

Questions that were asked via Slido but were not discussed during the meeting

Many questions were asked via Slido. Only few of them could be discussed during the meeting. Our speakers Toby Bruce, Karel Bolckmans and Christy van Beek were so kind as to provide answers via email to several of these questions. Please find their responses below.

1. Will next gen crop protection make consumers choose between chemicals or gen-tech? And if so, which one will win?

Toby Bruce: I don't think consumers are being offered this choice. Currently "organic" versus "conventional" gives a choice between only natural products pesticides and a ban on GM crops versus synthetic inputs and GM crops (where conventional regulations allow them).

2. Will gen tech not need any crop protection?

Christy van Beek: crop protection will still be needed, because gentech will not prevent all pests/diseases.

3. Do you think removal of actives is a sensible policy to reduce pesticide usage or should regulation be on number and/or volume of usages... or something else?

Toby Bruce: If there is evidence particular actives are more harmful than others, then it makes sense. However, limiting the number of actives can mean there will be increased selection pressure on the remaining actives if they are used more. It would be sensible to promote spot treatment of crops rather than blanket spraying of 100% of the crop area. Advances in precision agriculture with sensors and fine control of where sprays go mean spot treatments are becoming more feasible. This would help reduce pesticide use and off-target effects.

Christy van Beek: In my view it should be about what kind of food production system/agriculture do we want and where. Removing actives is not a sensible policy because it ignores the reason for using these products. It is like a jenga tower, you cannot simply remove actives and expect the system will hold. Yes, for some time. We need to redesign the system.

4. How to ensure a fair income for farmers? In general the new innovative crop protection systems are more expensive.

Toby Bruce: This is a very good point. The quality of the produce may be improved if there are lower pesticide residues and therefore farmers should be able to sell produce for a higher price. This is not always the case though sometimes big supermarkets/buyers have more say in crop price negotiations than farmers do. Sometimes they import food from other countries at a lower price where crop production is less regulated and farmers have to compete with the price of imported crops.

Christy van Beek: Innovations in precision technology will reduce the volumes needed.

5. Is strip cultivation a way for the future in the approach towards less chemicals?

Toby Bruce: This is currently being evaluated by Wageningen University. It will be interesting to see to what extent pest populations are reduced with this approach.

Christy van Beek: It can be part of the solution, but it depends on the cropping system.

6. You keep using the analogy to fight against nature. But isn't this approach proven not too work. Should we not work together more? Bring back more biodiversity.

Toby Bruce: I don't think farming and being able to harvest a large yield of one plant species is a natural situation. We can certainly learn lessons from nature because wild plants often have highly sophisticated defence mechanisms and also have to "fight" against attacking organisms. Biodiversity

doesn't necessarily mean food security - it could mean more pests, weeds and diseases if farms are left to go wild. The Push-Pull companion cropping system is a good example of where increased biodiversity has improved crop protection but this requires careful choice of species to grow together and not a random return to nature. Agroecosystems are human managed, unnatural systems. Christy van Beek: I don't recall fighting against nature. But true, agriculture is not nature, IPM is about working with nature.

7. Can Hyper-spectrum sensing, and other vision sensors compete with machine olfaction (smell), or do you see them as complementary?

Karel Bolckmans: Absolutely. Machine olfaction does not allow to easily locate the plant where the pest or disease is residing as volatiles easily spread through space. If olfaction is used then it should be combined with vision techniques, but this might make it too costly for the grower.

8. It is a bit problematic that Biobest, Koppert etc. are advising on use of their own products. We need more independent specialists/advisors on IPM.

Karel Bolckmans: The big advantage of advisors from (international) producers of biological control agents is that (1) they can tap into the knowledge and expertise of an international network of colleagues technical advisors ("corporate brain"), (2) they can tap into the knowledge of their respective corporate R&D department. At Biobest we make a point of principle of not pushing more beneficials than needed and are investing heavily in data-driven advice, so advice will be based on hard data (that can be checked by the grower) and not on gut feeling. We want to be the grower's partner in optimizing his total crop protection costs, while making sure his pests and diseases are kept under control. Moreover, being in the field, close to the growers, allows us to identify new, important challenges in an early stage and feed that into our research and development pipeline to develop a new solution. The other way around, introducing a new beneficial into the market requires close collaboration between advisors and the R&D department. Separating advice and sales of beneficials and mites would slow down innovation and clearly decrease the quality of the advice. Advice by our specialists goes beyond advising only the use of beneficials. IPM is much broader than only beneficial insects and mites. We also advise the growers for example which pesticides can be used in combination with beneficials.

