### HERBICIDE 除草剂

<table>
<thead>
<tr>
<th>Name</th>
<th>Formulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glyphosate</td>
<td>TC, SC, SG</td>
</tr>
<tr>
<td>Glyphosate Isopropylamine Sulfate</td>
<td>TC, SL, SG</td>
</tr>
<tr>
<td>Glyphosate Ammonium Sulfate</td>
<td>TC, SL, SG</td>
</tr>
<tr>
<td>Glyphosate Potassium Sulfate</td>
<td>TC, SL, SG</td>
</tr>
<tr>
<td>Glyphosate Dimethylamine Sulfate</td>
<td>TC, SL, SG</td>
</tr>
<tr>
<td>Glyphosate + Deamba</td>
<td>SG, SL</td>
</tr>
<tr>
<td>Glyphosate + 2,4-D</td>
<td>SL, GC</td>
</tr>
<tr>
<td>Glyphosate + MCPA</td>
<td>SL, WC</td>
</tr>
<tr>
<td>Glyphosate + Fluroxane</td>
<td>WSG</td>
</tr>
<tr>
<td>Glyphosate + MCPP</td>
<td>WSG</td>
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<tr>
<td>Diquat</td>
<td>TC, SC, SG, WP, GC</td>
</tr>
<tr>
<td>Quadricat</td>
<td>TC, SC, WC, SG</td>
</tr>
<tr>
<td>2,4-D</td>
<td>TC, SC, SG, WP, GC</td>
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<td>Clomazone</td>
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<td>Parquat</td>
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<td>Oflloxacin</td>
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<td>Mefubluconol</td>
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<td>Dicamba</td>
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<td>Acetamiprid</td>
<td>EC</td>
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<tr>
<td>Buprofezin</td>
<td>TC, SC, SG, WP, GC</td>
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<td>Lambda Cyhalothrin</td>
<td>EC</td>
</tr>
<tr>
<td>Atrazine</td>
<td>EC</td>
</tr>
<tr>
<td>Emamecin Benzoate</td>
<td>SC, TP</td>
</tr>
<tr>
<td>Spirodiclofen</td>
<td>SC</td>
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<tr>
<td>Thiamephoxam</td>
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<tr>
<td>Methomyl</td>
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<tr>
<td>Carbaryl</td>
<td>TC, SC, SG, WP, GC</td>
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### FUNGICIDE 杀菌剂

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<tr>
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<tbody>
<tr>
<td>Carbazim</td>
<td>TC, SC, WC, WP</td>
</tr>
<tr>
<td>Thiophanate-methyl</td>
<td>TC, SC, WP</td>
</tr>
<tr>
<td>+ Nystatin</td>
<td>WP</td>
</tr>
<tr>
<td>Azoxystrobin</td>
<td>TC, SC</td>
</tr>
<tr>
<td>Fosetyl-Al</td>
<td>TC, SC, WC, WP</td>
</tr>
<tr>
<td>Tebuconazole</td>
<td>WC, EW</td>
</tr>
<tr>
<td>Mancozeb</td>
<td>GC</td>
</tr>
<tr>
<td>Chlorothalonin</td>
<td>TC</td>
</tr>
<tr>
<td>Pyraclostrobin</td>
<td>GC</td>
</tr>
<tr>
<td>Cyproconazole</td>
<td>TC</td>
</tr>
<tr>
<td>Prothiconazole</td>
<td>TC</td>
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</tbody>
</table>

### CHEMICAL PRODUCT 化工品

#### General Chemical Product
- 2,4-Dichlorophenoxy
- 1-Chloro-2-nitrobenzene
- O-Phenylenediamine
- 3,4-Dichlorophenylisocyanate
- Sodium pyrophosphate
- 2,4,5-Trichlorobenzoic
- O- Octyl chlorophenoxy
- Phosphorus Trichloride
- Phosphorus Oxychloride
- Sodium triplyphosphate
- Methyl chloride

#### Flame Retardant
- Tri(2-Chloropropyl)Phosphate (TCP)
- Tri(2-Chloroethyl)Phosphate (TCP)
- Isopropyl Trisphenyl Phosphate (IPPP)

#### Agrochemical Adjuvants
- Agricultural organosilicon adjuvants: XHG-248 Silicon Sulfonate

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The herbicide, glyphosate, occupied centre stage in the EU through most of 2017 as member state politics sought to subvert the regulatory process. The European Commission struggled to overcome some member states’ concerns over conflicting scientific opinions on the active ingredient’s carcinogenicity classification, despite the positive conclusions of EU evaluations. It had to cut the proposed approval period from the standard 15 years to ten and then five years. The Commission also met fierce resistance from some members of the European Parliament, who wanted a five-year phase-out of the ai.

The Commission declared its intention in July not to go ahead with the approval renewal without the support of a qualified majority of member states. That meant many months of indecision and inconclusive voting by member states when getting a qualified majority seemed impossible. After failing in late October to gain sufficient EU member-state support for a ten-year approval, the Commission cut its proposed renewal period to five years.

Finally, in almost a repeat of the scenario in 2016 when an 18-month extension to the ai’s authorisation was given merely days before it was to expire, the Commission managed to get a qualified majority of EU member states to back its proposal for a five-year renewal of the EU approval of the herbicide, two weeks before the extension was to expire on December 15th.

But the controversy was far from over as following the renewal, three political parties in the European Parliament called for a lawsuit against the renewal and the setting up of a special committee to examine the wider EU assessment process for pesticides. Following that, six EU member states, Belgium, France, Greece, Luxembourg, Malta and Slovenia, urged the Commission to go further than the five-year renewal and take steps towards ending the use of the ai.

**ED criteria**

Disagreements were the order of the day on the issue of criteria for identifying potential endocrine disruptors (EDs). In October, the European Parliament threw out proposed criteria for identifying potential EDs in “In 2017, the Commission set about the task of extending the scope of ais that may be considered as “low-risk” substances, in a bid to boost approvals of biological and naturally occurring pesticides” agrochemicals, causing a further delay for the proposals, which were originally meant to be finalised by the end of 2013. The criteria were rejected because of an objection to the proposed exemption of insect growth regulators (IGRs) from the ED criteria.

Finally, in December, member states voted in favour of amended criteria for EDs in which an exemption for IGRs was removed. In the previous month, ED criteria for biocides were passed and published as Regulation 2017/2100. The IGR exemption was included in the biocide criteria, which did not receive any objection from the Parliament.

**Neonicotinoids**

An EU member-states vote on a proposed ban on all outdoor uses of the neonicotinoid insecticides, clothianidin, imidacloprid and thiamethoxam, which was scheduled for December, was postponed to spring 2018. The move came as a result of a delay by the European Food Safety Authority (EFSA) in its evaluation of data for a review of measures imposed in 2013 that suspended uses on certain crops. The completion of the review was delayed until February 2018. Member states will vote following the completion of the EFSA review.

**Low-risk ais**

The parity of the approval process of biologials with conventional pesticides has been a cause for complaint in the biologials sector of the crop protection industry, which has been asking for a more favourable registration procedure. In 2017, the Commission set about the task of extending the scope of ais that may be considered as “low-risk” substances, in a bid to boost approvals of biological and naturally occurring pesticides. It came about in August, when new criteria for identifying “low-risk” agrochemical ais came into force. Under the new criteria, micro-organisms, baculoviruses and semiochemicals will be considered as low-risk, unless specific concerns are identified, while naturally occurring substances will be exempted from certain hazard-based criteria.

**REFIT**

Consultations for the Commission’s REFIT programme, which aims to made EU laws simpler and less costly, got under way in November when the Commission opened two consultations for the public and for stakeholders on its “fitness check” review of the implementation of the EU agrochemical registration Regulation (1107/2009) and the EU pesticide residues Regulation (396/2005). A roadmap was issued towards the end of 2016 outlining various concerns raised by industry and EU member states, including: mutual recognition of product approvals; the geographic zonal system for product approvals; implementation of comparative risk assessment of products containing ais that are candidates for...
substitution; data protection provisions; and the implementation of setting harmonised maximum residue limits. The deadlines for comments are February 12th 2018 for the public and December 31st 2018 for stakeholders.

**Transparency**

In December, the Commission committed to allowing public access to industry studies submitted for agrochemical approvals. Legislative proposals will be issued in spring 2018. The commitment came as a response to a European Citizens Initiative petition that was demanding a ban on glyphosate as well as a reform of the pesticide approval procedure and setting of EU-wide mandatory reduction targets for pesticide use. The Commission rejected the demands for a ban and mandatory reduction targets.

The Commission acknowledged the concerns raised in the petition about transparency, and promised to act on its earlier pledge to examine ways to improve the rules. Those will include measures such as public access to raw data from study reports, but any changes will respect existing rules on the protection of legitimate confidential business information.

Another petition demand was for pesticide approvals to be based on published studies commissioned by public authorities, rather than industry. The Commission stressed the principle that public money should not be used for studies that would eventually help industry put a product onto the market, especially in view of the high cost. Nevertheless, an option under consideration, already suggested at an earlier hearing on the petition, was to give the EFSA the power to commission ad hoc studies in case of serious doubts or conflicting results, for example, in case of widely used substances.

“The Commission advised companies to carefully consider the time needed for EU procedures before they submit new applications and also be prepared to transfer existing applications out of the UK”

**Sustainable use**

A long-awaited report by the Commission on the implementation of the EU sustainable use of pesticides Directive (2009/128) in EU member states was finally released in October. It found that implementation in member states had been insufficient and improvements made so far have not been enough to achieve the Directive’s aims of reducing the risks and impacts of pesticide use. But the report noted good progress in other areas, such as minimising aerial spraying and pesticide use in public places, and establishing training and certification programmes. The report was originally meant to be produced in 2014.

**Brexit**

Although discussions between the EU and the UK are in the initial stages on Brexit, the Commission began issuing specific advice in September for European agrochemical, biocide and biotechnology companies on the impact of the UK leaving the EU in 2019.

The advice for agrochemicals was in the form of a notice and “question and answer” document covering the implications for procedures for approving agrochemicals and setting maximum residue limits (MRLs). It warned firms that they may need to transfer some EU approval applications away from the UK. When and if the UK becomes a “third country”, it will no longer be able to act as a rapporteur for assessing applications for ais, zonal product approvals or MRLs. The Commission advised companies to carefully consider the time needed for EU procedures before they submit new applications and also be prepared to transfer existing applications out of the UK.

Similar advice was issued to biocide and biotechnology companies.

Towards the end of December, member states voted through the reallocation of 21 ais going through the renewal process to a different rapporteur or co-rapporteur member state, because the UK will not complete its assigned duties before it leaves the EU in 2019. The vote came just in time for some of the ais that have a deadline of February 28th 2018 for companies to submit supplementary dossiers for evaluation.
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Trump administration stirs up US pesticide controversies

By J R Pegg

The past year has seen major shifts in US pesticide policy as President Donald Trump’s “pro-business” approach and his bid to reduce the influence of the US EPA has prompted the rollback of federal agrochemical rules and regulations.

The results on the regulatory front in 2017 were good for pesticide registrants and farm groups, but the Trump administration’s brief tenure has not been without controversy and concern. Pesticide manufacturers and agricultural interests are uneasy with White House plans to slash the EPA budget as well as Mr Trump’s calls to upend existing trade deals. They are also wrestling with controversies sparked by the rocky rollout of new dicamba herbicides and from litigation challenging the safety of glyphosate.

The policy changes enacted under Mr Trump in 2017 have also energised critics of the agrochemical industry, prompting legal challenges and allegations that the Agency is putting industry interests ahead of its mission to protect public health and the environment.

