Top 20 2018
Includes Agrow Awards
2018 Shortlist
Top 20 Global Agrochemical Companies
Welcome to Our AgroChemEx 2018 Booth (1A17)
Venue: Shanghai World Expo Exhibition and Convention Center
Date: 16-18 October, 2018

Wynca
Committed to become a global leader in the fields of silicon-based new materials and crop protection.

**HERBICIDE 杀草剂**
- Glyphosate
- Glyphosate Isopropylamine Salt
- Glyphosate Ammonium Salt
- Glyphosate Potassium Salt
- Glyphosate Dimethylamine Salt
- Glyphosate-Dicamba
- Glyphosate +2,4-D
- Glyphosate+MCPA
- Glyphosate+Glufosinate
- Glyphosate+Oxyfluorfen
- Diuron
- Quinclorac
- Parquat
- Atrazine
- Nicosulfuron
- Clethodim
- Oxyfluorfen
- Metolachlor
- Dicamba
- Isoproturon
- Propachlor

**FUNGICIDE 杀菌剂**
- Carbendazim
- Thiofanoxate-methyl
- Myclobutanil
- Azoxyphosphor
- Posethyl-Al
- Tebuconazole
- Mancozeb
- Chlorothalonil
- Pyraclostrobin
- Cyproconazole
- Prothioconazole

**CHEMICAL PRODUCT 化工品**
**General Chemical Product**
- 3,4-Dichloroaniline
- 1-Chloro-2-nitrobenzene
- O-Phenylenediamine
- 3,4-dichlorophenyl isocyanate
- Sodium pyrophosphate
- 2,3,7,8-Tetrachlorodibenzo-p-dioxin
- O-O-Dimethyl Phosphate
- Phosphorus Trichloride
- Phosphorus oxychloride
- Sodium tripolyphosphate
- Methyl chloride
- Flame Retardant
  - Tri(2-Chloroethyl)Phosphate (TCP)
  - Tri(2-chloroethyl)phosphate (CEP)
  - Isopropyl triphenylphosphate (IPPP)
  - Agrochemical Adjuvants
  - Agricultural organosilicon adjuvants

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All of the agrochemical companies below the top five multinationals in Agrow’s dollar-based top 20 ranking posted higher sales in 2017, with ten recording double-digit gains. There were substantial increases for all of the Chinese firms. Among the top five, only BASF and Monsanto were ahead of the previous year.

The merger of DuPont and Dow Chemical meant that ChemChina subsidiary Adama became the sixth-largest player in the industry. It was formed from the reverse merger between Chinese company Hubei Sanonda and Adama Agricultural Solutions. Agrochemical sales were up by 5.7%, with volumes up by about 8%. The company saw gains in each of its geographic regions except Europe, where there was a slight dip.

FMC advanced two places in the ranking on its 11.3% sales increase. Revenues were boosted by the acquisition of certain crop protection assets from DuPont (part of DowDuPont) on November 1st 2017. That business added $193 million to fourth-quarter sales, which grew by 40%. Legacy business grew by about 9% for the quarter and 3% for the full year.

Sumitomo Chemical posted an 8.6% rise in sales in yen terms and 4.8% in dollars. Revenues were boosted by higher insecticide sales, especially in Brazil and India, and acquisitions over the previous two years. The company acquired the Australian pyrethrin insecticide company, Botanical Resources, in November 2017 and Indian agrochemical company Excel Crop Care in 2016.

UPL saw an 8.8% sales rise in rupees, which represented an 11.9% increase in dollars. The company saw consistent gains of 6-8% in rupees in each of its regions.

Nufarm posted an 11.1% revenue increase in Australian dollars and a 13.4% rise in US dollars. The company recorded double-digit gains in each of its regions with the exception of Europe where sales were down by nearly 2% in Australian dollars.

Platform Specialty Products’ agrochemical business, Arysta LifeScience, recorded a 4.5% sales increase. The business saw organic growth of 3% and foreign currency gains driven primarily by the Brazilian real and the euro.
Companies below the top 11 have annual agrochemical sales nearly $1 billion less than those above. Six of these are Chinese companies, with all posting double-digit increases in 2017. Beijing Nutrichem, Shandong Weifang Rainbow, Nanjing Red Sun and Jiangsu Yangnong all reported sales increases of more than 30% over the previous year. Sichuan Leshan Fuhua Agro-Chemical Technology had a sales rise of about 18% and Jiangsu Huifeng Agrochemical some 28%.

The only Japanese companies in the lower half of the ranking were again Kumiai Chemical and Nissan Chemical. Both recorded double-digit increases in yen, with Kumiai’s revenues being boosted by the merger with its sister company, Ihara Chemical.

Italy-based Sipcam-Oxon returned to the ranking with an 8.2% sales increase in euros, which represented a 15% dollar gain.

<table>
<thead>
<tr>
<th>2017 (2016) ranking</th>
<th>Company</th>
<th>$ million</th>
<th>Reported currency million</th>
<th>% change $</th>
<th>% change reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (1) Syngenta³</td>
<td>9,244 (9,571)</td>
<td>$9,244</td>
<td>($9,571)</td>
<td>-3.4</td>
<td>-3.4</td>
</tr>
<tr>
<td>2 (2) Bayer Crop Science⁴</td>
<td>8,713 (8,810)</td>
<td>€7,403</td>
<td>(£7,961)</td>
<td>-1.1</td>
<td>-7.0</td>
</tr>
<tr>
<td>3 (3) BASF</td>
<td>6,704 (6,163)</td>
<td>€5,696</td>
<td>(£5,569)</td>
<td>+8.8</td>
<td>+2.3</td>
</tr>
<tr>
<td>4 (-) DowDuPont⁵</td>
<td>6,100 (6,162)</td>
<td>6,100</td>
<td>(6,162)</td>
<td>-1.0</td>
<td>-1.0</td>
</tr>
<tr>
<td>5 (5) Monsanto⁶</td>
<td>3,727 (3,514)</td>
<td>3,727</td>
<td>(3,514)</td>
<td>+6.1</td>
<td>+6.1</td>
</tr>
<tr>
<td>6 (7) Adama⁷</td>
<td>3,259 (3,084)</td>
<td>3,259</td>
<td>(3,084)</td>
<td>+5.7</td>
<td>+5.7</td>
</tr>
<tr>
<td>7 (9) FMC</td>
<td>2,531 (2,275)</td>
<td>$2,531</td>
<td>($2,275)</td>
<td>+11.3</td>
<td>+11.3</td>
</tr>
<tr>
<td>8 (8) Sumitomo Chemical⁸</td>
<td>2,487 (2,373)</td>
<td>¥279,484</td>
<td>(¥257,393)</td>
<td>+4.8</td>
<td>+8.6</td>
</tr>
<tr>
<td>9 (10) UPL⁹,⁰</td>
<td>2,296 (2,051)</td>
<td>Rs 150,600</td>
<td>(Rs 137,920)</td>
<td>+11.9</td>
<td>+8.8</td>
</tr>
<tr>
<td>10 (11) Nufarm¹⁰</td>
<td>2,234 (1,969)</td>
<td>Aus$2,943</td>
<td>(Aus$2,648)</td>
<td>+13.4</td>
<td>+11.1</td>
</tr>
<tr>
<td>11 (12) Arysta LifeScience¹¹</td>
<td>1,897 (1,816)</td>
<td>$1,897</td>
<td>($1,816)</td>
<td>+4.5</td>
<td>+4.5</td>
</tr>
<tr>
<td>12 (13) Beijing Nutrichem</td>
<td>923 (685)</td>
<td>Yuan 6,122</td>
<td>(Yuan 4,549)</td>
<td>+34.8</td>
<td>+34.6</td>
</tr>
<tr>
<td>13 (15) Shandong Weifang Rainbow</td>
<td>780 (565)</td>
<td>Yuan 5,174</td>
<td>(Yuan 3,751)</td>
<td>+38.2</td>
<td>+37.9</td>
</tr>
<tr>
<td>14 (17) Nanjing Red Sun</td>
<td>724 (526)</td>
<td>Yuan 4,799</td>
<td>(Yuan 3,496)</td>
<td>+37.5</td>
<td>+37.3</td>
</tr>
<tr>
<td>15 (14) Kumiai Chemical¹²</td>
<td>693 (577)</td>
<td>¥77,817</td>
<td>(¥62,549)</td>
<td>+20.1</td>
<td>+24.4</td>
</tr>
<tr>
<td>16 (16) Sichuan Leshan Fuhua Agro-Chemical Technology</td>
<td>651 (552)</td>
<td>Yuan 4,318</td>
<td>(Yuan 3,664)</td>
<td>18.0 +</td>
<td>+17.8</td>
</tr>
<tr>
<td>17 (-) Jiangsu Yangnong¹¹</td>
<td>587 (401)</td>
<td>Yuan 3,891</td>
<td>(Yuan 2,664)</td>
<td>+46.3</td>
<td>+46.1</td>
</tr>
<tr>
<td>18 (-) Sipcam-Oxon</td>
<td>531 (461)</td>
<td>€451</td>
<td>(£417)</td>
<td>+15.0</td>
<td>+8.2</td>
</tr>
<tr>
<td>19 (19) Nissan Chemical⁸¹⁴</td>
<td>517 (479)</td>
<td>¥58,138</td>
<td>(£51,952)</td>
<td>+8.0</td>
<td>+11.9</td>
</tr>
<tr>
<td>20 (18) Jiangsu Huifeng Agrochemical¹⁵</td>
<td>515 (403)</td>
<td>Yuan 3,416</td>
<td>(Yuan 2,679)</td>
<td>+27.7 +</td>
<td>+27.5</td>
</tr>
</tbody>
</table>

