  
 **Business Report**

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**For**

**Hawkens’s gingerbread,**

**28 London Road, Grantham, Lincolnshire NG31 6EJ**

**(01476) 501740**

The report has been submitted to fully satisfy the coursework requirements For

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# **Feasibility Study on Ginger Production in the UK for Hawkens Gingerbread**

## **Executive Summary**

This research provides a thorough feasibility analysis on cultivating ginger in the United Kingdom, specifically for Hawkens Gingerbread. The main goal is to evaluate the financial feasibility, environmental sustainability, and competitiveness of locally grown ginger in the UK market. The study encompasses a range of factors, such as market analysis, agricultural methods, cost analysis, risk evaluation, and potential advantages of local production.

## **Introduction**

The United Kingdom's dependence on imported ginger from nations such as China, India, and Peru present difficulties such as disruptions in the supply chain, increased expenses, and a substantial environmental impact in terms of carbon emissions. This feasibility study examines the viability of growing ginger in the UK utilising sophisticated agricultural methods such as polytunnel soil cultivation, and vertical farming. The objective of the study is to perform a cost analysis, risk assessments, and evaluations of pilot projects, assessing the environmental and economic implications. The study offers Hawkens Gingerbread valuable information to make well-informed decisions regarding sustainable and competitive local ginger production by comparing various cultivation methods.

**Market analysis**  
  
**UK Ginger Market:**

* Rising Demand: The demand for ginger is on the rise because of its health benefits, which encompass anti-inflammatory, anti-nausea, and digestive qualities. Both savoury and sweet meals widely incorporate it, and it plays a crucial role in numerous wellness products such as teas, detox drinks, and dietary supplements.
* The UK relies on imports for 60% of its ginger supply, sourcing it primarily from nations such as China, India, and Peru. The reliance on this relationship makes the market vulnerable to supply chain interruptions caused by geopolitical difficulties, tariffs, and transportation challenges.
* Market Growth Projections: The worldwide ginger market had a valuation of $3 billion in 2020, exhibiting a Compound Annual Growth Rate (CAGR) of 6%. The UK market is projected to experience a compound annual growth rate of 5%.
* Major importers and distributors currently dominate the market in the competitive landscape. Locally cultivated ginger provides a distinctive advantage with its exceptional freshness, sustainability, and contribution to local economies.

**Advantages of Local Production:**

* Enhanced quality of perishable goods with an extended duration of storage.
* Shorter transit distances result in lower carbon emissions.
* Creating employment opportunities and fostering growth in rural areas achieves positive economic impact.
* Consumers exhibit a strong inclination towards locally sourced and organic produce.

## **Aims & Objectives**

### **Aim:**

* To evaluate the financial feasibility of growing ginger locally in Lincolnshire.

### **Objectives:**

* Conduct Detailed Cost Analysis and Financial Modelling.
* Perform Risk Assessment and Mitigation.
* Implement and Evaluate Pilot Project.
* Measure Environmental and Economic Impact.
* Compare Cultivation Methods.

**Assumptions**

* We derive the anticipated cash flow analysis from a 9-month timeframe that represents the duration of the ginger life cycle.
* We standardize the land measurement for cost analysis to one hectare.
* We use precise processes and techniques at each step to ensure the efficient manufacture of ginger.
* The cash flows forecast are cumulative and not subject to discounting.

## **Farming Techniques**

|  |  |  |
| --- | --- | --- |
|  | Polytunnels | Vertical Farming |
| Advantages | Year-Round Cultivation- Weather Protection- Versatility- Controlled Environment | Optimal Space Utilization- Environmental Control- Reduced Emissions- Advanced Technologies |
| Disadvantages | - High Initial Costs- Environmental Impact- Space Requirements- Climate Control Challenges | High Initial Costs- Technical Requirements- Energy Consumption |
| Estimated Yield | Estimated Yield 20,000 to 30,000 kg per hectare annually. | Estimated Yield 1,00,000 kg per hectare annually. |
| Estimated setup cost | Enhanced bioactive compounds- Renewable energy sources reduce carbon footprint | Enhanced bioactive compounds- Renewable energy sources reduce carbon footprint |
| Environmental impact | Estimated setup cost £78,500 per hectare. | Estimated Setup cost £2,340,000 per hectare. |

## **Cost Analysis**

**Land Preparation:**

* The UK has the highest cost for land preparation (£800 per hectare), reflecting higher labour and equipment costs compared to China (£390), Peru (£468), and India (£351).

**Planting Material (Ginger Seed Requirement)**

* Plants per Hectare: 110,000 plants.
* Average price per Rhizome: £0.01.