Reverse and delay

Few pesticide policy decisions in 2017 caused as much controversy as EPA Administrator Scott Pruitt’s order to abandon an Agency plan to ban the organophosphate insecticide, chlorpyrifos. Mr Pruitt issued his decision in March, formally denying a petition filed in 2007 by environmentalists to cancel registrations and revoke food tolerances for the insecticide.

Mr Pruitt issued his decision in March, formally denying a petition filed in 2007 by environmentalists to cancel registrations and revoke food tolerances for the insecticide.

Critics said that the EPA administrator had failed to identify any new science that countered the Agency’s previous conclusions that the insecticide could cause neurological harm and that aggregate exposures exceeded federal safety standards. Environmentalists and attorneys general from several states filed an administrative appeal calling on the EPA to reconsider the decision along with a lawsuit asking a federal court to intervene and force the Agency to impose the ban.

California, which as the most populous US state and largest agricultural producer, has a major impact on pesticide policy, responded by proposing new rules to further restrict chlorpyrifos use. The state also added chlorpyrifos to its Proposition 65 list of substances known to cause cancer or reproductive harm, a move that could require new warning labels of products that contain the insecticide.

Opponents of the ban, including the USDA and the National Association of State Departments of Agricultural, argued that the EPA had overstated the potential risks and exposures from the insecticide.

But the move drew the ire of environmentalists, consumer advocates and several state attorneys general as well as Democrat party lawmakers in Congress who introduced legislation to reverse Mr Pruitt’s order.

“California added chlorpyrifos to its Proposition 65 list of substances known to cause cancer or reproductive harm, a move that could require new warning labels of products that contain the insecticide”

Opposition to the chlorpyrifos decision also put funding for the EPA’s pesticide office in jeopardy. Senator Tom Udall, a New Mexico Democrat, blocked reauthorisation of the Pesticide Registration Improvement Act (PRIA) out of frustration with Mr Pruitt’s refusal to formally respond to objections raised about the chlorpyrifos order as well as decisions by the Trump administration to delay implementation of two pesticide safety rules. In December, Mr Pruitt said that the EPA would allow the two safety regulations – the Certified Pesticide Applicator rule and the Worker Protection Standard – to go into effect in 2018 but also directed the Agency to reconsider minimum age requirements and several other provisions of the rules in response to stakeholder concerns.

The move did little to satisfy Mr Udall, who criticised the EPA for delaying the Obama administration regulations and showed little sign of lifting his hold on the PRIA reauthorisation bill. Lawmakers temporarily extended the existing PRIA through stopgap spending bills, but failure to reauthorise the law would be a serious blow to registrants and pesticide users. The PRIA allows the EPA to collect industry fees to ensure timely reviews of pesticide products, providing some 20-25% of the funds used by the Agency’s Office of Pesticide Programs (OPP). A reauthorisation bill cleared the US House of Representatives in March and the Senate Agriculture Committee in June, but has since been subject to Mr Udall’s hold.
Dicamba and glyphosate

Federal courts look likely to play a major role in EPA actions, including the fate of new dicamba products amid growing concern around the safety of the herbicide and the proliferation of genetically modified dicamba-tolerant crops. A lawsuit challenging the new dicamba registrations is mired in a document dispute, but the controversy surrounding the herbicide is not going away anytime soon.

Investigations are under way in 22 states of nearly 3,000 drift complaints reported in 2017 and dicamba drift had harmed an array of crops, including an estimated 3.1 million acres (1.3 million ha) of soybeans. Missouri and Tennessee state officials responded by enacting new restrictions on applications for the latter half of the 2017 growing season while Arkansas imposed a temporary ban in July.

“The drift problems prompted the EPA in October to reclassify the new dicamba herbicides as “restricted use” pesticides and to impose new limits on applications as well as additional training and recordkeeping requirements. The label changes were proposed by Monsanto, which contended that the increase in drift damage was probably caused by farmers who were using older formulations of dicamba or not following the label directions on the new pesticides, including weather restrictions and equipment requirements.

But the flood of drift complaints had some farmers, state officials and agricultural researchers concerned that the new formulations may have been approved without adequate testing of their volatility potential and worried about the ability of farmers to safely use the technology without harming non-target crops.

By the end of the year, some states remained unconvinced that the EPA changes were sufficient. Minnesota, North Dakota and Missouri have each imposed additional restrictions on dicamba for the 2018 growing season, further limiting when the herbicides can be applied. Arkansas has imposed the nation’s strictest restrictions on dicamba, prohibiting spraying of the herbicide from April 16th through October 31st. State officials in Iowa have imposed additional training requirements and Tennessee is also considering new limits.

Controversy over dicamba also prompted farmers from Arkansas, Missouri and Illinois to file class actions against the agrochemical companies, alleging that they were liable for crop damage from dicamba drift.

The EPA released its new risk assessments for glyphosate in December, including a human health review that found the herbicide is not a likely carcinogen. The finding is a relief for industry and farmers, but looks unlikely to quell disputes about the safety of the world’s most popular herbicide. In March, an EPA scientific advisory panel said that it was unconvinced by the Agency’s preliminary assessment of glyphosate’s carcinogenicity and split on whether to endorse its conclusion that the herbicide is “not likely” to cause cancer in humans.

Meanwhile, the EPA’s Inspector General is investigating reports that a former top pesticide official may have colluded with Monsanto to skew the Agency’s review of glyphosate and the company continues to battle a class action lawsuit brought by cancer victims claiming that the herbicide caused their illnesses as well as California’s decision to add the herbicide to the Prop 65 list. A state judge upheld the listing decision in early 2017, but the company has appealed the ruling and joined a federal lawsuit filed in November by a coalition of food and ag interests led by the National Association of Wheat Growers.

Rulemakings derailed or delayed

The Trump administration’s effort to overhaul the federal regulatory process impacted several other rulemakings of keen interest to the pesticide industry. In November, the USDA withdrew an Obama administration proposal to overhaul regulations for GM crops. The plan called for major changes to the regulatory regime, notably a new trigger for regulation and new provisions to potentially enable the USDA to regulate a broader array of GM crops, including those made with new gene-editing technologies. Stakeholders on all sides have long called for the rules to be revised but disagreements over how best to
update the 30-year old regulatory framework appeared to have once again derailed the process. The Trump administration has yet to detail how it would move forward or when it might propose a new plan beyond a commitment to launch “fresh stakeholder engagement.”

The EPA eased back from plans to potentially restrict pesticide uses to protect bees and other pollinators and withdrew a rule intended to clarify the reach of the Clean Water Act. The Agency also sent mixed signals about its efforts to overhaul how the OPP implements the Endangered Species Act (ESA). The law has long been a headache for the industry and the EPA, which is required by the statute to consider the effects of legal pesticide uses on endangered species and to consult with federal wildlife officials on potential mitigation measures.

The EPA has been working on a new framework for ESA compliance for several years and has developed interim approaches along with the federal wildlife agencies and the USDA. Draft biological evaluations for chlorpyrifos, diazinon and malathion developed with those approaches were released in the final week of the Obama administration. The court-ordered evaluations found that the three insecticides were likely to harm the majority of listed species and suggested that new restrictions might be imposed.

But the agrochemical industry pushed back hard in April, calling the reviews “fundamentally flawed” and urged Mr. Pruitt to withdraw the evaluations and revamp the ESA framework yet again.

Industry concerns appeared to influence the administration, which in November asked a federal court for an additional two years for the National Marine Fisheries Service (NMFS) to complete the biological opinion (BiOp) for the three organophosphates. But in December, the Trump administration withdrew that request and the NMFS sent the BiOp to the EPA for further action.

Litigation remains at the heart of the ESA controversy and the EPA faces several lawsuits challenging its alleged failure to assess the impacts of active ingredients on listed species, including a long-running complaint known as the pesticide “mega-suit”. A federal judge threw the environmentalists behind the mega-suit a lifeline in February, keeping alive claims that involve some 38 a.i.

In May 2017, a federal judge in California found that the Agency violated the ESA when it approved 59 products that contained the neonicotinoid insecticides, clothianidin and thiamethoxam. The judge concluded that the EPA had registered the pesticides without completing its ESA obligations and was considering whether to pull the products from the market while the Agency completes the required review.

The EPA also lost a key ESA case in June 2017 when a federal appeals court ruled that the Agency had violated the species law by failing to consult with federal wildlife officials before it had registered the then DuPont insecticide, cyantraniliprole (trade-marked as Cyazypyr – now owned by FMC). The court, however, opted to leave the registration in place while the EPA completes the required review.

The assessments were conducted in collaboration with the US EPA and the California EPA’s Department of Pesticide Regulation.

The PMRA proposed three-year registrations for clothianidin technical and 13 end-use products following reviews of additional data on pollinator risks. It called for the phase-out of Bayer Crop Science division’s Sepresto 75 WS (clothianidin + imidacloprid). The Agency also proposed three-year registrations for thiamethoxam technical and 12 end-use products.

The Canadian Federal Court denied applications from the Canadian government and four agrochemical companies to block a lawsuit filed by environmentalist groups over the regulation of neonicotinoid insecticides. The suit was filed in 2016 by the law firm, Ecojustice, on behalf of Friends of the Earth Canada, the David Suzuki Foundation and the Wilderness Committee. The action was aimed at the PMRA via the Minister of Health. It also involved clothianidin registrants Bayer and Sumitomo Chemical subsidiary Valent Canada and thiamethoxam registrants Syngenta and Elanco Canada.
## Herbicides
- 2,4-D 406 g/L + Pidostim 103 g/L SL
- 2,4-D, 98% TC, 806 g/L SL
- Citenilox, 37% TK, 240 g/L EC
- Dicamba + Glyphosate 40% SL
- Ethoxysulfuron 10% + Penoxsulam 20% WDG
- Ethoxysulfuron, 95% TC, 15% WDG
- Glufosinate, 95% TC, 200 g/L SL
- Glyphosate, 98% TC, 41% AS
- Mefenacet 60% + Ethoxysulfuron 10% WDG
- Metamitron 98% TC, 700SC, 75% WDG
- Metalsulfuron-methyl, 98% TC, 60% DF
- Pidostim TC
- Rimoseluron, 98% TC, 25% WDG

## Fungicides
- Carbendazim, 500 g/L SC, 98% TC
- Chlorothalonil 40% + Thiplanate-methyl 35% WP
- Difenoconazole 15% + Azoxystrobin 15% SC
- Iprobenfos, 95% TC, 50% EC, 50% EW
- Picoxystrobin 20% + Propiconazole 10% SE
- Picoxystrobin 20% + Tebuconazole 10% SC
- Picoxystrobin, 98% TC, 95% SC
- Propiconazole, 98% TC, 41.8 EC
- Tebuconazole 20% + Azoxystrobin 10% SC
- Tebuconazole, 98% TC, 430g/L SC

## Plant Growth Regulators
- 4-Indol-3-ybutyric acid 0.85% + 1-Naphthyl acetic acid 0.2% AS
- Cyanamide, 50% AS
- Forchlorfenuron, 98.0% TC, 0.8% SL
- Paclorbutazol, 98% TC, 240g/L SC

## Insecticides
- Abamectin, 96% TC, 1.8% EC
- Acarphate, 97% TC, 90% SG
- Buprofezin, 25% WP

## Bacillus Subtilis
- Bacillus subtilis, $1x10^{10}$ CFU/g WP, $8x10^9$ CFU/g SC
Latin American market continued to struggle
by Robert Birkett

Predictions for the trend in the agrochemical market in Brazil last year ranged in drops of 3-6%. It accounts for some 70% of the Latin American market. The latest industry expectation is for a $9 billion market, a considerable fall over the previous three years. Industry analysis saw similar trends prevailing to the prior year with a fall in use of older products, and a rise in use of products focused on the harder-to-control diseases and pests, towards fungicide mixtures and newer herbicides.

