

## Case 2 – Vegetables

### Case material for VBA Programming in Business Economics by Sanne Wøhlk

Please use the data file corresponding to this case.

A small company has specialized in making boxes with vegetables and distributing them to their customers. The company is very service oriented. Each week (Tuesday, at the latest) each customer can make a number of choices and the content of the box will be determined according to these choices.

The goal of this case is to create a system where choices of the customer can be obtained. Based on this information an ILP model is solved to determine the content of the customer's box. This information is stored in customer files. A customer file contains an information sheet and a number of sheets – one for each week - stating the content of the box to be delivered to the customer the corresponding week.

Furthermore, Wednesday morning the owner of the company should be able to automatically obtain information about the amount of each type of vegetables to buy. This information should be based on the weekly sheets of the customer files.

#### Information about the data file:

The file corresponding to this case contains three sheets:

- The main sheet contains a button with the text *Add New Customer*. Pressing it will execute an existing macro that shows a user form where information about a new customer can be entered. The information is stored in a file determined by the customer id. The file is currently stored in the default folder of your computer. The macro assumes that no customer with the same id already exists.
- The sheet *Data* contains a list of vegetables. The vegetables are categorized into groups: A (also referred to as spices), B, C, and D. For each vegetable the group and the value is stated. A number indicates the amount of food one unit contains and a number indicates how interesting the vegetable is.
- The sheet *ILP* contains a possible setup of an ILP model that can be used when determining the content of a box. Feel free to use this if you want to and feel free to make any changes to this sheet as you like.

#### Details about the customer choices:

Each week each customer should make a number of choices regarding that week's box. The choices are as follows and should be obtained through a user form.

- The customer can choose between a small box or a large box. The price, including delivery, is 200 DKK for a small box and 300 DKK for a large one.
- The customer can choose if the box should contain few ( $\leq 2$ ) types of spices or many types of spices ( $\geq 2$  for small boxes,  $\geq 3$  for large boxes).
- The customer determines if the content of the box should be chosen with the goal of maximizing the *food* amount in the box or with the goal of making the box as interesting as possible.
- Given a list of all the vegetables the customer may choose 3 types that should be included in the box.

#### Details about restrictions other than the customer choices:

Besides the customer choices, a number of restrictions should be respected.

- Each box can only contain each type of vegetable once (i.e. 1 green pepper, 1 bag with five tomatoes etc.).
- A small box must contain at least 7 different types whereas a large box must contain at least 10 types.
- A small box must contain at least 2 types from each of the groups B, C, and D, whereas a large box must contain at least 2 types from group D and 3 types from each of the groups B and C.
- To ensure a fair service across customers, the value of the content of a small box must be between 140 and 160 DKK and the value of the content of a large box must be between 230 and 250 DKK.

**The assignment:**

1. Change the code of the *Add New Customer* user form such that the customer files are stored in the same folder as the file corresponding to this case. Use the user form to add a couple of new customers.
2. Make a number of macros to do the following: Display one or several user forms where choices for a customer can be entered. Based on the information obtained through this/these user forms an ILP should be solved to determine the best set of vegetables for the customer the current week (week 1, week 2, week 3, ...). Information about which vegetables the customer should have in his box that week should be entered in a separate sheet of the customer file. The name of that sheet should be "week 1", "week 2", "week 3", ... The whole thing should be activated by pressing a button on the main sheet.

After all the customers have made their choices for the current week the company must know the amount of each vegetable to buy.

3. Make a number of macros to do the following: Add a sheet to the file corresponding to this case and name it based on the week number. In this sheet you should display a list of vegetables along with information about the total number of each vegetable to be packed in the current week when considering all customers. Charts can be displayed to show information about the order. The whole thing should be activated by pressing a button on the main sheet.