Total price per hectare = Plants per Hectare x Average price per Rhizome

Total price per hectare = 110,000 x £0.01

Total price per hectare = £1100

* The cost of ginger rhizomes in the UK is £1,100 per hectare, which is higher than in China (£780), Peru (£936), and India (£702).

**Labour:**

* Labour costs are significantly higher in the UK (£2,000 per hectare) compared to China (£1,170), Peru (£1,326), and India (£1,014), reflecting higher wage rates.

**Fertilizers and Soil Amendments:**

* The UK also has higher costs for fertilizers and soil amendments (£900 per hectare) compared to China (£624), Peru (£702), and India (£546).

**Pest and Disease Control:**

* Pest control costs are higher in the UK (£400 per hectare) than in China (£234), Peru (£312), and India (£195).

**Irrigation:**

* Irrigation costs are highest in the UK (£300 per hectare), compared to China (£156), Peru (£234), and India (£117).

**Harvesting:**

* Harvesting costs are also highest in the UK (£1,200 per hectare) relative to China (£780), Peru (£858), and India (£702).

**Post-harvest Processing:**

* The cost of post-harvest processing is highest in the UK (£600 per hectare), with China (£390), Peru (£468), and India (£351) having lower costs.

**Miscellaneous Costs:**

* Overhead and loan interest costs are higher in the UK (£400 per hectare) compared to China (£234), Peru (£312), and India (£195).

**Total Cost:**

* Overall, the total cost of ginger production per hectare is highest in the UK (£7,700), followed by Peru (£5,616), China (£4,758), and India (£4,173).

## **Cash Flow Projections**

**Polytunnels**

Annual yield and revenue:  
  
The starting output of 25,000 kg/ha increases annually by 2%, resulting in a yield of 30,475 kg/ha by year 10.  
The revenue increases from £37,500 in the initial year to £61,433 in year 10.  
Financial Evaluation:

* The initial costs amount to £86,200 in year 0 and gradually decrease to around £10,348 by year 10.
* The annual net cash flow begins at a deficit of £48,700 in the initial year and gradually increases to £51,085 by the tenth year.  
  Total amount of cash generated or consumed over a period of time, including both inflows and outflows.
* The initial cash flow starts at a negative value of -£48,700 and becomes positive in the second year, reaching £357,307 by the tenth year.

**Vertical farming**

Annual yield and revenue:  
  
The initial production is 100,000 kilogrammes per hectare, and it increases each year to reach 297,173 kilogrammes per hectare by the tenth year.  
The revenue begins at £150,000 in the initial year and increases to £599,064 by year 10.

* Cost Analysis:  
    
  The starting costs amount to £2,347,700, which gradually decrease to approximately £10,348 by the tenth year.  
  The initial net cash flow is -£2,310,200 in year 0, and it increases to £588,715 by year 10.
* Total amount of cash generated or consumed over a period of time, taking into account all inflows and outflows.

The cumulative cash flow initiates at a deficit of -£2,310,200, becomes positive by the ninth year, and reaches a value of £606,221 by the tenth year.

**Important Observations**  
Polytunnels are structures made of polyethylene or similar materials that are used in agriculture to create a controlled environment for growing plants. The initial investment of £78,500 is relatively cheap, which enables a faster break-even point by the second year and consistent profitability. By the tenth year, the cumulative cash flow reaches £357,307.

Vertical Farming: Despite the need for a substantial initial investment of £2,340,000, it generates higher revenues and delivers a substantial cumulative cash flow of £606,221 by year 10, becoming profitable by year 9.

In the UK, both the use of polytunnels and vertical farming methods for ginger cultivation demonstrate encouraging financial profitability. Polytunnels provide a faster point at which costs are recovered and consistent growth, whereas vertical farming provides greater long-term profitability despite the significant initial investment. These forecasts demonstrate the feasibility of producing ginger locally, which is in line with Hawkens Gingerbread's objectives of sustainability and economic growth.

## Risks involved in producing ginger

Producing ginger in the UK faces several risks, including unsuitable climate conditions, poor soil quality, and vulnerability to pests and diseases. Limited local expertise and infrastructure increase costs and inefficiencies. Market acceptance and consumer preferences for domestically grown ginger are uncertain, and economic factors like fluctuating import prices and changing agricultural policies further impact profitability and sustainability.

