



Consulting Report

Strawberry Fields Farm

Confidential



EXECUTIVE SUMMARY:

This report aims for maximization of profit for the client, Strawberry Fields. To achieve this several avenues for profit are explored and an optimum solution is achieved by optimizing ingredient purchase, manufacturing volume and product storage. The assessment is divided into three stages. In stage 1, analysis of profit and waste for 2021 is considered initially to justify the validity of the subsequent Xpress model. In stage 2, the new model assesses the production of new products by allowing for a variety of ingredients, assuming a constant supply and demand throughout the year. In stage 3, the assumption of constant supply and demand is removed, and inventory control as well as dynamic storage is introduced. In essence, recommendations to increase profit are made based on the analysis.

STAGE 1:

The situation and resources in the year 2021 were modeled using Xpress to get more insight into the business' fiscal year. This also served to validate the Xpress model, ensuring the obtained figures are similar to actual figures for the year.

Table 1: Summary of ingredients purchased, used, and sold in 2021, obtained from Xpress

Ingredient	Amount Purchased (kg)	Amount Used (kg)	Amount Sold (kg)
Fresh Strawberries	7600	1600	6000
Thin Cream	916	916	0
Sugar	1484	1484	0

The Xpress model utilizes provided data, such as the demand, purchase costs etcetera to maximize profit for the year. Table 1 shows the results obtained from the Xpress model. A total revenue of £35,000 was obtained, with an associated cost of £12,905 and A final profit of £22,095 was achieved. The actual profit for 2021 was £22,000, the difference between the model value and actual value is minimal, ensuring validity of the model. 4000kgs of regular ice cream were manufactured. All the manufactured ice cream was sold; however, the demand was not fully met. The amount manufactured was limited by the production ability, limiting overall sales.

This limit in production capacity seemed to affect the profit the most. Analysis showed that maximum price for increasing the production capacity to keep the model profitable was only £1.84 per kg ice cream. When the production capacity is doubled with an increment to £1.00, for the blending price, the profit increases to approximately £26,000. Furthermore, the warehouse was not used in 2021. It could have been rented for additional revenue or storage utilized to store ice cream and sell in high-demand months.

STAGE 2:

At stage 2, a range of strawberry ice cream types, in addition to regular, were considered. These include low fat strawberry ice cream and luxury strawberry ice cream. To produce the new types, additional ingredients were required. These were skimmed milk, egg yolks, and thick cream. The new information was included in the Xpress model and profit was maximized. At this stage the demand and supply were kept constant for simplicity.

Overall, a revenue of £54,110 was obtained, with a corresponding profit of £32,945. This shows a 49.1% increase in profit from stage 1. The increased profit is achieved because only manufacturing the most expensive ice cream type, luxury strawberry ice cream. Any excess of other raw ingredients is also sold. This minimizes waste as well as loss of revenue. Overall, 4000kgs of the luxury ice cream were manufactured and sold. Additionally, no storage was used to ensure minimal capital costs and again leaving the opportunity for it to be rented. Detailed results for stage 2 are shown in Table 2.

Table 2: Summary of ingredients purchased, used, and sold (kg) in 2022

Ingredients	Fresh Strawberries	Frozen Strawberries	Egg Yolk	Thick Cream	Will Thin Cream	Milk	Sugar
Purchased	8000	200	600	3000	3000	0	6000
Sold	6000	200	0	2846	3000	0	0
Used	2000	0	600	154	0	0	0

There is again room for improvement by increment in production. We double the capacity and the product make cost, to account for extra machinery rented to meet the 7000 kg demand of luxury ice cream. As a result, the net profit increases to approximately £35,700 with total revenue being £61,925. The problem with this model is that it assumes constant demand and supply of ingredients and products throughout the year, which is not possible in practice, hence it is needed to develop a model which accounts for variability of demand and supply throughout the year.

STAGE 3:

At stage 3, dynamic storage is introduced. This means that the variability of demand and supply is now integrated into the model, so the results are a more accurate representation of the real-life situation. Inventory control is then introduced in the Xpress model with the objective of profit maximization. We obtain a profit of £47,700, which is more than a 116% percent increase from the last year with a corresponding revenue of £95,028 and total cost of £47,327. The monthly amount made and sold for each product type is shown in Figure 2.