9. In greenhouses, we have all tools that are needed, you say; should the research agenda of the topsector therefore focus on outdoor solutions?

Karel Bolckmans: I did not say "all" tools for all pests and all diseases, but for most pests and diseases in greenhouse crops. There are still a few challenges, especially new (exotic) pests, out there that we are working on. But the currently available tools allow to very substantially reduce the use of pesticides in greenhouse crops. The theme of the meeting was about the Future of Crop Protection, especially how to reduce pesticide use with 50% as per the European objective. But yes indeed, a research agenda focussed on developing additional outdoor solutions is needed. However, I'm convinced that by using the already available IPM tools and techniques this 50% goal should be achievable for many outdoor crops. We are not talking about 100% reduction here but 50% reduction. Let's not get trapped in black-and-white thinking here and focus on what is possible already instead of what is not possible yet.

10. To Karel: Story is focussed on high value crops in greenhouses. How to make a profitable business case with (expensive) input for low valuable arable crops?

Karel Bolckmans: We tend to think in alternative "products" when talking about reducing pesticide usage in low-value arable crops, but the IPM toolkit is about much more than just "products". IPM is also about using resistant crop varieties, being careful with the choice of pesticides in order to give naturally available beneficials a chance to control the pests in the crop (a lot of pest problems are

pesticide induced), applying methods to further stimulate naturally available beneficials (“Functional AgroBiodiversity or FAB, a.k.a. Conservation Biocontrol), different cropping systems (e.g. crop rotation, strip cropping, etc), etcetera. You can find for example an extensive list of IPM tools in the GlobalGAP IPM Toolbox (Annex CB 2 of the GlobalGap Integrated Farm Assurance – Crops Base) (which I wrote many years ago together with Rob Wessels from Bakker). Also Toby Bruce gave several examples in his talk.

11. What is the problem with risk based considering the end consumer has no control about potential exposure (food, air, water...)?

Christy van Beek: There is no problem with risk based. It should be risk based. The problem is hazard based evaluation. Sorry if this was unclear.

12. Isn't it also logical that a lot of AIs in re-evaluation are removed as we now know way more about (eco) toxicity. Should saving biodiversity not be a main goal?

Christy van Beek: It is indeed logical that there is a continuous coming and going (and improvement) of AIs. However, it is currently out of proportion.

13. Is it already possible to predict which types of pathogens and pests will increase in the coming decade? This would be great input for breeding and IPM.

Christy van Beek: Yes, that is indeed done to some extent. But we do not know exactly which pests and diseases to prepare for.

14. Shouldn't the consumer adapt as well? They currently only accept 100% perfect vegetables, fruits and flowers.

Christy van Beek: I agree.

15. The toolkit of the farmer is decreasing. That's the chemical toolkit. But the biological toolkit is increasing. How to speed up the latter?

Christy van Beek: This is a combination of research (ongoing) and regulatory processes. Also biologicals need thorough testing.

16. Are weeding robots making pesticides redundant?

Christy van Beek: sometimes, for some crops. Think IPM, mechanical technologies are part of the solution.

17. Will we ever get enough data in the Ag business to create algorithms to predict 10.000 different pests, 800 fungi etc?

Christy van Beek: On a personal note: I think we will always need farmers experiences and judgments.

18. What is the percentage biological AIs of the 261 Bayer AIs and what will this percentage be in 2030?

Christy van Beek: We currently have 24 biological products in our portfolio, with 5 upcoming launches. Most farmers use biological next to conventional products. We have 270,000 microbes in our collection that we use to develop new products.

19. I agree that legislation should drive change but what to do about multinationals like Bayer that lobby actively against this change?

Christy van Beek: We don't lobby against the legislation. It is important to test all products for their safety.

20. Do biological crop protection products also hinder the growth of the plant?

Christy van Beek: all interventions have an effect. There is no intervention without impact.

21. Should banning all synthetic pesticides be a goal (regardless of steps that can mitigate off target effects) ?

Christy van Beek: Should banning all (human) medicines be a goal? Look at the system, not at the products.