**Mars Farm**

**Lesson 8: Scaling up the plan**

**Learning Objectives:**

Having established a baseline for one day, the students are exposed to an equation using dimensional analysis that scales their calorie requirement up to account for the growth time of their chosen crops.

**Lesson Standards (NGSS, CCSS, CTE):**

#### [CCSS.Math.Content.6.RP.A.1](http://www.corestandards.org/Math/Content/6/RP/A/1/)

#### Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

**Materials**

* Science notebooks
* Excel worksheet file
* Computers
* Whiteboard / Chalkboard / DocCam

**Lesson Preparation**

* The instructor should be familiar with the concepts of dimensional analysis i.e., using units of measurement to develop equations.

**Time Required**: 45 minutes

**Grouping of Students for Instruction**

Same groups as previous lessons.

**Lesson Components[[1]](#footnote-0):**

* The baseline plan created in lesson 7 will only provide calorie requirements for one day. The plan must be scaled to accommodate the number of days it will take to grow each crop.
* Use a class discussion to walk through the calculations below.

The problem statement asks students to supply 1000 calories *per 1 person per 1 day*:

They already scaled that up to accommodate three researchers for the baseline plan:

Since the crops do not grow overnight, students now need to figure out the total calories their crops will need to support in order to account for the time it takes to grow their crops. In order to minimize the complexity of the problem, instruct students to use the max growing time from their baseline plan. In this example, we’ll use 30 days:

The result of the calculation, 90,000 in this example, is the real number of calories students must produce with their crops. After the first 30 days, they will have enough food to last the next 30 days while the next batch of crops is growing.

After explaining the formula, students should calculate their own group’s calorie requirement using the maximum growth time of the crops in their baseline plan. They will then modify their plan to achieve the new calorie target. They may do this by changing quantities or changing the chosen crops or both. However, the crop with the longest growth time must remain in their plan. This prevents the students from having to repeatedly recalculate their calorie requirements.

The new plan should be saved and labeled as revision 1.

**Assessment:**

* Equation showing how students arrived at their revised calorie requirement.
* Revised crop plan to achieve the new calorie requirement.

**Accommodations:**

* Engineering profile could be turned into a Google Doc for word processing if handwriting an issue.
* Teacher will be reading and rereading assignment.
* Classrooms have microphones for hearing impaired.
* Teachers could also enlarge any documents under document camera.

**Extensions:**

* The instructor may choose to add complexity to the module by allowing students to change their crop with the longest growing time.

1. The sub-sections of the procedure section (e.g., Understand the Problem, Explore the Problem) are from the Illinois Math and Science Academy’s PBL Teaching and Learning Template, however, the descriptions were developed by WABS and do not necessarily represent the views of IMSA. [↑](#footnote-ref-0)