However, credit availability conditions were reportedly improving, while Bayer’s Crop Science division reported that it had greatly increased the use of barter in Brazil.

One key indicator could be imports, which account for the majority of pesticides purchased in Brazil. Imports were down some 13% in the first five months of last year, although there was a recovery towards the end of the period.

Registrations
Brazil’s Ministry of Agriculture granted a record 326 registrations for new active ingredients, generic ais, and formulated products in 2017. That came after a four-fold increase the previous year to a then record 326 registrations. However, a 2017 study claimed that the deficit in the registration of pesticides in Brazil was growing at a rate of 45% per year. That compared the amount of registrations with the number of new applications entering the process. The 277 approvals in 2016 were outnumbered by some 400 products that entered the approval process. That study also highlighted that new ai approvals were in single digits.

The registration system has been a thorny issue for the industry. Process times are typically longer than in many other countries, including neighbouring nations.

Discussions have considered amendments to speed up the approval process. In July, a Ministry of Agriculture working group listed 12 measures to change the process. The proposals included the creation of an electronic system to integrate the three bodies responsible for registering agrochemicals in the country: the Ministry of Agriculture, along with the environmental agency, the Ibama, and the national health surveillance agency, the Anvisa. Another recommendation was that the Ministry become the lead authority.

“In October, the Anvisa approved measures to simplify registration and post registration amendments on ais and pesticide products”

Earlier in the year, the Ministry said that it would launch its integrated pesticide system along with the other registration bodies to co-ordinate actions so that the supply of agrochemicals be speeded up. The Ministry drafted proposals to loosen registration rules towards a risk-based approval system and away from hazard criteria. The major proposal was to amend legislation that prohibits the use of certain toxicity pesticides to permit registrations under risk mitigation measures. Meanwhile, the Anvisa held a public audience on proposals that included adopting risk-based cut off criteria.

In October, the Anvisa approved measures to simplify registration and post registration amendments on ais and pesticide products. The regulation proposed a simplified electronic petition and submission procedure for the granting and alteration of registration of certain products. The toxicological assessment would be carried out in the “parent application” and the same class assigned to the simplified petition.

Costa Rica’s Regulation RTCR 484/2016 on synthetic pesticide formulations, ais and other substances for agricultural use was published in January. It was due to enter into force late in the year to be administered by the Ministry’s plant health inspection service, the SFE. Industry association CropLife Latin America anticipated that the reform would end the almost ten years in which it was impossible to register new ais, leaving the country behind in the provision of technology.

Reassessments
In February, the Anvisa issued a public consultation call on its recommendations to alter its pesticide toxicology re-evaluation procedures. It sought new criteria for the selection of ais that should be submitted for re-evaluation. The regulation anticipated the publication of a list of the selected ais for re-evaluation, in advance, in order to provide greater predictability to the public, pesticide manufacturers and users.

The agency claimed that the existing rules no longer addressed the inherent complexity of re-evaluations and presented limitations. The agency has struggled to complete a reassessment programme covering 14 ais since 2008. Some were concluded in 2017.

The Anvisa ordered a six-month phase-out of the carbamate insecticide/acaricide/nematicide, carbofuran, in October for use on bananas, coffee and sugar cane. All other uses were immediately banned. The agency also ordered a three-year phase-out of the herbicide, paraquat, in September. But, in December it issued a resolution to “amend the ban” on paraquat. That followed a Ministry of
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## HERBICIDE
- Flumioxazin
- Isoxaflutole
- Mesotrione
- Butoxydim
- Penoxsulam
- Diclosulam
- Cloransulam
- Flumetsulam
- Florasulam
- Imazethapyr
- Imazamox
- Imazapic
- Imazapyr
- 2,4-D
- 2,4-DB
- 2,4-DP-p
- Dicamba
- Glyphosate
- Glufosinate
- Amicarbazone
- Flucarbazone
- Mesosulfuron
- MCPA
- MCPB
- MCPP-p
- Clopyralid
- Picloram
- Diuron
- Triclopyr
- Bromacil
- Hexazinone
- Clethodim
- Metribuzin
- Fomesafen
- Oxyfluorfen
- Atrazine
- Ametryn
- Bispyribac
- Propanil
- Flufenacet
- Acethloprid
- Metazachlor
- Metolachlor
- S-Metolachlor
- Cyhalofop
- Clodinafop
- Fenoxaprop
- Quinclorac
- Haloxyfop

## INSECTICIDES
- Thiamethoxam
- Clothianidin
- Dinotefuran
- Chlorfenapyr
- Methoxyfenozide
- Indoxacarb
- Pyremtonizine
- Bifenthrin
- Lufenuron
- Profenofos
- Acephate
- Chlorpyrifos
- Imidacloprid
- Acetamiprid
- Ethiprole
- Fipronil
- Diafenthiuron
- Pyriproxyfen
- Methomyl
- Oxamyl
- Abamectin
- Emamectin
- Bifenazate
- Lambda-cyhalothrin

## FUNGICIDES
- Azoxystrobin
- Pyraclostrobin
- Trifloxystrobin
- Picoxystrobin
- Prothioconazole
- Cyproconazole
- Difenconazole
- Epoxiconazole
- Fluazinam
- Boscalid
- Fludioxonil
- Cyprodilan
- TEBUconazole
- Propiconazole
- Isoprothiolane
- Dimethomorph
- Benomyl
- Carbendazim
- Pyrimethanil
- Spiroxamine
- Captan
- Chlorothalonil
- Mancozeb
- Propineb

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Agriculture report that the Anvisa had U-turned and reapproved the herbicide for three years. Nevertheless, grower groups welcomed the amendments as the original order limited use of the herbicide to growers who had already bought supplies meaning a de facto immediate withdrawal. In August, it revealed that the reassessment of glyphosate was not expected to be completed until 2019.

Conclusions on some ais are outstanding. They include glyphosate, lactofen herbicide; the fungicide, thiram, that despite the agency’s deadline of the end of 2017 for the ai; and the acaricide/insecticide, abamectin.

Councillors in Argentina’s third-largest city, Rosario, approved a draft bill to ban the sale and use of glyphosate. The bill forwarded by two councillors called for ban of all uses. It was presented in the days after the UN’s International Agency for Research on Cancer (IARC) classification of the herbicide as “probably carcinogenic”.

The Brazilian Ministry of Agriculture suspended the sale and use of 37 fungicide products for the control of Asian soybean rust (Phakopsora pachyrhizi) in the middle of last year. That followed the suspension at the end of 2016 of 63 fungicides used against the disease. The suspensions followed efficacy evaluations on single ai products in 2016 and combinations in 2017. Registrants have had to exclude recommendation for that use for a period of 120 days from publication of the listed products. The industry’s Fungicide Resistance Action Committee (FRAC) reported developing resistance to succinate dehydrogenase inhibitor (SDHIs) carboxamide fungicides. It identified a mutation allowing increased resistance.

The FRAC noted that performance of such fungicides “remains in general good”, but that for the first time in 2015/16, and more so in 2016/17 in areas of intensive use of SDHIs and where rust pressure was great a fall in efficacy rates was noted.

The Ministry determined which pesticide products should get priority analysis in 2017 at a meeting of the competent authorities. It prioritised 53 products. The major pests/diseases/weeds included soybean rust, as well as whiteflies, white mould, sorghgrass (Digitaria insularis), and earworms (Helicoverpa armigera).

Several Brazilian states extended the emergency controls against earworms for 2018. The government went a step further and approved the insecticide, emamectin benzoate, for the control of the pest on cotton, maize and soybeans. Previously, emergency controls allowed the temporary import and use of emamectin benzoate.

“Monsanto called for Argentine legislation guaranteeing its royalty rights, while it remains in discussions with the government over rights for its soybean technology”

The Uruguayan Ministry of Agriculture withdrew commercial registrations on four ais and placed restrictions on another two. The withdrawn ais were the insecticides, azinphos-methyl, methidathion and methomyl, and the herbicide, atrazine, while restrictions were placed on “certain uses” of parathion-methyl and carbofuran insecticides. Paraguayan regulators sought to eradicate the use of carbaryl insecticide on sesame.

Brazil reported that it had registered 90 formulated pesticide products under the minor crops programme by the middle of last year. The system extrapolates maximum residue limits among crops of the same group, linked to crops for which pesticides already had approvals and that suffered from similar diseases and pests. Registration guidelines were issued in 2014.

GMOS

Argentina approved the sale and use of a stacked herbicide-tolerant soybean line. The Syngenta and Bayer Crop Science developed SYHT0H2 line is tolerant to glufosinate-ammonium and mesotrione herbicides. It was one of just two commercial approvals last year. The second came in December for an Argentine Bioceres group’s affiliate, Indear safflower line producing the enzyme, chymosin. The latter was one of three unnamed GM crops approved as safe for use in food and feed in November. They included a glyphosate herbicide-tolerant alfalfa line with reduced lignin content, and an insect-resistant and glyphosate-tolerant maize line.

The Brazilian biosafety authority, the CTNBio, recommended the approval of ten GM crops in 2017, along with four other non-plant products. In just under 20 years, it has recommended the approval of 72 GM plants. Approvals reached a high of 14 in 2015, and the ten of last year was an increase of one on the previous year. Last year’s included two for cotton, four for maize, three soybean lines and one for sugar cane. An early study found an adoption rate of over 80% in Brazil last year.

Paraguay approved the commercial release of three more GM crops, bringing its total of such approvals to 19, while Uruguay authorised the sale of eight GM plants. They were the country’s first such approvals since 2014.

Monsanto called for Argentine legislation guaranteeing its royalty rights, while it remains in discussions with the government over rights for its soybean technology. The company sought a regulatory framework for it to launch its latest technology, the stacked insect-resistant and glyphosate-tolerant Intacta RR2 Pro (MON87701xMON89788) soybeans. The Argentine government had promised a grain shipment inspection programme to identify the presence of Monsanto technology, and it reported hitting 90% control levels last year.

The Argentine Ministry of Agroindustry “institutionalised” the opening of public comments on biotechnology events through Resolution 4/2017. Comments can be made on GM events that have passed through the second phase evaluations of the Argentine agricultural biotechnology assessor commission, the Conabia.
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Rising exports and glyphosate prices boost Chinese industry

by Sanjiv Rana

China’s pesticide industry overcame two difficult years of export declines by recording a 17.1% rise in pesticide exports to $4,850 million during the first nine months of 2017 compared with the same period during 2016. Double-digit growth in FOB (freight on board) prices for most of the top-exported active ingredients played a part in the increase. Exports during 2016 and 2015 were down 23% and 17%, respectively.

Herbicides accounted for over half (54.2%) of exports during the first three quarters. Some $3,041 million of the category were exported. A 20% increase in the FOB price of glyphosate during 2017 to $4,200/tonne boosted exports. Prices began rising during the middle of the year, coinciding with the start of the second round of environmental verification being conducted by authorities. That was reflected in the financial results of domestic companies, most of which registered double-digit sales as well as profit increases.

Some 90% of glyphosate (around 400,000 tonnes) manufactured in China is exported and the ai accounted for almost 18% of total exports from the country in 2016. Feedback from the Chinese industry suggests that the downturn in glyphosate prices over the previous two years is over, with excess inventory having been liquidated and the industry entering a new cycle of channel replenishment. Increasingly stringent environmental protection supervision is likely to result in the exit of some capacity in China’s glyphosate production, making it more concentrated and efficient.

Prices for the herbicide, paraquat, which is the second-highest exported ai, shot up during the year by 77.8% to $3,200/tonne. An increase of 29.2% in prices for the herbicide, glufosinate-ammonium, to $27,000/tonne bolstered exports. Prices for the ai hit rock bottom in 2016, dropping to under $18,000, close to near cost level.