¹ unless otherwise stated; ² converted using average annual exchange rates for 2017 and 2016; ³ owned by ChemChina - excludes lawn and garden sales of $681 million in 2017 and $663 million in 2016, and seed and trait sales of some $2,826 million in 2017 and $2,657 million in 2016;
⁴ excludes environmental science sales of $671 million in 2017 and $598 million in 2016, and seed and trait sales of $1,503 million in 2017 and $1,356 million in 2016; ⁵ pro forma results as if DuPont and Dow Chemical merged on January 1st 2016 - excludes seed and trait sales of some $8,200 million in 2017 and $7,810 million in 2016; ⁶ year ended August 31st 2016/17 - excludes seed and trait sales of $10,913 million in 2017 and $9,988 million in 2016; ⁷ owned by ChemChina – figures restated following merger with Hubei Sanonda; ⁸ year ended March 31st 2017/18; ⁹ excludes seed and chemical sales of Rs 23,720 million in 2017 and Rs 23,000 million (restated) in 2016; ¹⁰ year ended July 31st 2016/17 - excludes seed technology sales of Aus$369 million in 2017 and Aus$344 million in 2016; ¹¹ part of Platform Specialty Products; ¹² year ended October 31st 2016/17; ¹³ 2016 figure restated; ¹⁴ includes undisclosed veterinary product sales; ¹⁵ includes intermediates.
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S-METOLACHLOR  BENTAZONE
MESOTRIONE      FLORASULAM
ISOXAFLUTOLE    PROTHIOCONAZOLE

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www.zschem.com
Syngenta’s crop protection sales increased by 6.5% to $5,280 million in the first half of 2018 compared with the same period during the previous year. “It is pleasing that we have returned to growth, on an adjusted basis, in all regions, particularly in Brazil where a solid performance was achieved after several years of declining sales,” says chief executive officer Erik Fyrwald.

Including revenues from the “controls” business, which comprises turf and landscape and professional pest management products, sales were up by 6.5% (3% at constant exchange rates) to $5,532 million. The company points out that the growth occurred despite anti-trust divestments reducing sales by 2%. Syngenta, along with ChemChina’s other subsidiary, Adama, divested a portfolio of crop protection products to Nufarm for a total agreed transaction value of $490 million, of which Syngenta’s share was $95 million.

Seed and trait sales slipped by 0.9% to $1,628 million. Including flowers, which comprise flower seeds, cuttings and young plants, revenues were almost flat (-0.2%) at $1,751 million. The company points out that sales were 5% higher when adjusted for the 2017 sugar beet divestment. In 2017, Syngenta divested its global sugar beet seeds business to Danish seed company DLF Seeds.

**Syngenta’s sales by business segment ($ million)**

<table>
<thead>
<tr>
<th>1st half ended June 30th</th>
<th>2017</th>
<th>% change</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop protection</td>
<td>4,960</td>
<td>+6.5</td>
<td>5,280</td>
</tr>
<tr>
<td>Seed &amp; traits</td>
<td>1,643</td>
<td>-0.9</td>
<td>1,628</td>
</tr>
<tr>
<td>Controls</td>
<td>233</td>
<td>+8.2</td>
<td>252</td>
</tr>
<tr>
<td>Flowers</td>
<td>111</td>
<td>+10.8</td>
<td>123</td>
</tr>
<tr>
<td><strong>Total¹</strong></td>
<td>6,920</td>
<td><strong>+4.8</strong></td>
<td>7,249</td>
</tr>
</tbody>
</table>

¹ may not add up due to elimination of inter-segment sales.
Total sales for the first half, including crop protection, seeds, flowers and controls, grew by 4.8% to $7,249 million. Earnings before interest, tax, depreciation and amortisation (EBITDA) were up 1.5% to $1,700 million. The growth was 8% excluding divestments, Syngenta says. The EBITDA margin, however, dropped by 0.8 percentage points to 23.4%.

**Product category sales**

Herbicides remained the company’s largest category, accounting for 40.2% of first-half crop protection revenues. Sales were up 2.6% to $2,124 million. Sales of selective herbicides grew by 1.5% to $1,716 million. Non-selective products boosted revenues, rising by 7.7% to $408 million.

Fungicides made up 32.8% of crop protection sales. The category increased by 3.4% to $1,730 million.

Insecticides provided a boost to crop protection revenues. Sales were up by 21.3% to $901 million.

Seedcare (seed treatment business) sales grew 10.3% to $459 million during the first two quarters.

**Regional sales**

Europe, Africa and the Middle East (EAME) was the company’s largest region, accounting for 40.1% of six-month crop protection and seed sales. Revenues grew by 3% to $2,910 million. Sales were up by 7% when adjusted for divestments.

North America made up 31.5% of six-month crop protection and seed sales, which grew by 2.1% to $2,280 million. Revenues grew by 4% on adjusted basis, with “solid” sales in the US more than offsetting a slow start in Canada due to cold weather. Seeds sales were 2% higher on an adjusted basis, despite reduced maize and soybean acres.

First-half sales in Latin America rose by 12.5% to $1,016 million. Volumes in crop protection improved, particularly in Brazil. Solid growth in crop protection more than offset reduced seed sales, which were impacted by reduced second season maize acres.

In Asia Pacific, sales were up 8.9% to $1,043 million, driven by strong performances across both the crop protection and seeds portfolios.

Stronger first half sales of crop protection and vegetable seeds in China, helped drive growth of 13.6%.

