Farmers often use fertilizers to improve their crops but do fertilizers really make difference?

Farmers often use fertilizers to improve their crops. For our year 10 coursework we have to find if the fertilizers actually make a difference. To aid us in compleating this task we have been given the following pieces of equipment: -10 Marrow Seeds

5 Plastic Cups
Compost
Water
Liquid Fertilizer
Weighing Scales
Measuring Cylinder

Because the question asks if fertilizers make a difference, I need to have a control pot, with just marrow seeds and water in. In the other cups I will have different amounts of liquid fertilizer in them. Because I have 10 marrow seeds, I will put 2 marrow seeds into each cup: - meaning that I can have 5 cups, one of which will be a control – leaving me with 4 cups to alter the variable in. In this experiment the variable is the amount of fertilizer, because the question asks if fertilizers make a difference. These are my first thoughts on the amount of liquid fertilizer in each cup.

Cup	Amount of fertilizer
Control (cup 1)	0mls
Cup 2	5mls
Cup 3	10mls
Cup 4	15mls
Cup 5	20mls

In each of the cups I am planning to have 50 grams of compost – I must ensure that each cup has exactly 50 grams of compost to make the experiment fair. To ensure that there is exactly 50 grams in each cup I will first weigh the cup, then I will add fertilizer to the cup until the scales read 50g (+ how much the cup weighed). This way of measuring out the fertilizer means I get optimal results – as there is no chance of not all of the fertilizer going in if I weighed it outside of the cup, meaning the expiriment is more fair. Also it keeps the work place cleaner, and easier to work in.

Once I have recorded the results from the cups I will add two seeds to each of them: - the reason for putting two seeds into each of the cups is to increase the chances of germination. i.e. One seed may not germinate, but I will still have results from the other seed. I will put all the seeds at the same depth in each of the cups, and as close to the centre as I can put them. I will put the seeds at a depth of 30 milimetres (measured from the highest point of the seed).

When I have put all the seads into all of the cups I will add the amount of fertilizer I have stated above. To ensure that the test is fair I will use a measuring cylinder and measure out each amount to the best of my abilities, to do this I will make sure my eyeline is to the specified amount making the measuring more acurate.

Once the cups are labeled suitably to allow me to easily identify them when I come to look at them again I will put them in the sunlight on a windowsil. To make this fair I will put them all in a row next to one another, aswell as making sure they will get an even amount of sunlight (i.e. not having 2 cups behind a pillar and the others in direct sunlight).

After all that I have wrote is compleate I will leave the seeds to grow for 2 weeks (the duration of my work expirence), this should allow time for enough growth to see a difference between the plants.

When I return from work expirence I will take the plant out carefully, brush off any excess soil and weigh the plant like that. I will do it that way because if I weigh the plant pot with the plant in it, it will be reasonably accurate – the reason for me taking it out is that foreign bodies such as flies and spiders may have got into the pot.

I'll record all my results in the form of tables, then draw graphs to give a graphical representation of them. Using both the tables and the graphs I should be able to make a good, fair, correct conclusion.

Here are diagrams to help explain my method of going about ths experiment:

*Background Research:

Commercial liquid fertilizer has 284kg of fertilizer dissolved into 1000kg of water, and since 1kg of water is 1litre in 1 litre of liquid fertilizer you would expect to have 284g of fertilzer and 716g of water. This means that the concentration of the fertilizer could also be altered, but this would also alter the consistancy and the "fluidity". For example pure fertilzer would be very highly concentrated, so less would be needed. However it would be a solid and harder to apply. Farmers use liquid fertilizer because it is easy to apply to large areas and is quite econimcal.

Plants need quite a number of chemical eliments to grow and sustain their life's well. Some of which are availiable in large quantities easily, these include Carbon, hydrogen and oxygen. Although the other nutrients are in (most) soil the 3 main ones which are not got from the air are Nitrogen, phosphorus and potassium – these are the main chemicals in fertilizers.

