches 160⁰ to 170⁰ F, turn the pile. Repeat this step three more times, until you can no longer smell ammonia, the straw pieces are about four inches in length, and the pile has a fluffy texture.

Once the growing medium is pasteurized and cooled, you can begin sowing the mushroom spawn by sprinkling it over the substrate. Each species of mushroom will have their own light, temperature, and humidity requirements but generally mushrooms like high humidity, good air circulation, low light, and room temperatures. Keep the substrate moist by misting it with water twice per day and, if using an open container, trap moisture within by covering it with wet newspaper.

Once you see the mycelium growing, you can add a one inch layer of casting – moistened loamy soil or peat moss – which will boost growth. Casting needs to be sterilized too; you can use the oven or microwave it on high for two minutes.

10 Helpful Tips On How To Grow Mushrooms Indoors



Many people don't know how to grow mushrooms indoors and many would think about it as a difficult task since there are some requirements for planting mushrooms.

The trend for growing food indoors has become very common for three obvious reasons, first to fight off with the world food crisis, second to save some money by growing fruits and vegetables home rather than purchasing from the market and third to enjoy the best and fresh taste right at your home.

In order to grow mushrooms, the first thing to decide is what type of mushrooms ones want to grow. The shitake, Oyster and Button mushrooms can grow well indoors and the result can be actually great. Below mentioned are ten tips for how to plant mushrooms at home:

1) When growing mushrooms indoors, it is important to decide what type of mushrooms you are growing because different mushrooms require different growing medium to grow and one cannot grow every type of mushrooms indoors.

2) How to grow oyster mushrooms at home and have a successful cultivation? The answer to this is to grow in the most perfect growing medium that is in the straw. This is because for the growth it has some nutritional needs which can be provided through damp straw or even sawdust logs.

3) For quick cultivation and successful growth of mushrooms, always damp or moisten the growing medium after every two to three days so that it keeps moist and can grow well. The best growing place to keep the container for the mushroom is in the garage, basement or laundry room or any place else which have a high moisture level, avoid the bathroom, it is definitely not the place to grow something you want to eat.

4) You can find the spores or mushroom spawn from different retailers however they are available online as well. You can purchase mushroom spawn which is sawdust with mycelia. Mycelia are an important root structure for the fungus and helps in growing. You can say this is a seedling which facilitates the growing of mushroom indoors.

5) For those who are beginner or amateur, they should go for mushroom spawn for growing of mushrooms rather than spores because spores may take a long time to cultivate and is recommended for professionals only or those who have been growing mushroom since a long period of time.

6) How to grow button mushrooms? They can be easily grown indoor however you require composed manure because they grow the best in that medium. They get all the necessary nutrients from the manure such as urea which is essential for their growth.

7) When to grow mushrooms? When the temperature on a warmer side. The temperature should be 21 degree Celsius and higher. The humidity is good in this period and so is the temperature which encourages the growth of the mushrooms.

8) After three weeks of damping the growing medium along with spawn, one has to keep the container or the log in a place which should be cool and dark, temperature should be 15

Celsius. The growing medium should be sprayed with water and kept cool so that the mushrooms can grow.

9) When to know the mushrooms are ready? It can be seen through the texture and the size of the mushroom specie you have grown. The steps of mushroom growth should be done very carefully because it is very important for grower. The cultivation of mushroom is very important in various parts of the world.

10) How to cultivate mushrooms? When they are ready, you just have to twist and pluck them out. These are simple and best steps to grow mushrooms in the field.

Chapter 5

Getting Spawn For Mushroom Farming



Mushroom spawn is simply any substance that has been inoculated with mycelium, the vegetative growth of a fungus. Mycelium, a thread-like collection of cells, is to a mushroom like an apple tree is to an apple. You need to have one as the base for producing the other.

Mushroom spawn is used to transfer mycelium onto any material from which mushrooms will grow, called a substrate. There are many different kinds of substrates, with straw, cardboard, logs, and wood chips just being a few examples.



Can we grow mushrooms straight from spawn, without using a substrate? Well, sometimes but it's not ideal. A certain amount of spawn can inoculate a much greater amount of substrate; resulting in many more mushrooms than if you used spawn alone.

The rest of this section of the chapter explains some of the ins and outs of mushroom spawn. First we'll take a look at types of spawn, and then move on to which type of spawn you should use. We'll end with how to acquire and store it.

Types of Mushroom Spawn

Any material with mycelial growth used to propagate mushrooms is considered 'spawn'. However, you'll usually find that spawn comes in one of these forms:

Sawdust



Sawdust Spawn is sterilized sawdust that has been inoculated with mycelium, often by grain spawn. The sawdust is usually made out of some type of hardwood with pieces neither too large nor too fine (a few mm in diameter).

Sawdust spawn can be used to inoculate logs, outdoor mushroom beds, pasteurized straw, cardboard, and a variety of other substrates. It's also used to inoculate wooden dowels to create plug spawn.

One of the main advantages of mushroom spawn in the form of sawdust is the size of the particles. Because they are so small and numerous, there are many more inoculation points for the mycelium to grow into the substrate. This results in faster mycelium colonization with less time for contaminants to take hold.

A disadvantage of sawdust spawn is that, on its own, it's not as nutritious for mushroom growing as one would like. Thus you may be disappointed with your yield if you try to grow mushrooms from straight sawdust. Mushroom growing kits made from sawdust are usually enriched with bran or some other source of nitrogen to increase yields.

Grain



Grain spawn is sterilized grain that has been inoculated with spores or a sterile culture of mycelium. Many types of grain can be used with rye and millet being some of the most common. Other choices are corn, wheat, and different cereal grains. I've even had good luck with popcorn!

Grain spawn can be used to create sawdust spawn, more grain spawn, or inoculate all sorts of pasteurized substrates such as straw.

A big advantage of using grain is that it's much more nutritious than sawdust, making it ideal to create more spawn or to inoculate indoor substrates.

A disadvantage is that it's not as good a choice for inoculating outdoor beds. The yummy grains are a big target for birds and rodents.

Plug/Dowel



Plug spawn is a collection of small wooden dowels that have been inoculated with mycelium. This can be done with sawdust spawn, or even with stems of live mushrooms.

An advantage of plug spawn is that it's very effective for inoculating substrates made from wood or fibers. It easily colonizes cardboard, wood chips, paper, stumps, and logs.

A disadvantage is it's not always the best choice for straw or grain based substrates.

Other Types of Mushroom Spawn

You may see spawn in many other forms as well. A few examples are:

- ❖ Woodchip spawn - Made from woodchips of various hardwoods
- ❖ Straw spawn - Pasteurized straw inoculated with mycelium
- ❖ Sawdust spawn plugs - Sawdust spawn in the shape of a plug with Styrofoam on the end
- ❖ Liquid spawn - Water enriched with mushroom spores/mycelia slurry

The Best Mushroom Spawn

So which type of mushroom spawn is best for your project? The answer depends on what you're doing.



A general rule of thumb is to match your spawn to your substrate.

For example, if you want to grow mushrooms on logs, a wood-based spawn such as plugs or sawdust is best. The argument is that the mycelium is already familiar with this material, reducing colonization time.

Certain mushrooms also grow better on certain substrates. Before starting, research the types of mushrooms you want to grow to see which substrate to use.

Below lists which substrates are best for which spawn. This is just a general guideline, nothing is set in stone.