Insecticides accounted for over a quarter (26.8%) of nine-month exports at $1,502 million. The FOB price for imidacloprid, which was the third-largest exported ai in 2016, almost doubled (+92%) to $36,923/tonne to boost exports. Price increases of over 50% for chlorpyrifos and acephate, both among the top ten exported ais from China, further supported export growth.

“A 20% increase in the FOB price of glyphosate during 2017 to $4,200/tonne boosted exports”

China also ushered in a new set of regulations governing pesticides, which became effective on June 1st. The Regulation on Pesticide Administration contains revised rules that replace the first Regulation that came into place in 1997.

India

In India, as in the past few years, controversy surrounding genetically modified crops held centre stage during 2017. The approval for the commercial cultivation of high-yielding Dhara Mustard Hybrid 11 (DMH-11), which looked imminent in 2016, had not even happened by the end of 2017. The country’s Genetic Engineering Appraisal Committee (GEAC), which cleared the hybrid in 2016, is again examining it after the issue of commercial cultivation was referred back to it by the Environment Ministry. The final approval is to come from the Environment Ministry.

Controversy seems to stem from the fact that it is being touted as the first food crop to be approved in the country, with mustard oil contributing a large part of the vegetable oil used for cooking. That was the reason why a moratorium was imposed upon GM insect-resistant brinjals (aubergines) in 2010. But the claim of GM mustard being the first GM food crop to be commercialised is not entirely true. While mustard contributed to a majority of edible oil production within the country, a sizeable portion of edible oils also comes from cotton seed, over 95% of which comprises GM lines. The GEAC has also pointed out that mustard oil does not contain any proteins, ruling out the probability of oil extracted from DMH-11 or any other future hybrids to have any of the three proteins expressed by the introduced genes.

India has not approved any other GM crop since Bt cotton received the go ahead in 2002.

On the Bt cotton seed front, the Competition Commission of India imposed a fine of Rs 15 million ($230,000) on Monsanto for being too slow in replying to questions in a competition probe against it. The Commission initiated an investigation into Monsanto’s potential abuse of its dominant position as a supplier of GM cotton seeds. The investigation was launched at the behest of domestic seed companies that were taken to court by Monsanto for non-payment of royalties. The company is pursuing legal action challenging the Commission’s probe.

Monsanto decided to sell its branded cotton seed business in India, which included Paras cotton hybrid seeds with GM insect-resistant Bollgard cotton traits, to Indian company...
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Tierra Agotech (Hyderabad). But the company will continue licensing the Bollgard and Bollgard II technologies to around 42 Indian seed companies through its joint venture, Mahyco Monsanto Biotech.

On the agrochemical front, India moved to a new sales tax regime in July. The crop protection industry was not too happy with the move as it imposed an 18% Goods and Services Tax (GST) on pesticides. The excise tax rate before the move was 12.5%. Under the GST tax regime, seeds are exempt from tax, while fertilisers are taxed at 12%. The crop protection industry has been making representations to the government requesting parity with the fertiliser industry.

But despite the perceived setback from the tax, good monsoon rainfall after a couple of erratic seasons during the last two years resulted in industry growth. Most domestic players recorded sales rises during the first three quarters of 2017.

**Australia**

The Australian Pesticides and Veterinary Medicines Authority (APVMA) came in for severe criticism in 2017 by the Australian National Audit Office (ANAO). The APVMA had not achieved greater efficiencies in the delivery of its regulatory activities and the regulatory burden imposed on industry had not been reduced since efficiency reforms were implemented in 2014, the ANAO concluded. While key legislative reforms were implemented by the legislated timeframe of July 2014, the full scope of the reform package had yet to be implemented more than four years since the legislative amendments were developed, the ANAO pointed out.

The APVMA completed just 45% of pesticide registration applications within the statutory timeframes in the 12 months to June 30th 2017. That compared with 57% in fiscal 2016 and 81% in fiscal 2015. The Authority’s interim chief executive officer, Dr Chris Parker, commissioned an independent review of its operational performance to identify the underlying causes for delays in assessments. It was due to be completed by the end of the year. Dr Parker was confirmed as CEO in November having held the interim post since June following the resignation of former CEO Kareena Arthy.

Earlier in the year, a Senate committee report slammed the government’s planned relocation of the APVMA to Armidale, New South Wales from its established site in Canberra, Australian Capital Territory. The Senate’s Finance and Public Administration References Committee called for the move to be halted or at least paused until the Authority had concluded a review of its business model. The Committee raised concerns about the APVMA’s ability to perform its statutory functions in the lead up to and after the relocation of the regulator.

“The Indian crop protection industry was not too happy with the move to a new sales tax regime as it imposed an 18% tax on pesticides”
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M&A review 2017: Crop protection industry getting reshaped

by Sanjiv Rana

The restructuring of the industry that began in 2016 took shape in 2017 when two of three major deals involving the erstwhile Big Six were completed. Those three were: Dow’s merger with DuPont; ChemChina’s acquisition of Syngenta; and Bayer’s proposed acquisition of Monsanto. The divestments resulting from the deals meant that other players not directly involved in the deals ended with enhanced portfolios. These were BASF, FMC, Nufarm and Amvac.

ChemChina/Syngenta
ChemChina’s acquisition of Syngenta was the first deal to be finalised. The process that began in February 2016 with Syngenta’s board of directors recommending the acceptance of ChemChina’s offer valuing it at over $43 billion was completed in June 2017. Before clearing the acquisition, the US Federal Trade Commission (FTC) asked ChemChina to divest the herbicide, paraquat, the insecticide, abamectin, and the fungicide, chlorothalonil, to US company American Vanguard (Amvac). The European Commission added to the requirements by asking ChemChina to divest a “significant” part of Adama Agricultural Solutions’ pesticide business, notably fungicides for cereals, fruits and oilseed rape, herbicides for cereals, maize, sunflowers and vegetables, insecticides for cereals, maize, fruits, oilseed rape and vegetables and its seed treatment products for cereals and sugar beet. Furthermore, a total of 29 of Adama’s generic pesticides under development were to be divested. The total asset divestment from Adama was around $240 million.

In June, Amvac completed the acquisition of abamectin, chlorothalonil and paraquat from Adama in the US. That was followed by Adama acquiring several crop protection products in the US from Syngenta including Syngenta’s chlorothalonil-based fungicides, Bravo, Bravo Weather Stik, Bravo Ultrex and Bravo ZN, as well as the insecticide, Fulfill (pymetrozine), and the cyromazine-based insect growth regulators, Trigard and Armor. The move was perceived to have been taken in order to compensate Adama for the loss of its agrochemical business through divestments in the EU and the US.

In August, Amvac Mexico acquired selective herbicides and contact fungicides sold in Mexico from Syngenta. The sale resulted from Mexican regulatory authority Cofece’s divestment demands in approving the acquisition of Syngenta by ChemChina. The deal included seven branded herbicides for sugar cane and eight fungicide brands. Among the divested products were the herbicides: atrazine and ametryn-based Gesapax H-375, Gesapax Combi 80% WP, Gesapax H Autosuspendible and Paquete Gesapax Gold; and the water-dispersible granule formulation, Krismat WG (trifloxysulfuron-sodium + ametryn). There were also the chlorothalonil-based fungicides, Bravo 720, Bravo Gold and Daconil 2787 75% WP, and the isopyrazam-based Reflect.

There was another round of divestment in November when Nufarm agreed to acquire a portfolio of Syngenta and Adama’s crop protection products in the European Economic Area (EEA) for $490 million plus some $50 million for inventory. The transaction was carried out in accordance with the commitments given to the European Commission. It is expected to be closed in the first quarter of 2018.

The portfolio includes herbicides, fungicides, insecticides, seed treatments and plant
growth regulators sold in 29 European markets. Nufarm will take ownership of some 260 registrations relating to the products and will have access to additional registrations for new products within the regulatory approval process. The portfolio including over 50 crop protection formulations is expected to generate revenues of approximately AUS$250 million (US$196 million) for Nufarm.

The portfolio being acquired by Nufarm had sales of some AUS$286 million (US$224 million) in 2016. Among the main active ingredients are: the fungicide, tebuconazole, accounting for 33% of 2016 sales; the plant growth regulator, trinexapac-ethyl (12% of sales); the herbicide, fluazifop-P-butyl (10%); and the insecticides, beta-cyfluthrin (7%), chlorpyrifos (6%) and imidacloprid (5%).

**DowDuPont**

Dow and DuPont decided to merge in December 2015 and their merger was completed on August 31st 2017 to form DowDuPont. The journey towards the merger was not simple as DuPont had to divest a substantial portion of its crop protection business and most of its worldwide research and development operation to FMC. The assets generated revenues in 2016 of about $1.4 billion. The divestiture was done to satisfy DuPont’s commitments to the European Commission in connection with its conditional regulatory clearance of the merger with Dow.

**FMC** acquired DuPont’s cereal broadleaf herbicides and chewing insect control portfolios, including chlorantraniliprole – trade-marked as Rynaxypyr, cyrantraniliprole – trade-marked as Cyazypyr and indoxacarb. The cereal herbicides were azimsulfuron, chlorsulfuron, ethamsulfuron, flupyradifururon, lenacil, metsulfuron, thifensulfuron, triburon and triflusulfuron. In addition, FMC acquired the DuPont crop protection R&D pipeline and organisation, excluding seed treatments, nematicides and late-stage R&D programmes, which DuPont will continue to develop and bring to market.

The deal will see FMC emerge as a purely agrochemical operation with sales divided evenly between the main geographic regions. The DuPont business is expected to boost FMC’s forecast agrochemical sales for 2017 of some $2,350 million to around $3,800 million. That would represent over 90% of FMC’s total revenues, with the remainder made up of its lithium business. The company plans to create two separate publicly listed agrochemical and lithium businesses in the second half of 2018.

The DuPont acquisition will greatly increase the scale of FMC’s operations in Asia, more than doubling revenues in India and China. It will lead to a more balanced business, with about a quarter of sales taking place in each of the four major sales regions.

About $1,000 million of increased sales from the acquired business will come from chlorantraniliprole and cyrantraniliprole. The active ingredients are patent protected until 2022 and 2024, respectively. Insecticides will make up more than half (51%) of FMC’s sales but the R&D pipeline being acquired from DuPont is skewed towards herbicides and fungicides, which will help to bring greater balance to the company’s revenues over time.

After acquiring the assets from DuPont, FMC also needed to make some divestments to meet European Commission requirements. The Commission approved that deal on condition that FMC divest its sulfonylurea and florasulam herbicide businesses in the European Economic Area (the EU plus Iceland, Liechtenstein and Norway).

**Nufarm** agreed to acquire certain cereal herbicides from FMC for $85 million plus inventory valued at some $5 million. The portfolio comprised eight formulations based on four active ingredients primarily for broadleaf weed control in cereals. In the first full year of Nufarm ownership, the portfolio is expected to generate net sales of some AUS$30 million (US$23.5 million).

In addition to the above divestments, Dow sold a portion of Dow AgroSciences’ hybrid maize seed business in Brazil to the Chinese CITIC Agri Fund for $1,100 million. The deal was agreed to satisfy the Brazilian competition authority, the Code. The divested business includes four maize seed production sites and four research centres, along with a copy of Dow’s Brazilian maize germplasm bank, certain commercial and pipeline hybrids and the Morgan trade mark. The DowDuPont agriculture division will retain Dow’s Brazilian maize germplasm bank and the remainder of its maize seed production sites and research centres, commercial and pipeline maize hybrids and related assets.

**Bayer/Monsanto**

In September 2016, Monsanto accepted Bayer’s offer to purchase the company for $66 billion. Bayer began submitting applications for approval to authorities around the world.

