

DES

Best publicly available solutions for farming problems

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Guide
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Declaration

I declare that this written document represents my thoughts in my own words and where others' ideas or words have been included, I have adequately cited and referenced the sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/ data/ fact/ source in my submission.

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Acknowledgment

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Project Approval

The project titled “Best publicly available solutions for farming problems” by Pranav Pagar, is approved for partial fulfilment of the requirement for the degree of ‘Bachelor of Design’ at Industrial Design Centre, IIT Bombay.

Guide:

Chairperson:

Internal Examiner:

External Examiner:

Date: 2nd April 2021

Abstract

While doing my primary research for my P2 project Ixd in complex technological systems (Polyhouse) I came across few very interesting problems and how farmers are trying to solve them. Their approach towards the problem is to keep the cost to a minimum and the solution should last for a long time. So all the solution will eventually reduce the cost for the harvest or will increase the yield in the farm.

Introduction

This project aims to have a collection of ideas/solutions by the farmers which they developed after gaining several years of experience. Also, some of the solutions are available on the internet but I have mentioned a DIY method of such solutions. These ideas try to reduce the cost of buying equipment or help in increasing the production in the farm.

1) Insects management in a polyhouse

Problem - Warm and humid conditions in a polyhouse provide an excellent and stable environment for the development of pests. Also, polyhouse provides abundant food resource for such insects. Pest problem often develops in this indoor environment more rapidly than outdoors. Pest problems can be serious unless recognized. Some greenhouse insects can transmit diseases to the plants which are often more serious than the injury caused by the insect larva.



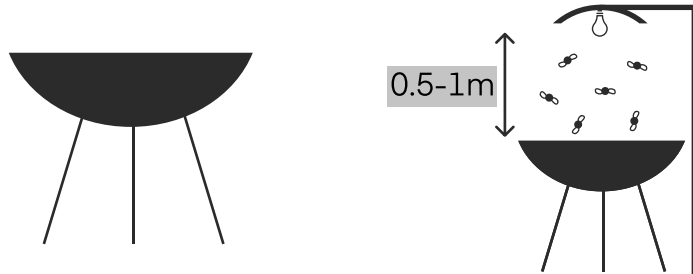
Solution - For the solution to this problem we have to create a setup to trap the insects. We can see the image of the setup below. For this setup, we need few things like a small tub or small container, a light bulb, a stand (to hang the light bulb at a height), water, oil, and a metal dish or white cardboard.

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For the stand, we can use two sticks as shown in the figure. For the long stick use. we can then fix the stand by digging a hole in the ground. Then we will fix our light and our dish on the stand. This is because we want insects to fly under the light bulb and not the other way. The second step is to keep the small tub on a stool or a box for some height from the ground. and the last step is to fill the tub with water and oil.



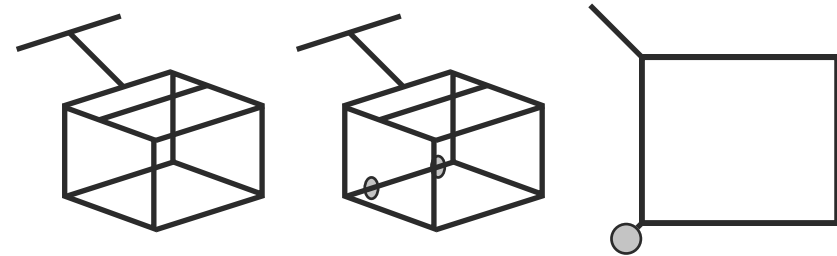
So now our setup is complete and we have to keep this setup in the polyhouse overnight to see the result. By keeping the light bulb on during the night all the insects will be attracted towards the light and will stick to the oil as it will be in their flying trajectory.



