# OrgFarm

**Sample Only**

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ISMT E-130

### Overview

The OrgFarm model consists of 10 excel sheets. The first two sheets, titled inputs and parameters require the user to enter data, while the remaining 8 sheets compute and summarize the results. The output of the model is a 12 quarter income statement for the OrgFarm. As farming is a business that typically does not require complex financing and elaborate business relationships, the income statement is by far the most important of the three financial statements to the farm owner. With this model, the user is provided with a clear projection of profits that incorporates many of the potential variables facing a farmer.

### Base Assumptions

 In order to capture all of the elements of the income statement we had to assume that some factors would not be subject to user change. These assumptions are listed on the base assumptions sheet in the model. While the exact names and values of the assumptions can be referenced in the model, it is important to point out their location and how they fit into the model. For example, if the user would like to know what we assumed for a growing cycle, they can find that value on the base assumptions page. Additionally, assumptions about the tax rate, equipment and labor are all listed on this page. These are all potential variables that could have been either inputs or parameters in a more complex model, but the scope of this assignment required an easy to use model that was effective in modeling the Spillman’s proposed technological innovations. Finally, our group wanted to highlight all the assumptions we made to allow the user to easily understand how different cost variables were calculated when they were not an input or parameter.

### Data Entry

As indicated above, two data sheets require user-defined variables. The first is the Input sheet. The Input sheet consists of three variables: price, land usage and sell-through rate. These variables can change throughout the life of the model. A more in-depth discussion of the inputs and their suggested values will follow.

The second user variable sheet is titled Parameters. The Parameter sheet consists of five variables: the labor productivity coefficient, cost of fertilizer per acre, packaging cost per bag, spoilage, and yield. These parameters stay constant throughout the 12 quarters of the model. As is the case with inputs, a more in depth discussion of the parameters will be provided.

### Inputs

#### *Price*

 The price input allows the user to enter the expected price the OrgFarm lettuce will return in the market. The price entered is the amount produce distributors will pay for the lettuce. It is not the retail price of the product. Being an input, price is allowed to change over the life of the model. While there are no restrictions on price, we used moderate price increases for each scenario. In scenario 1, our price is $2.50 in quarters 2 & 3 for all three years. In scenario 2, our price is $3.00 in quarters 1 & 4 and $2.50 in quarters 3 & 4 for all three years. A summary of all the values for the inputs and parameters is provided in Exhibit 1, with the historical base case included for comparison.

#### *Land Usage*

This input is the percentage of land available for production. In the model, it is assumed that the OrgFarm is a 1,000-acre farm that plants on 75% of its land during the season. However, this input allows the user to see the effect on profits if less land is used in a quarter, as is the case with the greenhouses. The user cannot enter a value greater than 75%, as values of this size would represent a reckless use of the land’s natural resources. Unless there is a technology in place to allow for winter production, i.e. a greenhouse, there should not be any values entered during Q1 & Q4. Finally, the user is expected to avoid large fluctuations in land usage especially between quarters 2 and 3, unless trying to model some sort of non-recurring event, like a flood or crop disease. For the first scenario, this input is set at the standard 75% for quarters 2 & 3, in all three years. In the second scenario, the new greenhouse allows lands usage to be 75% for the entire life of the model.

#### *Sell-Through Rate*

The percentage of our produced lettuce actually sold in the marketplace is the sell-through rate. This input accounts for the assumption that not all harvested product, which meets quality standards, is sold. The operator can use the sell-through rate to model different demand and market share trends. However, since it is impossible to sell more than you produce, the rate cannot exceed 100%. In our scenarios, we utilize a steadily increasing sell-through rate to capture the growing demand for our product. For scenario 1, the rate follows the below scale:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Y1 Q1** | **Y1 Q2** | **Y1 Q3** | **Y1 Q4** | **Y2 Q1** | **Y2 Q2** | **Y2 Q3** | **Y3 Q4** | **Y3 Q1** | **Y3 Q2** | **Y3 Q3** | **Y3 Q4** |
| 0% | 76% | 82% | 0% | 0% | 80% | 89% | 0% | 0% | 87% | 95% | 0% |

For scenario 2 we make the following adjustments to account for the greenhouse:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Y1 Q1** | **Y1 Q2** | **Y1 Q3** | **Y1 Q4** | **Y2 Q1** | **Y2 Q2** | **Y2 Q3** | **Y3 Q4** | **Y3 Q1** | **Y3 Q2** | **Y3 Q3** | **Y3 Q4** |
| 76% | 82% | 90% | 92% | 93% | 96% | 98% | 98% | 98% | 98.5% | 99% | 99% |

### Parameters

The model parameters can be split into two categories: cost and production.

#### *Cost Parameters*

 The cost parameters in the model are **cost of fertilizer per acre**, **packaging cost per bag** and **labor productivity coefficient**. The fertilizer and packaging variables capture the increased costs related to Anne and Bill’s technological innovations. In scenarios 1 & 2, the cost of fertilizer is set at $1.50, an increase of $.50 from the historical base, a result of the increased expense associated with the advanced fertilizer the Spillmans plan to use on the farm. Packaging costs are held constant at $.45 per bag in both scenarios. There are no restrictions on the value of the cost of fertilizer per acre or the packaging cost, but the user should keep in mind that fertilizer and packaging are both essential inputs in the production of lettuce, i.e. it’s hard to run a farm without either function.