---

**Syngenta’s crop protection sales by category ($ million)**

<table>
<thead>
<tr>
<th>1st half ended June 30th</th>
<th>2017</th>
<th>% change</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herbicides</td>
<td>2,070</td>
<td>+2.6</td>
<td>2,124</td>
</tr>
<tr>
<td>Selective</td>
<td>1,691</td>
<td>+1.5</td>
<td>1,716</td>
</tr>
<tr>
<td>Non-selective</td>
<td>379</td>
<td>+7.7</td>
<td>408</td>
</tr>
<tr>
<td>Fungicides</td>
<td>1,673</td>
<td>+3.4</td>
<td>1,730</td>
</tr>
<tr>
<td>Insecticides</td>
<td>743</td>
<td>+21.3</td>
<td>901</td>
</tr>
<tr>
<td>Seedcare</td>
<td>416</td>
<td>+10.3</td>
<td>459</td>
</tr>
<tr>
<td>Other</td>
<td>58</td>
<td>+13.8</td>
<td>66</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>4,960</td>
<td>+6.5</td>
<td>5,280</td>
</tr>
</tbody>
</table>

**Syngenta’s crop protection and seed sales by region ($ million)**

<table>
<thead>
<tr>
<th>1st half ended June 30th</th>
<th>2017</th>
<th>% change</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe, Middle East &amp; Africa</td>
<td>2,825</td>
<td>+3.0</td>
<td>2,910</td>
</tr>
<tr>
<td>North America</td>
<td>2,234</td>
<td>+2.1</td>
<td>2,280</td>
</tr>
<tr>
<td>Latin America</td>
<td>903</td>
<td>+12.5</td>
<td>1,016</td>
</tr>
<tr>
<td>Asia Pacific</td>
<td>958</td>
<td>+8.9</td>
<td>1,043</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>6,920</td>
<td>+4.8</td>
<td>7,249</td>
</tr>
</tbody>
</table>
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- Environmental Fate / ¹⁴C Studies
- Field Studies
- Regulatory Affairs

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Bayer agchem sales up 32% in second quarter

Boosted by the acquisition of Monsanto, Bayer’s Crop Science division recorded a 32.2% increase in crop protection sales to €2,419 million ($2,801 million at the current rate) in the second quarter of 2018.

Herbicides were the dominant category and grew by 38.7% (+12.7% on currency- and portfolio-adjusted bases) to €1,028 million ($1,190 million). Fungicides led growth with a sales increase of 41.2% (+47.8%) to €709 million ($821 million). Insecticides were up by 28.5% (+37.1%) to €329 million ($381 million).

Sales of “other” products increased by 6.6% (+12.7%) to €353 million ($409 million).

Bayer has modified its reporting structure following the Monsanto acquisition. The SeedGrowth business, which included seed treatment sales, has been included in the “Other” category. “Other” also includes cotton seed and traits as well as all other crop seeds and traits except maize, soybeans and vegetables, which will be reported as three separate strategic business entities within Crop Science.

### Bayer Crop Science 2nd-qtr sales by category (€ million)

<table>
<thead>
<tr>
<th>Segment</th>
<th>2017 ($ million)</th>
<th>% change</th>
<th>2018 ($ million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop protection</td>
<td>1,830 (2,119)</td>
<td>+32.2</td>
<td>2,419 (2,801)</td>
</tr>
<tr>
<td>Herbicides</td>
<td>741 (858)</td>
<td>+38.7</td>
<td>1,028 (1,190)</td>
</tr>
<tr>
<td>Fungicides</td>
<td>502 (581)</td>
<td>+41.2</td>
<td>709 (821)</td>
</tr>
<tr>
<td>Insecticides</td>
<td>256 (296)</td>
<td>+28.5</td>
<td>329 (381)</td>
</tr>
<tr>
<td>Other</td>
<td>331 (383)</td>
<td>+6.6</td>
<td>353 (409)</td>
</tr>
<tr>
<td>Seed and traits</td>
<td>141 (163)</td>
<td>+190.1</td>
<td>409 (474)</td>
</tr>
<tr>
<td>Environmental Science</td>
<td>192 (222)</td>
<td>-4.7</td>
<td>183 (212)</td>
</tr>
<tr>
<td><strong>Crop Science</strong></td>
<td><strong>2,163 (2,504)</strong></td>
<td><strong>+39.2</strong></td>
<td><strong>3,011 (3,486)</strong></td>
</tr>
</tbody>
</table>

1 at the current rate; 2 includes some seed sales within Other; 3 includes seed treatment and cotton and other seeds and traits, but excludes maize, soybeans and vegetables; 4 includes maize, soybeans and vegetable seed and traits.
Bayer’s 2nd-qtr sales\(^1\) by region (€ million)

<table>
<thead>
<tr>
<th>Segment</th>
<th>2017 ($ million)(^2)</th>
<th>% change</th>
<th>2018 ($ million)(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe/Middle East/Africa</td>
<td>908 (1,051)</td>
<td>+8.6</td>
<td>986 (1,142)</td>
</tr>
<tr>
<td>North America</td>
<td>865 (1,001)</td>
<td>+24.4</td>
<td>1,076 (1,246)</td>
</tr>
<tr>
<td>Asia Pacific</td>
<td>459 (531)</td>
<td>+10.7</td>
<td>508 (588)</td>
</tr>
<tr>
<td>Latin America</td>
<td>-69 (-80)</td>
<td>na</td>
<td>441 (511)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,163 (2,504)</strong></td>
<td><strong>+39.2</strong></td>
<td><strong>3,011 (3,486)</strong></td>
</tr>
</tbody>
</table>

\(^1\) total Crop Science sales including seed and traits and Environmental Science; \(^2\) at the current rate.

Bayer Crop Science first-half sales by category (€ million)

<table>
<thead>
<tr>
<th>Segment</th>
<th>2017 ($ million)(^1)</th>
<th>% change</th>
<th>2018 ($ million)(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop protection(^2)</td>
<td>4,522 (5,235)</td>
<td>+8.9</td>
<td>4,925 (5,702)</td>
</tr>
<tr>
<td>Herbicides</td>
<td>1,653 (1,914)</td>
<td>+10.6</td>
<td>1,828 (2,116)</td>
</tr>
<tr>
<td>Fungicides</td>
<td>1,289 (1,492)</td>
<td>+11.5</td>
<td>1,437 (1,664)</td>
</tr>
<tr>
<td>Insecticides</td>
<td>557 (645)</td>
<td>+12.7</td>
<td>628 (727)</td>
</tr>
<tr>
<td>Other(^1)</td>
<td>1,023 (1,184)</td>
<td>+0.9</td>
<td>1,032 (1,195)</td>
</tr>
<tr>
<td>Seed and traits(^4)</td>
<td>422 (489)</td>
<td>+54.0</td>
<td>650 (753)</td>
</tr>
<tr>
<td>Environmental Science</td>
<td>339 (392)</td>
<td>-12.4</td>
<td>297 (344)</td>
</tr>
<tr>
<td><strong>Crop Science</strong></td>
<td><strong>5,283 (6,117)</strong></td>
<td><strong>+11.1</strong></td>
<td><strong>5,872 (6,798)</strong></td>
</tr>
</tbody>
</table>

\(^1\) at the current rate; \(^2\) includes same seed sales within Other; \(^4\) includes seed treatment and cotton and other seeds and traits, but excludes maize, soybeans and vegetables; \(^4\) includes maize, soybeans and vegetable seed and traits.

Bayer’s first-half sales\(^1\) by region (€ million)

<table>
<thead>
<tr>
<th>Segment</th>
<th>2017 ($ million)(^2)</th>
<th>% change</th>
<th>2018 ($ million)(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe/Middle East/Africa</td>
<td>2,370 (2,744)</td>
<td>-3.8</td>
<td>2,280 (2,640)</td>
</tr>
<tr>
<td>North America</td>
<td>1,907 (2,208)</td>
<td>+7.2</td>
<td>2,045 (2,368)</td>
</tr>
<tr>
<td>Asia Pacific</td>
<td>825 (955)</td>
<td>+6.2</td>
<td>876 (1014)</td>
</tr>
<tr>
<td>Latin America</td>
<td>181 (210)</td>
<td>+270.7</td>
<td>671 (777)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,283 (6,117)</strong></td>
<td><strong>+11.1</strong></td>
<td><strong>5,872 (6,798)</strong></td>
</tr>
</tbody>
</table>

\(^1\) total Crop Science sales including seed and traits and Environmental Science; \(^2\) at the current rate.

Total quarterly sales for the Crop Science division, which also includes seed and traits as well as the Environmental Science businesses, rose by 39.2% to €3,011 million ($3,486 million). That included €543 million ($629 million) from the June 7th 2018 acquisition of Monsanto on a prorated basis, and €468 million ($542 million) from the businesses divested to BASF in August. A 22% increase in volumes and 25% from portfolio effect more than offset a price decline of 0.6% and a negative currency impact of 7.2%. The Monsanto acquisition has “considerably expanded” Bayer’s herbicide business as well as its seed business, particularly for maize and soybeans. In terms of regions, the transaction primarily expanded its business in North America and Latin America.