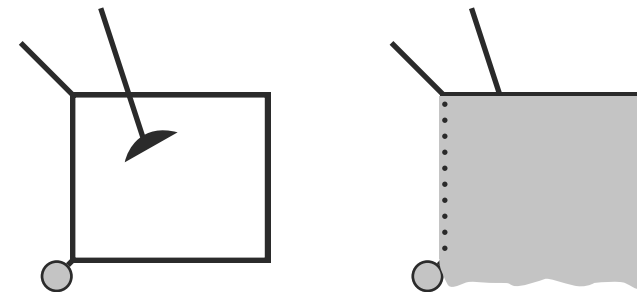
2) Herbicide dispenser

Problem - After few months of planting the crops we see the development of unnecessary plants like grass growing on the farm for this farmers needs to spray herbicides to kill such unwanted crops. But the real problem is to avoid spraying the herbicides on the planted crops. As the plants are only a few months old they will die with just a small quantity of herbicide.

Solution - This solution makes the process easy and quick the whole setup will cost under Rs900. First Make a box frame with a metal L strip with a handle as shown in the figure. The second step is to attach wheels to this box so that we can drag the frame in the farm with minimum efforts.



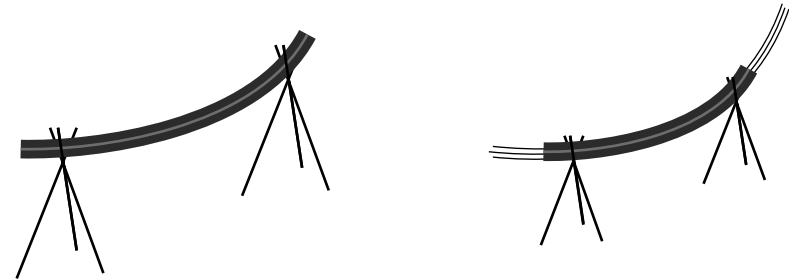
Next, we will need a pump to spray the herbicides. Ideally, try to use a backpack pump most of the farmers have one of this. Now fix the spray nozzle in the box so that it won't move while walking through the farm. now the most important part is to wrap the four sides (top and bottom sides excluded) of the box frame with plastic paper or mulching paper also works, keep some extra paper on the bottom side as we don't want the herbicides to escape the frame. Now just start the pump and pull the frame where ever you don't want any unwanted grass growing.



3) Drip pipe maintenance

Problem - Most important part of a farm is its irrigation and farmers spend a significant amount of money on this. In irrigation, there are few types but the most important one is drip irrigation as it is used for a wide variety of crops. Mostly after one year, the drip pipe starts to choke up and mould starts to grow on it. Because of this life span and efficiency of the irrigation is reduced. There are few drip pipe cleaning acid in the market but applying that on the pipe is a time-consuming process.

Solution - This solution will reduce the time required to clean the pipes and by cleaning the pipes every year the life span will increase from 2 years to 6 years. First, we will arrange a big pipe as shown in the figure. The diameter should be 2-3 times the diameter of the drip pipe. Now we will pour acid and in the big pipe, for every 2 litres of acid pour 20 litres of water. While doing this process pour acid first. After this setup is ready we can start cleaning 3-4 pipes at a time. This will increase the speed of cleaning and the cleaning will be perfect.



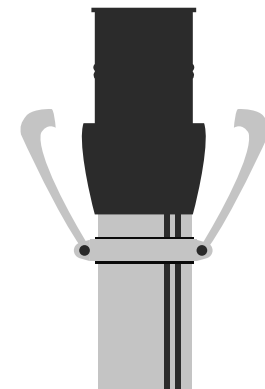
4) PVC pipe end cap

Problem - Most of the pipes used in irrigation are PVC pipes and the problem with PVC is that they are very brittle. A small amount of force can be the cause of a big crack. Now at the end of a pipeline farmers usually use the PVC cap as shown in the figure but it can not withstand a large amount of pressure coming from the motor. So farmers use big rocks to keep the cap in place. The second problem with such caps is they are not easily removable. Farmers need to check the water pressure in the pipe so they check it by removing the end cap but it is quite difficult to remove them as there is no grip and in winters you can't even remove the cap by hand as it's a pain full process. So farmers usually use a rock to remove the cap but this may cause a crack in the cap.



Solution - For this type of problem there are two different solutions first deals with the gripping problem and the second one deals with the water pressure problem.

