

Bayer AG – Investor Relations
Investor Conference Call:
Crop Science R&D Pipeline Update
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Welcome

Oliver Maier

Head of Investor Relations, Bayer AG

Good morning and welcome to those joining us on the call today. We very much appreciate you joining us; we know it's a busy day today. We're very excited to be with you and share our annual research-and-development pipeline update for Bayer Crop Science. As leaders in this space, we look forward to providing this update every year, not only for the benefit of our owners but to provide transparency on the innovation we are bringing to our growers, customers and other stakeholders.

With me on the call today are Liam Condon, the President of our Crop Science division, Bob Reiter, who leads R&D for Crop Science and several members of his leadership team, including Mike Graham, Head of Breeding, Jeremy Williams, Head of Plant Biotechnology, Axel Trautwein, Head of Small Molecules and Sam Eathington, Climate's Chief Science Officer, who many of you also met during our Crop Science technology showcase in St. Louis.

As always, I would like to start the call today by drawing your attention to the cautionary language that is included in our safe-harbour statement as well as in all of the materials that we have distributed today.

[See disclaimer](#)

With that, no further ado, I'll hand it over to you, Liam. The floor is yours.

Research at Bayer

Liam Condon

President, Crop Science, Bayer AG

I. The Importance of Research

Thanks, Oliver, and thank you all very much for joining us today. I'd like to start with why we put such an emphasis on research at Bayer. With the challenges we've seen in the last two years, it's kind of logical to ask if higher yields and better agronomic performance are really necessary. The short answer is yes. Despite weather, trade and the near-term effects of African swine fever in China, long-term demand for grain continues to grow. At the same time, climate change and finite resources are making it more difficult to meet that demand.

Innovation is the answer to bridge these two challenges, so that agriculture can be part of a sustainable solution. We are acutely focused on anticipating needs and developing the products necessary to provide our planet with healthy food and feed.

II. Our Mission

Now, on slide five you can see that our mission is to shape agriculture to benefit farmers, consumers and our planet, and we are uniquely positioned to do it. We've assembled the industry's best ingredients – seeds and traits, crop protection and digital tools – to tailor sustainable solutions for our customers' challenges. Many of our competitors have pieces of this, but our leading position in these areas enables a unique combination that no others can claim.

On slide 6 you can see that perspective here is important. We'll spend our time today looking out over what is on the horizon, but it helps to look back to see how far we've actually come. In this image from our Jerseyville research farm, which some of you on the line actually experienced in August last year, you can see the amount of land in each of those strips that it took to grow 10 bushels of corn in that year in the United States. Increasing scientific and technological know-how was continually infused to reduce the amount of land needed to produce the same amount of output. Advances in insect and weed control, genetics, nutrient management, tillage practices and planting density all contributed to driving these productivity gains, and we still see room for improvement.

III. Technology and Sustainability

Technology creates opportunity. These advancements don't just improve productivity; they enable farmers to manage land and resources more effectively. And reducing the amount of land we put into production preserves biodiversity and improves carbon sequestration.

This brings us to our sustainability commitments. As the leader in this space, we are unequivocal in our pursuit of setting new standards in sustainability. It is the innovation we will share with you today that will allow us to meet those goals, whether it is through digital tools provided by the FarmRise platform or new higher yielding Arize rice hybrids to smallholders or Intacta 2 Xtend soybeans for large scale growers in Brazil. For each of the products we will highlight today, we've

included a sustainability advantage that reflects how closely these commitments and our technology priorities are intertwined. With that, I'll hand it over to Bob.

Research and Development Update

Bob Reiter

Head of R&D, Crop Science, Bayer AG

I. Responsible Investment

Thank you, Liam, and a warm welcome to all of you. I've really been looking forward to today and the opportunity it affords us to showcase the tremendous contributions and advancements from my team, and I'm so glad you can join us.

Realising the vision Liam highlighted takes responsible investment, and we are a clear frontrunner. We're converting €2.3 billion every year into meaningful products that growers around the world are demanding. To put this into context, it's nearly double the R&D spend of our next closest competitor, and we don't expect that to wane. In fact, we've committed to €25 billion of R&D investment over the next decade. These resources are more than financial. With approximately 7,800 R&D employees in more than 50 countries, we are the partner of choice for new technologies and serve as the technology provider to the industry.

II. Opportunities

And it isn't just about scale. It's about the productivity of that investment, and the opportunities it can unlock. This investment manifests itself in two ways. On one hand, we pursue incremental improvements that strengthen our position as a leading technology provider in seeds-and-traits and crop protection. And don't read incremental as any less important than disruptive, because farmers count on annual germplasm upgrades for higher-yielding seeds every year. And they seek to protect that yield potential with our latest innovation in biotech traits as well as chemical or biological crop protection, be it a new mode of action or a new formulation.

However, the landscape in agriculture is evolving quickly, and disruptive opportunities exist, whether that comes from gene editing, predictive algorithms or new modalities and applications for crop protection. To realise these opportunities, we know that we need to take advantage of the great science that happens inside, and outside, of Bayer. Our open innovation model is designed to ensure that we have access to the best that science can offer, and we have a broad network that supplements the great work of our discovery teams and the work they are leading.

This network, combined with our in-house capabilities, helps us to unlock new potential in breeding, biotechnology, small-molecule development, biologicals and data science. We have assembled the world's premier innovation platforms in agriculture. Our strength and scale in each of these scientific disciplines gives us a significant competitive advantage in creating the solutions for growers that will meet the challenges they face today and tomorrow.