On a currency- and portfolio-adjusted basis, total sales increased by 21.4%. This was partly attributable to significantly higher provisions for crop protection product returns recognised in the prior-year quarter due to high inventory levels in Brazil, the company says. Inventories there have normalised as a result of the significantly higher provisions attributable to the weak prior-year quarter in India. Fungicide sales were boosted by a product launch in China. Bayer also “considerably expanded” business in herbicides, especially in Australia.

North America was the company’s largest region during the quarter. The region led growth as well, with revenues increasing by 24.4% to €1,076 million. The contribution of the acquired Monsanto business was €284 million. Sales fell by 1.9% on a currency- and portfolio-adjusted basis, mainly because of “intensified competitive pressure” on herbicides in the US and a “significant decline” in the Environmental Science business. These effects were partly offset by higher license revenues for soybean seeds in the US.

In the Asia Pacific region, sales increased by 10.7% (+10.2%) to €508 million. The contribution of the acquired Monsanto business was €38 million. The company registered double-digit-percentage sales increases in insecticides, particularly because of the weak prior-year quarter in India. Fungicide sales were boosted by a product launch in China. Bayer also “considerably expanded” business in herbicides, especially in Australia.

Latin America brought in €441 million of revenues. Bayer recorded negative revenues of €69 million Latin America in the second quarter in 2017 due to product returns in Brazil. That was because at the end of the harvest season, regular stocktaking revealed high channel inventories of crop protection products in the Brazilian market. The contribution by the acquired Monsanto business was €155 million in the second quarter of 2018. After a negative currency effect of €25 million, the currency- and portfolio-adjusted sales increase was largely attributable to the significantly higher provisions for crop protection product returns recognised in Brazil in the prior-year period due to high inventory levels. Excluding Brazil, the other countries in the region registered a slight increase overall.

First half
Crop protection revenues in the first half rose by 8.9% to €4,925 million. Total sales for the Crop Science division increased by 11.1% to €5,872 million. The businesses being divested accounted for €1,359 million of the figure. An 8.6% increase in volumes...
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Herbicide
- Nicosulfuron 97% TC
- MCPA 95% TC
- MCPA-2-ethylhexyl 93% TC
- Glyphosate 95% TC
- Fenoxaprop-P-ethyl 97% TC
- Glyphosate-ammonium 98% TC
- Glufosinate-ammonium 95% TC
- Quinclorac-P-ethyl 97% TC
- Tribenuron-methyl 97% TC

Insecticide
- Imidacloprid 95%TC, 97% TC
- Fipronil 95% TC, 97% TC
- Cartap 98% TC
- Lambda-cyhalothrin 97% TC
- Chlorpyrifos 97% TC
- Phosalone 95% TC
- Pirimicarb 95% TC
- Dichlorvos 94% TC

Fungicide
- Kresoxim-methyl 96%TC
- Carboxim 98% TC
- Thiophanate-methyl 97% TC
- Flusilazole 95% TC

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Tel: 0086-551-55343120/65646155 Fax: 0086-551-55343133
E-mail: wx@huaxingchem.com; trade@huaxingchem.com http://www.huaxingchem.com
### Herbicides
- 2,4-D 406 g/L + Plocoram 103 g/L SL
- 2,4-D, 98% TC, 806 g/L SL
- Clethodim, 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, 96% TC, 41% AS
- Mefenacet 60% + Ethoxysulfuron 10% WDG
- Metamitron 98% TC, 700 SC, 75% WDG
- Metsulfuron-methyl, 98% TC, 60% DF
- Plocoram TC
- Rimsulfuron, 98% TC, 25% WDG

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

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

### Bacillus Subtilis
- Bacillus subtilis, $1 \times 10^{11} \text{CFU/g WP, } 8 \times 10^5 \text{CFU/g SC}$
Bayer Crop Science results (€ million)

<table>
<thead>
<tr>
<th>2nd quarter</th>
<th>2017 ($ million)¹</th>
<th>% change</th>
<th>2018 ($ million)¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>2,163 (2,504)</td>
<td>+39.2</td>
<td>3,011 (3,486)</td>
</tr>
<tr>
<td>EBITDA²</td>
<td>233 (270)</td>
<td>+51.5</td>
<td>353 (409)</td>
</tr>
<tr>
<td>EBIT³</td>
<td>117 (135)</td>
<td>+31.6</td>
<td>154 (178)</td>
</tr>
</tbody>
</table>

First half

| Sales       | 5,283 (6,117)    | +11.1    | 5,872 (6,798)    |
| EBITDA²     | 1,324 (1,533)    | +0.8     | 1,334 (1,544)    |
| EBIT³       | 1,087 (1,259)    | -3.8     | 1,046 (1,211)    |

¹ at the current rate; ² earnings before interest, tax, depreciation and amortisation; ³ earnings before interest and tax.

Bayer Crop Science pro forma sales¹ (€ million)

<table>
<thead>
<tr>
<th>2nd quarter</th>
<th>2017 ($ million)²</th>
<th>% change</th>
<th>2018 ($ million)²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop protection</td>
<td>2,713 (3,141)</td>
<td>+10.2</td>
<td>2,990 (3,462)</td>
</tr>
<tr>
<td>Herbicides</td>
<td>1,402 (1,623)</td>
<td>+3.7</td>
<td>1,454 (1,683)</td>
</tr>
<tr>
<td>Fungicides</td>
<td>502 (581)</td>
<td>+41.4</td>
<td>710 (822)</td>
</tr>
<tr>
<td>Insecticides</td>
<td>256 (296)</td>
<td>+28.5</td>
<td>329 (381)</td>
</tr>
<tr>
<td>Other</td>
<td>553 (640)</td>
<td>-10.1</td>
<td>497 (575)</td>
</tr>
<tr>
<td><strong>Crop Science</strong></td>
<td><strong>5,013 (5,804)</strong></td>
<td><strong>+1.6</strong></td>
<td><strong>5,095 (5,899)</strong></td>
</tr>
</tbody>
</table>

First half

| Crop protection | 5,811 (6,728) | -0.5     | 5,782 (6,694) |
| Herbicides      | 2,954 (3,420) | -6.7     | 2,757 (3,192) |
| Fungicides      | 1,290 (1,494) | +11.4    | 1,437 (1,664) |
| Insecticides    | 559 (647)     | +12.2    | 627 (726)      |
| Other           | 1,008 (1,167) | -4.7     | 961 (1,113)    |
| **Crop Science** | **11,980 (13,870)** | **-6.2** | **11,243 (13,017)** |

¹ as if both the acquisition of Monsanto and the associated divestments had taken place as of January 1st 2017; ² at the current rate.

and 10.3% from portfolio effect more than offset a price decline of 0.5% and a negative currency impact of 7.3%.

The Europe/Middle East/Africa region was the company’s largest during the first half, despite it being the only region that experienced a decline. Total revenues were down by 3.8% to €2,280 million mainly as a result of unfavourable weather conditions in western Europe and regulatory changes in France. Sales shot up in Latin America mainly because of the normalisation of inventory during the second quarter.

**Earnings**

Earnings before interest, tax, depreciation and amortisation (EBITDA) rose by over half (+51.5%) to €353 million. But EBITDA before special items increased by 99.1% to €631 million. That was mainly because in the prior-year quarter, earnings had been negatively impacted in Brazil by the recognition of provisions for product returns, impairment losses on receivables and inventory write-offs. The newly acquired business also provided a positive contribution of €70 million to earnings. By contrast, earnings were diminished by a negative currency effect of €52 million (excluding the acquired business).

EBIT grew by 31.6% to €154 million. Included in this figure is additional depreciation and amortisation in the amount of €55 million resulting from re-measurements or the first-time recognition of assets in the course of the purchase price allocation. Earnings were also held back by special charges of €280 million, primarily in connection with the acquisition of Monsanto. Of this figure, €126 million pertained to the sale of acquired inventories that were re-measured at fair value in the course of the purchase price allocation.

**Pro forma results**

Bayer has also presented sales on a pro forma basis to better show the operational business development for the combined business of Crop Science and Monsanto. In this context, sales are presented as if both the acquisition of Monsanto and the associated divestments had taken place as of January 1st 2017.