For the gripping problem, farmers can use a sprinkler end cap. This type of end caps has a bigger area for gripping. They might come in a small height but we can stick an extra gripping cylinder on it so that it will be easy to grip. And for the second problem farmers can use clips as shown in the figure. These clips can easily withstand pressure from 1-2 motors. Use some rubber tubes to hold the clips in place



5) Granular fertiliser dispenser

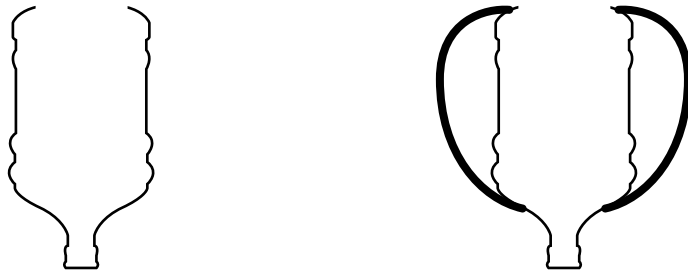
(<https://agrinomix.com/other-solutions/fertil-dispenser/>)

Problem - From time to time farmers have to spread granular fertilisers on the farm. The process is quite a time consuming and farmers spread this type of fertilisers by hand.

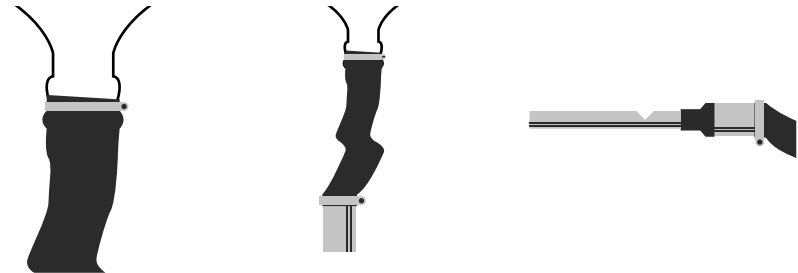
Solution - To speed up the process farmers usually take a container with them. Now to create a dispenser we will need few things- a 10L water jar, Tire tube 2m, PVC pipe with two different diameters and reducer, two straps, two circular clamps for PVC pipe.



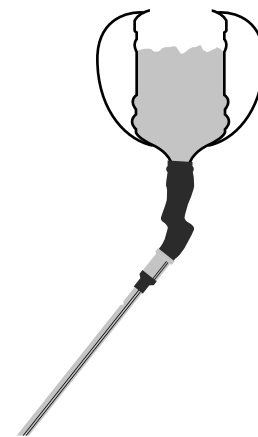
First, we have to make a big cutout at the bottom of the jar so that we can pore our fertilise in it. The second step is to attach the straps to the jar so that we can carry it on our backs.



Now we will attach the tire tube to the small opening of the jar with the help of a circular clamp. now insert the bigger PVC pipe in the other end of the tire tube and fix it with the circular clamps.



Next, we will use a reducer and PVC pipe with a smaller radius to increase the length. To control the flow of the fertiliser we will have to make a cut in the PVC pipe as shown in the figure. We can control the output of the fertiliser by inserting our thumb through the cut. Now we can simply carry the fertiliser on our back and spread this type of granular fertilisers on the farm.



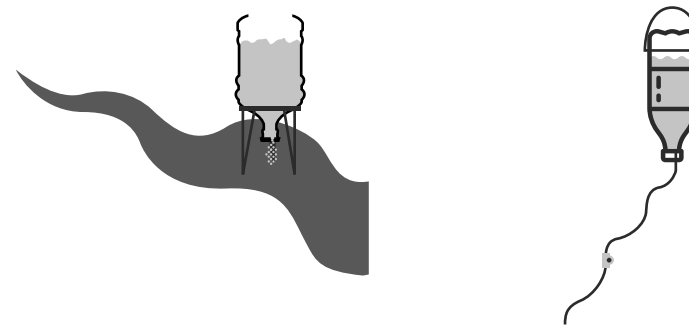
6) Granual fertiliser dispenser for flood irrigation

Problem - A lot of farms don't have a proper irrigation system or the crop requires a flood irrigation system. In such cases giving fertilisers through water becomes difficult. Farmers usually mix the fertilisers in a big tank and then mix it with the water flow. But this way the fertilisers don't spread evenly on the farm.