III. The Bayer Pipeline

And it all comes down to this: the most productive pipeline in the industry. In 2019, we delivered 55 key product and formulation advancements and commercialised more than 450 new hybrids and varieties across corn, soybeans, cotton and vegetables. This isn't science for the sake of science. These products generate real value. We're expecting nearly €30 billion in non-risk adjusted peak sales for the products we're developing. Corn products and germplasm upgrades account for close to half of that value, with strong representation in the other relevant crops. Roughly half of this peak sales is expected incremental sales, and the rest are replacement sales that sustain our base.

IV. New Technologies

Let's move beyond the summary and let's take a look at some of the new products and technologies we'd like to highlight for you today. This slide summarises the key product launches we expect in the next decade, including the annual refresh of products from our breeding programme and the new formulations of existing actives from our crop protection programme. The products featured here are expected to generate more than €22 billion of the total pipeline peak sales of 30 billion and span every reporting segment.

The biotech traits shown here create global licensing opportunities and many are the first in the space for the desired characteristic, whether it is ThryvOn technology for piercing/sucking insects in cotton, next generations of weed or insect control in soybeans or short-stature in corn. And each of these new formulations extends the life and value of existing molecules for the benefit of our customers, while each new hybrid provides a yield advantage over the prior generation. We pride ourselves on leading, not on being the 'me-too'. With that, I'll hand it over to Mike Graham, our global breeding lead, to begin with the breeding highlights.

Breeding Highlights

Mike Graham

Head of Plant Breeding, R&D, Crop Science, Bayer AG

I. Leading in Corn Hybrids

Thank you, Bob, and a very good morning to everyone on the call. One of the largest drivers of value in our pipeline is the annual class of corn hybrids that my global team develops. We've compiled the largest and most diverse collection of germplasm, and with our unique tools we're able to generate leading hybrids for our customers.

This translates into the leading position in five of the six key corn markets and, with the advantage our hybrids deliver as compared to the previous generation, we expect to grow that lead. In particular, I'd highlight that in 2019 our leading US corn hybrids continued to deliver the seven to 10 bushel per acre performance advantage compared to our leading competitors, and we saw even wider advantages in Brazil and Argentina.

II. Breeding Pipeline

Developing a new commercial hybrid requires years of breeding to advance the best products from one generation to the next. Since most of our breeding work is done in open-field research farms, any adverse weather event can delay product development. As we know from the difficult growing season in the US last year, weather can be one of the biggest challenges of any work that is done in the field. One way to accelerate development timelines and eliminate weather events is by bringing part of the breeding process indoors. In a greenhouse, we can double the number of breeding generations in a year, accelerating product development. Additionally, doing production in a controlled environment allows us to ensure that our researchers have the required seed on time.

Our product design centre in Marana, Arizona, in the United States, will be the first of its kind when it comes on line next month. This centre fully capitalizes on advancements in proprietary seed chipping, advanced marker technology, automation and data science. Innovations like this are helping our breeding organization move from selecting the best seeds to truly designing the best seeds for our farmers.

Another way breeding has the potential to fundamentally change agriculture is with short-stature corn, where we have made tremendous progress in the last year. Both the breeding and biotechnology approaches to create short-stature corn are advancing from phase two to three, and I'm pleased to announce today that we've developed a third pathway to short-stature corn through gene editing, which Jeremy will cover in more detail shortly.

III. Vitala

We've also just launched a commercial beta for the breeding approach in Mexico under the brand name Vitala, and the broader-scale breeding approach in phase three will build from this commercial beta. This aerial shot from the Sinaloa region in Mexico is particularly compelling. The plot in the middle is the Vitala hybrid and there is a clear differentiation between it and the commercial checks on either side.

While a very visually striking project, the benefits go beyond just height. We believe this product will transform corn production, and the benefits can be summarised in three categories: reduced crop loss, more precise use of crop protection and the potential to optimise use of key resources like nitrogen, land and water.

First, short-stature corn improves plant standability, which reduces greensnap and stalk lodging. These are challenging environmental conditions that contribute to significant crop loss. In fact, some experts believe that in the United States alone annual yield loss due to stalk lodging can range from 5% to 25%. Second, we can extend in-season crop access due to the shorter stature of the plant. Rather than having to apply insecticide or fungicide late in the season with an airplane, a ground-based rig can be used more cost effectively. Third, the product has potential to reduce both land and nutrient requirements for corn production by enabling increased planting density and allowing late-season access for nitrogen application.

And with advancements in the three approaches we now have, we have increased confidence that the potential fit has grown to more than 220 million acres, opening access to markets in Europe and Asia. With that, I'll hand it over to Jeremy to discuss the progress we are making in gene editing and plant biotechnology.

Gene Editing Update

Jeremy Williams

Head of Plant Biotechnology, R&D, Crop Science, Bayer AG

I. Possibilities in Gene Editing

Thanks, Mike. Gene editing is an area of tremendous promise, and we are best positioned to create value in the space, given that these tools build on our leading genomic libraries and trait platforms. The greatest gene editing capability in the world doesn't mean a lot if you don't already have a leading crop line-up to edit and improve.

Two of our most exciting agreements are with the Broad Institute and Pairwise Plants. Broad offers us RNA-guided nucleases, which are basically the 'cutting technologies' of CRISPR-Cas9 and CRISPR-Cpf1. Pairwise Plants offers us access to base-editing technology from Harvard, which is the next generation of editing capability that has the potential to have an enormous impact on the speed and precision with which plant scientists can improve crops. Under the agreement, Pairwise works exclusively with us in corn, soybeans, cotton, wheat and canola.