- ❖ Sawdust - Logs, wood chip beds, enriched sawdust, cardboard, and outdoor beds of non-pasteurized straw.
- ❖ Grain - Pasteurized straw (not used in an outdoor bed) and enriched sawdust
- ❖ Plug/Dowel - Logs and wood chips

A little research regarding your mushroom and spawn type in the beginning can save you a lot of time and hassle in the long run. If you're overwhelmed, it's best to start with some easy mushroom growing kits to help you understand the fungal life cycle.

Acquiring and Storing

So you've done some research on how to grow mushrooms and now you're ready to get some spawn. Awesome! Let the fun begin.

Mushroom spawn can be purchased from a variety of different producers, either over the Internet or offline. There are many companies out there, so do a little research and also visit your local agrovet to find one highly recommended. Quality varies greatly so take your time to find someplace good.



Spawn should come to you with a date of inoculation on it. Pay attention to this date, as degradation due to mold, bacteria, and waste products will happen quickly. See the yellow spots on the pic above. That's the waste product of the mycelium in a spawn bag.

Mushroom spawn is a "use it or lose it" product, and rarely lasts beyond 2 months.

Thus you should use it as soon as possible after it arrives. If not, refrigerate it to prolong its life span. Keep in mind that you're still working against the clock, so bust out that spawn as soon as you can!

Purchasing spawn is just fine for the occasional mushroom grower, but what if you want to continuously grow a lot of mushrooms? Or start growing on a commercial level?

In this case buying spawn from afar isn't worth it. The expense and lack of control of quality won't suit your needs.

So is it possible to make your own mushroom spawn? Of course! Making your own grain or sawdust spawn isn't too difficult, but it does require more sterile procedures.

Let me show you how to;

Make Mushroom Spawn with Cardboard at Home

Making mushroom spawn with cardboard is an awesome method, yet in my opinion very under-rated. I grew my own mushrooms for years before learning about it. Now I think using cardboard is one of the best ways to grow mushrooms!

Spawn is simply any material that has been inoculated with mycelium, the vegetative growth of a fungus. Mycelium eventually produces mushrooms under the right conditions. Thus having, producing, and nurturing your own spawn becomes very important.

Why is cardboard such a great material for making mushroom spawn?

- ❖ It's easy and cheap to find.
- ❖ It retains moisture well.
- ❖ Cardboard is a wood-based product, so it's an easy and familiar substance for many types of mycelium to colonize.



- ❖ The corrugations allow for air exchange. Poor air exchange may prevent the mycelium from colonizing, a concern with finer substances such as sawdust.
- ❖ You don't have to be overly worried about sterility. Make sure your work area and products should be clean, but you don't have to be too concerned about sterile techniques.
- ❖ It allows you to make **A LOT** of mushroom spawn with very little work!

I'm not kidding about that last part. It's one of the best ways to make a boatload of spawn with minimal effort.

Intrigued? Read on to learn how easy making mushroom spawn with cardboard really is.

How to Make Cardboard Spawn

There are a few different ways to make cardboard spawn. The process basically involves soaking the cardboard, layering it with mycelium or a piece of a mushroom, and allowing it to be colonized.

First you'll need to get some cardboard. Gas stations, grocery stores, and liquor stores are good places to ask. Often they'll be glad to let you take some off their hands. Don't be shy, grab as much as you can carry!



Or, if your house is like ours, you'll have a growing recycling pile threatening to overtake your kitchen. These piles are known to contain cardboard treasures so dig in, if you dare.

A word of caution: Not all pieces of cardboard are created equal. Sometimes they have toxic dyes or glue. Cardboard from the Kenya, United States, Europe, and Canada is probably okay. Beware of things shipped from countries with few environmental regulations.

We'll look at making cardboard spawn from sawdust and from mushroom stem butts.

Sawdust and Other Types of Spawn

You can use sawdust or some other type of mushroom spawn to inoculate cardboard. The advantage of doing this is that you put yourself in a position to create lots more spawn easily and cheaply by using cardboard than some other material.

I purchased an oyster mushroom grow kit from JKUAT university. As you will see, it worked very well for me.

You'll need:

- ❖ A few 5 gallon buckets or some other plastic containers (Remember that lots of plastic containers contain toxic BPA! If possible, use a BPA-free container. Don't use anything you wouldn't want to eat out of or store food in).
- ❖ Mushroom spawn (I used the spawn from a grow kit, but grain and wood chips will also work)

Begin by tearing your cardboard into smaller pieces. There's no rules for size, just make sure they're small enough to fit in your bucket.

Soak all the cardboard pieces in a tub of warm water. You can use another bucket, wheelbarrow, or some other clean container. Allow it to soak for one hour. (Note: if you forget about it like I did and leave it in there for 5 hours you'll still be okay!)



While the cardboard is soaking, make some holes in the bottom of your buckets with a drill or scissors. This will be for drainage, as standing water can encourage mold growth.



Drain the extra water from the cardboard. Now make alternating layers with it and your spawn. Lay down a layer of cardboard on the bottom of the bucket, add a layer of spawn on top of that, and repeat. Do this for up to two feet.



When you're finished, gently compress the layers with your fist. We want to make sure that everything's in contact with each other, while still retaining air spaces. Cover the top of the bucket with a plastic bag to keep the humidity level high.



That's it! Make sure to watch the cardboard so it does not get dry, and water it when it does.

Also know that colonizing mycelium needs oxygen, so take off the bag and fan the bucket at least once a day. You want carbon dioxide wastes replaced with fresh oxygen.

Moisture level, mushroom spawn quality, and temperature will all affect how fast your cardboard is colonized. It usually takes a few weeks to 2 months. Below is your end result.



Mushroom Spawn Stem Butts

You can also make mushroom spawn from cardboard by using stem butts. Stem butts are the bottom of the mushroom stem, the area where the stem meets the mycelium.

Mushroom stem butts often have rhizomorphs or pieces of mycelium attached to them. Rhizomorphs are root like structures used to transfer nutrients. Know that not all mushrooms have rhizomorphs, and not all mushrooms will regrow from stem butts.

Some mushrooms are famous for regrowing from stem butts:

- ❖ Oyster Mushrooms

- ❖ Morels
- ❖ Woodlovers
- ❖ Pioppinno
- ❖ Garden Giants
- ❖ Turkey Tails

So your spawn run may depend on the mushroom used, but I encourage you to experiment. If you have the stem butt of a mushroom try this method and see if it colonizes the cardboard.

To perform this experiment you'll need:

- ❖ Some mushrooms with the stem butts intact. To get these, you'll need to be very delicate when pulling them out of the ground by the base.
- ❖ Cardboard
- ❖ A plastic bucket or container

Make some holes in the bottom of whatever container you're going to be using for drainage.

Oh so gently cut off the bottom inch of the mushroom stem. You want to keep the rhizomorphs and any mycelium intact so be kind!

Tear the cardboard into pieces and soak them in a clean container of warm water for an hour, keeping them submerged. The size of the pieces doesn't matter; make them large enough to fit the container you'll be using.

Drain the cardboard, and rip all of the top layers off to expose the middle corrugated layer.

Put the stem butts on top of the corrugations, spacing them a few inches apart.

Cover them again with the top layer that you previously ripped off. If you managed to shred it too badly you can just use another layer of corrugation.