Solution - For this type of problem we will need a 10L water jar a lid and a stand. The first step is to cut open the bottom of the 10L water jar. Next, cover the opening with the lid and poke a small hole. This hole will determine the rate at which the fertiliser will mix with water. Now set up the stand in the way of water flow so that the fertiliser will directly mix with water. Finally, place the water jar on the stand and pore some fertiliser in it.



For liquid fertilisers, we can use a small water bottle and saline pipe. connect the saline pipe to the bottle cap and hang the bottle upside down. You can also control the flow with the saline flow controller.

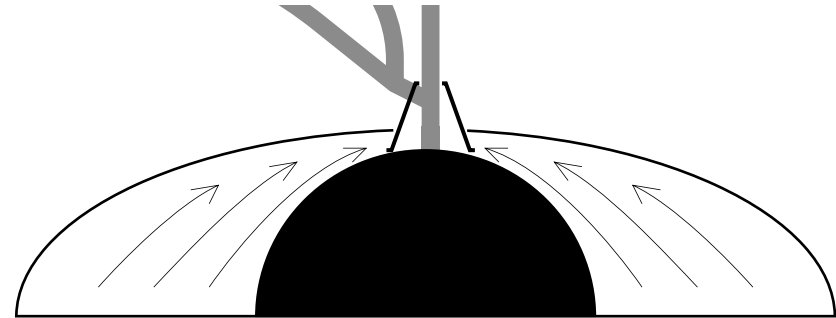
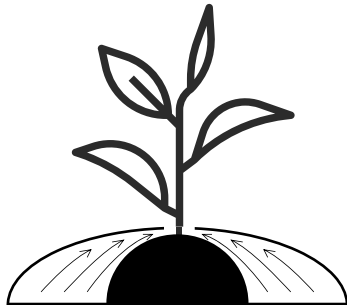


7) Mulching paper plant burning problem

Problem - Most farmers use mulching paper on farms. Using mulching papers have multiple advantages such as it reduces the water evaporation rate in the farm, it does not allow unwanted grass to grow around the crop. But this type of paper also creates some problem. A lot of heat is trapped under the mulching paper and this heat escapes through the hole from which the plant is growing. This heat is very dangerous for young plants as it directly burns the crop. Around 20%-30% of the crops planted die because of such burning.

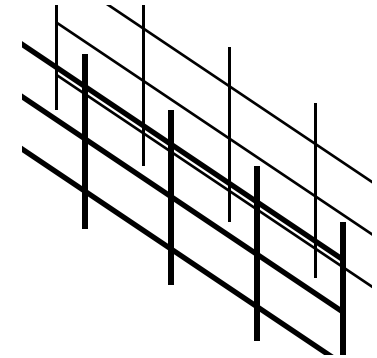
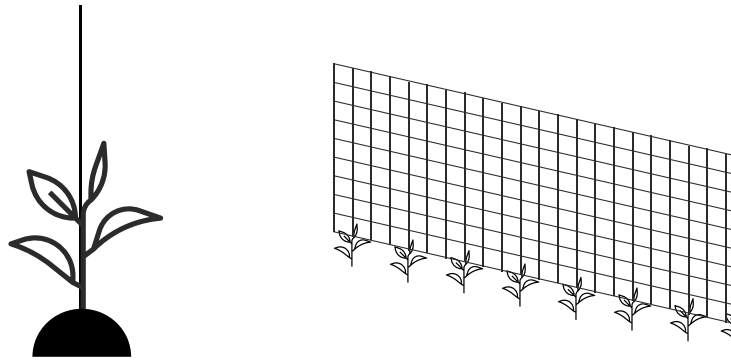


Solution - Take a small teacup as shown in the figure. and remove the bottom of the cup. now put the cup around the plant. This will prevent the plant from escaping heat. also the cups are cheap they cost Rs.40 for 100 cups and you can also reuse them.