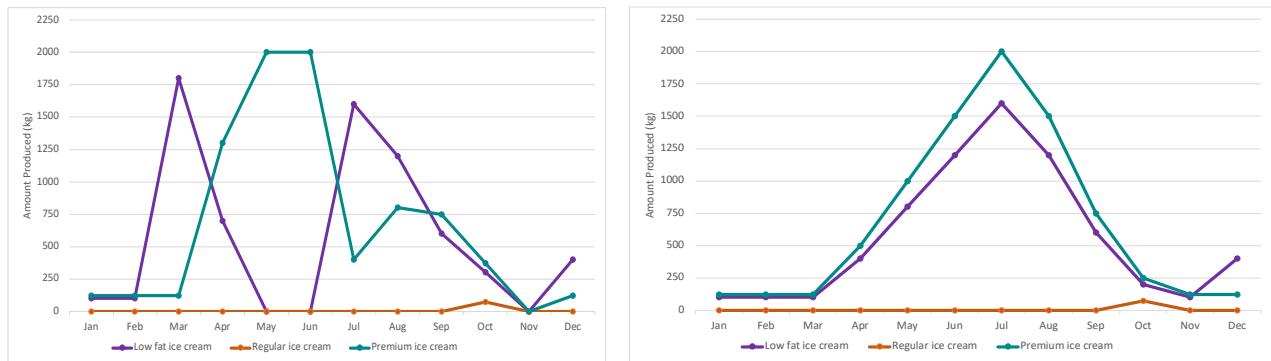


Figure 1: Amount produced (left) and sold (right) of each type of ice cream product every month in 2022

Figure 1 depicts overproduction in certain months that isn't sold, this is so that the excess amount can be stored and sold the months where demand exists. Table 3 shows the amount of each product type stored per month.

Table 3: Inventory Storage (kg) per month

Product	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Low Fat	0	1700	2000	1200	0	0	0	0	0	100	0	0
Regular	0	0	0	0	0	0	0	0	0	0	0	0
Luxury	0	0	800	1800	2300	700	2300	700	0	120	0	0

With the given nutritional content limitations, the proportion in which the ingredients are blended matters and therefore was given consideration while maximizing the profit. The proportions in which Low Fat Ice cream is produced in each month is shown in Figure 2.

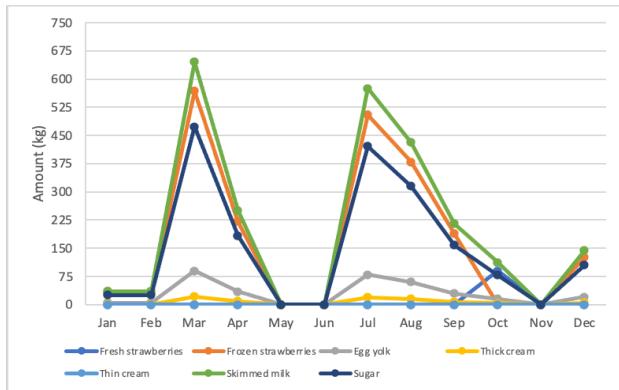


Figure 2: Ingredient break down for low fat ice cream.

Similar proportion figures for regular and luxury ice cream are shown in Figure 4 in the appendix. There are some amounts of ingredient which are purchased but not for ice cream production purposes, but rather to sell. Hence, the breakdown in which the ingredients are purchased and sold is shown in Figure 3.