**Poor climate control** – Ginger needs specific temperature and humidity levels to grow well. If the climate conditions are inconsistent or not suitable, it can hinder growth and lower the total yield. Poor climate conditions can also affect the quality of ginger, resulting in issues like poor texture, taste, or colour, making it less appealing for sale. Additionally, temperature and humidity fluctuations can create conditions that promote diseases, increasing the risk of outbreaks that can severely damage the crops.

High Initial Investment- Setting up the necessary structures, racks, lighting, irrigation systems, and climate controls for growing ginger can be very expensive. The large initial costs might not be quickly recovered from selling the ginger, especially if the harvest is smaller than expected or market prices change. This financial challenge can be difficult for small farmers or new growers to overcome.

Technological Dependence-Dependence on technology means that any malfunction or failure in these systems can lead to significant crop damage or loss. Power outages, technical glitches, or maintenance issues can disrupt operations and affect crop health.

Water Management Issues-Overwatering or poor drainage can cause the roots to rot and lead to fungal infections. Too much water can also wash away important nutrients from the soil. On the other hand, not enough water can stress the plants, causing them to grow poorly and produce less. Good water management is needed to avoid these problems.

Disease and Pest Risks- In a closed environment, diseases can spread quickly if proper cleaning isn't done. Germs can grow well in the controlled climate if not carefully managed. Pests can also become a big problem, so constant monitoring and control are needed.

## STRATEGIES FOR MITIGATION OF LOSS

**Apply Balanced Nutrients Based on Soil Tests**

Farmers can improve their ginger crops by testing their soil regularly. This simple test reveals the specific nutrients the soil is lacking. Armed with this knowledge, farmers can provide their ginger plants with exactly what they need to thrive. This targeted approach ensures the plants receive the perfect amount of essential nutrients, promoting healthy growth and abundant yields. It's a win-win! Not only do the plants flourish, but there's also no waste of resources and less risk of harming the environment from excess fertilizer.

**Conduct Frequent Field Inspections to Detect and Manage Pest**

Regular checks help you spot bugs and diseases early, so you can stop them before they spread.

There are ways to fight pests without using strong chemicals. One method is

called "integrated pest management" (IPM). Think of it as a toolbox with different

tools to handle pests. You can use natural enemies like ladybugs, traps, or

remove weeds where pests hide. If needed, you can use safe sprays as a last

resort. Using IPM helps keep pests under control and ensures a healthy ginger

harvest.

**Consider Tissue**

Using a method called tissue culture, we can grow ginger plants in a clean, germ-free environment. This ensures they start out healthy, unlike plants grown from seeds or cuttings that might have pests or diseases. With tissue culture, scientists select the best and strongest ginger plants to copy. These top plants grow similarly, giving consistent harvests each year. They're also better at fighting off diseases, leading to healthier crops and less ginger lost to sickness.

**Adopt Organic Farming Practices**

Organic farming is a popular way to grow crops naturally. Instead of using chemical fertilizers and pesticides, organic farmers use compost, manure, and other natural methods to nourish their plants. They also rotate different crops in the same field each year to keep the soil healthy. This method has two big benefits. First, it produces chemical-free food that many people want. Second, it helps the environment by protecting the soil and promoting biodiversity. So, organic farming is great for both people and the planet!

**Implement Renewable Energy, Efficient Irrigation Systems, Sustainable Packaging, and Optimized Logistics**

Ginger farming can be more eco-friendly by using solar panels or wind turbines for power. This reduces pollution and saves money on electricity. Water is precious, so drip irrigation systems are great because they deliver water directly to the ginger plants, drop by drop. This avoids waste and prevents diseases caused by too much water. When your ginger is ready, pack it in containers that break down naturally. Also, find the best way to transport your ginger to market with fewer stops. This saves money and reduces pollution from trucks and trains. By doing these things, ginger farmers can help the planet, save resources, and make their business stronger. It's a win-win for everyone!

**CarbonEmission**

Carbon Emission is a vital issue to the environment. In this business report mainly focuses on carbon emission from Agriculture sector in the United Kingdom.

Greenhouse gases (GHGs) adversely affect natural and socio-economic systems in the atmosphere. The vast amounts of GHGs currently being released globally are widely acknowledged as a significant driver of climate change (Zhang, Luo and Skitmore, 2015). According to Lal (2004) agricultural practices contribute to carbon emissions through various activities categorized into primary, secondary, and tertiary sources.