 The Labor productivity coefficient parameter provides the ability to capture potential cost increases resulting from poor labor productivity. Part-time labor cost is multiplied by this variable to capture additional costs associated with employee ineffectiveness. The model assumes that factors exist over the 3 years that could adversely affect labor productivity, including weather, labor skills and worker availability. Increasing the labor productivity cost coefficient equates to lower labor productivity. This translates into a longer time to complete the required tasks and thus a higher expense. With this parameter, the user can capture these costs for the three years. The labor productivity parameter can not be set below 1, as labor will always at least be equal to the product of the wage rate and number of hours worked. In the first scenario, labor productivity is assumed normal with the coefficient set at 1.10. We increase the coefficient to 1.20 in the second scenario to account for the change in working conditions in the greenhouse and availability of labor resources in New England during the winter.

##### *Production Parameters*

 The remaining parameters, **spoilage** and **yield** (bags/acre) can be grouped as production parameters. Spoilage is the percentage of the total harvested crop that does not make it to market due to quality concerns, while yield is the amount of bags produced on a per acre basis. Put another way, the total yield determines how many bags the farm produces in a growing season, while spoilage is the percentage of total production that either wilts or is damaged once it is harvested. The model practitioner can use yield to adjust the capacity of the farm, while manipulating spoilage based on quality assumptions. In both scenarios for the OrgFarm, the fertilizer improves our production amount and quality, while the packaging also improves quality. Accordingly, we have set yield higher than the farm’s historical performance at 1,100 bags/acre and spoilage lower than historical performance at 10%. As it is unrealistic to assume that the amount of lettuce produced will equal the amount available for sale, spoilage cannot be set at zero. For yield, there is a ceiling of 2,000 bags per acre, as the size of the land constrains how much lettuce can grow.

### Sheet Relationships

 While the reference guide provides the model practitioner with a detailed listing of the formulas used in the model, it is also useful to have a brief summary of the relationships between the sheets in the model. Production begins the calculation sheets and provides a total number of bags produced by quarter. This number is used in the revenue sheet to calculate total sales after accounting for price, spoilage, and the sell-through rate. The revenue sheet provides the income statement with its “top line”.

 The remaining sheets all provide pieces of the total cost. The labor schedule calculates the cost of labor per quarter, which is then included on the COGS sheet. The COGS sheet takes the labor expense along with other cost of goods sold factors, including seed cost and irrigation cost, to provide the total COGS line for the income statement. The EqptOwned and EqptLeased sheets calculate depreciation and lease expenses for the model. These costs are factors of the amount of land used, and roll directly to the income statement. The income statement contains some additional costs, including taxes and sales & marketing, calculated using base assumptions, and of course calculates the farm’s net income.

### Results

After reproducing our scenarios, or experimenting with their own, the user needs to analyze the results of the model. To best analyze the results of the scenarios modeled; we recommend the user start with the income statement. This is the only sheet that provides a comparison of the total sales and costs generated by the OrgFarm, ultimately providing profits generated and a profit margin. Of course, if profits are not the users only concern, he/she can dig further into the model for other important data. For example, if the model practitioner wants to get a sense of total production, he/she can refer to the production sheet. While the standard user may not be interested in these levels of detail, the information available can be useful if a more detailed operational analysis is necessary.

**Exhibit 1: Inputs and Parameters for the OrgFarm Model**

**Inputs**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Price** | **Y1 Q1** | **Y1 Q2** | **Y1 Q3** | **Y1 Q4** | **Y2 Q1** | **Y2 Q2** | **Y2 Q3** | **Y2 Q4** | **Y3 Q1** | **Y3 Q2** | **Y3 Q3** | **Y3 Q4** |
| Base | $0.00 | $2.00 | $2.00 | $0.00 | $0.00 | $2.00 | $2.00 | $0.00 | $0.00 | $2.00 | $2.00 | $0.00 |
| Scenario1 | $0.00 | $2.50 | $2.50 | $0.00 | $0.00 | $2.50 | $2.50 | $0.00 | $0.00 | $2.50 | $2.50 | $0.00 |
| Scenario2 | $3.00 | $2.50 | $2.50 | $3.00 | $3.00 | $2.50 | $2.50 | $3.00 | $3.00 | $2.50 | $2.50 | $3.00 |
| **Land Usage** |  |  |  |  |  |  |  |  |  |  |  |  |
| Base | 0% | 75% | 75% | 0% | 0% | 75% | 75% | 0% | 0% | 75% | 75% | 0% |
| Scenario1 | 0% | 75% | 75% | 0% | 0% | 75% | 75% | 0% | 0% | 75% | 75% | 0% |
| Scenario2 | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% | 75% |
| **Sell Through** |  |  |  |  |  |  |  |  |  |  |  |  |
| Base | 0% | 70% | 73% | 0% | 0% | 71% | 74% | 0% | 0% | 73% | 75% | 0% |
| Scenario1 | 0% | 76% | 82% | 0% | 0% | 80% | 89% | 0% | 0% | 87% | 95% | 0% |
| Scenario2 | 0% | 80% | 86% | 88% | 90% | 92% | 93% | 94% | 95% | 95% | 96% | 96% |

**Parameters**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Base** | **Scenario1** | **Scenario2** |
| **Labor Productivity**  | 1.10 | 1.10 | 1.20 |
| **Cost of Fertilizer/Acre** | $1.00 | $1.50 | $1.50 |
| **Packaging Cost per Bag** | $0.45 | $0.45 | $0.45 |
| **Spoilage** | 40% | 10% | 10% |
| **Yield (Bags/Acre)** | 900 | 1,100 | 1,100 |