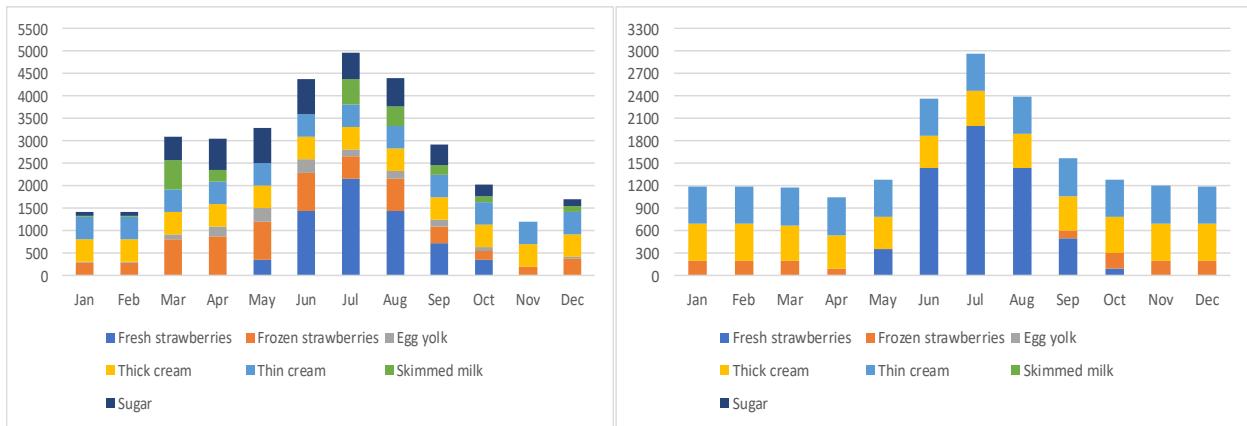


Figure 3: The ingredient purchase and selling quantity in kilograms

It was noticed that during the months of higher demand, the production capacity was fully utilized leaving room for additional equipment to be rented to produce more ice cream. This is backed up by the observation that there was no selling of regular ice cream except in October, hence if production capacity were to be increased, the profit would be expected to rise further. Other than that, the client can also purchase ready-made regular ice cream and sell it at a profit.

The remarkable fact about this model is it fully satisfies the demand for both low fat and luxury ice cream, implying there is little we can do for these products to increase profit. We also realized that the strawberry production this year was only 6480 kg compared to the 12,000 kg last year. Further analysis into the fresh strawberry demand tells us that there was a significant amount unsatisfied due to this production limitation which brings us to recommendations section for our client to consider.

FURTHER RECOMMENDATIONS & ANALYSIS:

With additional considerations in mind, the profit can be increased even more. These executive decisions for profit maximization are mentioned below, corresponding with our appendix, should you choose LPMS consulting.

Recommendation 1: Renting more land to produce more Strawberries:

To satisfy this demand and consequently an opportunity to increase profit, the client can rent more land (hectares) which maximum can cost £500 annually per hectare in the United Kingdom. From our optimization model, the expected production of strawberries would approximately double and the expected profit increase to £58,859. This is a 23.4% increase from the initial profit of £47,401. Further data as to how this can be achieved is given in appendix section A.

Recommendation 2: Introduction of New Product, Vanilla Custard:

It is noted that ice cream has seasonal demand, which means it sells more in the summers. On the contrary, strawberries have a seasonal supply. It can therefore be a good idea to introduce a product which can be produced throughout the year and has a consistent demand throughout the year. A good strategy could be to introduce a new product, vanilla custard. The client can invest in obtaining vanilla extract, a compulsory ingredient into the model. This raises the question of freezing the custard. We previously saw that there was always room available for storage in Figure 2, hence freezing the custard would be no problem. It is in fact a very simple recommendation, since the custard is blended the same way as the ice cream. This increases the profit to about £51,260 with a corresponding revenue of over a £103,933. Further details about the quantity of products and ingredients bought and is explained in the appendix section B.

Recommendation 3: Variable Nutrition Requirements:

If the client wishes to be a bit more flexible with the nutrient composition limits and requirements, there is a wide opportunity for increasing the profit even further. One of the reasons this is considered is because there are variety of products across the UK, all with varying nutrient compositions. For example, when the requirement is lowered by a factor of 0.1 and limit increased by a factor of 1.9 on all the nutrient contents, the profit jumps up to £59,525. The model breaks this down into steps of 0.1, meaning increasing upper limit by 0.1 whilst decreasing the lower limit by 0.1 simultaneously. Further details of profit breakdown is shown in the appendix section C.

Further Analysis:

a) Consideration of fixed price tariff contract for Energy

The UK is currently undergoing an energy crisis and the energy price is expected to double over the next year. There are two options for energy tariffs which our client can consider, one is a variable rate tariff, and one is a fixed rate tariff. The fixed rate tariff guaranteed a fixed electric price over the next year which is 1.5 times of the current tariff. The variable rate is the rate where the market is at a specific time period. In the model it's assumed to increase at a fixed rate over the course of the next year and will be two times the current price at the end of the next year. The estimated profit when under the fixed tariff is £42,868 and the profit under the variable tariff is £44,447. However, the energy prices under the variable tariff are an estimation, it can be higher or lower than the estimation. If the client wants to be safe without taking any risk, then the fixed tariff will be a better option.

b) Fulfilling at least 20% of the Regular Ice Cream demand

Our model suggests that we are only going to sell regular ice cream in October which was popular last year. If the client wishes to fulfill at least 20% of regular ice cream demand, our model suggests fulfilling at least 20% of Regular Ice Cream demand will only decrease the profit by 1.3% (£598).