According to Lal (2004) Primary sources arise from direct agricultural operations, which can be further divided into mobile and stationary activities. Mobile operations include activities such as tillage, sowing, harvesting, and transportation. Stationary operations encompass tasks like water pumping and grain drying, all of which emit significant amounts of carbon. Secondary sources of carbon emissions are linked to the production and handling of agricultural inputs. This includes the manufacturing, packaging, and storage of fertilizers and pesticides. Tertiary sources of carbon emissions in agriculture stem from the broader supply chain and infrastructure activities. This category encompasses the extraction and processing of raw materials, as well as the manufacturing of equipment and construction of farm buildings. These activities add another layer to the carbon footprint associated with agricultural operations (Lal, 2004).

According to Ball and Pretty (2002) in Agriculture Deforestation significantly contributes to carbon emissions, as standing forests store large amounts of carbon that is released as CO2 when these forests are cleared to create cropland. The use of limestone and urea in agriculture also adds to carbon emissions which Limestone, used to reduce soil acidity, and urea, a common fertilizer, both release CO2 upon application (Gibbons, Ramsden and Blake, 2006). Fertilizer production is a significant source of carbon emissions, primarily due to the energy consumption and greenhouse gases emitted during the synthesis of synthetic fertilizers (Ball and Pretty, 2002). Once applied to fields, fertilizers and crop residues are further broken down by soil bacteria, leading to direct emissions of nitrous oxide (N2O), a potent greenhouse gas (Gibbons, Ramsden and Blake, 2006). Additionally, some fertilizers and residues may be washed away or volatilized, later being digested by bacteria off-field, which results in indirect N2O emissions (Gibbons, Ramsden and Blake, 2006). Additionally, farm machinery, essential for various tasks such as fertilizer application and harvesting, is powered by energy sources that often rely on fossil fuels, leading to further emissions. According to Hillocks (2012) the production of pesticides is another contributor, as it requires substantial energy to manufacture these chemicals intended to control pests and weeds. According to Martin-Gorriz et al. (2021) the carbon footprint of irrigation systems varies based on their energy source, with systems powered by renewable energy having a lower carbon impact compared to those using fossil fuels.

According to Maraveas et al. (2023) related to the ginger cultivation in the UK, heating greenhouses especially during colder months, contributes the carbon emissions. The extent of these emissions is influenced by the energy source, with fossil fuels having a higher carbon footprint compared to renewable energy sources (Maraveas et al., 2023). According to Jia et al. (2024) Processing the ginger involves various energy-consuming activities. Drying ginger can be particularly energy-intensive, although solar drying provides a more eco-friendly, low-carbon alternative, producing ginger syrup involves concentrating the juice through evaporation, a process that requires continuous heating and additionally, the production of packaging materials, such as plastic and cardboard, generates emissions. Organic waste, if composted improperly, can produce methane (Jia et al., 2024).

Transportation also plays a role in emissions. According to McKinnon and Piecyk (2009) Moving ginger from farms to processing facilities generates CO2, with emissions depending on the distance and vehicle type. By using electric or hybrid vehicles can further reduce the carbon footprint compared to diesel or petrol trucks (Hickman, Ashiru and Banister, 2010). For international shipments, maritime shipping emits less CO2 per ton-kilometer than air freight, which, though faster, is significantly more carbon-intensive due to the rapid transport of perishable goods (McKinnon, 2007).

A chart of gas emissions

Description automatically generated

According to GOV.UK (2023) this pie chart illustrates the UK's domestic GHG emissions for 2021 total 426.5 MtCO2e, with key contributors being Transport (26%), Energy Supply (20%), Business (18%), Residential (16%), Agriculture & LULUCF (11%), Waste (4%), and Other (4%). Transport is the largest emitter, necessitating a shift to electric vehicles and alternative fuels. Significant emissions from energy supply call for a transition to renewables, Business and residential sectors highlight the need for energy efficiency and sustainable practices and Sustainable agriculture and reforestation are vital for reducing emissions from Agriculture & LULUCF (GOV.UK, 2023). According to GOV.UK (2023) improved waste management and recycling can cut emissions from the waste sector, while a comprehensive approach is needed for the diverse "Other" category.

A graph of a graph showing the growth of gas emissions

Description automatically generated

According to GOV.UK (2023) this line graph from 1990 to 2021, the UK's greenhouse gas emissions show notable trends across sectors. Transport including domestic and international is the largest emitter despite recent declines, necessitating further promotion of electric vehicles, the energy supply sector has significantly reduced emissions by shifting to natural gas and renewables, Business and residential sectors show gradual declines due to improved energy efficiency but still contribute significantly, Emissions from agriculture and LULUCF remain stable, highlighting a need for sustainable practices and the waste sector has steadily reduced emissions through better management and recycling (GOV.UK, 2023). Continued targeted interventions across all sectors are essential to meet the UK's climate goals.