Pro forma crop protection revenues for the second quarter were up 10.2% to €2,990 million. Double-digit growth was recorded for fungicides and insecticides. Maize seed and traits increased by 7.7% on a currency-adjusted basis. The rise was predominantly attributable to a one-time effect and associated higher license revenues in Brazil, as well as expanded volumes due to a late start to the season in North America and eastern Europe. Soybean seed and traits were down by 14.8% (-6.6% on adjusted basis), primarily as a result of a challenging market environment in the US. This was partly offset by the higher level of market penetration achieved by genetically modified dicamba and glyphosate herbicide-tolerant Roundup Ready 2 Xtend in North America and by insect-resistant and herbicide-tolerant Intacta RR2 PRO in Latin America.

Pro forma crop protection revenues dipped 0.5% to €5,782 million.

**Outlook**

Bayer forecasts Crop Science sales of slightly more than €14 billion ($16.2 billion). That includes a positive sales effect of more than €5 billion ($5.8 billion) from the acquired business as well as a negative effect of approximately €1 billion ($1.2 billion) from the divestment of selected businesses to BASF.

The company continues to expect a mid-single-digit percentage increase on a currency- and portfolio-adjusted basis. As for EBITDA before special items, the company anticipates an increase by a mid-twenties percentage. On a currency-adjusted basis, Bayer expects an increase of around 30%.
DowDuPont’s agchem sales up 7% in Q2

DowDuPont’s crop protection sales rose by 7% to some $1,900 million in the second quarter of 2018. Volume gains were associated with recovered sales from weather-related delays in the first quarter and an increase of nearly 20% in insecticide sales. Currency gains offset a decline in regional prices.

Seed sales grew by 35% to some $3,900 million due to volumes recovered from weather-related planting in the northern hemisphere. Higher prices were associated with new maize hybrids and A-series soybeans.

The company’s agriculture business recorded a 24.7% increase in revenues to $5,730 million. There was a 20% rise in volumes, a 4% gain from prices and product mix, and a 1% boost from currency effects.

Earnings before interest, tax, depreciation and amortisation (EBITDA) grew by 44.6% to $1,685 million. That was attributed to volume growth in North America and the Europe, Africa and Middle East region, along with higher seed selling prices, cost synergies and currency effects. Those gains were partly offset by lower expected plantings in North America, higher soybean royalty costs, increased research and development expenditure and investments in digital agriculture.

Six months
Crop protection sales rose by 3% while seed sales fell by 3% in the first six months of the year. Agriculture sector revenues fell by 1.1% to $9,538 million. A 2% gain from currency effects and 2% from price and product mix effects were more than offset by a 5% drop in volumes due to reduced planted areas in North America and Brazil.

Insecticide sales were 17% higher than in the first half of 2017. Operating EBITDA dropped by 1.9% to $2,576 million due to higher product costs, reduced plantings and investments to support product launches. Those factors were partly offset by cost synergies, currency effects and sales gains in crop protection.

Outlook
DowDuPont forecasts mid-single-digit percentage growth for its agriculture division in the third quarter and overall second half. The company expects gains from crop protection product launches, pricing and increased penetration of its genetically modified insect-resistant Optimum Leptra (MIR162xMON810xTC1507) maize. EBITDA is expected to rise in the “mid-20s” percentage in the third quarter due to sales gains, cost synergies and lower expenses, partly offset by unfavourable currency effects and portfolio changes.

Full-year sales are forecast to be flat, with gains from product launches and pricing being offset by reduced plantings in North America and Latin America. Operating EBITDA is expected to rise by a mid-single-digit percentage due to pricing, cost synergies and lower costs, partly offset by higher royalty expenses and investments in R&D and digital platforms.

DowDuPont expects to spin off its agriculture business as Corteva Agriscience on June 1st 2019.

DowDuPont’s agriculture segment results ($ million)

<table>
<thead>
<tr>
<th>2nd qtr ended June 30th</th>
<th>2017</th>
<th>% change</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>4,595</td>
<td>+24.7</td>
<td>5,730</td>
</tr>
<tr>
<td>Operating EBITDA¹</td>
<td>1,165</td>
<td>+44.6</td>
<td>1,685</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Six months</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>9,644</td>
<td>-1.1</td>
<td>9,538</td>
</tr>
<tr>
<td>Operating EBITDA¹</td>
<td>2,626</td>
<td>-1.9</td>
<td>2,576</td>
</tr>
</tbody>
</table>

¹ earnings before interest, tax, depreciation and amortisation.

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HERBICIDE

Flumioxazin
Isoxaflutole
Mesotrione
Butojoxynil
Pinoxylol
Dicoxylo
Cloransulam
Flumetsulam
Florasulam
Imazethapyr
Imazamox
Imazapyr
Sulfentrazone
Carfentrazine
Amicarbazone
Flucarbazone
Mesosulfuron
2,4-D
2,4-DB
2,4-DP-p
Dicamba
Glyphosate
Glufosinate
Bentazon
Clomazone
Fluroxypyr
MCPA
MCOP
MCP++p
Clopyralid
Picloram
Diuron
Triclopyr
Bromacil
Hexazinone
Clothodim
Metribuzin
Fomesafen
Oxyfluorfen
Atrazine
Ametryn
Bispyribac
Propanil
Flufenacet
Acetol
Metazachlor
Metolachlor
S-Metolachlor
Cyhalofop
Clodinafop
Fenoxaprop
Quinalofop
Haloxyfop

INSECTICIDES

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

FUNGICIDES

Azoxystratin
Pyraclostrobin
Trifloxystrobin
Picoxystratin
Prothioconazole
Cyproconazole
Difenconazole
Epoxiconazole
Fluazinam
Bosalid
Fludioxonil
Cyprodinil
Tebuconazole
Propiconazole
Isoprothiolane
Dimethomorph
Benomyl
Carbendazim
Pyrimethanil
Spiroxamine
Captan
Chlorothalonil
Mancozeb
Propineb

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Global Presence  Branches in More Than 40 Countries  4 Production Bases in Worldwide
BASF recorded a 1.6% decline in crop protection revenues to €1,501 million ($1,748 million at the current rate) during the second quarter of 2018. A 4% growth in volumes, especially in South America and Asia, and a 1% price rise could not offset the 7% decline due to currency effects.

Earnings before interest, tax, depreciation and amortisation (EBITDA) for the quarter fell by 4.5% to €321 million. EBIT before special items grew by 2.2% to €278 million. Despite the negative currency effects, a more favourable product mix lifted the average margin. This more than compensated for the slight increase in fixed costs.

Combined with the 6.8% decline in the first quarter, the results brought a six-month revenues decline of 4.5% to €3,229 million. EBITDA was down 13.9% to €802 million. EBIT before special items decreased by €104 million to €701 million.

Sales in Europe decreased “slightly” as a result of negative currency effects. These could not be completely offset by higher volumes, particularly for herbicides in central and eastern Europe.

In North America, revenues were considerably lower than in the second quarter of 2017. Sales were reduced by lower volumes, particularly of fungicides in Canada due to the late start to the season and higher inventories with the company’s customers. Negative currency effects also contributed to the decline in sales.

BASF recorded “considerable” sales growth in Asia thanks to higher sales volumes of fungicides in India and China, among other countries, and a slight increase in prices in the region. Currency effects had a negative impact on sales.

Sales in the region South America, Africa, Middle East rose considerably, mainly due to higher volumes. Growth in volumes in Brazil was driven by fungicides and insecticides, while Argentina saw particularly strong increases in herbicide volumes. Significantly negative currency effects had an offsetting effect, the company says.

**Bayer assets acquisition**

BASF plans to conclude in August, the acquisition of the businesses it agreed to purchase from Bayer. The agreement was part of the divestments Bayer had to make as conditions for its acquisition of Monsanto. Some 4,500 Bayer employees will be transferred to BASF. The acquisition represents a strategic complement to BASF’s activities in the areas of crop protection, biotechnology and digital farming, the company says. It also marks BASF’s entry into the seeds business.