Appendices

A Proportions

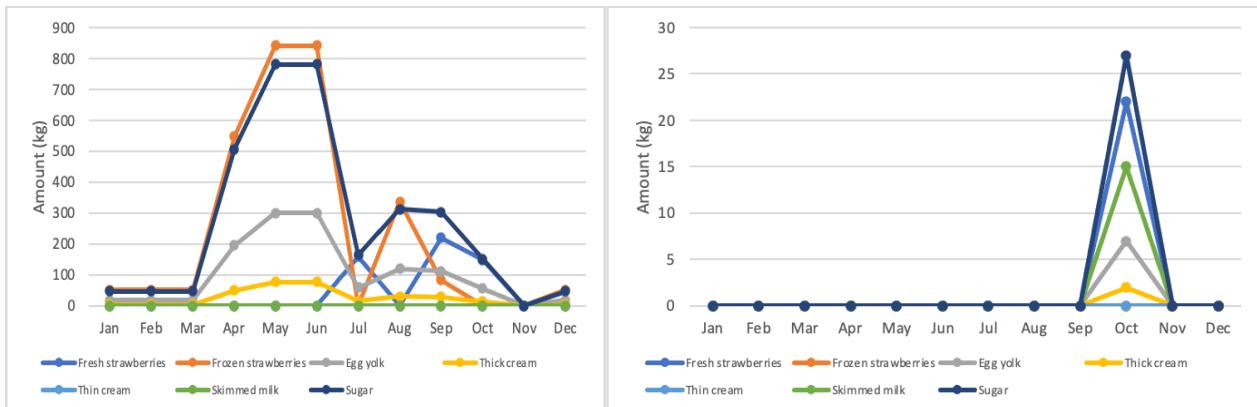


Figure 4: Ingredient proportion breakdown for Regular and Premium ice cream

B Analysis on renting more land

When we rent out more land, the ingredient usage, purchase and sale changes therefore the updated data is shown in Table 4.

Table 4: Tables showing the comprehensive breakdown of ingredient purchased, sold and used respectively

Month	Fresh Strawberries	Frozen Strawberries	Egg Yolk	Thick Cream	Thin Cream	Skimmed Milk	Sugar
Jan	0	282	23	500	500	35	73
Feb	0	282	23	500	500	35	73
Mar	0	818	108	500	500	646	520
Apr	0	784	150	500	500	538	589
May	667	736	200	500	500	359	653
Jun	2667	87	250	500	500	183	748
Jul	3000	0	300	500	500	0	622
Aug	2667	87	250	500	500	183	748
Sep	1333	100	207	500	500	233	673
Oct	667	200	162	500	500	371	585
Nov	0	200	0	500	500	0	0
Dec	0	200	0	500	500	0	0

Month	Fresh Strawberries	Frozen Strawberries	Egg yolk	Thick cream	Thin cream	Skimmed milk	Sugar
Jan	0	200	0	494	500	0	0
Feb	0	200	0	494	500	0	0
Mar	0	200	0	474	500	0	0
Apr	0	100	0	463	500	0	0

May	667	0	0	449	500	0	0
Jun	2000	0	0	436	500	0	0
Jul	2000	0	0	423	500	0	0
Aug	2000	0	0	436	500	0	0
Sep	500	100	0	447	500	0	0
Oct	100	200	0	459	500	0	0
Nov	0	200	0	500	500	0	0
Dec	0	200	0	500	500	0	0

Month	Fresh strawberries	Frozen strawberries	Egg yolk	Thick cream	Thin cream	Skimmed milk	Sugar
Jan	0	82	23	6	0	36	73
Feb	0	82	23	6	0	36	73
Mar	0	619	108	27	0	647	520
Apr	0	684	150	38	0	539	590
May	0	737	200	51	0	359	653
Jun	667	87	250	64	0	183	749
Jul	1000	0	300	77	0	0	623
Aug	667	87	250	64	0	183	749
Sep	833	0	208	53	0	233	674
Oct	567	0	162	41	0	371	585
Nov	0	0	0	0	0	0	0
Dec	0	0	0	0	0	0	0