In May, South Africa’s competition authorities conditionally approved the proposed takeover provided Bayer divested its entire global genetically modified herbicide-tolerant Liberty Link technology and its associated glufosinate-ammonium-based Liberty herbicides.

In October, Bayer agreed a deal for BASF to acquire those of its assets for a combined €5.9 billion ($7 billion). The assets generated net sales of some €1.3 billion ($1.5 billion).

As well as the global glufosinate-ammonium and LibertyLink technology, the deal included the sale of essentially all of Bayer's field crop seeds businesses, as well as respective R&D capabilities. The businesses being divested includes the global cotton seed business (excluding India and South Africa), the mainly European oilseed rape seed businesses, canola hybrids in North America under the InVigor brand using the LibertyLink technology, and the soybean seed business. The deal would result in BASF’s entry into the seeds market.

In other jurisdictions where the acquisition is being considered, Bayer has received approval from the Committee on Foreign Investment in the United States (CFIUS). In the EU, the provisional decision deadline for the European Commission’s in-depth inquiry into Bayer’s proposed acquisition of Monsanto has been extended to March 5th 2018. In November, the Brazilian competition authority, the Code, extended its deadline by up to 90 days. In the same month, Russia’s Federal Anti-monopoly Service (FAS) gave Bayer three months to enter into an agreement with a “competent organisation” authorised by the FAS to provide access to its technologies. The FAS found that the acquisition could cause anti-competitive effects and recommended the establishment of “behavioural remedies” aimed at creating conditions for the development of potential competition from Russian companies.

Bayer expects the acquisition to be completed early this year.
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- Spirobiclofen + Abamectin SC
- Spirobiclofen + Bifenazato SC
- Spirobiclofen + Pyridaben SC
- Spiromesifen 25% SC
- Spiromesifen 15% + Pyridaben 25% SC
- Tolfenpyrad 150 g/L EC, 300g/L SC
- Abamectin 5% EC

FUNGICIDE
- Pyraclostrobin 25% SC
- Pyraclostrobin 250g/L EC
- Pyraclostrobin 25% WDG
- Pyraclostrobin 13% + Boscalid 25% WDG
- Pyraclostrobin 23.7% + Epoxiconazole 14.3% SC
- Pyraclostrobin 15% + Difenoconazole 25% SC
- Pyraclostrobin 6.7% + Dinthromorph 12% WDG
- Pyraclostrobin 12% + Thifluazamide 12% SC
- Pyraclostrobin 5% + Metiram 55% DF
- Thifluazamide 240 g/L SC

HERBICIDE
- Cleftine 24% EC
- Ammonium Glyphosate 65% SP
- Glyphosate-isopropylammonium 30% AG
- Fomesafen 260 g/L AS
- Nicosulfuron 40 g/L OD
- Cyhalofop-buty1 100 g/L EW
- Quizalofop-P-ethyl 10% EC
- Fluoroglycofen 10% EC
- Mesotrione 5% + Atazine 20% OD
- Nicosulfuron 25% + Atazine 22.5% OD
- Imazapic 240 g/L AS
- Fluoroazimethy 10% OD
- Mesosulfuron-methyl 30g/L OD

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Mergers, acquisitions and deals in 2017

A monthly listing of the mergers, acquisitions and deals in 2017, with links to the original articles.

JANUARY

- ChemChina subsidiary Adama Agricultural Solutions partnered with the Israeli agri-tech company, AgroWebLab, to introduce decision-support systems into agriculture.
- US biostimulant company Agrinos entered into a distribution partnership with US distributor Van Diest Supply Company.
- US agrochemical company American Vanguard acquired the turf fungicide, FFIII (pentachloronitrobenzene + chlorothalonil + propiconazole), from the plant nutrient group of the US agribusiness operation, The Andersons.
- BASF and Brazil-based start-up facilitator ACE launched the second edition of its programme to aid start-up companies delivering agricultural products and services in Latin America.
- Monsanto and Danish company Novozymes’ BioAg Alliance granted exclusive distribution rights in the US and Canada for its biofungicide, Taegro 2 (Bacillus subtilis var amyloliquefaciens strain FZB24), to Italian agrochemical company Isagro's US business, Isagro USA.
- The Canadian company, Bee Vectoring Technologies, entered into formal agreements with several leading US strawberry growers to conduct large-scale commercial demonstrations of its proprietary growing system for its bee-delivered biofungicide, Vectorite with CR-7 (Clonostachys rosea strain CR-7).
- UK-based enabling technology company Exosect extended its licensing agreement with US company Talc USA to cover the US market. The companies previously entered into a manufacturing and licensing agreement for Exosect’s proprietary Entostat enabled fluency and dust reduction technology covering Canada.
- Monsanto entered into a further licensing agreement with the US non-profit research organisation, Broad Institute of MIT and Harvard, over CRISPR genome editing technology.
- Monsanto entered into a non-exclusive, multi-year, global licensing deal with the Israeli genomics technology company, N R Gene.
- Monsanto formed a collaboration with the US charitable group, Two Blades Foundation, to discover novel sources of genetic resistance to maize diseases.
- Nufarm and US biopesticide company Marrone Bio Innovations (MBI) agreed to develop MBI’s bioinsecticide/acaricide, Grandevo (Chromobacterium subsutsgae strain PRAA4-1T), for Australia and New Zealand.
- Chinese agricultural biotechnology company Origin Agritech and US agricultural biotechnology firm Arcadia Biosciences agreed to co-operate on the development of information on genetically modified maize traits for submission to regulatory authorities in the US, China and elsewhere.
- Platform Specialty Products’ agrochemical business, Arysta LifeScience, entered into a global collaboration with DuPont to develop combination insecticides based on DuPont’s chlorantraniliprole (trade-marked as Rynaxpyr) and Arysta’s acetamiprid.
- BASF and the European Space Agency reached a collaboration agreement to evaluate the best use of satellite-derived data and images for agricultural purposes.
- Bayer CropScience and Norwegian agricultural technology supplies company Yara International agreed a software licensing deal aimed at digital farming solutions.
- The Belgian biological products company, Biological Products for Agriculture (Bi-PA), acquired a 25% stake in Australian company Innovate Ag. Bi-PA will develop and register Innovate Ag’s bioinsecticide, Sero-X (Clitoria ternatea extract), outside Australia and New Zealand.
- Chinese company Lianhe Chemical Technology agreed to acquire Chinese company Nutrichem’s stake in the Brazilian agricultural inputs business, CCAB Agro.
- French co-operative group InVivo acquired Chinese company Nutrichem’s stake in the Brazilian agricultural inputs business, CCAB Agro.

FEBRUARY

- Adama Agricultural Solutions and the US rice company, RiceTec, entered into a collaboration to develop a non-genetically modified system of herbicide-tolerant rice, FullPage Rice Cropping Solution.
- Chinese agricultural biotechnology company Origin Agritech and US agricultural biotechnology firm Arcadia Biosciences agreed to co-operate on the development of information on genetically modified maize traits for submission to regulatory authorities in the US, China and elsewhere.
• Mitsui Chemical’s agrochemical business, Mitsui Chemicals Agro, acquired a 10% stake in Belgian company Belchim Crop Protection.

• Japanese company Mitsui & Co acquired Monsanto’s Latitude (siltiopham) fungicidal seed treatment business. The deal was agreed in January.

• The US agrochemical company, PBI-Gordon, entered into an exclusive partnership with Kumiai Chemical and its sister company, Ihara Chemical, to introduce the herbicide, pyrimisulfan, to the US turf market.

• Swiss inspection, verification, testing and certification company SGS acquired the Moroccan laboratory facilities company, Laboratoire LCA.

• Israeli biopesticide company Stockton agreed a long-term, non-exclusive distribution deal for its Melaleuca alternifolia extract-based biofungicide, Timorex Gold, with Chinese company Chongqing Shurong Crop Science.

• Sumitomo Corporation subsidiary Summit Agro International acquired Japanese marketing rights to the strobilurin fungicide, metominostrobin, from Bayer CropScience. In 2014, Summit Agro acquired the right to manufacture, develop, register and sell the fungicide worldwide except in Japan, where rights were licensed back to Bayer.

• Spanish biological pesticides company Symborg agreed a deal with Japanese CBC group’s European subsidiary, CBC Europe’s bioproducts company, Biogard, for distribution rights in Italy for Symborg’s biofungicide, MycoUp (Glomus iranicum var tenuihypharum).

• The US biopesticide company, Vestaron, entered into a marketing agreement with US greenhouse and nursery specialist OHP for Vestaron’s peptide-based bioinsecticide/acaricide, Spear-O (GS-omega-Htx-Hv1a – trade-marked as Versitude), for use on greenhouse ornamentals.

• BASF entered into a global licensing agreement with the US non-profit research organisation, the Broad Institute of MIT and Harvard, for the use of CRISPR-Cas9 genome editing technology.

• Bayer CropScience and Brazilian co-operative Cooperativo Coproset established a partnership for the installation of industrial seed treatment machines at the co-operative’s seed processing unit.

• Bayer CropScience established a partnership with the Sao Paulo Federal Institute of Education, Science and Technology, the IFSP, in Brazil to back education and develop technologies for agriculture.

• Bayer CropScience and Brazilian seed multiplier Plantar formed a partnership to provide precision farming in the Brazilian Parana state.

• French genomics company Cellectis’ US plant science subsidiary, Calyxt, signed a technology framework agreement with UK investment company Plant Bioscience to expand Calyxt’s intellectual property portfolio.

• Dow AgroSciences entered into a collaboration with pharmaceutical company Eli Lilly and the US Indiana Biosciences Research Institute to generate a shared data platform for the early assessment of potential effects of different molecules on human health and the environment.

• UK-based enabling technology company Exosect reached its first commercial agreement with an unnamed “leading” agrochemical company for a “novel” insecticide formulation using Exosect’s proprietary Entostat technology.

• Dutch bioproducts company Koppert Biological Systems, Brazilian pest management company ISCA Technologies and Dutch remote sensing firm TEC-IB joined forces on a project to control red palm weevils (Rhynchophorus ferrugineus) on date palms in the Middle East.

• Mitsui Chemical’s agrochemical business, Mitsui Chemicals Agro, raised its ownership of the Thai agrochemical company, Sotus International, to 17.7%.

MARCH

• US agrochemical and specialty chemical company Albaugh’s Brazilian operation, Albaugh Brasil, signed a distribution deal with fertiliser supplier P H Soluções to commence sales of its products in the north-east region of Brazil.
• Brazilian agrochemical company Ourofino Agrocia agreed a tie-up with start-up company Perfect Flight to supply pesticide application tools.
• US specialist chemistry company Precision Laboratories entered into a partnership with Monsanto to include its drift reduction agent, Intact, in Monsanto’s Roundup Ready Plus Crop Management Solutions programme in soybeans and cotton.
• Chinese companies Shenzhen Noposion, Jiangxi Heyi and Beijing Nutrichem agreed a three-way collaboration on pesticide product supply, distribution, marketing and e-commerce.
• Israeli biopesticide company Stockton entered into an agreement with New Zealand distributor Grosafe Chemicals to sell Stockton’s biofungicide, Timorex Gold (Melaleuca alternifolia extract), in the country.