8) Advance cucumber farming

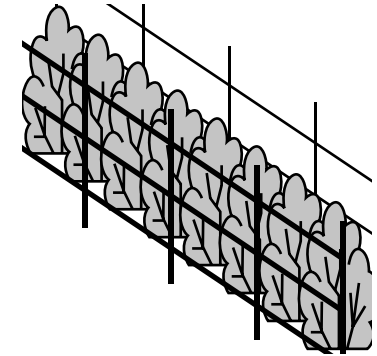
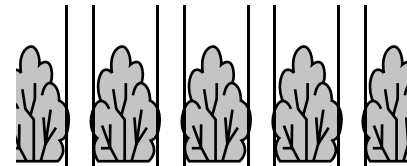
Plants like cucumber climb on support and grow till the support lasts. Mostly farmers tie a string as a support and the plant grows on the string. This string limits the growth of the plant. This results in a low yield on the farm. So instead of using a string, we can use a fishing net as support. Now the creeper can grow on the fishing net and it won't limit the growth of the plant either. The plant can again grow downwards once it reaches the top. This can happen any number of time and it will increase the yield in the farm.



9) Advance marigold farming

Marigold is a shrub and it grows till a certain height. The number of flowers on a tree depends on the height and size of the tree. Once the shrub achieves a certain height it starts to grow towards the sides.

To Have a better yield in such farms we have to increase the height of this plant. One solution for this is to build wall support around the plant and the cheapest way to build wall support is by using bamboo and string. We can create a setup as shown in the figure so that the plant will start to grow upwards. The second use of such a wall setup is that we can reduce the distance between the beds. This will increase the number of plants planted in the farm and thus will increase the yield in the farm.

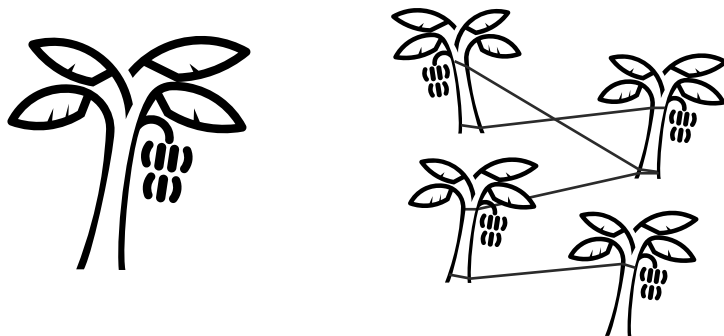


10) Banana tree support

(<https://www.kvkc.org/success-technology.php?id=59>)

We have seen a bunch of bananas hanging from a tree. But most of the time the tree will start to bend because of the excess weight. This will result in the falling of the tree. Farmers usually use bamboo as a support to the tree but this just increases the total cost of the harvest. To avoid this type of loss there is a super simple solution. This will just require a strong thread.

For the support tie the thread on the top of the plant and tie the other end at the bottom of another plant as shown in the figure. make sure that the thread is tied on the opposite side of the banana bunch. You can create a series of such support for each plant in the farm.



Why digital monitoring of a farm?

Some of the above solutions are temporary solutions or are alternatives for some other solutions. But eventually, the farmer will need to monitor his/her farm. They will need some interface to study the data collected by the sensors in the farm. This will lead to farmers taking good decisions and taking calculated risks.

This type of monitoring will become a permanent solution for many problems like checking water pressure or properly mixing fertilisers. Farmers can pretty much rely on automation and monitoring in the farm as it will reduce a lot of heavy work. Most important advantage of such monitoring is that the yield in the farm will be of export quality and hence farmer will have a better income.

Now the question arises of such heavy investment for automation and monitoring. While talking to the farmers, every one of them said that they will rather invest in such controlled farming than an open and uncontrolled farm as the return on investment is high and the farm becomes super profitable in the long run.

Conclusion

In the end farmers need solution for all their problems. So the next step would be to have a system in which farmers can exchange ideas or experts can spread their thoughts. There are few ways to do such knowledge sharing such as groups on social media, videos, or some blogs. But there is no full proof solution to get a solution to their problems or in fact to post their problems. That's why the next step should be towards the development of such ecosystem where farmers can share knowledge or resources.