

Battle! Agriculture: Proactive vs. Reactive!

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1 Introduction

This battle is about whether you want to prevent damages to crops or you prefer to react in the best way to them. Hardly you are able to do both. If you focus on preventing probably you won't be able to react in the best way, and on the other side, if you are ready to manage diseases probably you won't manage to prevent them.

Try to not focus much on the agriculture, but try to think about the technology behind it.

Regardless to what presentation will say, try to focus on which attitude will set up a better world where you want to live.

2 Proactive

2.1 Definition

Looking at the time flows, the proactive approach acts before the problem arise, the reactive approach acts after.

The focus is on trying to predict issues/diseases (through data collection and model building) and act properly!

2.2 Example: caries

- Proactive approach - Washing teeth
- Reactive approach - Dentist

2.3 Proactive approaches

2.3.1 Seed treatment

Nearly every farm in the world use seed treatment preventing diseases. The difference with a reactive approach is that in a reactive approach you can lose a lot of seeds and you have to use more substances afterwards if needed.

2.3.2 Fungus

A very big problems in farms. One of major case of troubles in Europe. Some of them are cancerogenous and they growth very fast! The biggest issue is that the unrecoverable point is before they become visible to human eye.

2.3.3 Biochemicals

Use natural instruments to prevent diseases! (Pyricularia grisea, bamboo oil)

2.4 Q & A (FAQ)

2.4.1 Is proactive more dangerous for health?

No! A reactive approach use more and more toxic substances!

2.4.2 Is GMO a reactive approach?

Yes! but usually adopted to support reactive approaches!

3 Reactive

3.1 Costs

Why should we adopt a reactive instead a proactive approach? The first reason is related to money! Proactive treatments are very much expensive compared to reactive ones. A farmer will always choose lower cost and higher economic return!

3.2 Disease prevention

Prevention creates new diseases to prevent! Every year new need to research and fight against new diseases. Is a vicious circle extremely expensive.

3.3 Environmental sustainability

If a new illness appear (a new insect, fungus, ...) proactive systems are lost, reactive systems are prepared to fight.

3.4 Climate change

How can a proactive system defeat the fast changes of the last years? A reactive system is prepared (With radar monitoring, ...)!

3.5 Biodiversity

Proactive approaches causes global warming and destroy biodiversity!

3.6 Technologies

3.6.1 Detection

Very active field of research, a lot of available data and strategies (computer vision, remote sensing, drones, ...).

3.6.2 Diagnosis

Also there a lot of data and available, enough to train neural networks!

3.6.3 Cure

Again a lot of possibilities nowadays, also environment friendly, without pesticides!

3.7 Health

The use of pesticides and antibiotics may cause evolution of bacteria! And the evolution of Superbugs! Immune to almost all the Antibiotics.

4 Q & A

For the questions, try to put aside the preconceptions that were focused on the presentations, and try to go deeper and check if the common sense you rely on holds or not. For the team, try not to argue on the common issues (i.e. who use more pesticides) but try to focus on the environment.

Legenda

- Q2P : Question to Proactive
- AoP : Answer of Proactive
- Q2R : Question to Reactive
- AoR : Answer of Reactive

[Q2R]: 30 % of CO₂ comes from agriculture due to pesticides, but you said that you use them when needed and proactive use them more , do you have data to argue about it?

[AoR]: Treatments depends on the region, in Trentino we have the "protocollo d'intesa Trentino" that talks about it.

[Q2R]: Of course is not your task to deny any proactive/reactive. How can u be sure that nowadays if a problem is surely there you can react to it effectively? Whithout losing what is there?

[AoR]: We brought examples of detection in early stage, and once is detected effectively, you can prevent the issue to spread on the filed. Saving remaining crops.

[Q2R]: You are talking in a micro prospective, the question is more about a macro perspective. How do you approach the problems?

[AoR]: Reactive approach is about react to problems, it is a micro perspective. The macro view is more about proactive approaches. By definition.

[Q2R]: They said proactive use more pesticides, but is not true. On average is used less than reactive approaches. In USA a farmers university made researches on proactive /reactive approaches and showed proactive approaches uses 10 % less pesticides.

[Prof]: Don't argue too much on semantics!

proactive - act before the problem has appeared

reactive - act after the problem has appeared

[Prof]: Don't talk about data! talk about impacts! social, ecological, health!

[Q2Both]: You know some pesticides are resistance to chemicals? (evolutional resistance) How do you manage them? How do you make sure that your approach will not face the problems of the past?