II. Corn

Using these tools, we're starting to see tangible progress. For the first time, we've been able to elicit a short-stature response in corn using only gene editing, as you can see in the photo on this slide. This gives us three different approaches to deliver short-stature corn, which has the potential to expand the market opportunity. We're also working on other growth and development traits, disease resistance and quality traits. While still early days, gene editing is yet another tool to solve the challenges that growers face.

III. Soybeans

Let's switch to soybeans next and to a product whose commercialisation is right around the corner. XtendFlex, the next generation of weed control for soybeans, is advancing to the launch phase, and commercial availability will be dependent on regulatory approval timing. This triple stack of glyphosate, dicamba and glufosinate tolerance is built on the foundation of Roundup Ready 2 Xtend soybeans and has comparable yields. It promises to provide excellent flexibility and weed control, with expectations that the system will control 375 weeds as compared to 350 for Roundup Ready 2 Xtend and only 260 for Enlist E3 soybeans.

Further, with the inclusion of low-volatility dicamba in the Roundup Ready Xtend crop system, it is the only weed-control system in soybeans to offer 14 days of residual soil activity for the control of weeds not yet emerged at the time of spraying. We are expecting the US acres to be limited this spring, as is often the case in the first year, but anticipate high demand longer term.

IV. Herbicides

Not only did XtendFlex advance this year, but so did our entire herbicide tolerance pipeline in soybeans. Beyond XtendFlex, we have the fourth- and fifth-generation versions coming in the next decade and they bring additional herbicide tolerances to provide weed-control flexibility.

Let's start first with the fourth generation of herbicide tolerance. This project advances to phase three and, we are pleased to share for the first time that this will carry the XtendFlex tolerances, plus HPPD and 2,4-D tolerance, which we developed in-house. Beyond that, the fifth generation is advancing from phase one to phase two. It will offer tolerances to six herbicide classes, with the addition of PPO herbicides. We are also developing a new herbicide to be used with this trait on a parallel path with Sumitomo. You can see the excellent efficacy of this new herbicide in the photograph on the slide.

Technologies like these continue to contribute to our integrated weed-management program, which is vitally important for sustained, responsible farming.

V. Insect Control

While weed control is critical to growers globally, insect control is also vitally important, particularly in South America. Intacta RR2 PRO soybeans have been widely adopted and were grown on more than 65 million acres in the 2018/19 season. This product was a game-changer, not only for the direct benefits that the technology provides in terms of yield performance but also in terms of sustainability. Planting Intacta RR2 PRO soybeans instead of conventional soybeans enables no-till farming and reduces insecticide sprays. This decreases carbon-dioxide emissions and water use significantly.

This is truly remarkable technology. Intacta 2 Xtend soybeans builds on these benefits by providing an additional mode of action for insect control plus dicamba tolerance for weed control. This additional mode of action not only expands the spectrum of insect control, but it enhances resistance management for the primary pest. We are targeting commercialisation next year.

VI. Cotton

Another late stage project we're excited about will fill an important need in the cotton market. Our ThryvOn Technology, a trait for lygus and thrips control, will be the first-ever biotechnology offering for the control of piercing/sucking insects and is expected to launch in 2021. We expect this trait to offer better control and reduced insecticide use with an acre opportunity of more than 10 million acres in the United States. As with nearly all our technologies, we expect to broadly license this trait.

These are just a few of the biotechnology projects we're working on, but they illustrate our sustained and unrivaled leadership in the space and will pair nicely with the crop protection solutions we'll share with you next. With that, I'll hand it over to Axel.

Small Molecules Update

Alex Trautwein

Head of Small Molecules, R&D, Crop Science, Bayer AG

I. Small Molecule Progress

Thanks, Jeremy. We continue to make great progress in our small molecule discovery, which allows us to increase the number of developmental candidates with new modes of action and a higher probability of regulatory success. And this stems from our extensive, early safety testing and from the use of differentiated starting points in discovery, which we identify through complementary technologies in biological screening, target-based screening and phenotyping, all of which is fueled by data-science driven approaches. Since we established the strategy in 2015, we've seen a doubling of new small molecule candidates, and I'm excited to share one of these with you shortly.

II. Disruptive Potential

Now, Bob spoke earlier about the concepts of incremental and disruptive innovation, which is very relevant for small molecules. We have truly disruptive potential in collaborations like Oerth Bio, while having an equal focus on incremental formulation innovation to maintain efficacy and extend the life of our vast portfolio.

To illustrate how this works, let's look at an example. In this chart, you can see how we rapidly grew fluopyram sales as we expanded its formulations and registrations across crops, spectrum and application methods. This drove an eightfold increase in sales of the molecule since its initial launch, and we see the potential to double the sales over the next decade. Our technical expertise, high standards for safety and our keen awareness of grower convenience and use preferences has driven our leadership in lifecycle management and has defined our approach.

Fluopyram is just one example for how we sustain our molecules. Another is Fox Xpro, a new soybean fungicide formulation in Brazil that is comprised of three active ingredients from three different chemical classes. It features excellent control of diseases like Asian soybean rust, which can be devastating in soybeans in South America. In fact, Fox Xpro was recently recognized as 'Best Formulation Innovation' in the industry-wide Agrow Awards, because of its performance and ability to minimise environmental impact by reducing off-target losses. We enjoy our leading position in soybean fungicides today and expect that to continue with Fox Xpro, which has the potential to achieve €600 million in annual sales. And coming right behind it in phase four is next-generation Fox Supra, which includes Indiflin in the formulation.