What the 3 main chemical elements do:

- Phosphorus increases the speed of root growth, root branching, stem growth, flowering, fruiting, seed formation, and maturation.
- Potassium aids the plant to be able to withstand difficulties such as drought and desiese.
- Nitrogen is needed for the greeness and health of a plant.

From my background research I predict that more fertilizer on the plants would mean that the faster they grow, I say this because the fertilizer contains at least one of the three elements needed to sustain life: Therefore in larger quanitities the plant should grow faster, and better. For example Phosphorus in the fertilizer should increase the speed of the growth of the plant, Nitrogen should improve the health finally Potassium, this makes the plant more durable – these three things combined in a fertilizer should definatly aid the plant in growth amount and speed.

Unforunatly, while on work expirence only one of the ten seeds actually germinated and began to grow. Because of this, I have no results – however, the same problem happened to most of the people in my biology class. Our teacher thankfully had a set of results from a previous year, althought they had a different amount of fertilizer in each of the cups, they were still keeping everything else the same and like us placed their pots in the same place, and put the seeds down 30 millimetres.

Amount of fertilizer added	**Mass of the larger plant**	**Mass of the smaller plant**	**Average Mass of the two plants**
0 ml – Control	6.8g	2.4g	4.6g
3 ml – Cup One	5.9g	4.1g	5.0g
6 ml – Cup Two	7.4g	6.4g	6.9g
9 ml – Cup Three	6.9g	7.5g	7.2g
12 ml – Cup Four	8.3g	6.7g	7.5g

Amount of fertilizer added	**Average Mass of the two plants**	Change of mass
0 ml – Control	4.6g	-
3 ml – Cup One	5.0g	+ 0.4g
6 ml – Cup Two	6.9g	+ 1.9g
9 ml – Cup Three	7.2g	+ 0.3g
12 ml – Cup Four	7.5g	+ 0.3g

Conclusion:

My results show that my prediction was right – an increase in the amount of fertilizer also increases the average mass of the plant. This occours because the fertilizer contains the nutrients the plant needs to grow. Also, after looking at my results I saw that the increase of mass was to a lesser extent after 0.6ml: - Because the growth rate then goes down, I would asume there would be an amount of fertil izier that would give the maximum amount of growth: for example it could not grow faster and there would be no point in adding more fertilizer. This would be an important factor for a farmer to consider – he wants to increase the crop yeild by as much as possible, and also wants to be keep cost effective at the same time: he would have to find the biggest increase in crop yeild using the least amount of fertilizer. Which, in this experiment was 6ml.

Unfortunatly adding more fertilizer does not nesecarily mean higher yeild/faster growth. This is the same with planting a seed does not mean it will grow. Every seed/plant is unique and so will grow at different rates and yeild different amounts. The only way to tell how much more a plant will grow is to take an average: with my experiment I took an average of just two plants – if I wanted more accurate results I would of added a few more. In industry they take the average of over 100 plants for example.

However, from my average (however accurate it may be) I can still say that increased amounts of ferilizer increases the mass of the plant, but higher amounts of fertilizer makes the plant increase in mass less dramatic. As these results show:

6 ml – Cup Two	6.9g	+ 1.9g
9 ml – Cup Three	7.2g	+ 0.3g

Evaluation:

The results for this experiment turned out as I had expected however it was a difficult experiment to gain accurate results for as each plant is different and therefore has a different growth rate. It is not possible to tell before the start of the experiment which seeds will germinate therefore not all the plants will grow, if one plant doesn't grow then this affects all the results as the plant in the same pot which did grow would have more fertiliser than it would if both had grown therefore it would not be an accurate result. Even if all the plants germinate the results are not very exact as some plants were a lot bigger than the other one in the same pot, however taking the average of both plants in the same pot gives me a more accurate set of results. For more accurate results I could have grown more plants with the same amounts of fertiliser and taken the average of those as well, this would also have shown me any anomalous results. I think the range of results I have is good because it shows how the increases decrease as the mass of the plants are bigger, if I had used a larger amount of fertiliser I think that my results would have stopped increasing at all and therefore would not be very helpful. The results I got were accurate for the experiment I did.