Stack the cardboard layers in your plastic container and water whenever it feels too dry. Also make sure there is adequate air exchange.

You'll start to see growth in this cardboard spawn after a few weeks, but it may take months before it's looking really colonized.

Using Your Cardboard Spawn to Grow Mushrooms

After some time has gone by, you'll have many pieces of cardboard covered with beautiful mycelium. Now what?

Now you can use these pieces by themselves to grow mushrooms or introduce them into a substrate!

Here are just a few things you can do:

- ❖ If you leave your cardboard spawn alone, it'll often produce mushrooms on its own. You may have to adjust the temperature, light cycle, and water to suit the mushroom that you're trying to grow. Growing mushrooms on cardboard is the easiest way to use this spawn.
- ❖ Use it to inoculate outdoor beds of wood chips, compost, or straw bales.
- ❖ Introduce the cardboard pieces into bags of pasteurized straw. This is a good way to grow mushrooms indoors.
- ❖ Use it to inoculate some other type of substrate such as paper or coffee grounds.
- ❖ Make more cardboard spawn! Sandwich the sheets between new, freshly moistened pieces of cardboard and begin the cycle again.

Note that there is a lifespan to your cardboard pieces. They won't last forever, and sooner or later the mycelium will use up all their nutrients. Always be looking to use it to make something else and don't let it sit colonized for too long.

Also don't overlook the power in using these methods to create more mushroom spawn. Once a batch of cardboard is colonized, you can use part of it to grow mushrooms and part of it to create more cardboard spawn.

By doing this you'll have a near endless supply of cheap, quick, and easily replenishable spawn.

And if that doesn't make you want to make mushroom spawn with cardboard, I don't know what will!

But if you can't make mushroom spawn by yourself, you can purchase from reputable sellers or suppliers.

Chapter 6

Preparing Substrate For Mushroom Farming



When trying to grow mushrooms, choosing a substrate is an important decision. A mushroom substrate is simply any substance on which mycelium will grow.

Mycelium, a thread-like collection of cells that is the vegetative growth of a fungus, is to a mushroom like an apple tree is to an apple. You need to have one as the base for producing the other.

Many different materials may be considered a substrate. From logs to straw to coffee grounds, you always have a variety of cultivation choices.

A substrate is inoculated with mycelium through the use of mushroom spawn. Spawn is just a smaller amount of a nutritious material upon which the mycelium can begin to grow before it's ready to colonize a substrate.



This Chapter goes into more depth on substrates. We'll cover some of the more common materials, including advantages and disadvantages. Then we'll look at which one is right for your project. Once you understand the purpose and use of substrates, you'll be able to grow mushrooms with greater success.

Types of Mushroom Substrates

Below are some examples of substrates, various materials on which one can grow mushrooms. This list is by no means exhaustive!

Straw



Cereal straws such as wheat, rye, and oat all make a good base for mushroom growth. They're easy to get and fairly cheap. I buy mine in large bales from a local feed store.

A big advantage of straw is that it can be used to grow many different types of mushrooms. Most mushrooms have no problem breaking down the plant fibers of straw, making it a versatile substrate.

A disadvantage of straw is that it should be prepared first, especially if you're growing mushrooms indoors. Straw is laden with other microbes, and if you don't get rid of those tiny competitors the mushroom mycelium may not have a chance to grow.

Straw is treated by a variety of methods, usually heat pasteurization.

Logs

One can grow mushrooms on logs with great success. The log is cut, inoculated with dowel spawn, and left to incubate. When using logs, you must take into account the type of wood and when the log was cut.

It's best to choose the same type of wood that your desired mushroom grows on in nature. Do some research on the mushroom that you're planning to grow. It will save you a lot of time and heartache in the end.



However, often any quickly decomposing hardwood that's not too dense will do. Elm, beech, alder, ash, and cottonwood are all good choices. Thicker hardwoods, such as oak, will take much longer to produce mushrooms.

Cut your logs and make sure they're healthy, with no signs of decay, rot, or previous fungal growth. There's no standard length that they have to be, but I usually like to make mine just a few feet long for ease of storage and handling.

What are the advantages of using logs? Certain types of mushrooms prefer wood to straw, and thus grow much better on logs. A log may also produce mushrooms for years, as opposed to just a few flushes when using straw.

The biggest disadvantage here is time. It takes a while for mycelium to colonize a log and start fruiting, often a year or longer. I urge you, however, to be patient! Watching your logs burst with mushrooms is immensely satisfying when it finally happens.

Enriched Sawdust

Enriched sawdust is a mushroom substrate more commonly seen with commercial rather than home cultivators. Although it works quite well with a variety of different mushrooms, there are a few factors to consider.



To begin, one must think about the type of wood and the creation of the sawdust. The same rules apply as do for logs, meaning hardwoods are best. Once you choose your wood, it's up to you to either have the equipment to turn it into sawdust yourself or find somewhere that sells it. Note that the resulting dust shouldn't be too fine, as it will pack too densely and the mycelium won't get the air it needs.

Another consideration is that sawdust itself is often not nutritious enough. It needs to be enriched with a nitrogen supplement such as bran. Doing this will yield many more mushrooms than using plain sawdust alone.

A final concern is that, due to possible microscopic competitors, sawdust should be sterilized before use. This requires some sort of equipment such as an autoclave.



Do note that many mushroom growing kits are simply blocks of enriched sawdust themselves. If you're a beginner who's just learning how to grow mushrooms, these kits are a great way to get started. Someone else has done all the sawdust prep for you!

Grow Mushrooms on Other Substrates

You can grow mushrooms on many, many more materials than just straw, logs, and sawdust. Below are a few other effective substrates:

- ❖ Stumps
- ❖ Compost
- ❖ Paper/paper products (make sure any inks used were non-toxic)
- ❖ Cardboard (again, only if non-toxic dyes were used)
- ❖ Used coffee grounds (organic)
- ❖ Used tea leaves (organic)
- ❖ Gardening debris
- ❖ Other organic materials such as seed shells, corncobs, and banana fronds. Use your imagination and experiment!

The Best Mushroom Substrate

So which type of substrate is best for your project? Much like when choosing spawn, the answer depends on what you're doing.

A general rule of thumb is to match your spawn to your substrate. For example, if you want to grow mushrooms on logs, a wood-based spawn such as plugs or sawdust is best. The theory is that since the mycelium is already familiar with the spawn material, colonization time will be reduced if the spawn and substrate are similar.

You also need to take into account the types of mushrooms that you want to grow. Some mushrooms, such as reishi, maitake, and lion's mane, prefer a wood-based substrate. Others, such as oysters, will thrive on almost anything.

Below lists which substrates are best for which spawn. This is just a general guideline, as nothing is set in stone.

- ❖ Sawdust - Wood-based substrates such as logs, wood chips, enriched sawdust, and cardboard. Also good for outdoor straw beds.
- ❖ Grain - Indoor bags of pasteurized straw and enriched sawdust
- ❖ Plug/Dowel - Logs and wood chips

Two final points to take into account are your time and budget. Maybe you don't have the time to mess around with logs or pasteurize straw. Perhaps you don't have the money to purchase a lot of extra materials.

Don't fret! There's a mushroom growing solution for you. A little ingenuity can take a project a long way.

If you just want to grow mushrooms without a lot of extra work, look into purchasing mushroom growing kits. These pre-made blocks of mixed substrate and spawn are a great way to grow some fungal treats with little effort.