III. New Molecules

Now let's move beyond formulations to new molecules, which is a particularly exciting area. I'd like to begin with iblon, a novel new fungicide for use in cereals. It demonstrates the most reliable control of all relevant diseases in wheat, and it exceeded the commercial standards more than 80%

of the time. We plan to launch in New Zealand in 2020 and then expand to Europe and several other regions. Overall, we expect the product to deliver peak sales of greater than €400 million.

This next product I'd like to share with you is also based on a new molecule and provides us with the opportunity to meet our customers' needs in Asia. With a peak sales potential of more than €300 million, tetraniliprole, the brand name Vayego, is a new broad-spectrum insecticide that is aimed primarily at our Asia-Pacific market, with an initial launch in Korea this past year. As with many of our other actives, we expect the list of geographies it serves to expand significantly, with up to 17 launches planned in 2020 and 2021. Vayego, or its seed treatment form known as Reatis, is quite versatile. It provides broad-spectrum control of caterpillars, certain beetles and sucking pests and can be used in many crops and has several application methods.

I'll close the crop protection highlights with a molecule that just advanced to phase two of our R&D pipeline, and it is the first new post-emergent mode of action for broad-acre weed control in 30 years, which is particularly exciting. It's a very tangible example of our commitment to invest more than €5 billion in new methods of weed control over the next decade. The reason why it's so beneficial is that it offers very effective post-emergence control of tough grasses that have shown resistance to glyphosate. Additionally, our discovery programme in biotechnology is focused on developing a herbicide tolerance trait to pair with the molecule, and we already have some approaches under evaluation.

With that, I'll turn it over to Sam, Chief Science Officer at Climate, to share some highlights from our digital pipeline.

Digital Pipeline Update

Sam Eathington

Chief Science Officer, The Climate Corporation

I. Climate FieldView

Well, thanks, Axel. As we start to draw today's update to a close, it's fitting that we end with an update on our Climate FieldView platform, because the digital space is where all this technology converges. FieldView offers our customers opportunities for new insights and new ways to optimise our leading portfolio more effectively on-farm.

Today, FieldView is the clear digital platform leader with more than 95 million paid acres. We exceeded our paid-acre target for 2019, even in the face of significant agronomic challenges in the US. And with more than 1 billion acres of potential in crops like wheat, soybeans and corn, we're just scratching the surface. As further endorsement, the number of platform partners is now close to 70, allowing us to bring even more services to our grower customers.

This leadership in paid acres represents more than just a statistic: it enables a core competitive advantage. We make it easy for growers to connect their acres and capture data from planters, sprayers and combines. More data translates into better informed models, which leads to improved

recommendations for growers. These recommendations improve as we get new data each season. To quantify our pace, the first 10 million connected hours of data took about 32 months to collect, while the second 10 million hours of data took only nine months, a remarkable acceleration of our new platform.

II. Seed Advisor

Now let's look at a product that has been enhanced by the data we have been collecting, our Seed Advisor. This tool is designed to help farmers place the right corn seed in the right field and at the right planting density. We've been testing Seed Advisor for a few years now, and our proprietary algorithms utilise data from FieldView combined with our extensive plant-breeding data. In fact more than 6 million data points from more than 7,700 hybrids have fueled the advisor. What we've found through our on-farm testing is that use of the tool is improving corn yields by six to nine bushels per acre, across multiple years and locations. For the 2020 season, we intend to increase the acres using Seed Advisor in the US and are planning a beta launch of a similar tool in soybeans closer to the middle of the decade.

III. Advanced Seed Scripting

Next, I'd like to highlight our advanced seed scripting tool, which is already commercial in the US and just advanced to phase three for both Argentina and Europe. This tool provides planting-density recommendations and variable rate planting scripts in corn. We've seen a yield benefit of more than three bushels per acre from use of the tool in Brazil and are planning to beta launch in Brazil, Argentina and Europe in 2021.

These are just a few examples of the more than 35 projects and models under development at Climate today, but they highlight how digital tools can be used in conjunction with the other products in our portfolio to improve their performance. With that, I'll pass it back to Bob to close.

Concluding Remarks

Bob Reiter

I. Investment in Innovation

Sam, thank you, and thanks to the entire team. Before we summarise, I wanted to pause and reflect on why our investment in innovation is so important. At the end of the day, it's all about growers and meeting their needs on the farm all season-long. From the time they plant their seed until they harvest their crop, we are with them every step of the way.

We have a long history of converting R&D into viable, value-added solutions for growers that enhance productivity and reduce the use of inputs necessary to produce a crop. You can see that from the leading positions we have established to date, and the growth of our pipeline builds on that strong foundation.

If we do that, we leave more land to support biodiversity, conserve more carbon and reduce the overall environmental impact of agriculture. Our customers win, the planet wins and we win.

II. Summary

We've covered a lot here today, and it's only a fraction of what's to come. Truth is, there are more than a hundred projects, thousands of hybrids and varieties, and more than a hundred formulations in development here at Bayer Crop Science. We don't simply have the largest pipeline in the industry; it's the most productive and comprehensive. Each project has a place and purpose, serving unmet needs and imagining better ways to farm.

