**Letter of Engagement**

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| **To:** | Ms. Gisella Bassani |
| **From:** | Group 4 |
| **Subject:** | Improving Farming Efficiency |
| **Date:** | April 19, 2021 |
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**The Opportunity**

Growing for Good is a company leveraging technology with intent to improve farming efficiency and lower emissions specifically caused from the production of farming. The database will enable the following key metrics in reaching the goal of decreasing emissions:

* Increase awareness of supply emissions
* Reduce crop supply travel distance
* Analyze historical data to determine next years crop rotation
* Improve prediction for harvest periods
* Increase contract and vendor satisfaction
* Enhance competition among local and regional farmers for better customer service
* Reduce overall crop waste

Farming is a complex business with many dynamic aspects that can influence an individual growers yearly revenues. In addition, farming provides a critical good to society but is also one of the major contributors to global warming. Positively addressing these factors means that a farmer must be given beneficial trade offs in order to adjust operational production methods. Through the implementation of this database, it will empower farmers with the ability to analyze inputs and make better informed decisions to pragmatically reduce individual grower emissions.

Farmers are aware of the urgency to curb and ultimately eliminate carbon emissions but few tools have addressed the day to day operations that a farmer can leverage today to begin the journey to zero. Limited capital and high switching costs prevent most farmers from having the ability to purchase expensive more efficient equipment. The utilization of this database will allow a farmer to better control day to day sinputs and make strategic decisions to more feasibly achieve a carbon zero farm operation.

**Database Description**

We, the systems consultants, propose to create a database information system to assist Growing for Good. Our proposed database will house the following eight main entities:

* Plot
* Crop
* Waste
* Equipment
* Usage
* Vendor
* Supervisor
* Employee

These entities revolve around several key assumptions:

* Each plot can grow zero or many crops, but each crop must be grown by only one farm.
* Each crop can produce zero or more types of waste and each type of waste must be produced by one or more crops.
* Each plot can operate zero or many pieces of equipment, but each piece of equipment can be operated by only one plot.
* Each piece of equipment must produce at least one or more type of usage, and each type of usage must be produced by one or more pieces of equipment.
* Each piece of equipment is sold by only one vendor, but each vendor can sell one or multiple pieces of equipment
* Each plot must be supervised by only one supervisor and each supervisor must supervise one or more plots.
* Each plot can employ zero or many employees, but each employee must work at only one plot.

Attachment A provides the conceptual design (ER Diagram). Attachment B provides the Data Dictionary for the database.

**Transactions**

The user shall be able to create, retrieve, update and delete multiple queries in the final database. In order to do so, the following transactions are proposed for the database of Grow for good.

* CROP by PLOT Query: This query tells the user about the type, quality and quantity of crop assigned to a farm. This query aids Growing for good to keep track of the type of crops grown and plan crop rotation cycles to protect the soil and keep it from eroding and maintain healthy soil levels.
* WASTE by CROP Query: This query tells the user about the amount of waste produced by a crop during its production cycle. This helps in the process of reduction and elimination of waste as well as aids in safe disposal of waste products on the farm
* EQUIPMENT by PLOT Query: This query tells the user which equipment is assigned to a plot for a particular schedule. This will allow the company to allocate equipment more efficiently to maintain a smooth flow in the day to day requirements of a particular contract.
* EMPLOYEE by PLOT Query: This query tells the user which employee is assigned to work on a plot in a particular schedule. This helps in maintaining an uninterrupted workflow as well as aids in accounting for the work done on the farm by a particular employee.
* VENDOR by EQUIPMENT Query: This query tells the user about the contracts established with a vendor for any equipment used on the farm. This includes information on whether a particular equipment was bought or leased, the cost of buying/leasing and the lease period.
* USAGE by EQUIPMENT Query: This query tells the user about the time and quantity of usage of a particular equipment and the quantity of emissions released on the farm. This helps the Growing for good company keep the rate of emissions produced on the farm in check and protect the environment.

**Reports**  
In order to facilitate maximum efficiency, Grow for Good proposes to use the following reports to gather information that will assist them in maximising production quality as well as DU good for the society by maintaining safe and minimal emissions and waste disposal rates and play their part against the fight with global warming.