[AoP]: There are some different methodologies, for example trying to switch to natural pesticides. (Proactive approaches acquired technical knowledge to switch from chemical to biologic pesticides)

[AoR]: The last time reactive strategies were used were some years ago, nowadays we acquired new technologies to be sure to not commit the same errors that were done. (technological evolution in 2 ways - reduced detection time, and more accurate) Those lead to less collateral damages!

[Q2P]: How do you make sure that your proactive approach are what is needed and what happens if you use a proactive approach that is useless and you miss a useful one?

[AoP]: We use a lot of technologies also the satellite technology to study what is needed. Also biological techniques are safe.

[Q2P]: Can you summarize your point?

[AoP]: Normally when we introduce a natural predator in the environment, we are sure that the predator have enough foods. (we have reached the point in which the techniques we use are not applied randomly)

[Q2Both]: We live in a world that increase his globalization. How can you be sure your techniques are generalized enough? (otherwise you spend a lot of resources for solutions that are too specific)

[AoP]: We said that we have a lot of diseases, but every country have specific techniques generalized for their region.

[Q2P]: In reactive approaches you can use them in all the world, in proactive is harder.

[AoP]: Nowadays we have history and labs to do tests to reach an accuracy higher enough for the approach

[Q2P]: Since we are in a world with higher and higher globalization, in which ways you can apply proactive approach to unexpected diseases? Do you think is a limitation to your approach or is acceptable?

[AoP]: Normally we are in a globalized world, but the ecosystems are very different (example Europe and Australia). The capability of the ecosystem to react to unexpected diseases is predictable too.

[Q2P]: How many of you are familiar with "Xylella fastidiosa"? Is a disease of southern Italy (Puglia) and we are failing to react because we focused too much on prevent without minding about eradication or other reactive techniques. We are in a system every day more proactive, is this good?

[AoP]: In this year, you can see that aren't solutions to xylella. We are putting moneys trying to solve xylella problems. I don't thing putting money in a reactive approach would have solved the problem.

[Q2P]: I have a paper explaining that we could have eradicated the infected plants and solved the problem with a reactive approach.

[Q2R]: You solution is to remove the plant. What if your solution bring to the eradicatons of all trees?

[AoR]: Now this solution is obviously no more applicable.

[prof]: For the class, we are now discussing something that passed from the realm of prevention to the realm of cure. Take it as a test case.

[Q2R]: If you think about this problem, the proactive measure failed, but the reactive too. You have to eradicate all trees. Do you think that in 2020 we will use this approach? "if it will appear again we will eradicate them all again?"

[AoR]: If xyllella would appear again, we will eradicate the infected plants tempestively.

[Professor]: Now i don't see any team that is able to clear one bit advantage respect to the other.

[Q2R]: Which approach is creating superbacteria?

[AoR]: The proactive approach.

[AoP]: I don't agree to this, if you think to an antibiotic, you have some side effects, and small bacterias that resist are trasmitted to others making survive those resistance. You take antibiotics as a reactive approach. The evolution of bacteria is related to reactive approaches.

[Q2R]: About scalability, the reactive approaches are difficult to scale, you need to setup your system (may be costly) and wait for useful datas.

[AoR]: Farmers can use both low cost systems and high tech high cost systems, depending on their money and crops.

[Q2Both]: In both cases you are talking about how technologies are used in proactive and reactive (computer vision, sensor networks). Can you think about a technology that may be fitted in your approach in the enxt years?

[AoR]: Nanotechnologies and quantum radars can be used to detect the type of diseases. Send a quantum over the air and understand if the host is there and nature/color of disease. Is a super sensor.

[AoP]: Intelligent machines can be used to sense the state of crops and datas.

[Q2Both]: About biodiversity, how do you plan to deal with biodiversity with a proactive system? you are killing microbios and insects before they become a problem even before they become a problem. Also the production of seeds is killing the subspecies. When we abandon microscale reactive agriculture we have a strong reason. we are trying to fulfill the needings of growing population (scalability). Are we mature enough to go back to reactive systems?

[AoP]: Is true, expecially in europe there is a small number of company that makes seeds. This is not so true in other states like Australia.

[Q2P]: How can you preserve biodiversity with proactive approach?

[AoP]: We can use a year rotation to recover biodiversity.

[AoR]: The market is shifting his attention, the customers joy to spend something more than usual for high quality products than may preserve biodiversity.

5 Conclusions

5.1 Reactive Conclusion

When you fail prevention, the damages of your failure is unsustainable! for you and environment! times are mature to shift back to reactive approaches.

5.2 Proactive Conclusion

Do you want to be a person to solve the problem just when they appear or you want to be a person that plan his life before?

5.3 And the winner is...

Reactive!

Proactive: 22 %

Reactive: 77 %