Our team is hard at work discovering disruptive innovation, improving the products making a difference today, and delivering on our promise to shape the future of agriculture. Thanks for joining today's call and we look forward to sharing more with you in the year ahead. And, with that, I'll pass it back to Oliver for Q&A.

Questions and Answers

Oliver Maier

Great, thank you very much, Bob – very much appreciated. Thanks, everybody, actually, for your comments and remarks. As always, to allow for as many people to ask questions as possible, we ask to limit your questions to two per person.

Vincent Andrews, Morgan Stanley

Thank you and good morning, everyone. First, a question on the addition of the gene-editing path for short-stature corn... You know, one of the touts about gene editing is that it's supposed to be able to move through pipelines faster, both in terms of the science aspect but also the regulatory aspect. Could you give us a sense of, you know, at a rough high-level, sort of how fast you think that product could move through the pipeline versus the biotech route?

Bob Reiter

Sure. Good morning, Vincent. We do believe that we can move products in gene editing more quickly. Obviously it'll depend on which geography, because of course, if we have to have other trait packages for the grower, then we're obviously going to have to match against that timeline for our trait packages, but in other types of geographies I do think there's an opportunity to accelerate, depending on what kind of gene edit we're making. Maybe I can have Jeremy comment a little further on where we're at with our gene-edited version and kind of how we see that.

Jeremy Williams

Yeah, thanks, Bob. That's a great question. In the early days, we were really excited about the potential of gene editing to allow us to take this technology into more market segments. To the

question you asked, I think one of the advantages we see is a more streamlined and efficient discovery and early-development process that we think can take some time off the early phases of getting the actual event off to regulatory handoff. And then, depending on how the regulatory system evolves, one could contemplate a system where perhaps the hurdles are lower in most geographies for gene-edited crops. But, as Bob said, this does depend on all the major regulatory agencies, and so it's still early days there. But I'd say overall we're really excited about the ability to have this technology accelerate - at the very least - the discovery and development phases of advancing something as transformational as short-stature corn.

Vincent Andrews

Thanks. If I could just add a follow up on XtendFlex Soybeans, I'm just looking at slide 19 here, where you talk about the increased spectrum of control from 350 to 375 weeds. I'm just trying to understand the value proposition of XtendFlex versus the base Xtend, as well as Enlist. And maybe you could talk about the prevalence of those incremental 25 weeds that you're providing control against in the key geographies as well as what the farmer is spending today presumably on a crop chemical solution to control those weeds.

Bob Reiter

Yeah, Vincent, maybe I'll start and then I'll hand it over to Axel just to kind of talk a little bit from a weed-resistance management perspective. You know, obviously we see this as a product fit across all of the North American market. And, given that, depending on the individual conditions for different growers and also their weed-control preferences in terms of how they're using weed-control packages, we expect growers to kind of use these various options differently, so the more options, by having these three modes of action, gives them more flexibility and allows them to do chemistry rotations and other weed-management practices to kind of manage resistance. Maybe, Axel, you can comment real briefly on kind of the advantages of having that extra control over additional weeds.

Axel Trautwein

Yeah, exactly. Just like Bob said, we're doing this to offer additional solutions and complementary modes of action, which help growers to have different offers and basically combat weed-resistance development. And dicamba offers different opportunities compared to glyphosate, because it controls weeds that glyphosate actually does not control. And we actually also use this as input for our early-discovery process, where we regularly monitor field samples and look for mutations in weed species in order to find new modes of action and to complement that offering even further in the future.

Vincent Andrews

Thanks so much.

Steve Byrne, Bank of America

Yes, thank you for the opportunity here. I wanted to ask a question about your vegetable seed business, which doesn't seem to get much exposure. You have this expertise in gene editing. One

of the other advantages is it avoids the GMO label stigma. Do you have any update on the use of this technology to advance your vegetable seed business?

Bob Reiter

Well, Steve, we've been obviously looking at gene editing. Given the qualitative nature of many of the products and the attributes that you want to bring to vegetable growers, gene editing is natural to think about. I think what we're also, though, looking at is the overall regulatory environment right now, particularly in Europe, where we have a very large presence, and the complexity of making gene edits and then also at the same time wanting to see a germplasm flow on a global basis. So we're kind of looking at that balance and trying to make a decision on how that should all kind of pull together. Maybe I'll let Jeremy comment a little bit on kind of, you know, where we see that gene editing and vegetables stand from a technical perspective and kind of how we can anticipate it.

Jeremy Williams

Yes, great question. There are lots of opportunities. I think, if you think about the complex regulatory situation currently, one area we have been looking at in particular is sort of in protected culture, sort of vertical-farming types of segments, where you might have the ability to keep gene edits out of general commodity flow, and where you can imagine using the technology to do things like improve the ability to work with artificial light, modify architecture, those are some of the things that you could imagine using to accelerate and complement breeding, particularly for these sorts of high-value segments, as the regulatory climate evolves. The good news is I think we're seeing lots of positive development around the world with respect to how gene-editing is likely to be regulated, but there are still some key major geographies that need to have further advancements before I think you can fully leverage the technology broadly in open settings. But I do think you do have, in the nearer term, some of these vertical segments that would be very attractive.

Steve Byrne

And then I just wanted to ask about your corn Seed Advisor. When you look at that platform going forward, do you see that yield bump that you can provide growers as primarily a mechanism to drive market-share gains in your corn-seed platform or do you see it as a potential revenue generator to share in that revenue gain?

Bob Reiter

Yeah, I'll pass it to Sam, and he can talk a little bit more in detail on your question, Steve.