APRIL
• US agrochemical company American Vanguard agreed to acquire US rights to three pesticides from ChemChina subsidiary Adama Agricultural Solutions. The move was aimed at satisfying US Federal Trade Commission approval of ChemChina’s acquisition of Syngenta.
• BASF agreed to acquire the US digital agricultural intelligence company, ZedX.
• Bayer CropScience agreed a partnership with anti-malaria fundraiser and educator Goodbye Malaria in southern Africa.
• Belgian company Belchim Crop Protection acquired German agrochemical company Proagro.
• FMC agreed to acquire part of DuPont’s crop protection business, including certain research and development capabilities. The move was aimed at satisfying commitments to the European Commission over its approval of DuPont’s merger with Dow Chemical. The deal was completed on November 1st.
• German agrochemical company Jebagro agreed to acquire part of Israeli biopesticide company Stockton’s generic registrations and distribution rights for various countries in Central and South America.
• Mitsui & Co’s agrochemical distribution company, Certis Europe, and Greek firm K&N Effthymidis’ joint venture, KNE Certis, agreed a distribution deal with Nufarm covering certain Nufarm products in Greece, Bulgaria, Cyprus and Albania.
• Chinese agrochemical company Limin Chemical agreed to acquire a 79.5% stake in Chinese agrochemical firm Hebei Shuangji Chemical.
• Japanese agrochemical company Nihon Noyhayaku’s US subsidiary, Nichino America, agreed a licensing deal with Japanese company Kyoyu Agri for its rice herbicide, pyraclonil.
• Brazilian agrochemical company Ourofino Agrocia signed a partnership deal with the Brazilian Ministry of Science’s innovations funder agency, the Finep, to fund formulation improvements and an industrial facility for water-dispersible granule formulations.
• Chinese agrochemical company Sanonda shareholders approved combining the company with Adama Agricultural Solutions. Both companies are subsidiaries of ChemChina.

MAY
• US agrochemical and specialty chemical company Albaugh partnered with the Colorado Wheat Research Foundation and Limagrain Cereal Seeds to develop a non-genetically modified herbicide-tolerant wheat production system, CoAxium.
• BASF partnered with researchers at the US Louisiana State University’s AgCenter and the plant science company, Horizon Ag, to commercialise its non-genetically modified herbicide-tolerant Provisia rice system.
• Bayer CropScience formed its first partnership through its Bayer ForwardFarming initiative with a Dutch farm, Het Groene Hart.
• Belgian company Belchim Crop Protection agreed to acquire Canadian agrochemical company Engage Agro’s US business, Engage Agro USA.
• French genomics company Cellectis’ US plant science subsidiary, Calyxt, entered into a service agreement with the US University of Minnesota to field test a powdery mildew-resistant spring wheat variety.
• Brazilian fertiliser supplier Grupo Vittia acquired an 80% stake in Brazilian biopesticide company Biovalenos.
• The US agribusiness company, Hartung Brothers Inc, agreed to acquire Syngenta’s seed production operations in the US state of Hawaii on Oahu and Kauai.
• The US biopesticide company, Marrone Bio Innovations, and US agrochemical and specialty chemical company Albaugh’s Mexican distributor, Agri-Star, agreed a distribution deal in Mexico.
• Marrone Bio Innovations entered into a distribution agreement with US company Jet Harvest covering the latter’s fungicide/bactericide/algaecide, Jet-Ag (hydrogen peroxide + peroxyacetic acid).
• Japanese company Mitsui & Co acquired Israeli seed company Top Seeds and renamed it Top Seeds International.
• The UK crop enhancement company, Plant Impact, agreed a research and development collaboration with the Belgian Ghent University granting Plant Impact exclusive development access and a licensing option to a novel group of phosphonamide pyrabactin analogues involved in water loss from plants.
• Chinese company Sinocoag Biochemical R&D agreed to collaborate with Syngenta on the research and development of pyrimidinamine fungicides.
• Syngenta agreed to partner with US applied informatics for agriculture company Iteris to provide growers in Italy with the ClearAg land and soil modelling platform.

JUNE
• Indian specialty chemical company Aarti Industries entered into a multi-year contract with an unnamed global agriculture company to supply a “high-value” agrochemical intermediate for use in herbicides.
• ChemChina subsidiary Adama Agricultural Solutions and US rice company RiceTec agreed to extend their US partnership to develop a non-genetically modified system of herbicide-tolerant rice to
farmers worldwide. The US deal was agreed in February.

- The Canadian agricultural products company, Agrium, acquired Australian company Starpharma Holding’s agrochemical business. The purchase was made through Agrium’s US agrochemical and fertiliser operation, Loveland Products.

- US agrochemical company American Vanguard completed the acquisition of three pesticides from ChemChina subsidiary Adama Agricultural Solutions. The deal was agreed in April to satisfy US Federal Trade Commission approval of ChemChina’s acquisition of Syngenta.

- Platform Specialty Products’ agrochemical business, Arysta LifeScience, acquired the business assets of South African biosolutions supplier Verios.

- Japanese company Mitsui & Co’s US biopesticide subsidiary, Certis USA, acquired the US biopesticide business, LAM International.

- ChemChina completed the acquisition of Syngenta following a process that started in February 2016 with Syngenta’s board of directors recommending the acceptance of ChemChina’s offer valuing it at over $43 billion.

- Danish seed company DLF Seeds agreed to acquire Syngenta’s global sugar beet seed business.

- DuPont seed subsidiary DuPont Pioneer entered into a technology licensing agreement with Irish genomics firm ERS Genomics for CRISPR-Cas genome editing technology.


- The US biopesticide company, Marrone Bio Innovations, engaged the US investor relations firm, M Z Group, to manager a strategic investor relations and financial communications programme across all key markets.

- Monsanto formed a research collaboration with the US artificial intelligence company, Atomwise, aimed at increasing the speed and probability of developing new crop protection products.

- Kumiai Chemical and Indian company P I Industries agreed to form a 50:50 agrochemical joint venture, P I Kumiai, in India.

- Sipcam-Oxon’s US agrochemical business, SipcamAdvan, entered into an agreement with Canadian company Vive Crop Protection to commercialise products for the turf, ornamental and specialty markets containing Vive’s proprietary Allosperse delivery system.

- Sumitomo Chemical and BASF agreed to collaborate on the development of a new unnamed fungicide discovered by Sumitomo.

- The German Tentamus Group acquired a majority stake in the US contract research company, Symbiotic Research.

- Japanese agrochemical company Agro-Kanesho acquired BASF’s imazaquin herbicide business in Japan.

- BASF and Israeli plant genetics and breeding technology company Kaiima Bio-Agritech agreed to collaborate on the discovery of novel herbicide tolerance traits to develop new weed control systems.

- Bayer’s Crop Science division and Israeli company Netafim agreed to co-operate on supplying a drip chemigation system in Mexico.

- Dow AgroSciences agreed with Chinese drone maker DJI Innovation Technology to work on the research and application of crop protection drones and technology.

- Dow Chemical agreed to sell a portion of Dow AgroSciences’ hybrid maize seed business in Brazil to the Chinese CITIC Agri Fund for $1,100 million. The sale was completed in December.

- DuPont seed subsidiary DuPont Pioneer entered into a multi-year collaboration with Israeli biotechnology company Evogene on the development of microbiome-based biostimulant seed treatments for maize.

- US agrochemical company Gowan’s affiliate, Gowan Crop Protection, completed the acquisition of the Chilean company, Agrotechnology, after purchasing a majority stake in the business in 2011.

- Sipcam-Oxon agreed to invest in UK company Eden Research and signed several commercial and developmental crop protection deals.

- Israeli biopesticide company Stockton and Spanish biopesticide firm Seipasa entered into an agreement to introduce a Bacillus
AUGUST
• US agrochemical company American Vanguard subsidiary Amvac Chem entered into a preliminary agreement with US positioning technology company Trimble over Amvac’s Smart Integrated Multi-Product Prescription Application System (SIMPAS).
• US agrochemical company American Vanguard subsidiary Amvac Mexico acquired certain selective herbicides and contact fungicides sold in Mexico from Syngenta (owned by ChemChina).
• BASF and digital connectivity company Proagrica entered into a development and operation agreement to launch the first farm management system interface for BASF’s online platform for crop management decisions, Maglis.
• Bayer’s Crop Science division entered into an exclusive global distribution deal with Italian biostimulants producer Sicit 2000.
• Bayer’s Crop Science division agreed to collaborate with US not-for-profit company Citrus Research and Development Foundation on developing solutions to the bacterial citrus greening disease (Candidatus liberibacter).
• Italian agrochemical company Diachem acquired Dutch biosolutions business Pireco.
• Dow AgroSciences and US biotechnology company M S Technologies granted a non-exclusive licence to Syngenta (owned by ChemChina) for the use of the herbicide tolerance Enlist E3 (DAS44406) trait in genetically modified soybeans.
• Dow AgroSciences entered into an agreement with US plant biotechnology company Arcadia Biosciences to develop and commercialise in North America non-genetically modified wheat with improved nutritional qualities.
• Dow AgroSciences expanded its collaboration with US company TeselaGen Biotecnology on the production of a biological design automation platform aimed at accelerating the discovery of crop protection and seed products.
• DuPont agreed to acquire the US agricultural software and analytics company, Granular.
• DowDuPont was formed on the completion of the merger of Dow AgroSciences parent company Dow Chemical and DuPont.
• Contract research company Eurofins Scientific agreed to acquire Indian CRO Advinus Therapeutics from parent company Tata Group.
• Eurofins Scientific acquired Japanese testing laboratory Japan Analytical Chemistry Consultants.
• Mitsui Chemicals’ agrochemical business, Mitsui Chemicals Agro, agreed with Indonesian agrochemical company PT Agriculture Construction to acquire a 30% stake in its agrochemical distribution subsidiary, PT Agriculture Construction Indonesia.
• Monsanto and Sumitomo Chemical subsidiary Valent USA Corporation again extended their US herbicide and insecticide promotion arrangement for maize, soybean and cotton growers.
• Monsanto entered into a global licensing agreement with the South Korean genome editing company, ToolGen, to use the latter’s CRISPR technology platform to develop agricultural plant products.
• The Israeli biopesticide company, Stockton, granted Syngenta (owned by ChemChina) exclusive rights to commercialise and distribute Stockton’s biofungicide, Timorex Gold (Melaleuca alternifolia extract), for use on edible crops in Australia and New Zealand.
• Sumitomo Chemical agreed to acquire Japanese company Kyowa Hakko Bio’s plant growth regulator business.
• The Canadian company, Vive Crop Protection, entered into a three-year deal with four unnamed biopesticide manufacturers to develop improved versions of their products using Vive’s proprietary Allosperse polymer-based delivery system.

SEPTEMBER
• The US plant biotechnology company, Arcadia Biosciences, signed a global licensing deal with the US non-profit research organisation, Broad Institute of MIT and Harvard, over CRISPR-Cas9 genome editing technology.
• Bayer’s Crop Science division started a five-year research collaboration with the Greek Institute of Molecular Biology and Biotechnology to discover insect control solutions.
• Bayer’s Crop Science division and German technology provider Bosch agreed to collaborate on the development of crop protection spray technology.
• Canadian company Bee Vectoring Technologies agreed a sales and distribution deal with US biological products marketing and distribution company Guardian Soil Solutions in the US state of Florida.
• US agrochemical company Brandt agreed a distribution deal with US landscape products distributor SiteOne Landscape Supply.
• US biopesticide company Marrone Bio Innovations agreed to collaborate on a pilot project with US agricultural technology company AgShift to assess the impact of the use of biopesticides on the quality of fresh produce.
• US biopesticide company Marrone Bio Innovations formed a partnership with Swiss technology transfer company Éléphant Vert to distribute two biopesticides in North Africa.
• The US agricultural technology development investment company, TechAccel, awarded $60,000 to the Donald Danforth Plant Science Center to further the development of a sprayable RNAi-based biopesticide for the control of diamondback moths (Plutella xylostella).
• US chemical distribution company Univar’s wholly owned subsidiary, Univar Brasil, acquired Brazilian agrochemical custom formulation and packaging services company Tagma Brasil.

• UPL acquired a 33.3% stake in Brazilian seed company Serra Bonita Sementes from its Brazilian parent company, SinAgro Produtos Agropecuários.