BASF’s crop protection results (€ million)

<table>
<thead>
<tr>
<th>2nd qtr ended June 30th</th>
<th>2017 ($ million)</th>
<th>% change</th>
<th>2018 ($ million)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sales</strong></td>
<td>1,526 (1,777)</td>
<td>-1.6</td>
<td>1,501 (1,748)</td>
</tr>
<tr>
<td><strong>EBITDA</strong></td>
<td>336 (391)</td>
<td>-4.5</td>
<td>321 (374)</td>
</tr>
<tr>
<td><strong>EBIT</strong> before special items</td>
<td>272 (317)</td>
<td>+2.2</td>
<td>278 (324)</td>
</tr>
<tr>
<td><strong>EBIT</strong></td>
<td>270 (314)</td>
<td>-4.1</td>
<td>259 (302)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6 months</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sales</strong></td>
<td>3,381 (3,937)</td>
<td>-4.5</td>
<td>3,229 (3,760)</td>
</tr>
<tr>
<td><strong>EBITDA</strong></td>
<td>931 (1,084)</td>
<td>-13.9</td>
<td>802 (934)</td>
</tr>
<tr>
<td><strong>EBIT</strong> before special items</td>
<td>805 (937)</td>
<td>-12.9</td>
<td>701 (816)</td>
</tr>
<tr>
<td><strong>EBIT</strong></td>
<td>801 (933)</td>
<td>-15.6</td>
<td>676 (787)</td>
</tr>
</tbody>
</table>

1 at the current rate; 2 earnings before interest, tax, depreciation and amortisation; 3 earnings before interest and tax.
Last December the European Food Safety Authority (EFSA) and the European Chemicals Agency (ECHA) issued a joint, harmonized, draft guidance document: Guidance for the identification of endocrine disruptors in the context of Regulations (EU) No 528/2012 and (EC) No 1107/2009. The guidance laid out the scientific criteria necessary to evaluate the endocrine disrupting potential of plant protection products (PPP) and biocidal products (BP). The guidance is limited to humans and non-target vertebrates (mammals, fish, birds, amphibians and reptiles) and only covers estrogen, androgen, thyroid and steroidogenesis (EATS) modalities.

This webinar will discuss key aspects of the guidance document, including new key phrases like EATS mediated parameters and sensitive to but not diagnostic of EATS mediated parameters, new considerations like maximum tolerated concentrations in ecotoxicology studies, relevant OECD tests and potential strategies for assembling and collecting the necessary data for assessment. We will also walk through the assessment strategy flow chart using the new terminology and understanding where and how to use some of the proposed test methods.

Speaker
Ronald C. Biever
Chief Scientific Officer
Smithers Viscient

Mr. Ronald C. Biever has been with Smithers Viscient for over 30 years working in nearly every science and business-related aspect throughout his tenure. Ron started with mesocosm and large-scale field studies, and then headed up analytical services and some environmental fate and metabolism programs before becoming the Director of Ecotoxicology Services. Mr. Biever served as Vice President of North American Operations for five years before taking on the role of Chief Scientific Officer. He has been involved in the endocrine disruptor field since 1996 including working on numerous commercial opportunities and the SETAC Pellston Workshop™, Guidance for Environmental Hazard and Risk Assessment Approaches for Endocrine-Active Chemicals (GEHRA): A Case Studies Approach.

To listen to this webinar please go to
Plant metabolism studies including confined rotational crop studies, are an important component of the registration of plant protection products. The USA, EU and Japan all require such testing as required by the following guidelines of the U.S. EPA Residue Chemistry Guidelines, OPPTS 860.1300: Nature of the Residue – Plants, Livestock. The OECD 501 (Metabolism in Crops) and OECD 502 (Metabolism in Rotational Crops) guidelines satisfy the requirements of the EU regulation EC 1107/2009 and the data requirements for active ingredients (EU 283/2013) and in Japan, the Ministry of Agriculture, Forestry and Fisheries of Japan (12-Nousan-No. 8147, 2-4-1, 2000) are followed. Similarly, translocation studies in plants have also become increasingly important in the safety assessment of these products, especially in relationship to pollinator insects.

During this webinar, case studies will be presented to demonstrate the functional conduct of such studies from planting to dosing and to harvesting and analysis. Selected results of the case studies using tomato plants and other crops will be presented and their potential impact on risk assessment of plant protection products discussed.

Speakers

Sean McLaughlin
Research Director
Smithers Viscient

Mr. Sean McLaughlin has been with Smithers Viscient for 27 years, including four years in Europe conducting standard/non-standard environmental fate and metabolism studies, and has been the company’s Radiation Safety Officer in both Europe and the United States. Mr. McLaughlin has participated in multiple plant metabolism and confined rotational crop studies, provided support in formulation preparation for field and greenhouse studies, and conducted the applications for greenhouse exposures. He also supported rodent and avian ADME studies in a similar capacity, and participated in a pesticide plant uptake ring test using a hydroponic-like test system using a wheat species.

Thea Cooper
Study Director
Smithers Viscient

Ms. Thea Cooper has been working in contract research for 13 years. She obtained her MSci in Chemistry at the University of Nottingham in the United Kingdom, and is a Member of the Royal Society of Chemistry. She was previously at Covance as a research analyst in the environmental fate and plant metabolism department and progressed through the laboratory to study supervisor. In her current role at Smithers Viscient she serves as a Study Director for environmental fate and plant metabolism studies.

Christopher Lewis
Senior Scientist
Smithers Viscient

Dr. Christopher Lewis has worked in contract research for more than 30 years and has a wealth of experience in the conduct of environmental fate, plant metabolism, and livestock studies. He obtained his BSc in Physiology and Biochemistry, and PhD in animal metabolism at the University of Reading in the United Kingdom. Dr. Lewis continued his work in animal metabolism at Reckitt and Colman for nine years before transferring to contract research. He worked previously at Hazleton Laboratories and Covance before joining Smithers Viscient as a senior scientist and consultant specialising in environmental fate and plant metabolism.

To listen to this webinar please go to https://event.on24.com/wcc/r/1777741/5E419EC38EDBA3A32592C52BA888D65F?partneref=proof
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Confirmed speakers include
David Esdaile (Citoxlab)  
Euros Jones (ERM)  
Jean-Pierre Busnardo (DowDuPont)  
Nick Pyke (FAR, NZ)  
Chris Hartfield (NFU)  
Ludovic Bonin (ARVALIS, Institut du végétal)  
Hans Mattar (ECCA)  
Zahid Mehmood (TSG Consulting)  
Mike Carroll (Arysta LifeScience)  
Johan Axelman (Swedish Chemicals Agency)  
Selwyn Wilkins (Fera Science Ltd)  
Dave Bench (Chemicals at Health and Safety Executive)  
Henry Dieudonne-Demaria (Defra)  
Dr Martyn Griffiths (Bayer Crop Science)  
Dr Gerco Hoogeweg (Waterborne Environmental, Inc)

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Adama sales up 9% in Q2

ChemChina subsidiary Adama recorded a 9.2% increase in revenues to $1,023 million in the second quarter of 2018. Excluding the negative impact of hedge positions for European currencies created in 2017, sales were up by 10.6% to $1,036 million, the company points out. Adama points to 6.2% volume growth, driven by continued demand for differentiated products and market share gains in all key regions. Quarterly agrochemical sales are not disclosed.

Earnings before interest, tax, depreciation and amortisation (EBITDA) dipped by 0.8% to $188 million. Excluding the European hedge impact, EBITDA would have increased by 5.9% to $201 million. EBIT fell by 2.2% to $136 million. Excluding the hedge impact, EBIT would have grown by 7% to $149 million.

Agrochemical sales rose by 10.3% to $1,905 million in the first six months of the year. Total revenues were up by 10% to $2,045 million. Excluding hedging, sales grew by 12.1% to $2,084 million. EBITDA fell by 2.1% to $379 million (or up 7.9% to $417 million without hedging) and EBIT was down by 3.5% to $273 million (or up 10.1% to $311 million).