* Profit and Loss statement: This report provides the user with a detailed summary of revenues generated and expenses incurred by the farm for a production year. Expenses include cost equipment, salary allocated to employees, materials and harvest supplies, electricity, fuel, land mortgage, waste disposal expenses, marketing and sales expenses, license fees, etc. Revenues may include the profits generated from the sale of crops harvested by the farm and the sale of all the dairy products produced.
* Yield report: This report provides a detailed summary of the output generated by the farm for a particular season or a production year. It includes a summary of crops harvested for a season as well as output from livestock like cows and hens which may include the number of eggs laid by hens or liters of milk yielded by cows on a daily basis.
* Employee report: This report includes the number of employees and the total cost of salary spent on all the employees. It also includes a detailed summary of the number of hours of work required by a contract and the quantity of work done on each project.
* Geographical report: This report shows the demographic information of the farm that includes the access to the nearest resources and suppliers, summary of the fastest, most affordable and efficient routes to connect to suppliers and customers which helps in cost cutting and travel time consumptions.
* Climate Report: This will provide the user with the information of various temperature records, the humidity levels, rainfall, soil quality etc which are recorded for a production year. This report helps identify trends seen in the climatic conditions and plan harvest time according to the conditions that best match the requirements needed for a particular project as well as plan crop rotation cycles to maintain healthy soil.
* Usage Report: This report tells the user about the type and category of emissions released by an equipment as well as the severity rating of the emissions emitted during the usage of various equipment. It helps the company identify the negative impacts of any operation performed on the farm and take the necessary actions to reduce the emission impacts.

**The Schedule of Deliverables**

The following chart is a rough outline of the key milestones for the Growing for Good.

Growing for Good database:

|  |  |  |
| --- | --- | --- |
| **Deliverable** | **Due Date** | **Completed** |
| Letter of Engagement | **4/19** | **4/19** |
| SQL Server Data Structure | **5/17** |  |
| User Manual | **6/7** |  |
| System Documentation | **6/7** |  |
| Operating Database | **6/7** |  |
| Complete System Design and Documentation | **6/7** |  |

**Acceptance of Letter of Engagement**

All involved parties agree to the guidelines and milestones set forth by this letter of engagement.

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Client System Consultant

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Date Date

**Appendix A – Conceptual Design (ERD)**

**Appendix B - Data Dictionary**

**Data Dictionary for Growing for Good Database**

Table A = represents Plot Entity

Table B = represents Equipment Entity

Table C = represents SupervisorDetail Entity

Table D = represents Employee Entity

Table E = represents Crop Entity

Table F = represents Waste Entity

Table G = represents Usage Entity

Table H = represents Vendor Entity

Table I= represents EquipmentUsage Entity

Table J = represents PlotEquipment Entity

Table K = represents CropWaste Entity

Table L = represents DisposalLocation Entity

**Table A- Plot**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute Name** | **Key Type**  **(if any)** | **Definition** | **Data Type** | **Constraints**  **(if any)** |
| PlotID | PK | Identifies a specific plot | INT |  |
| EmployeeID | FK | Identifies a specific employee working on a given plot | INT |  |
| CropID | FK | Identifies the type of crop growing on a specific plot | INT |  |
| Size |  | The size of the plot in acreage | INT |  |
| Location |  | Determines the plot location by 10digitgrid coordinates | CHAR(10) |  |

**Table B - Equipment**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute Name** | **Key Type**  **(if any)** | **Definition** | **Data Type** | **Constraints**  **(if any)** |
| EquipmentID | PK | Identifies the equipment used in operation | INT |  |
| VendorID | FK | Identifies the vendor responsible for selling a type of equipment | INT |  |
| Name |  | Identifies the date an equipment is placed for use. | VARCHAR(50) |  |
| Placed In Service Date |  | Identifies the date an equipment is placed for use. | DATETIME |  |
| Classification |  | Identifies the equipment type of a particular equipment. | VARCHAR(35) |  |

**Table C - SupervisorDetail**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute Name** | **Key Type**  **(if any)** | **Definition** | **Data Type** | **Constraints**  **(if any)** |
| SupervisorDetailID | PK | Identifies the supervisor responsible for overseeing the plot | INT |  |
| EmployeeID | FK | Identifies the EmployeeID for the Supervisor | INT |  |
| FirstName |  | Supervisors First Name | VARCHAR(50) |  |
| LastName |  | Supervisors Last Name | VARCHAR(50) |  |
| FirstDay |  | Day supervisor first promoted to management position | DATETIME |  |
| LastDay |  | Day supervisor was demoted from supervisor. | DATETIME |  |

**Table D - Employee**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute Name** | **Key Type**  **(if any)** | **Definition** | **Data Type** | **Constraints**  **(if any)** |
| EmployeeID | PK | Identifies a specific employee working on a given plot | INT |  |
| FirstName |  | Employee First Name | VARCHAR(50) |  |
| LastName |  | Employee Last Name | VARCHAR(50) |  |
| DateOfBirth |  | Employees recorded day of birth | DATETIME |  |
| FirstDay |  | Day Employee began work | DATETIME |  |
| LastDay |  | Day Employee stopped working | DATETIME |  |