Sam Eathington

Yeah. Thanks, Steve. Actually, I would say we see it as both ways. One is, obviously, if we can continue to see increased yields of six to nine bushels on our products, that's a great way for us to think about how optimally to place them, which really should help us think about our market share. And of course, we still look at mechanisms of how we share that revenue with our customers, and, you know, this year we had a few pilots out there testing some new business models to look at that. So I think both of them are in play, and today the digital space is so early and we're really still figuring out the best way to bring this technology and value to the marketplace.

Steve Byrne

Thank you.

Tony Jones, Redburn

Good afternoon, good morning, everybody. I've got two. So, firstly, the number of pipeline advances looks to be much higher than we're seeing from Monsanto and Bayer on a standalone basis. And I know that you called out earlier scale in terms of molecule discovery, but is there something else going on? Is it just an innovation-cycle effect or are we seeing merger benefits starting to come through there? And then, secondly, on XtendFlex, any indication of what the price premium will be, maybe 2021/22, above the current market price range for regular Xtend?

Bob Reiter

So I'll go ahead and I'll take the first piece on the pipeline. You know, if you look at our pipeline numbers, they obviously fluctuate year to year, because we report out on phase advancements. So, as we mentioned, we have a huge number of projects in our portfolio and so advancement sort of can ebb and flow a little bit. You know, plus I think given the comprehensive nature of our portfolio, given that we've covering such an array – compared to our competitors, we have large number. So, you know, what's exciting to me, though, is this year we've got some really quality advancements on some very key products for the market, and I think that for me is really the highlight for this year. Maybe I'll pass it to Liam on the second question.

Liam Condon

Yeah, thanks Tony. So, on pricing we haven't finalised the pricing yet for XtendFlex coming to market, but you can be assured that we'll be looking for a premium price, of course, for this type of innovation. And I guess you can take a hint from what we've already seen from the cotton market, where we've had, I think, an outstanding success with XtendFlex in cotton.

Tony Jones

Great – thanks, guys.

Lucy Hancock. Bernstein

Thank you. Thank you for the presentation, and thanks for taking my question. My question was regarding NemaStrike. We understand that you announced to customers this year that you would not be offering this technology in 2020. We just wondered if you had any update on that, on what you would do going forward. Thank you.

Bob Reiter

Yeah, so our technical teams are continuing to work on the formulation, so we would have potentially opportunity to relaunch the product in the following years and really have what we want to have as the desired experience with our growers. So we're continuing to work on the formulation side of it, and, as you said, this year we don't intend to have sale of NemaStrike in the market. So that's where we're at.

Ms Hancock

Thank you.

Keyur Parekh, Goldman Sachs

Hi, good morning. I have two questions, please. The first one is kind of... How do you guys think about this 45% incremental sales capture, as you were talking about it, in the context of changing pricing models. If you're thinking about bundling seeds, chem, precision ag, and how should we think about how that all kind of plays out from a commercial perspective in the mid-to-long term? That's question number one. And then question number two, it would be great to hear some of your thoughts on how you think the world planting changes over the next 10, 15, 20 years as people's eating habits change with things like less meat, more vegetables. What do you think that means as it relates to the shape or the picture of world planting and what does that mean relative to your business? Thank you.

Liam Condon

Okay, thanks a lot for the questions. So on the 45% incremental, the way we think about this is about half of what we have in the pipeline, we're estimating, is going to be replacement sales. And this is really important for us – that we're continuing to refresh the pipeline. But it's not all incremental, of course, but it helps maintain – that we can keep or build our market share. And then of course we have the incremental part of the pipeline. The way we map this out over time – we have pretty precise models to do this. We have different lifecycles per product. We have some products that reach lifecycle peak like after 40 years, and we have some products that reach a peak after three or four years. I guess an average that you could take for peak sales is in the ballpark of 12 years, so just to give you a sense of what we're talking about, but very different by molecule, by product segment. And, again, half of this is on top or incremental sales.

On the question of how the world will change over time and ag and the shift to plant protein, we're actually quite excited about the increasing interest now in plant protein and particularly in how agriculture's performed, because a lot more people, consumers, are interested in how farming is done and they want to know it's done in a sustainable manner, which is a core competence of us. And we're actually – if you step back, we're actually the world's largest plant-protein company. If you look at our market share in soybeans and corn, we are the number one. We would assume over time that there's going to be a decrease in per capita consumption of meat. So, today, if per capita consumption is maybe 42 kg per capita, this is going to decrease a bit over time, but at the same time the population is going to increase by probably 50% over the next decades. So net-net there is going to be an increase still in the demand for meat and protein, which is heavily driven by Asia. This isn't necessarily driven by the western world; this is largely driven by Asia. So we see increasing demand for both meat and, with that, feed, but also for plant protein, and we think with our product portfolio, we're very well positioned to tap into that growing potential.

Keyur Parekh

Thank you.

Christian Faitz, Kepler Cheuvreux

Hi, Liam, hi, Oliver and teams. Two questions, please. First of all, short-stature corn – am I right in assuming that short-stature corn still comes out of the BASF cooperation with Monsanto? And, if so, is it correct that BASF would fetch a good part of the profit pile eventually? Then, second question, on your insecticide pipeline, is there any new mode of action planned for the European market any time soon after the ban of the neonics?