Regional sales
Sales in Europe rose by 5.4% in the second quarter and were 0.7% lower in the six-month period at constant exchange rates (CER). Without hedging, sales were up by

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>% change</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sales</strong></td>
<td>937</td>
<td>+9.2</td>
<td>1,023</td>
</tr>
<tr>
<td>EBITDA(^1)</td>
<td>190</td>
<td>-0.8</td>
<td>188</td>
</tr>
<tr>
<td>EBIT(^2)</td>
<td>139</td>
<td>-2.2</td>
<td>136</td>
</tr>
<tr>
<td><strong>Six months</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sales</td>
<td>1,859</td>
<td>+10.0</td>
<td>2,045</td>
</tr>
<tr>
<td>Agrochemicals</td>
<td>1,727</td>
<td>+10.3</td>
<td>1,905</td>
</tr>
<tr>
<td>EBITDA(^1)</td>
<td>387</td>
<td>-2.1</td>
<td>379</td>
</tr>
<tr>
<td>EBIT(^2)</td>
<td>283</td>
<td>-3.5</td>
<td>273</td>
</tr>
</tbody>
</table>

\(^1\) earnings before interest, tax, depreciation and amortisation; \(^2\) earnings before interest and tax.
9.8% and 4.9%, respectively. Growth was driven by higher volumes, partly offset by softer pricing in regional currencies. The recovery in the second quarter completely made up for the late start to the season as a result of the extended winter in the first quarter, bringing half-year revenues in line with last year. Severe drought in northern Europe towards the end of the second quarter reduced the use of fungicides and insecticides.

North American sales increased by 10.4% in the quarter and by 11.8% in the first half at CER. Strong demand in the US drove volume growth, supported by a generally stronger pricing environment and exacerbated by industry-wide supply shortages. Canada delivered a “strong” performance, with growth across the portfolio despite high channel inventories and dry weather conditions, which impacted fungicide sales.

In Latin America, sales grew by 22.5% in the second quarter and by 21.8% in the first half at CER. The strong performance was driven by significant volume growth and product launches, alongside stronger pricing across most countries in the region. The company introduced the fungicide, Cronnos (picoxystrobin + tebuconazole + mancozeb), for the control of Asian soybean rust (*Phakopsora pachyrhizi*) in Brazil. It is expected to make a meaningful contribution to growth in the second half of the year.

The Asia Pacific region saw a sales decrease of 5.7% for the quarter and growth of 6.2% for the first half at CER.

### Adama’s sales by region ($ million)

<table>
<thead>
<tr>
<th>Region</th>
<th>2nd qtr ended June 30th</th>
<th>2017</th>
<th>% change</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>287</td>
<td>2017</td>
<td>+7.5</td>
<td>309</td>
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<tr>
<td>North America</td>
<td>192</td>
<td>2018</td>
<td>+11.1</td>
<td>213</td>
</tr>
<tr>
<td>Latin America</td>
<td>150</td>
<td>2017</td>
<td>+14.7</td>
<td>172</td>
</tr>
<tr>
<td>Asia Pacific</td>
<td>171</td>
<td>2018</td>
<td>-1.8</td>
<td>168</td>
</tr>
<tr>
<td>China</td>
<td>74</td>
<td>2018</td>
<td>+19.6</td>
<td>88</td>
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<tr>
<td>India, Middle East &amp; Africa</td>
<td>138</td>
<td>2018</td>
<td>+17.7</td>
<td>162</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>937</strong></td>
<td><strong>2018</strong></td>
<td><strong>+9.2</strong></td>
<td><strong>1,023</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Region</th>
<th>Six months</th>
<th>2018</th>
<th>% change</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>686</td>
<td>2018</td>
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<td>702</td>
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<tr>
<td>North America</td>
<td>361</td>
<td>2018</td>
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<td>407</td>
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<tr>
<td>Latin America</td>
<td>266</td>
<td>2018</td>
<td>+16.8</td>
<td>311</td>
</tr>
<tr>
<td>Asia Pacific</td>
<td>319</td>
<td>2018</td>
<td>+11.6</td>
<td>356</td>
</tr>
<tr>
<td>China</td>
<td>127</td>
<td>2018</td>
<td>+36.6</td>
<td>173</td>
</tr>
<tr>
<td>India, Middle East &amp; Africa</td>
<td>226</td>
<td>2018</td>
<td>+19.4</td>
<td>270</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,859</strong></td>
<td><strong>2018</strong></td>
<td><strong>+10.0</strong></td>
<td><strong>2,045</strong></td>
</tr>
</tbody>
</table>

1 includes non-agrochemicals.

The decline in the second quarter was primarily due to the severe drought in Australia and Indonesia, which was partly offset by strong growth in China and elsewhere, as well as price increases across the region. Thailand, Vietnam, South Korea and the Philippines delivered strong sales growth, supported by favourable weather conditions.

In India, the Middle East and Africa, quarterly sales grew by 20.8% and half-year sales by 19.4% at CER. There was significant volume growth and substantial price increases, with generally favourable weather conditions. The company points to an outstanding performance in India. Adama continued to grow strongly in Turkey, notably in the sugar beet sector. Sales growth in Israel was driven partly by a strong performance from the recently introduced nematicide, Nimitz (fluensulfone).
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1999-2019
The 2018 BCPC Congress in Brighton on 13-14 November addresses current issues in the EU Regulatory environment. Additionally it provides insights into the related agricultural and political landscape and the impact of the resultant regulatory and farming practice on growers, food production and public goods.

Inevitably, Brexit implications feature strongly in the opening sessions. These feature talks on the wider implications for UK crop production, as encapsulated in the theme of this year’s event. This builds on the event’s objective, to broaden the range of topics to provide information on policy changes, both for the regulatory community and for the whole arable farming industry.

The plenary presentations will be of particular interest to those wanting to get up-to-date on the possible impact of environmental and pesticide regulatory policy, including the changes anticipated in the UK agricultural subsidy regime.

On 12 September, UK Environment Secretary Michael Gove set out post-Brexit policy to invest in the environment and take back control for farmers after almost 50 years under EU rules. During his presentation, Henry Dieudonne-Demaria (Defra) will review Government priorities for the future of environmental land management. He will outline how Brexit and the 25 Year Environment Plan are likely to change policy, the risks and the opportunities, as well as the various impacts on agricultural regulation and practice.
Following on, Dave Bench (UK Health and Safety Executive) will provide the latest information on progress in forming the post-leave UK agrochemical regulatory policy, including outcomes of the recent Defra consultation.

Nick Pyke, recently retired CEO of the Foundation for Arable Research, the New Zealand arable levy organisation, will outline how industry and regulators have worked together to develop agricultural production with appropriate management of agrochemicals and cropping in a small, non-subsidised market. He will allude to the impact of the sudden and total withdrawal of farm subsidies in New Zealand, and the lessons learned from this.

Glyphosate has had a temporary reprieve in the EU, but is still threatened by politically motivated elements. Ludovic Bonin (ARVALIS) will discuss technical and economic aspects of a possible withdrawal of glyphosate in France. The presentation will review current solutions with their technical, agronomic and economic consequences. He will also detail new strategies, which have been tested on systems impacted by this possible withdrawal, such as no-till.

Pesticide regulatory policy has, not surprisingly, been one of the controversial issues since the referendum took place. Many see pesticide regulation as an ideal candidate for changes, though with a wide divergence of views on what post-Brexit changes should be. Future UK regulation needs to be fit for purpose, protecting both the environment and the public and providing effective support for productive and competitive agriculture. Chris Hartfield (NFU) will look at how Brexit may change crop protection for UK farmers and growers and what opportunities the overall Brexit deal may bring.

The focus of the afternoon will appeal to stakeholders interested in a regulatory affairs update and regulatory science, including Dr Martyn Griffiths’ (Bayer SAS) presentation on key industry initiatives to improve the transparency of regulatory studies submitted by industry in Europe.

The EU’s REFIT exercise was initiated in mid-2017 and the first results of that evaluation are expected in the autumn. In parallel, we have seen a number of other initiatives which look at the implementation of the EU’s legislative framework for pesticides, especially in the European Parliament. Euros Jones’ (ERM) presentation will look at some of the key points coming out of the evaluations and will consider the potential impact on future legislative changes.