• Italian biostimulants company Valagro and French crop protection and home garden group SBM Company agreed a distribution deal covering Europe and the US.

• The Japanese federation of agricultural co-operative associations, Zen-Noh, and Mitsubishi Corporation, agreed to form a 50:50 joint venture, tentatively called Z-MC Crop Protection Corporation, for the manufacturing, registration and distribution of agrochemicals.

**OCTOBER**

• The merger of ChemChina subsidiaries Adama Agricultural Solutions and Hubei Sanonda to form Adama was completed. Sanonda shareholders approved the move in April.

• US agrochemical company American Vanguard subsidiary Amvac Chemical acquired the US greenhouse and nursery products specialist, OHP.

• BASF agreed to acquire Bayer’s Crop Science division’s glufosinate-ammonium herbicide and selected seed businesses including genetically modified herbicide-tolerant LibertyLink products.

• Dow AgroSciences (part of DowDuPont) entered into an agreement with US agribusiness company Archer Daniels Midland to provide a “closed loop” system for the cultivation of genetically modified herbicide-tolerant Enlist E3 (Dasg44006) soybeans in the US next year.

• DowDuPont seed business DuPont Pioneer entered into a multi-year partnership with the US non-profit Donald Danforth Plant Science Center on the use of gene editing technology in improved food security crops.

• DowDuPont seed business DuPont Pioneer reached an agreement with the US non-profit research organisation, Broad Institute of MIT and Harvard, to provide non-exclusive licences to their respective intellectual property covering CRISPR-Cas9 genome editing technology.

• Chinese company Hubei Xingfa Chemicals agreed to acquire Hubei Xianlong Chemical Industry’s subsidiary, Inner Mongolia Tenglong Agrochem, in an all-cash deal.

• The US biopesticide company, Marrone Bio Innovations, agreed an exclusive distribution deal with Kenya Biologics to deliver its products in Kenya and Tanzania.

• Japanese agrochemical companies agreed to invest in the Japanese drone company, Nileworks. Investors included Kumiai Chemical, Sumitomo Chemical, Sumitomo Corporation and the national federation of agricultural co-operative associations (Zen-Noh).

• Nufarm agreed to acquire certain off-patent pesticides from ChemChina subsidiary Adama in the European Economic Area. Adama would receive certain products and distribution rights from ChemChina’s Syngenta business. The transaction was carried out in accordance with commitments given to the European Commission related to ChemChina’s acquisition of Syngenta.

• Nufarm and Sumitomo Chemical agreed a long-term extension to a series of global agrochemical collaboration agreements.

• Israeli biopesticide company Stockton and Israeli chemical distributor Lidorr Chemicals built a new biological manufacturing unit at Lidorr’s sister contract manufacturing company Liad Agro’s facility in Jerusalem, Israel for the production of Stockton’s new products.

**NOVEMBER**

• Adama (owned by ChemChina) agreed an agrochemical delivery research and development deal with Dutch crop protection company Ceradis. They intend to supply products based on Adama active ingredients and Ceradis application technology.

• The US non-profit research organisation, the Broad Institute of MIT and Harvard, granted Syngenta (owned by ChemChina) a non-exclusive licence to its CRISPR-Cas9 genome editing technology for agricultural applications.

• DowDuPont entered into a global seed treatment collaboration with Platform Specialty Products’ agrochemical business, Arysta LifeScience.

• US agribusiness company J R Simplot and Spanish company Iden Biotechnology agreed to explore the potential for nutritional enrichment in potatoes.

• Nufarm agreed to acquire certain cereal herbicides in Europe from FMC for $85 million plus inventory valued at some $5 million.

• Swiss inspection, verification, testing and certification company SGS acquired the Canadian seed, grain and soil testing firm, BioVision Seed Research.

• Sumitomo Chemical acquired an 82.9% stake in the Australian pyrethrin insecticide company, Botanical Resources Australia and its affiliated companies. The remaining 17.1% share was acquired by Sumitomo’s US subsidiary, McLaughlin Gormley King.

• Syngenta (owned by ChemChina) agreed to acquire the Argentine seed supplier, Nidera Semillas.

**DECEMBER**

• Adama group and the German pharmaceuticals delivery company, Alrise Biosystems, agreed an R&D deal aimed at sustainable crop protection products.

• The US pre- and post-harvest agrochemical company, AgroFresh, acquired a 75% stake in the Spanish post-harvest products specialist, Tecnidex.

• US agrochemical company American Vanguard subsidiary Amvac Chemical signed an exclusive distribution agreement with Chinese agrochemical company Rotam’s North American business, Rotam North America, to market and sell Rotam’s oxamyl-based insecticide/nematicide, ReTurn XL. 42%.

• Bayer’s Crop Science division signed a research deal with the Brazilian Federal University of Viçosa aimed at improving production in tropical region agriculture.

• Belgian company Belchim Crop Protection’s Italian subsidiary, Belchim
Policy change can have major impacts on the agri-food and bioenergy sectors, as well as on the overall macro economy. In the EU, policy makers must address the direct impact of Brexit as well as the shape of the Common Agricultural Policy post-2020. This will be impacted by the post-2020 EU budget agreement as the EU loses its second largest net contributor.

A host of policy issues – both directly and indirectly impacting agriculture – are being discussed around the world. These involve trade agreements, environmental regulations, climate change and renewable fuels/bioenergy, approach to GMOs.

There is considerable uncertainty about what the new agri-food and bioenergy policies might look like and what they may mean for businesses operating along the value chain. Are you prepared for these changes and how they will impact your business?

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Italia, agreed to distribute several products from French crop protection company De Sangosse in Italy.

• The Australian biotechnology company, Bio-Gene Technology, entered into an extended research collaboration with the Australian state of Queensland’s Department of Agriculture and Fisheries to assess Bio-Gene’s β-triketone-based insecticide, Flavocide (flavesone), against grain storage pests. It also entered into an extended collaboration with the Australian research organisation, the CSIRO, to develop improved manufacturing systems for Flavocide.

• UK biostimulants company Biotechnica agreed a distribution deal with Chinese company Dyacare Bio-Tech for Biotechnica’s organic certified seaweed extract concentrate, Algaflex, in mainland China.

• Japanese company Mitsui & Co’s US biopesticide subsidiary, Certis USA, entered into an agreement with the Colombian Corporation for Agriculture Research, Corpoica, to develop a viral bioinsecticide for the control of fall armyworms (Spodoptera frugiperda).

• Indian company Coromandel International agreed to acquire its parent company EID Parry’s biopesticides business as well as its wholly owned subsidiary, Parry America.

• DuPont (part of DowDuPont) and Sumitomo Chemical agreed a global deal to collaborate on the development, registration and commercialisation of seed-applied technologies for use in key crops around the world.

• Contract research company Eurofins Scientific acquired the US scientific services company, EAG Laboratories.

• Dutch bioproducts company Koppert’s Brazilian subsidiary, Koppert do Brasil Sistemas Biológicos, acquired Brazilian biologicals enterprise BUG Agentes Biológicos.

• US biopesticide company Marrone Bio Innovations (MBI) agreed an exclusive distribution deal with Guatemalan agricultural inputs supplier Disagro for MBI’s biofungicide, Regalia Maxx.

• Mitsui Chemicals Agro and BASF agreed a long-term deal for the commercialisation of Mitsui’s insecticide, broflanilide.

• Japanese company Nippon Soda agreed to acquire the plant health business of US animal health company Zoetis.

• The US-based, UK-listed bioproducts company, Plant Health Care, entered into an evaluation agreement with a fifth major agricultural/seed company for its Innatus 3G peptide technology.

• Syngenta (owned by ChemChina) extended its agreement with US distribution company Gavilon Grain to enable US farmers to plant its genetically modified insect-resistant Duracade (5307) maize in 2018.

• Syngenta (owned by ChemChina) agreed a supply deal with Belgian agrochemical company Globacem for the distribution of Syngenta’s Amistar (azoxystrobin) branded fungicides.
Agrow Adjuvants and Additives 2017

Full Company Profiles | Classification | Selection | Research and Development

Key Insights
- General landscape of the sector
- Advances in adjuvant usage
- Recent patent literature
- Companies, organisations and associations involved in the sector
- Regulatory processes

Gain critical insight into the future market for adjuvants and additives.

This unique fully updated and revised report comprehensively defines the various categories of adjuvants and additives and explains their ‘mode of action’.

Current estimates are the global adjuvants market should grow at a Compound Annual Growth Rate of about 6% over the next few years. The global adjuvant market is set to grow to $3.5 billion by 2021 and almost $3.8 billion by 2022.

The report clearly explains the often complex nomenclature and claimed effects. In addition, advances in the use of adjuvants are covered, together with a review of recent patent literature.

The companies involved in various parts of the adjuvants and additives sector are listed and profiled and include crop protection companies, speciality chemical companies, and specialist adjuvant companies.

There are a number of organisations and associations relevant to the adjuvant sector and these are also listed and profiled.

The regulatory processes for adjuvants in Europe and the US are described.

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New active ingredients registered or launched in 2017

New active ingredients registered or launched in 2017.

<table>
<thead>
<tr>
<th>Company &amp; active ingredient</th>
<th>Use</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FUNGICIDES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BASF</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>fluxapyroxad – trade-marked as Xemium</td>
<td>Cereals</td>
<td>Launched in Spain as Priaxor Pack (with pyraclostrobin), South Africa as Ceriax (with pyraclostrobin &amp; epoxiconazole) &amp; India as Adexar (with epoxiconazole)</td>
</tr>
<tr>
<td><strong>Bayer CropScience</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bixafen</td>
<td>Cotton, barley, sunflowers, soybeans, wheat, canola &amp; chickpeas</td>
<td>Launched in Australia as Aviator Xpro (with prothioconazole), approved in Brazil as Fox Xpro (with prothioconazole &amp; trifloxystrobin) &amp; launched in Argentina as Cripton Xpro (with prothioconazole &amp; trifloxystrobin)</td>
</tr>
<tr>
<td><strong>DuPont (part of DowDuPont)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>oxathiapiprolin (trade-marked as Zorvec)</td>
<td>Approved in EU</td>
<td></td>
</tr>
<tr>
<td><strong>Ishihara Sangyo Kaisha</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>isofetamid</td>
<td>Proposed approval in Australia</td>
<td></td>
</tr>
<tr>
<td><strong>Ishihara Sangyo Kaisha/Sumitomo Corporation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pyriofenone</td>
<td>Cucurbits, caneberries, bushberries, small-fruit climbing vines &amp; low-growing berries</td>
<td>Approved &amp; launched in US as Prolivo 300SC</td>
</tr>
<tr>
<td><strong>Nippon Soda</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cpicarbtrazox</td>
<td>Cucurbits, tomatoes &amp; leafy vegetables</td>
<td>Launched in Japan as Pythilock</td>
</tr>
<tr>
<td><strong>Otsuka AgriTechno Agrio</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>flutianil</td>
<td>Apples, cantaloupes, cherries, cucumbers, grapevines, squash &amp; strawberries</td>
<td>Proposed approval in US as Gatten</td>
</tr>
<tr>
<td><strong>Syngenta (owned by ChemChina)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>benzovindiflupyr (trade-marked as Salatenol)</td>
<td>Cereals</td>
<td>Approved in Ireland &amp; Germany as Elatus Era (with prothioconazole), launched in Italy as Elatus Plus &amp; Elatus Era (with prothioconazole) &amp; launched by DuPont in Brazil as Vessarya (with picoxystrobin)</td>
</tr>
<tr>
<td>isopyrazam (trade-marked as IZM)</td>
<td>Vegetables</td>
<td>Launched in Italy as Reflect</td>
</tr>
<tr>
<td>INSECTICIDES/ACARICIDES/NEMATICIDES</td>
<td></td>
<td></td>
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<tr>
<td>-------------------------------------</td>
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<tr>
<td><strong>Adama Agricultural Solutions (owned by ChemChina)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>fluenzsulfone</td>
<td>Fruit, vegetables &amp; other crops</td>
<td>Approved in Japan, South Korea &amp; Taiwan, proposed approval in Canada Nimitz &amp; proposed approval in Brazil</td>
</tr>
<tr>
<td><strong>BASF/Nihon Nohyaku</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>metaflumizone</td>
<td>Various</td>
<td>Approved in Brazil as Verismo</td>
</tr>
<tr>
<td><strong>Dow AgroSciences (part of DowDuPont)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sulfoxaflor (trade-marked as Isoclast)</td>
<td>Cereals, potatoes, vegetables &amp; orchards</td>
<td>Approved in Ireland &amp; in France as Transform &amp; Closer</td>
</tr>
<tr>
<td><strong>Ishihara Sangyo Kaisha</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cyclaniliprole</td>
<td>Fruit, vegetables, grapevines &amp; tree nuts</td>
<td>Proposed approval in US, Canada &amp; Australia as Cyclaniliprole 50 SL</td>
</tr>
<tr>
<td><strong>Monsanto</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tioxazafen</td>
<td>Maize, soybeans &amp; cotton</td>
<td>Approved &amp; launched in US (subsequently postponed) as NemaStrike &amp; approved in Canada as MON 102133 SC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HERBICIDES/PGRs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BASF</strong></td>
</tr>
<tr>
<td>metazachlor</td>
</tr>
<tr>
<td><strong>Dow AgroSciences (part of DowDuPont)</strong></td>
</tr>
<tr>
<td>florpyrauxifen-benzyl (trade-marked as Rinskor)</td>
</tr>
<tr>
<td>haloxifen-methyl (trade-marked as Arylex)</td>
</tr>
<tr>
<td><strong>Gowan/SDS Biotech</strong></td>
</tr>
<tr>
<td>benzobicyclon</td>
</tr>
<tr>
<td><strong>Ishihara Sangyo Kaisha/Sumitomo Corporation</strong></td>
</tr>
<tr>
<td>tolpyralate</td>
</tr>
<tr>
<td><strong>Syngenta (owned by ChemChina)</strong></td>
</tr>
<tr>
<td>bicyclopyrone</td>
</tr>
</tbody>
</table>
Addressing the complex global regulatory challenges of product registration and compliance