**Table E - Crop**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute Name** | **Key Type**  **(if any)** | **Definition** | **Data Type** | **Constraints**  **(if any)** |
| CropID | PK | Identifies the type of crop growing on a specific plot | INT |  |
| Name | FK | The name of the type of crop by generic name (IE Corn) | INT |  |
| HarvestSeason |  | The season in which the crop is grown | CHAR(3) |  |
| HardinessRating |  | The resiliency of the crop type | INT |  |

**Table F - Waste**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute Name** | **Key Type**  **(if any)** | **Definition** | **Data Type** | **Constraints**  **(if any)** |
| WasteID | PK | Identifies the type of waste being disposed on the farm | INT |  |
| DisposalLocationID | FK | Identifies the specific disposal location for the type of waste | INT |  |
| Name |  | The name given to the type of waste | VARCHAR(50) |  |
| SeverityRating |  | The danger of the waste being disposed according to OSHA ratings | VARCHAR(25) |  |
| Cost |  | The cost associated with the waste removal | INT |  |

**Table G - Usage**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute Name** | **Key Type**  **(if any)** | **Definition** | **Data Type** | **Constraints**  **(if any)** |
| UsageID | PK | Identifies a unique type of usage | INT |  |
| Name |  | Shows the name of the usage being recorded | VARCHAR(50) |  |
| Category |  | Lists the category of usage by products | VARCHAR(25) |  |
| SeverityRating |  | The danger of the waste being disposed according to OSHA ratings | INT |  |

**Table H- Vendor**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute Name** | **Key Type**  **(if any)** | **Definition** | **Data Type** | **Constraints**  **(if any)** |
| VendorID | PK | Identifies the vendor supplying a particular equipment. | INT |  |
| Name |  | The name of the vendor company | VARCHAR(50) |  |
| BuildingNumber |  | Vendor Address for the specific building in which a vendor is located | INT |  |
| Street |  | The street number in which a vendor is located | VARCHAR(35) |  |
| City |  | The city in which the vendor is located | VARCHAR(50) |  |
| State |  | The state in which a vendor resides | CHAR(2) |  |
| ZipCode |  | The zip code associated with the location of the vendor | INT |  |

**Table I- EquipmentUsage**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute Name** | **Key Type**  **(if any)** | **Definition** | **Data Type** | **Constraints**  **(if any)** |
| EquipmentUsageID | PK | Identifies the usage from a specific piece of equipment | INT |  |
| EquipmentID | FK | Identifies the equipment used in operation | INT |  |
| UsageID | FK | Identifies a unique type of usage | INT |  |
| Amount |  | States the amount of usage that was recorded | INT |  |
| Date |  | The date which the usage was recorded | DATETIME |  |

**Table J- PlotEquipment**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute Name** | **Key Type**  **(if any)** | **Definition** | **Data Type** | **Constraints**  **(if any)** |
| PlotEquipmentID | PK | Identifies the type of equipment on which plot | INT |  |
| EquipmentID | FK | Identifies the equipment used in operation | INT |  |
| PlotID | FK | Identifies the type of crop growing on a specific plot | INT |  |

**Table K- CropWaste**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute Name** | **Key Type**  **(if any)** | **Definition** | **Data Type** | **Constraints**  **(if any)** |
| CropWasteID | PK | Identifies the type of waste produced by a given crop | INT |  |
| CropID | FK | Identifies the type of crop growing on a specific plot | INT |  |
| WasteID | FK | Identifies the type of waste being disposed on the farm | INT |  |
| Tonnage |  | The weight amount of the waste | INT |  |
| Date |  | The date in which the waste was disposed of. | DATETIME |  |

**Table L – DisposalLocation**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute Name** | **Key Type**  **(if any)** | **Definition** | **Data Type** | **Constraints**  **(if any)** |
| DisposalLocationID | PK | Identifies the location for disposal of waste | INT |  |
| BuildingNumber |  | The specific building in which a disposal site is located | INT |  |
| Street |  | The street number in which a disposal site is located | VARCHAR(35) |  |
| City |  | The city in which the disposal site is located | VARCHAR(50) |  |
| State |  | The state in which a disposal site is located | CHAR(2) |  |
| ZipCode |  | The zip code associated with the location of the disposal site | INT |  |