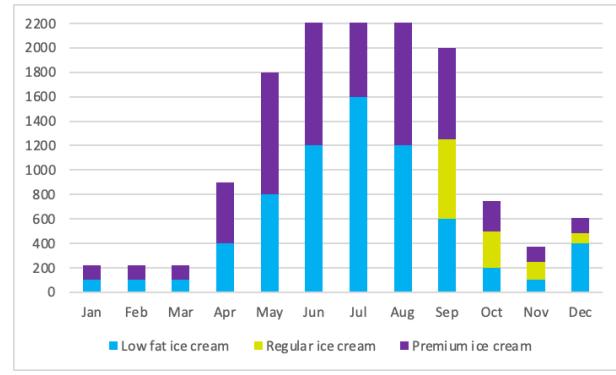
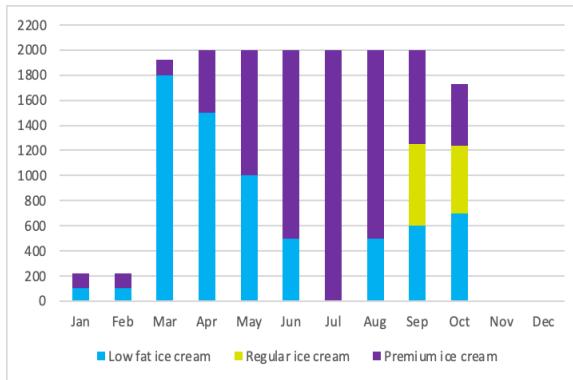


Figure 5: Purchase and sale quantity of the product range in kg.

The purchase and sale percentages for the product are also shown in Figure 5. The associated cost and revenue are £44,264 and £103,848 respectively.

C Analysis on introducing another product

When we introduce vanilla custard into our model we change the amount we produce and sell of each of the ingredient, since the blender is also being used to make the custard. The actual figures are shown in Table 5.

Table 5:Products produced and sold quantities in kg.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Low Fat	100	1500	0	1900	1500	0	0	500	600	300	0	400
Regular	0	0	0	0	0	0	0	0	0	73	0	0
Luxury	960	0	1100	0	0	1500	1800	1500	750	370	0	120
Custard	500	500	900	100	500	500	200	0	500	500	500	500

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Low Fat	100	100	100	400	800	1200	1600	1200	600	200	100	400
Regular	0	0	0	0	0	0	0	0	0	73	0	0
Luxury	120	120	120	500	1000	1500	2000	1500	750	250	120	120
Custard	500	500	500	500	500	500	200	0	500	500	500	500

The associated cost and revenue are £103,393 and £52,673.

D Variable Nutrition Requirements

We wish to see what happens when nutrient proportions are allowed to lie in a larger range. We introduce a variable μ and we let it increase from 0.1 to 0.9. We then multiply the upper nutrition limit by $1+\mu$ and the lower nutrition limit by $1-\mu$. We immediately noticed as this range is widened, the profits start to increase substantially. This can be seen in the Figure 6.

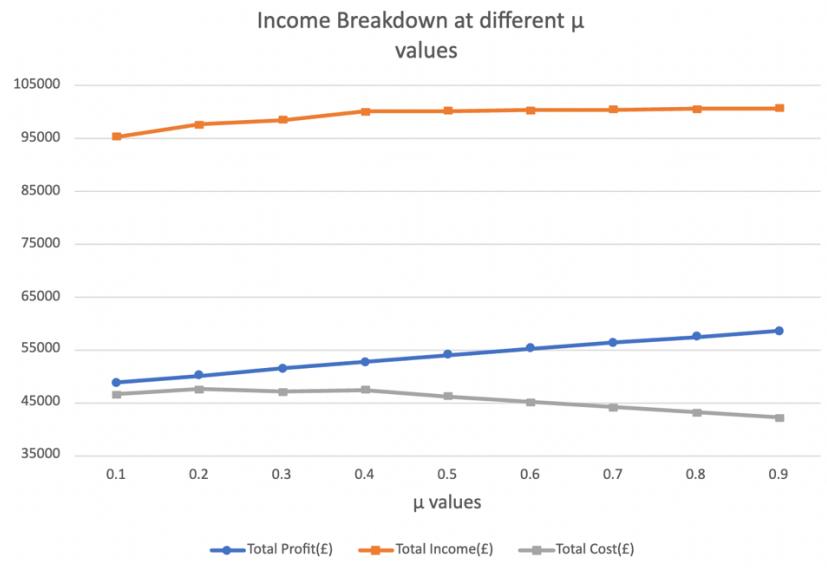


Figure 6