If money is a limiting factor, know that you can use many different types of materials as a substrate. Look around your house and property. You may have some logs or stumps that you can use for free. You can also save your tea leaves and coffee grounds as mushroom growing material.

Or is your house like mine, where you have a mountain of cardboard recycling so large that tourists show up to try and climb it? Use that cardboard to grow mushrooms and save yourself a trip to the recycling center!

So get your substrate in order and start growing some mushrooms.

Chapter 7

Packing the Bags/ Boxes/ Trays For Mushroom Farming



Grow pounds of mushrooms right in your home with fairly little effort and just a small amount of space. All you need is 16 square feet, a few plastic buckets, an organic material to the grow the mushrooms on, like spent coffee grounds, and some spawn. Use recycled or salvaged items and this hobby becomes a low cost investment that produces delicious returns you can eat, share with friends and sell surplus.

Urban Mushroom Cultivation

No forest? No spare garage? With a little creativity, mushrooms are easier to grow in tight places than you might think. You can grow a substantial amount of mushrooms by incorporating them into community or rooftop gardens, or even by growing them indoors in closets and spare bathrooms.



Of course, the amount and type of space you might have can vary considerably. Some people have horizontal space; some have vertical space; some may have both. The key is to evaluate your situation—with a site analysis or, if you are indoors, a walk-through—and choose the methods that will help you maximize yields for your given situation.

Indoor Small-Space Cultivation

The most common and efficient mushrooms for fruiting indoors in small spaces are oyster mushrooms (*Pleurotus* spp.). You'll be surprised by how little space they take up. You can pasteurize small batches of growing medium on your stovetop. You do not need a humidified room; an extra bathroom or closet works fine as long as you provide a simple humidity tent over the fruiting cultures, so that the primordia don't dry out and abort.



You can house as many as thirty 5-pound bags of inoculated fruiting substrate—enough to produce 8 to 10 pounds of oyster mushrooms a week—on a five-tiered rack placed near a window, which typically takes up about 6 square feet of floor space and rises to a height of about 6 feet (which coincidentally is very close to the size of a small closet, if you have an extra one you would like to devote to fruiting).

Or you can cultivate them in buckets on spent coffee grounds. Wherever and however you grow in your small space, if you're indoors be sure to provide ventilation to allow for gas exchange, add a fluorescent light if your setup isn't near a window, and cover the rack or containers with a humidity tent. (I would line the floor and walls with plastic if you are experiencing excessive moisture buildup. The object is to provide extra humidity to the mushrooms, but you also need to protect your structure from excess water to avoid rot.)

Growing Pearl Oyster Mushrooms in bags



Behold, for we have home-grown pearl oyster mushrooms, and you can too. The process of growing them from scratch is not that tricky once you know how, and results in a luscious harvest of fresh oyster mushrooms.

First of all, you need good spawn. For this session we used a block of grain spawn that would be grown at home, but you can buy a block of spawn if you're not quite up to speed on that step. Here's what to do next:



Will empties a bag of grain spawn into a tub of freshly sterilized straw



Fully colonized grain spawn on straw, ready to mix



Mixing it all in with freshly washed hands



Students start filling the bags





Hooray! Bag 'o' mushrooms



Finished mushroom bag, languishing amongst other student resources

So there you have it. Add grain spawn to freshly sterilized straw which is a bit damp, mix it well and bag it up. The last step is to ensure that a little, but not too much air can get into the bag while the mycelium colonises the substrate.

For these bags we used the off-the-shelf bag necks that you can get from mushroom suppliers, but you could cut down plastic bottle necks to do the same job. A piece of foam ensures that spores of other fungi + molds can't get in, while allowing a very small amount of air in.



Bag neck with foam inserted to prevent contamination while the straw gets its oysters on.



Mycelium starting to 'run' and colonise the straw... it doesn't take long at this time of year



Two weeks after packing the bags, the oyster mushrooms are bursting out the sides! This bag got a hole in it somewhere along the line, and the mushrooms made the most of it.



2 weeks after bagging, with the bags fully colonized by the mycelium, we remove the foam, wait a day or two, and out come the mushrooms out the neck hole... yum yum.

Fruiting mushrooms are a quiet cacophony. That's the best way I have to describe it... it's this wonderful event, worthy of trumpets. But it's silent. And at the end you get to eat them!

There's no way we could afford these mushrooms from the shops, nor is there any chance that in Mudgee we could source fresh organic ones anyway. But with a bit of know-how and good teachers, we're working up to skills that we can pass on far and wide, and which will give us a lifetime supply...

Chapter 8

Incubation For Mushroom Farming



The Incubation of Inoculated Compost Bags

The term of 'compost incubation' is assigned to the period of time from inoculation until mushroom fruiting. At *Pleurotus* this usually lasts between 17 and 27 days.

Incubation is usually done in the same room where mushroom fruiting occurs or may be done in a separate room especially designed for this purpose. The latter variant is even better since it reduces the contamination of your mushroom growing room with alien organisms.

To avoid the possible contamination of the bag and its extension to other bags as well and to facilitate gas exchange within the bags is important to:

- ❖ place the bags at 10-15 cm distance one from another;
- ❖ avoid overlapping the bags, this can increase the substrate temperature during spawn run;
- ❖ do not wet the bags.



Hanging column bags incubating in the grow room

To ensure the mycelium development during incubation it is necessary to create an environment similar to that found in nature which is specific for every mushroom species.

Further you should focus on:

- **Temperature:** should be constant (if possible). You should also keep in mind that temperature requirements are variable for thermophilic and criophilic mushroom species.

- **Humidity:** It is recommended to keep humidity at optimum levels (75-80%) by watering the grow room floors and walls from time to time.

- **Ventilation:** A continuous ventilation ensures air circulation and gas exchange in the grow room. Without equipment this may be achieved by forming a passive air current throughout the grow room.

• **Light:** At this stage is not mandatory.

		<i>Pleurotus ostreatus</i>	<i>P. ostreatus f. florida</i>	<i>P. citrinopileatus</i>	<i>P. eryngii</i>
Inoculation	Mycelium quantity/substrate:	2%	2%	2%	3%
Incubation	Temperature : °C	(10)20-24	20-22	22-29	23-25
	Temperature: F	(50)68-75.2	68-71.6	71.6-84.2	73.4-77
	Substrate temp.: °C	25-30	25-30	27-32	25-28
	Substrate temp.: F	77-86	77-86	80.6-89.6	77-82.4
	Time:	12-14(22) days	12-14 days	10-14 days	(12)14-18 days
Pinhead Formation	Temperature: °C	(8)10-15(20)	15-20	15-25(30)	10-18
	Temperature: F	(46.4)20-59(68)	59-68	59-77(86)	50-64.4
	Relative Humidity:	90-95%	90-95%	90-95%	90-95%
Fruitbody Conditions	Temperature : °C	(10)13-20(25) (50)55.4-68(77)	(11)13-20(28) (51.8)55.4-68(82.4)	(13)17-22(28)	14-18(21)
	Temperature: F			(55.4)62.6-71.6(82.4)	57.2-64.4(69.8)

	Relative Humidity:	85%	85%	85%	82-85%
	Concentration of CO2:	< 1000 ppm	< 1000 ppm	< 1000 ppm	< 1500 ppm
	Light:	800-1500 lux	800-1500 lux	800-1500 lux	800-1500 lux
Watering	No. times/day:	2-3	2-3	2-3	2
	Period:	7-10(14) days	7-10 days	7-10(14) days	7-14 days
	Relative Humidity:	90%	90-95%	90-95%	90%
Production Cycle	Period:	2-3 months	2-3 months	2-3 months	2-3 months

Note: The beginner mushroom cultivator may ignore some of the requirements presented in table above. Since we are discussing backyard mushroom farming, the notes above are rather concerning equipped grow rooms able to offer optimal environmental conditions for mushroom development. Oyster mushroom cultivation is very easy and do not requires much attention.