Bob Reiter

Good afternoon, Christian. Let me start with the first question. So, short-stature corn – you know, the biotechnology version, so one of the versions we're working on, is a joint collaboration with BASF, and there is a value-share component to, obviously, that, because that's a collaboration effort, and so they would obviously be a beneficiary as we commercialise that product in the future. I will turn it over to Axel, and he can maybe comment on how the pipeline looks in insecticides and overall maybe the situation for European insecticides.

Axel Trautwein

Okay, thanks, Bob, and thanks, Christian, for the question – happy to take that. So, yes, of course, we are continuing to innovate and look for new insecticides. Especially with our focus on early-safety testing and new modes of action and discovery, we want to find molecules for the European market. So specifically on your question on neonics, five years ago we launched Sivanto, which is not a neonic; it's a bee-friendly insecticide. That's a very prominent example of our recent launches. In our pipeline, I mentioned Vayego, which is mainly for the Asian market; it's also very bee-friendly and IPM-suited. But now, especially in our pipeline, we have – in the mid-stage phase three pipeline, we have a sucking pest insecticide which is very promising, and we have in our early-development pipeline a new acaricide with also a new mode of action completely new to the market and we just recently also introduced a biological, flipper, for pest control, so we are continuing with all technologies to look also for new insecticides. And also I cannot disclose any details on that, but in our research pipeline we also have promising leads for new candidates which we also believe can make it to the European markets, and we're focusing there especially on the safety aspects and regulatory aspects.

Christian Faitz

Okay, thanks very much.

PJ Juvekar, Citi

Yes, hi, good morning. You know, a question on short-stature corn – you're trying to get there through three different modes of action. Do you know which mode will yield better? Secondly, are these three ways working synergistically with each other? And then, lastly, is there a benefit from lower fertiliser application here because the corn is shorter?

Bob Reiter

Yeah, I'll take the very first piece, and then I'll hand it over to Jeremy to kind of talk about maybe the nuances of the various technologies. Short-stature corn, by its very description, what we've

done is we've made a modification of the plant to make it shorter. That by default doesn't make it yield more or less; it just makes the crop shorter. Having said that, I think, given the change in architecture in the crop, it opens up some new opportunities in terms of not just by default what we see as less crop loss, because of course the standability of the crop is improved, as Mike mentioned earlier, but also the new architecture, we think, opens up an opportunity for higher plant densities. And, also, when you couple that with our breeding engine, you know, and taking advantage of breeding specifically against that architecture, we see that we can potentially drive yields in potentially an unprecedented way against that type of plant architecture. But, as it stands, by default, making the plant shorter doesn't change its yield, per se.

I'll hand it over to Jeremy, because there are some nuances in terms of why we have different approaches, and they all are a little bit different from each other even though they all kind of look the same if you just give a quick eye in the field.

Jeremy Williams

Correct, and on the nitrogen question you asked, the short-stature corn, as far as we can tell, does not change how the plant utilises nitrogen, but it will allow you, because you can have more easy access, to more precisely manage how you apply nitrogen.

On the question of the nuance between the different approaches, there are differences technically that we think will allow us to transfer the technology to different parts of our germplasm pool with different levels of efficiency. We think there might also be subtle differences in the height that could allow us to position the product differently in different segments, but this is still early days. We are comparing in the field; we are looking at sort of the more fine-detail differences between the technologies. And the way I think about it, this gives us more opportunity to fill a broader segment of the market, ultimately. It gives you the ability to actually deploy the technology more efficiently, but it's still very early in terms of understanding how exactly they are complementary and how best to utilise them long term.

Bob Reiter

Maybe I'll also have Mike add a little comment as well. You know, we just had our first commercial beta in Mexico, and he could talk a little bit about kind of what we want to learn and also where he sees it, leading the breeding organisation on this important platform.

Mike Graham

Yeah, thanks, Bob. And, PJ, just a great question and obviously an area that we're very excited about. So in Mexico, as I mentioned, we just launched a beta of this product concept, and we launched in an area of Sinaloa, which is about a million acres. And the experience so far – and we've been working with our customers for really a number of years, just understanding, you know, how they view the product and getting feedback from them – has been very positive. And, as we've thought about this approach, not only combining the stature, but also with all the technology we've discussed, we see it as a very unique way to drive productivity in a way we just haven't done in the past as you combine all these technologies. So lots of excitement – we're learning a lot from the PoC or the beta that we have in place in Mexico, and we're very excited to see the results coming out of that.

PJ Juvekar

Great, thank you. And then my second is on your multiple soybean herbicide traits. You know, you're going from three traits to five to six. You know, if you take a step back and look at your Roundup experience, over time the weeds develop resistance, and now we're up to more than 47 weeds that are resistant to Roundup. Clearly, here you're trying to stay one step ahead of this resistance. So how do you balance that staying ahead versus weeds developing resistance to different herbicides? Thank you.

Bob Reiter

Yeah, well I think you hit on it. First of all, obviously in some ways it can be a race, but it's also an opportunity, I think, by providing more modes of action and more choice to growers and, I would say, better appreciation for the importance of weed management and the toolbox overall, because it isn't even all just about using the chemistries that provide over the top [flexibility] through traits. I think one of the beauties of being Bayer is that we have this broad selective portfolio as well, which really, I think, gives us a very comprehensive way of helping growers manage against what is an inevitability, which is that biology likes to survive and resistance is an inevitability in biology, whether it's weed control, insects, whatever the pest.