Where regulatory demands continue to increase in complexity, TSG Consulting’s objective is to enable the industry to meet these challenges, and to support the growth and development of new and existing products in Europe, USA, Canada and Asia-Pacific.

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---

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<table>
<thead>
<tr>
<th>Company/Merger</th>
<th>Species</th>
<th>Market Segment</th>
<th>Approval Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AgBiome Innovations/SePRO Corporation</strong></td>
<td><em>Pseudomonas chlororaphis</em> strain AF5009</td>
<td>Food crops, turf &amp; ornamentals</td>
<td>Approved in US as Zio &amp; Howler</td>
</tr>
<tr>
<td><strong>Arysta LifeScience (Platform Specialty Products)</strong></td>
<td><em>Beauveria bassiana</em> strain 147</td>
<td>Ornamental palm trees</td>
<td>Approved in EU</td>
</tr>
<tr>
<td></td>
<td><em>Beauveria bassiana</em> strain NPP111B005</td>
<td>Bananas &amp; ornamental palm trees</td>
<td>Approved in EU</td>
</tr>
<tr>
<td><strong>BASF</strong></td>
<td><em>Beauveria bassiana</em> strain PPRI 5339</td>
<td>Protected horticulture</td>
<td>Approved in Australia as Broadband OD &amp; proposed approval in Canada as Velifer</td>
</tr>
<tr>
<td></td>
<td><em>Bacillus subtilis</em> strain BU1814</td>
<td>Vegetables &amp; field crops</td>
<td>Proposed approval in US as Velondis Flex, Velondis Plus &amp; Velondis Extra (both with <em>B. amyloliquefaciens</em> strain MBI 600)</td>
</tr>
<tr>
<td><strong>BASF/Agrauxine</strong></td>
<td><em>cerevisane</em> [disease resistance activator]</td>
<td>Grapevines</td>
<td>Approved in France as Romeo</td>
</tr>
<tr>
<td><strong>Bayer Crop Science</strong></td>
<td><em>Bacillus firmus</em> [bionematicide]</td>
<td>Cotton, maize &amp; soybeans</td>
<td>Approved in Brazil as Oleage</td>
</tr>
<tr>
<td></td>
<td><em>Bacillus amyloliquefaciens</em> strain QST 713</td>
<td>Grapevines</td>
<td>Proposed approval in Australia as Serenade Opti</td>
</tr>
<tr>
<td></td>
<td><em>Coniothyrium minitans</em> strain CON/M/91-08</td>
<td>Oilseed rape, lettuces, cucumbers, beans &amp; sunflowers</td>
<td>Approved in EU</td>
</tr>
<tr>
<td></td>
<td><em>Paecilomyces lilacinus</em> strain 251</td>
<td>Fruit &amp; vegetables</td>
<td>Approved in Greece as BioAct Prime</td>
</tr>
<tr>
<td><strong>Consume em Verde</strong></td>
<td>BLAD (<em>Banda de Lupinus albus doce</em>) [biofungicide]</td>
<td>Stone fruit</td>
<td>Approved in Australia as Problad Plus</td>
</tr>
<tr>
<td><strong>Eden Research</strong></td>
<td>eugenol/geraniol/thymol [biofungicide]</td>
<td>Grapevines</td>
<td>Approved in France &amp; Portugal as 3AEY &amp; Mevalone</td>
</tr>
<tr>
<td><strong>Ihara</strong></td>
<td><em>Bacillus amyloliquefaciens</em> strain D747</td>
<td>Various</td>
<td>Launched in Brazil as Eco-Shot</td>
</tr>
<tr>
<td><strong>Marrone Bio Innovations</strong></td>
<td><em>Bacillus amyloliquefaciens</em> strain F727</td>
<td>Various including grapevines, leafy greens, potatoes, carrots &amp; onions</td>
<td>Approved in US as Stargus</td>
</tr>
<tr>
<td><strong>MosquitoMate</strong></td>
<td><em>Wolbachia pipiens</em> ZAP strain</td>
<td>Mosquitoes</td>
<td>Approved in US as ZAP Males</td>
</tr>
<tr>
<td>Company</td>
<td>Strain/Species/Extract</td>
<td>Industry/Products</td>
<td>Approval/Status</td>
</tr>
<tr>
<td>------------------------------</td>
<td>----------------------------------------------------</td>
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</tr>
<tr>
<td>National Machinery Traders</td>
<td>Cedarwood oil [repellent]</td>
<td></td>
<td>Proposed approval in Australia as Nature's Botanical Crème (with rosemary oil)</td>
</tr>
<tr>
<td>Novozymes BioAg</td>
<td>Streptomyces lydicus strain WYEC108 [biofungicide]</td>
<td>Vegetables, turf &amp; ornamentals</td>
<td>Approved in Australia as Actinovate</td>
</tr>
<tr>
<td>NuFarm</td>
<td>Aureobasidium pullulans strain DSM 14940 + A pullulans strain DSM 14941 [biofungicide]</td>
<td>Grapevines</td>
<td>Approved in Australia as Botector</td>
</tr>
<tr>
<td>Simbiose Agro</td>
<td>Trichoderma harzianum strain Cepa Simb-T5 [biofungicide]</td>
<td></td>
<td>Launched in Brazil</td>
</tr>
<tr>
<td>Stockton</td>
<td>Melaleuca alternifolia extract [biofungicide]</td>
<td>Cucumbers &amp; courgettes</td>
<td>Approved in Spain as Timorex Gold</td>
</tr>
<tr>
<td>Syngenta (owned by ChemChina)</td>
<td>Pasteuria nishizawae [bionematicide]</td>
<td>Soybeans</td>
<td>Approved in Brazil as Clariva PN</td>
</tr>
<tr>
<td>Valent USA (subsidiary of Sumitomo Chemical)</td>
<td>Bacillus amyloliquefaciens strain PTA-4838 [bionematicide]</td>
<td>Soybeans</td>
<td>Launched in US as Aveo EZ</td>
</tr>
<tr>
<td>Vitae Rural Biotecnologia</td>
<td>Spodoptera frugiperda multiple nucleopolyhedrovirus [bioinsecticide]</td>
<td>Maize</td>
<td>Launched in Brazil as CartuchoVIT</td>
</tr>
</tbody>
</table>
Gain critical insight into the global seed treatments market.

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During 2017, there were 58 crop protection-related plant biotechnology patents released via the US Patent and Trademark Office. The big six crop protection companies claimed 41 filings, accounting for 71% of those filed patents, continuing their dominance of plant biotechnology innovations. Dow AgroSciences (now part of DowDuPont) led with 15, followed by DuPont/DuPont Pioneer (also now part of DowDuPont) with 14, Monsanto with 10, Syngenta and BASF with one each. Universities and research centres have also been the driving forces in 2017, filing nine claims among them, making up 16% of the total.

Sorted by main targeted crops, maize topped with 29 filings (50%), followed by soybeans with eight (14%), cotton with three (5%), tomatoes with two (3%), as well as wheat, rice, potatoes and others.

Sorted by the three main trait categories, insect resistance traits dominated with 32 filings (55%), followed by pathogen resistance traits with 20 (34%) and herbicide tolerance traits with three (5%). There were two filings with stacked traits (3%).

Within herbicide tolerance traits, glyphosate herbicide traits were among most patent applications with two filings, followed by diketonitrile (DKN), tembotrione (TBT), mesotrione (MST) and protoporphyrinogen oxidase (PPO) herbicide resistance traits with one.

Among insect resistance traits, coleopteran resistance traits ranked number one with 15 filings, followed by lepidopteran resistance traits with 12 and hemipteran resistance with one. As usual, Bt maize was the main research target.

Within the pathogen resistance traits, virus resistance was the subject of most filings with six, followed by Fusarium spp diseases with three, and others such as citrus huanglongbing, Pseudomonas syringae, Sclerotinia spp, powdery mildew, Phacopsoraceae spp and Peronopora spp.

In terms of the molecular means used for research, most of the claims were achieved by transgene expression with 53 filings (91%). The rest were obtained by marker assisted breeding and other means.

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* Shuyou Han is a correspondent at Agrow (China). He can be reached by email at hanshuyou@gmail.com.
SICHUAN Leshan Fuhua Tongda Agro-Chemical Technology Co., Ltd., specializes in glyphosate and glufosinate manufacturing, with current annual Glyphosate 95% Tech production capacity of 120,000Mt (glycine route) and Glufosinate 95% Tech capacity of 10,000Mt. It is the largest producer in China and the second largest world-wide. Fuhua is projecting 2,4-D in capacity of 5,000Mt/a each in the next two years by fully utilizing the advantages of its integrated industrial production chain involving phosphorus, brine, glyphosate and silicone, making it to be the most competitive agro-chemical products producer in the field. The factory is located in Leshan city, Sichuan Province, an area with extensive resources for Agro-chemicals manufacturing, and the international sales offices are located in Shanghai and Singapore. Fuhua exports to America, Asia, Africa, Oceania and Europe, with over 2500 employees around the world.

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- DICamba
- 2,4-D

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- Atrazine
- Bisulfate
- Chlorpyrifos

CHEMICALS
- TEBUCONAZOLE
- Thiamefoxam
- Tricyclazole
- Melamine 99.8%
- Methionine
- Hexamine
- Soda Ash
- Ammonium Chloride
- Triple Superphosphate
- DAP
- NPK
- MAP
- Urea

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