Observation: After 3-4 days from inoculation the mycelium growth may be seen. The mycelium hyphae are slowly expanding their surface covering up the substrate. The incubation

phase ends with the induction of mushroom primordia formation (pinhead formation). In this moment the mycelium has already covered up the whole compost surface.



Oyster mushroom primordia formation



Primordia of Pleurotus

The mushroom fruit body formation occurs across the bag surface where we made holes through the plastic film. At first, they appear as small dark colored pinheads that gradually develop and get lighter in color. If you placed the sack on the ground and the room temperature is rather optimal you may untie the bags at the end and leave them wide open. The fruit body formation lasts between 4 to 10 days depending on the species, strain and microclimate conditions. However, at this stage you should consider the following aspects:

Humidity: Now is the moment when the growing mushrooms should be watered through the use of a pressure pump. They should be sprayed 2 to 3 times/day until harvest. If the mushrooms are stagnant in their growth or are getting dried the watering is insufficient.

Temperature: Should be constant if possible.

Ventilation: To prevent fungus drying avoid strong and dry direct airflow in the grow room.

Light: It is indispensable at this point for mushroom development, therefore this is very important. If the grow room is a basement and it doesn't have any natural light, then you should use artificial light: neon tubes preferably blue fluorescent of 40W power placed at 2-3 meters / 78.7-118.1 inches above or along the sides of the grow room. Leave them to light up the room from 8 to 12 hours per day.

Note: Light intensity is important and has direct effect on fruitbody development. A less intense light affects the mushroom stem making it longer while the cap is getting poorly developed.



Mushroom pinhead formation of Pleurotus



Fruitbody development by using artificial light

Mushrooms are harvested after 3-5 days once pinhead formation has occurred. Mature oyster mushrooms consist of well developed fruitbodies lighter in color and with the mushroom cap margin nearly flat. At this point harvest oyster mushrooms by hand twisting the whole mushroom bunch or by cutting the mushroom stem base with a knife.

Note: Mushrooms not harvested in time lose their quality.

After the first round of mushrooms has been harvested the plastic foil covering the bag may be removed if environmental conditions (especially humidity and airflow) allow this.

The harvest is followed by a time gap of 8 to 10 days until the next round of mushrooms; however, this is not a rule because sometimes they appear in a single round.



Oyster mushroom fruitbodies



Harvested oyster mushrooms

How many mushroom production rounds are there?

Well, there may be 3 to 5 rounds of mushrooms to be harvested (when you have equipment that provides proper environmental conditions for fruitbody development) or 2 to 3 rounds when you don't use such equipment.

The life-cycle of the whole culture should last 1 to 2 months (the case of classical mushroom cultivation).

Caution: To prevent respiratory system allergies caused by spore formation in the grow room it will be necessary to use a mask covering up your nose and mouth and a dressing suit only used for this purpose. Billions of spores are released when mushrooms reach the state of maturity. These spores spread all over the grow room and affect the lungs of the unprotected personnel when harvesting mushrooms. In order to avoid air load with spores in the grown room before each harvest you should spray all over with water.

Chapter 9

Fruiting In Mushroom Farming



All your efforts will ripen and bear ‘fruit’ in this stage of growing magic mushrooms.

No matter whether you've gone the cheap, at-home route of growing mushroom spawn on cardboard or carefully followed the optimal growing instructions using petri dishes, jars of grain, and sawdust, mycelium is just mycelium.

Mushrooms aren't like plants which pay attention to day length and then bloom and fruit on cue. Instead, you need to give your mycelium a hint when it's time to get some mushrooms. First of all, the mycelium has to have completely colonized the substrate --- reaching the end of its habitat is one natural cue that prompts mushroom formation.

When growing mycelium in an unnatural habitat, like plastic bags, you will also want to lower the carbon dioxide levels, which simulates the fungus reaching the outside world. Many growers punch small holes in the bags where they want the mushrooms to emerge. Increasing the light levels at least slightly also tells the mycelium that it has reached the surface and should send up a fruitbody.

Meanwhile, your mushroom is probably waiting for a specific season (though which one depends on the species you are growing.) Increase the humidity to nearly 100% and either increase or decrease the temperature to signal a seasonal shift. Oyster mushrooms are split into warm weather varieties which should be prompted to fruit at temperatures between 50 and 75 degrees Fahrenheit and cold weather varieties that need a few days at 50 to 60 degrees Fahrenheit.

If you give your mycelium the right cues, they should form what are called primordia --- little buttons on the surface that can grow into mushrooms. To prompt the mushrooms to develop properly, lower the humidity a bit and retain lower carbon dioxide levels and moderate light. If you want mushrooms fast, raise the temperature, or just leave the temperature where it's at and wait a few more days. Soon, you'll be feasting on gourmet mushrooms!

Creating Conditions for Fruiting

- High humidity. Most species like 80 to 95% humidity.
- Ideal temperature for fruiting — varies with species and strain.
 - Oyster and shiitake have cold and warm weather strain
 - See Stamets, *The Mushroom Cultivator*, for growth parameters of various mushroom species
- Good air exchange — ventilation or fan, low CO₂ levels
- Enough light. Indirect sunlight for most species. The button mushroom, *Agaricus bisporus* an exception — prefers darkness

Some Ways to Create the Conditions for Fruiting

- Build a "Grow Room" or house



Basement grow room made from 2x2s, plastic sheeting, humidifier, fan.

Banana leaf grow house. Banana leaves are also a substrate for Oyster mushrooms.

- Portable Greenhouse



- Terrarium: Sterilite bin with holes and layer of moist Perlite. There are also holes in the bottom of the bin. The whole terrarium would be elevated off the ground while fruiting the mushrooms on the substrate of choice.



- Humidity tent: clear plastic "umbrella" with holes for air flow; chopsticks for support. Mist twice daily.



- Fans, humidifiers, misters, heating or air conditioning are often needed for larger grow rooms or grow houses.

Chapter 11

Mushroom Harvesting & Storage



Harvesting.....

When do I harvest my mushrooms?

The best time to harvest mushrooms is just before the veil breaks. Normally veil breaking time is between 5 - 12 days after you see your first mushrooms pins popping up from the substrate.

As you can see the time indication is broad because the maturing of mushrooms can go pretty fast or can take a bit longer all depending on strain variation, humidity, temperature and fresh air.

Why harvest just before the veil breaks?

The veil connects the cap of the mushroom to the stem and covers the gills. When the mushroom matures the veil will break and uncover the gills. This is the time for the matured

mushroom to think of the next generation and it will release spores from the gills to make reproduction possible.

The released spores will cover the other mushrooms and the substrate underneath them. This is harmless for the mushrooms and the substrate. But the potency of the mushroom will reduce a bit when you wait with the harvest of your mushrooms after the spore release.