And so, you know, I think what's different now is that through our knowledge base, learnings, capacity and capability – you can see we're bringing new trait innovation in weed control virtually every four or five years. You've got to remember – when we went from Roundup Ready 1 to Xtend, that was a significantly longer timeframe, and I think that's a testament to our capacity and capabilities. And now, like I said, I'm super excited because, you know, we've got these new chemistry classes coming, and that opens up the opportunity to bring these new chemistries and have them be part, potentially, of trait packages in the future for growers as well. So that opens up even more choice and even more ways to manage the problem.

Jeremy Williams

And really a key thing about how these chemistries and traits are selected is we ensure they're complementary in terms of the control of known resistant weeds. And so one of the things about having these six opportunities for controlling weeds – it's not just about the number, but it's the fact they actually work in a complementary fashion to sort of cover off deficiencies in each of them, right? And so what you're looking at as a system is something that's actually much more robust than what we had in the early days of herbicide-tolerance technology.

PJ Juvekar

Thank you.

Falko Friedrichs, Deutsche Bank

I would have two questions, please. Firstly, can you share some more colour on the herbicide molecule that you have in early development and how that fits in in regards to potentially replacing glyphosate? Or does it have a very different place? Then, secondly, on your FieldView platform, what have been the main advances since you presented it in great detail at your capital markets day last year?

Bob Reiter

Sure, so I'll just pass it immediately over to Axel to talk about our new mode of action in herbicides, and then, Axel, if you could just pass it over to Sam right after that.

Axel Trautwein

Okay, thanks for the question. Yes, let me restate: this is a really exciting new molecule, because it's a new mode of action for post-emergence treatment in broad acre weed control. And this is part of our strategy to offer farmers additional complementary solutions and part of our strategy to invest €5 billion over the next decade into weed-management solutions. And we continue to believe that glyphosate over the years to come will continue to provide value and will be a very important tool for growers, but we need additional modes of actions and also, as Bob mentioned earlier, to rotate, and they have complementary profiles. For example, this new mode of action is active against certain grasses that are resistant to glyphosate, so, as Jeremy said, it contributes to providing a much more stable system to growers. And it's also a nice example of our strategy to focus on new modes of action and safe molecules. And I'll give it to Sam to add to that.

Sam Eathington

Yeah, thanks, Axel. So, on the FieldView platform, I'd characterise it in a couple of buckets. One is we expanded the number of countries that our product is in. So we've got more of a global reach, where farmers can use this technology to collect their data. Two, as I mentioned, we got to more than 95 million paid acres this year [2019]. So last year [2018] we were on about 60 million paid acres, another great growth in our product being utilised by farmers. And then the real value-creation opportunity, of course, Seed Advisor, which I talked about – we commercially launched that last year and tested it out there in a beta, had a great experience from the growers with that. And the product, again, demonstrated its ability to increase productivity. And then our seed-scripting tool, which was commercial in the US – we've now gone ahead and done betas in South Africa and Europe this coming year, so really a lot of advancement in both the platform being utilised and new value creation tools getting out to our customers.

Bob Reiter

You know, I'd probably add, Sam, just the intangibles as well, as we continue to expand the footprint of the platform, right? This gives us more intimacy with our customers, with our sales organisation, and an opportunity to also, you know, take advantage of something that others may look at as a threat, but we look at as an opportunity, which is transparency of performance. The FieldView platform allows growers to see the differentiation between our products and others. And, you know, the net of that is that we've seen that that helps us in terms of our overall, you know, capacity and showing customers that we have the best portfolio and the best products in the market.

Falko Friedrichs

Okay, thank you.

Dominic Lunn, Credit Suisse

So, going forward, do you think the balance between your own sales and traits licensing will stay broadly the same or do you think that your new traits will be so unique that the high margin-traits royalty income could rise faster? And then, secondly, on the prescription service and the adoption of the higher value-added services, can you give us an idea of the sort of timelines when you think customers could share in the upside of the higher yields that you mentioned at the capital markets day? Thank you.

Liam Condon

Yeah, thanks a lot, Dominic. So we don't break out individually our trait revenue line, but I think if you look at overall the pipeline that we have, that we've announced today and given you a lot of detail on, I think it's fair to expect that this will continue to be a major source of income for us. From a balance point of view, I don't expect any major up or down. We're going to continue to innovate. This has always been an important part of our revenue stream. In the future, it will continue to be an important part, because we will continue to innovate and we will continue to get paid for that innovation. So we don't expect a major increase or decrease, but it's built around our ability to continue to innovate, which I hope you've got a better sense for with the pipeline review today. And on the second question I'd hand it over to Sam.

Sam Eathington

Yeah, so the way I'd characterise it is this year in 2019 we did a pilot out there with our Seed Advisor tool in the United States in corn, and we combined it with a new business model opportunity with our customers. You know, it was a pilot where we were testing both the efficacy of our Seed Advisor tool and how to operate a new business model where we would help a grower share in the risk downside but also ask the opportunity to share in the upside on those models. And in 2019, even though it was a tough year; we really had a lot of learnings and it was a great experience for our customers. We've taken those learnings and put them into a new pilot in 2020 where we're expanding the number of acres, and we continue to see growers quite interested in helping share in the risk of farming and being willing to share in the upside, if we can deliver more value.

So, still early days, a lot we're learning – we're in a pilot phase, but the initial year looked good and we're expanding it in 2020.

Dominic Lunn

Great, thank you.

Oliver Maier

Thanks to everyone joining us today. We very much appreciate it. We look forward to talking to you again at our Q4 earnings call on 27 February. Thanks, everybody.

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<http://www.ubiquis.co.uk> / infouk@ubiquis.com

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