A word from the wise:

"The secret to potent mushrooms is in their age when picked. It has been scientifically proven that the small immature specimens are more potent than the larger mature specimens"

Spore print and spore syringe

If you want to make a spore print or syringe it is important to harvest the mushrooms before they release their spores, you will need the spores to conserve your mushroom strain for further cultivation. Best time to pick the mushrooms for a spore print is when the cap has opened. The cap will flatten and gets the shape of an umbrella. Most times this will be the same or in the next few days after the veil is broken.

General advice: pick the mushrooms before or just after the veil break.

But the mushrooms are still small I'm not going to harvest!

It can be a pain to harvest your fine crop of cubensis mushrooms when they are still small or medium sized. The mushrooms still grow a bit after the veil break. What you can do is just pick the mushrooms that you think are big enough. And let the other mushrooms mature for a couple of days. Keep a close watch on your grow kit the mushrooms can grow pretty fast in this stage of the growth. One night in the pub can be enough to find your mushrooms covered in spores.

When the mushrooms are not growing any more it is time to harvest them all to prepare the grow kit for the next flush. Remove all mushrooms and aborts from the substrate surface.

When you have some mushrooms growing on the sides between the plastic container and the substrate you can carefully try to get them out by lifting the substrate brick a bit. Do not force it, you do not want to break or damage the mycelium.

Tip: Pick the mature and immature mushrooms and let the pins grow a bit more

Also, size is not an indicator of when to pick. Bigger isn't always better. The general rule of thumb is to begin picking your mushroom harvest when the caps turn from convex to concave – turning down to turning up.

Oyster mushroom harvesting should occur 3-5 days after you see the first mushrooms begin to form. You are looking for the cap of the largest mushroom in the group to go from turning down at the edges to turning up or flattening out at the edges.

Shitake mushrooms are grown on logs and that is how they are sold as kits. Or you can establish a shitake garden by cutting your own logs during the mushroom's dormant season and then inoculating them yourself. The latter option requires patience since mushroom harvesting won't take place for 6-12 months! If you purchase pre-inoculated logs or sawdust blocks for your home, they should fruit right away. A couple of days after you see the first signs of growth, they will begin to cap. Three days later or so, you will have the first good sized shitakes ready to harvest. Picking your shitake mushroom harvest will take place over time and, with proper care, shitake logs can produce for 4-6 years, maybe even longer.

How to harvest wild mushrooms – Cutting v Picking

There are two schools of thought among foragers on the best way to actually “pick” a mushroom. One asserts that fruit bodies should be cut off where they join the ground (or whatever they are growing from) so as not to damage the delicate mycelium below. The other

prefers to twist and pull the mushroom from the mycelium. I have heard it argued that this stops the residual stump left by cutting from rotting and “infecting” the mycelium. This is clearly ridiculous as all fungi will rot away eventually if left to their own devices.



Fung-finder extraordinaire Pip demonstrates how chanterelles happily and cleanly detach from their mycellium. You then only need to snip off the dirty bit of base and give them a quick brush down and they are ready to cook when you get home

I have seen very heated exchanges between the two schools over whose technique is more ecologically sound. The truth is that it makes very little difference to the fungus either way, in the same way that it makes no odds to an apple tree how you pick its apples. The most important ecological consideration is that the fruit body has been allowed to mature to a point where it has distributed most of its spores. A forager is more likely to damage mycelium by compacting or disturbing ground or leaf litter with their feet than by any picking technique.

On the whole, I generally use the cutting method when picking easily identified species as it minimises disturbance. The accurate identification of some species (notably of the *Amanita* genus), however, can rely on minute identification features at and just below ground level. In these instances it can be necessary to uproot the entire specimen before covering up the exposed mycelium to keep it from drying out.

I also urge people to stick to the following rules when picking.

1. Don't pick chanterelles, hedgehog mushrooms, chanterelles and other small mushrooms that have a cap diameter less than 2cm. Similarly, ensure boletes, russulas, horse mushrooms, parasols and other larger mushrooms have caps larger than 4cm diameter. These sizes are legal requirements for selling mushrooms.

2. When you are picking a patch of fungi, try to leave the smallest 50%, regardless of size.

3. Where mushrooms are growing in pairs (commonly chanterelles), only pick one.

4. Collect mushrooms into a basket or porous cloth bag that will allow spores to disperse as you move – not a plastic bag.

5. Try to identify mushrooms without picking them. Often accurate identification requires close examination from all angles, but I often see people picking *before* they engage their brain, needlessly uprooting inedible mushrooms.

6. Dispose of mushroom trimmings and waste in a similar habitat to the one you picked it in. Its best to trim and clean them in situ, which also means dirt and debris doesn't get lodged in gills or pores, making them much harder to clean when you get them home.

With a few exceptions for highly invasive species such as honey fungus, these rules help support mycological diversity. Fungi perform a crucial job, breaking down debris, nurturing trees and building soils, as well as being a valuable food and home for insects. Following these rules will allow you to harvest on a regular basis with a happy heart and a clear conscience.

How to Store Fresh Mushrooms



Store fresh mushrooms the right way, and they'll last up to a week. Here's how:

Place whole, unwashed mushrooms in a brown paper bag, and fold the top of the bag over. Then, stick the bag in the main compartment of your refrigerator.

Why This Works:

The bag absorbs excess moisture from the mushrooms, so they don't get soggy or moldy.

Mushroom Storage Tips:

- Do not store mushrooms in the crisper drawer – it's too moist an environment
- Avoid placing mushrooms near foods with strong odors or flavors – they'll absorb them like a sponge
- Some mushrooms hold up better in the fridge than others. To avoid waste, try to buy your mushrooms close to when you plan to use them
- If you need to store mushrooms for more than a week, consider freezing or drying them

How to Freeze Mushrooms

Mushrooms freeze well, but it's best to get them in the freezer as soon as you can. Don't wait for your mushrooms to start deteriorating in the fridge before you decide to freeze some. If you have a large mushroom haul, be deliberate about setting some aside for eating right away and others for eating later. Try to be realistic about how many you'll eat in the next week, so you can freeze the rest before they go bad.

Mushrooms need to be cooked before they're frozen. This will stop the enzyme action, thereby preserving their quality, so it's important not to skip this step.

How to Dry Mushrooms

If you don't have a lot of freezer space to dedicate to mushrooms, drying is another option. Dried mushrooms can be rehydrated as needed, and they take up very little space in the pantry in the mean time.

Use a low temp oven or a food dehydrator to dry your mushrooms. Then, keep them in an air-tight container until you need them.

Chapter 12

Mushroom Farming Marketing



There is a wrong perception that mushroom farming is a walk in the park. You start today and reap the rewards tomorrow. “Far from it. I also embraced the project with that mentality and was in for a rude shock. The journey has been quite bumpy but I am now at a comfortable place,” Kahinju Muhia, from Dagoretti South opens up during an interview with him.

Muhia started mushroom farming on a high note in 2009, and his journey has been a learning experience. He shares his experiences with us and how he overcame one hurdle after another and finally how he got his big breakthrough.

“Like all young excited farmers, I knew I wanted to start mushroom farming but I had little information about it. I did not know any crop expert or farmer doing it. For more direction, I turned to the Internet,” he says. After digging up stuff online, Muhia, 28, realised he needed more. “I wanted an expert whom I could interact with at personal level,” he says.

In his fact-finding mission, a friend told him about Jomo Kenyatta University of Agriculture and Technology short training courses on mushroom farming. He enrolled for a two-week programme that cost Sh.15,000. The course he says, was quite comprehensive and he learnt a lot.

That sorted, his next hurdle was capital. He borrowed a soft loan from his parents. Armed with info and capital, early 2010, he rolled out the project. Soul-searching He bought 50 bales of wheat straw, a makeshift room and machine for steaming.

He purchased seeds from a local agent at Sh.12,000 per packet. With everything on course, he thought everything would run smoothly and soon he would hit the market with his bumper harvest.

He was in for a rude shock. “I nearly got ulcers. The seeds withered and I had no idea why. In retrospect, I think it was because I did not get the temperatures right. Some seeds also got contaminated because I had not adhered to strict hygiene standards.

I was so discouraged I did not know what to do next,” he recalls nostalgically. In his soul-searching, he toyed with abandoning the mushrooms project all together and embrace crops like tomatoes, onions, carrots, sukuma wiki and spinach, which had ‘less stress’.

Before making a drastic decision, he took some time off to reflect on his next course of action. “After that period of rest, I gathered the pieces and embarked on the journey again. This time round, I did not just rely on the training and the Internet alone, I also got an expert and worked with him every step of the way.

I did not want to make the same blunders again,” Muhia, a father of two says. Lucky for him, things went well and in three months, he got his first harvest. His neighbours offered a ready market and managed to make Sh.140,000.

Slowly, things started picking up. In the second harvest, Muhia reaped close to Sh.300,000 which he sold to hotels and supermarkets. Opportunities started coming his way and he even made a cool Sh.1 million, in one season. “I had never thought I would one day drive a car, but thanks to mushroom farming now I am driving a car worth Sh2.5 million.

I can confidently say farming pays,” he says. Muhia plants nutritional mushrooms like buttons and oyster and herbal gernodama and has employed five people. Having learnt the hard way, Muhia is a master in mushroom farming who even trains a number of farmers on the same.

Today, Muhia has close to 50 farmers spread across Kajiado, Kisumu, Kisii, Machakos, Kiambu, Thika and Ngong whom he trains under his farm which he has christened, Jolin Farm.

Soul-searching At Jolin Farm, he plants mushroom, trains upcoming farmers, seeks market for them and distributes prepared seeds. His clients are hotels and supermarkets. He also trains a number of banks and other corporate, which do agribusiness as part of their CSR.

Though he is now settled, he still encounters some small challenges. For instance, sometimes he purchases contaminated seeds that fail to grow. He explains that is double trouble when he sells them to aspiring farmers. “At times, the new farmers I supply seeds with blame me for their losses. Some even demand for compensation since I am responsible for the loss, yet those I buy from do not compensate me.

But I am learning how to spot the fake seeds,” Muhia points out. To avoid making costly mistakes like Muhia, crop expert George Mbakahya, says it is important for an aspiring mushroom farmer to seek training on the same before they sink their money into the venture. “It is good to attend seminars and training on mushroom farming before a farmer kicks off the project. There are some complicated procedures in mushroom farming that can only be learnt at a training forum,” Mbakahya says.

Mbakahya says cleanliness is paramount when it comes to mushroom farming. The fungi require germ-free environment and this can only be achieved through sterilisation. The material used in the process ought to be sterilised by steaming.

The expert says farmers can use a simple sterilisation procedure which involves immersing the bags full of the substrate in boiling water for about one hour to get rid of any germs. Then, suspend the gunny bags overnight to let them cool off. He warns that another way contamination can be introduced is during planting (inoculation).

He says clean planting materials can be purchased from JKUAT. He says farmers should sterilise hand gloves before mixing the spawn with the substrate. Methylated spirit can also be used. Mbakahya says mushrooms are on high demand because of their health benefits. What about value addition? Mbakahya says that there exists a lot of possibilities through value addition. “For example when grounded, and mixed with amaranth and sorghum they make delicious porridge mix,” the expert says.

Ways to Profit Growing Gourmet Mushrooms

Gourmet mushrooms continue to be a popular item. Growing mushrooms for profit can make you nice money quickly. So what are some ways you can profit with mushrooms? Here are ways to market your mushrooms:

1. Restaurants

Many restaurants love to use fresh mushrooms. They have to get their mushrooms from somewhere, so why not you? Talk to local restaurants and see if they are interested in what you're growing. Next, give them some free samples. If the chefs like the taste of your mushrooms, then you could see a lot of repeat business – the best kind for a mushroom grower, as you'll have fresh mushrooms to sell every week.

2. Grocery stores

Many people turn to grocery stores to find the mushrooms they're looking for. Like restaurants, grocery stores have to get their mushrooms from someone, and that person could be you. In particular, it's a good idea to target grocery stores that carry exotic mushrooms and

produce. These are often “upscale” grocers, which frequently cater to customers interested in buying premium mushrooms.

Many grocery stores get their mushrooms from an out-of-state distributor, so if you’re a local grower that can provide fresher mushrooms at a reasonable price, you’ll do well. Oyster mushrooms have a fairly short shelf life, which is an advantage for local growers who can pick and deliver the same day.

3. Farmers’ markets

Farmers’ markets routinely draw big crowds eager to buy from the best local growers. In particular, many people turn to farmers’ markets to find mushrooms they can’t find at their local grocery store. Set up a stand or booth and get selling. If the spots at your local farmers’ market are all sold out, then consider asking another grower if you can share their stand or booth.

4. Dried mushrooms

For less-than-perfect mushrooms that you don’t want to sell, consider drying them. This can turn into a great market for you and your mushroom-growing business. It’s fairly easy too. Most food dryers/dehydrators should do a good job of drying.

You can also supply dried and packed mushrooms to supermarkets in Kenya.

5. Frozen and pickled mushrooms

Oyster mushrooms are generally going to taste best when they are freshly picked. If you have a large surplus that you can’t sell right away, consider freezing your mushrooms. This allows you to sell them days or months later. Or maybe you’d like to sell pickled mushrooms.

Try any or all of these ways, and see what works best for you. Before long you could be making the type of money you've always wanted, all from growing mushrooms for profit.

Conclusion



According to the Consumer Federation of Kenya, over 700 tons of mushroom are imported annually. This is majorly from Netherlands, France and the United Kingdom. Only 500 tons are produced locally. This alone is enough inspiration to start out on this highly rewarding and profitable venture. The vegetarian and non-meat eating population are the highest consumers of mushrooms in Kenya.

Mushrooms are versatile and the good news is that they can grow in any part of the country. The main conditions mushrooms require to grow are; a reliable water supply, shelter and stable temperatures ranging from 15 to 30 degrees.

You don't require land to grow mushrooms. If you have land, it's a plus since you can make a mud house and use it to grow the mushrooms. However, you can still do this in your house or apartment as long as you have a dark room that is well ventilated. Install wooden shelves in the room to increase the vertical space. If the mushrooms are only for home consumption, you can grow them in a cardboard.

The more the accessible vertical space you have, the more the yield. Note that mushrooms thrive where there is good circulation of air. While making the shelter and shelves,

let your carpenter make those that will last longer. Save on costs by utilizing locally available materials.

The next step is finding the substrate. There are several substrates available. There is forest soil, bean straw, rice straw, millet straw and wheat straw. The main requirement here is that the substrate should have a great supply of nitrogen that is a requisite for mushroom growth. Before making use of the substrate, ensure you sterilize it from bacteria. In large scale, it is done by steaming but in small scale, this can be achieved by boiling water in a drum and then immersing the plastic bags with the substrate in them for approximately one hour to get rid of the germs.

Some farmers mix several substrates together to increase the nitrogen content. Many farmers in Kenya source wheat grain, cotton seed, gypsum, mill cake and wheat straw. In place of wheat, other farmers use millet or sorghum depending on what's available. They then mix it with chicken waste to make compost.

This should take up to 2 weeks and should be conducted in open air. Once it's ready, it should be transferred into the bags and taken into the shelter. The shelter should have a net to ward off insects and pests while allowing fresh air to enter.

Apart from providing lots of nitrogen, the chicken waste also assists in decomposition of the substrate. You will also need mushroom spawn. This is any substance that is inoculated with mycelium, the vegetative growth of a fungus. It is used to transfer the mycelium into the substrate. Wheat, sorghum or millet act as the food for the mycelia and further help the mushroom spawns to colonize (spread) the entire compost.

Button mushrooms are the most popular in Kenya because people like consuming them. Oyster mushrooms and shiitake mushrooms are the other mushroom varieties that are available locally. Oyster farming is not popular in Kenya since it is more labor intensive and produces less yield as compared to button spawns.

Seedlings are planted in small nylon bags and transplanted into big ones for growth. The small bags are similar to those used in local shops to package sugar. They cost 100 KSHs for 200 pieces. The bigger bags cost 15 KSHs per piece and in a 1/8 acre farm, you require around 1,000 of them.

Mushroom farming is a delicate enterprise that requires extremely good hygiene. One misstep in hygiene and you are at the risk of losing all your mushrooms. You will therefore require equipment like hand gloves, methylated spirit, drinking straws, cotton wool and a knapsack sprayer.

Once you are ready with the shelter and equipment, you need to buy the spawns. These are the mushroom seedlings. Some of the sources are research and seed propagating institutions like JKUAT or KARLO. One kilogram of button spawns goes for 1,000 KSHs. For a 1/8 acre farm, 5 kilograms are enough to get you started.

First sterilize the hand gloves with methylated spirit. Once you do this, pack the mixture of substrate and spawn in the small plastic bags. 1 kg of spawn mixed with substrate can result to 25 small plastic bags. Once you do this, tie a knot at the top of the plastic bag and wrap sterilized small pipes with holes around the knot. This will be used for watering. The pipes are connected to a bigger pipe that is connected to the water outlet. To protect the mushrooms, apply methylated spirit on the opening of the pipes.

Once your plastic bags are ready, transfer them to a dark corner of your structure and let them stay there for 21 days. After 21 days are over, you will notice that the plastic bags are covered with mycelium – a whitish substance. Transfer the plastic bags from the dark to places that have more light so that the mushrooms can form.

After 4 to 5 days, you will notice whiteheads beginning to form outside the plastic bag and from there, the mushrooms will begin to grow. Once the white heads begin to appear poke holes in the plastic bag to allow easy germination to take place and the mushrooms to pop out. This is the point where you use the knapsack sprayer to spray clean water to the mushrooms. Ensure that the jet water is in a misty form so that it doesn't affect the mushrooms.

In a 1/8 acre farm, expenses for constructing the farmhouse, purchasing the equipment and painting accrue to Ksh.230,000. If you don't have to build an entire mud house and you can use an available free room, the costs are cheaper. It will cost you only Ksh.15,000 to set up the shelves and a good ventilation system. However, once you have constructed the farm house, in the subsequent seasons you will only spend 150,000 KSHs for purchasing the spawns, water supply and labour.

It only takes 2 months for button mushrooms to mature. 1/8 acre farm can support 1000 bags and this can produce up to 2 tons. A farmer can sell one kilogram at 600 KSHs to consumers and this translates to 1.2 million KSHs in revenue. In Kenya, mushrooms can be purchased in the major supermarkets outlets at a prices between e.g. 400 to 600 KSHs a kilo. The price from individual sellers is better at 500 KSHs a kilo.

Mushroom farming is profitable since you can also sell the compost after you are done using it. A 50 kg bag can be sold for 2000 KSHs.

The highest demand for mushrooms in Kenya is in Nairobi. They are majorly grown in towns like Eldoret, Kisii and Kericho and are transported to Nairobi for sale.

Tips for successful mushroom farming

First try planting the mushroom crop in a small farm and see how it goes before moving to a big farm. This way, you have a better chance of learning from your mistakes. Seek advice from other mushroom farmers in the area and observe how they do it. Find a market in advance to avoid disappointments, because once harvested, mushrooms have a low shelf life. Remember to maintain very high standards of cleanliness in your farm. This is the key to success for mushroom farming.

Growing Mushrooms - A Fun and Rewarding Experience

I'm a firm believer in growing mushrooms. It's a fascinating pastime, one that always holds a sense of wonder. And it just doesn't get any better than eating something that you've grown yourself.

One doesn't have to be a trained mycologist or even have a green thumb to learn how to grow mushrooms. All you need is the right materials, good resources, and most importantly: **patience!**

Cultivation is all about the care and feeding of mycelium, which is the vegetative growth of a fungus. Have you ever picked a mushroom and seen a clump of white filaments or tissue in the ground or bark underneath it? That's mycelium, the organism that produces mushrooms. Think of mycelium as a tree, and mushrooms as the apples.

The advantages of growing mushrooms are many and varied. You can create your own healthy food. You can save money. You can learn and teach about biology without the classroom. It's fun and exciting (really!).

The list goes on, but I encourage you to try it on your own and see for yourself.

You **don't** have to be an expert in mushroom cultivation, anyone can do with a little knowledge and the right materials.

There are lots of different ways to grow mushrooms, making this a fun and varied hobby. Once you have the basics under your belt, you can create endless experiments!

- If you're short on time and patience you can always start with mushroom kits. Most kits come as a substrate inoculated with mycelium, so most of the hard work has been done for you. One can grow lots of tasty mushrooms by adding just water, fresh air, and a little light.

- Growing mushrooms on straw is one of the most popular methods. It can be done indoors or outdoors, with lots of effort or little.
- Learning how to grow mushrooms on logs takes some patience, but the results are so worth it. This involves making holes in wood and inoculating them with mycelium. Although it takes months for the logs to colonize, they can fruit for years. Some think this method yields the best tasting mushrooms.

Growing Mushrooms: Final Points

Even the experienced cultivator is bound to have some failures when growing mushrooms. I can't tell you how many times a project of mine turned into a big pile of.....well, nothing.



Yet once you've succeeded, what do you do with your spent substrate? It can be used to condition soil and bring nutrients to plants in gardens.

Whether seasoned cultivator or just starting out, growing mushrooms is a fun hobby that can be as easy or complicated as you like. Whatever your skill level, I wish you a rewarding experience and a bumper crop of mushrooms!

It is my hope that this ebook has been beneficial and enlightening to you. I wish you success in your quest to become a successful farmer.

Thanks for taking your time to read this guide. Am still writing more and more Agribusiness guides that will nourish you in your profitable farming endeavours. Always keep in touch with me on whatsapp **0714723004** to get more of my Agribusiness guides and Agribusiness advice.

Also whatsapp me and give me your feedback about this guide...