Mike Carroll (Arysta LifeScience) will examine the barriers to implementing a data call-in system in the EU. For many years data call in systems have been proposed as a solution to some of the difficulties of the EU active substance review process for plant protection products. These systems have been used in the USA and Canada particularly, and also in Australia and Brazil. A data call-in system requires confidence in the regulator. This is accepted in North America but is not currently in the EU. The implementation of a data call-in system in the EU would put the regulator at risk since taking a regulatory position on an active substance assumes that the regulator has almost perfect knowledge. Given the contingent nature of the regulatory process and the contrived randomness of requirements in terms of content and time of submission, implementation of a data call in system for the EU is unlikely.

This subject is likely to be aired on day two of the Congress, which will again include the highly popular, interactive and informative Chemicals Regulation Division (CRD) workshop. The workshop will cover issues related to CRD’s role within the EU regulatory regime. It will also look at Brexit-related vision and activity on agrichemical regulation in relation to our future trading relationship with the EU and the rest of the world, together with the emerging UK environmental policy covered in the previous day’s plenary session.

Delegates attending the BCPC Congress are encouraged to join a drinks reception on Monday 12 November from 6.30-7.30pm at the Hilton Metropole Hotel, Brighton. There will also be a dinner arranged by the AAB which will be taking place after the drinks reception at the Mercure Brighton Seafront Hotel.

If you would like further information on the BCPC Congress 2018, taking place on 13-14 November, please visit: www.bcpccongress.org or call +44 (0) 1423 863 522 or email: enquiries@tsgeforum.com
FMC agchem sales up 98% in Q2

The acquisition of certain crop protection assets from DuPont (part of DowDuPont) last year largely boosted FMC’s agrochemical sales, which rose by 98.1% to $1,154.4 million in the second quarter of 2018. FMC acquired the business on November 1st 2017. On a pro forma basis, sales were up by 8%, with gains in all major geographic regions, particularly for the insecticide segment.

Sales in North America rose by 8% on a pro forma basis to $342 million. The company saw volume growth for acquired products and strong demand for new herbicides. Revenues also benefited from increased plantings of wheat, cotton, and rice.

Asian sales grew by 6% to $319 million. FMC recorded double-digit growth in India from rice insecticides and in China from rice herbicides. However, business was impacted by extreme drought conditions in Australia.

Sales in the Europe, Africa and Middle East region were up by 3% to $294 million. The company saw market share gains from acquired insecticides, with insecticides and herbicides outperforming fungicides. Poor weather conditions adversely affected demand in northern and central Europe.

Latin American business grew by 21% to $199 million. There was strong demand for FMC’s legacy business herbicides and insecticides, and there was market growth in Mexico. The company also benefited from low channel inventories in Brazil.

Earnings before interest, tax, depreciation and amortisation (EBITDA) more than tripled to $343.5 million. Earnings were $14 million above the mid-point of the prior guidance range, FMC points out. The company forecast second-quarter EBITDA of $315-345 million when presenting first-quarter figures. EBITDA represented 29.8% of revenues in the second quarter of 2018 compared with 19.5% in the same period in 2017.

Agrochemical sales in the first half of the year more than doubled to $2,262.3 million and EBITDA more than tripled to $699.9 million.

Outlook

FMC forecasts third-quarter agrochemical revenues of $870-930 million and fourth-quarter sales of $980-1,100 million. EBITDA is expected to amount to $195-215 million in the third quarter and $275-315 million in the last three months of the year. Full-year sales are forecast at $4,100-4,300 million, representing some 9% growth on a pro forma basis. Full-year EBITDA is expected to reach $1,170-1,230 million.

<table>
<thead>
<tr>
<th>2nd qtr ended June 30th</th>
<th>2017</th>
<th>% change</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>582.8</td>
<td>+98.1</td>
<td>1,154.4</td>
</tr>
<tr>
<td>EBITDA(^1)</td>
<td>113.6</td>
<td>+202.4</td>
<td>343.5</td>
</tr>
<tr>
<td>Six months</td>
<td></td>
<td></td>
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<tr>
<td>Sales</td>
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<tr>
<td>EBITDA(^1)</td>
<td>215.4</td>
<td>+224.9</td>
<td>699.9</td>
</tr>
</tbody>
</table>

\(^1\) earnings before interest, tax, depreciation and amortisation.

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Biologicals and new technologies occupy centre stage at Crops & Chemicals USA

The biologicals sector including biopesticides and biostimulants was an area that generated a lot of interest and questions among attendees at the Crops & Chemicals USA conference held at Raleigh, North Carolina, US on July 23rd-25th.

The conference began with market presentations that laid out the roadmap for the development of the crop protection industry including biologicals. I talked about the global crop protection market during 2017, which grew by 2.5% to $54.2 million at the distributor level in 2017, according to figures from Phillips McDougall. The total global agrochemical market, including non-crop pesticides, was 2.6% higher at $61.4 billion.

Bill Dunham and Mark Trimmer from the consultancy, DunhamTrimmer, provided market figures for the global biocontrol market, which includes microbials, biochemicals and macro-organisms (including insects, mites and nematodes). DunhamTrimmer estimated global sales at $3.5 billion in 2017, representing some 5.6% of the global market of $61.4 billion. Pointing towards a sustained annual growth of 16-17% in the biocontrol market, they predicted that the market would touch $5.1 billion by 2020. The projected geographical break-up of the market would be: the US and Canada accounting for $1.8 billion; Europe for $1.7 billion; and Latin America and the Asia-Pacific region making up around $800 million each.

Mr Dunham and Mr Trimmer next sought to remove the misconception that biocontrol mostly caters to the organic crop farming sector. Citing figures from 2016, they said that permanent grasslands accounted for some 38 million ha or around 66% of the total land (57.8 million ha) under organic farming globally, followed by arable crops at 18%, permanent crops at 8% while others made up the remaining 8%. That revealed that only 26% of the area under organic farming was under arable and permanent crops.

Organic farming makes up some 1.2% of the global agricultural land but, if one only looks at arable and permanent crops, it accounts for under 0.4% of the total agricultural land. Key organic crops (including nuts, vegetables, grapes, fruits, root crops, berries and flowers) that use biocontrols represent 2.2 million ha globally and use some $330 million of biocontrol products. That led to the conclusion that their use in organic farming made up some 10% of the global biocontrol market, with the rest being used in conventional farming. “The use of biocontrol on traditional crops is driving the growth of this market,” the consultants said.

Among the cited strengths of biocontrol products compared with conventional products, they listed: lower regulatory barriers; reduced residues and shorter post-harvest intervals; use as pest resistance tools; enhanced worker safety; and addressing consumer demands on environmental issues. But biocontrols suffered from certain weaknesses including: weak market access; IP protection weaker than with chemicals; requiring more technical training at outset; and higher cost of goods.

US EPA’s biopesticides programme

Robert McNally, director of the US EPA’s Biopesticides and Pollution Prevention Division (BPPD), talked at length about the EPA’s biopesticides programme.

According to the EPA, biopesticides fall into three areas: biochemicals; microbials; and plant-incorporated protectants (PIPs) and other products of biotechnology.

Biochemicals are naturally occurring substances typically derived from plants, animals, and minerals. They have a non-toxic mode of action while targeting pests and act as irritants, lures, growth regulators and desiccants. Biochemicals have a history of exposure to humans and the environment with minimal toxicity in the form of semiochemicals, plant and insect growth regulators, and attractants and repellents. Mr McNally added the caveat that a naturally occurring substance should not automatically be presumed to be non-toxic.

Microbial pesticides involve active ingredients that are naturally occurring and bioengineered micro-organisms such as bacteria, fungi, viruses, protozoa and bacteriophages. Their modes of action can include competition, inhibition, use of pest as a growth substrate and toxicity.

PIPs involve genetic material incorporated into plants causing plants to reproduce “protectant” pesticidal substance. These include: genes exhibiting insecticidal properties; genes for plant disease resistance; and gene silencing through techniques such as RNAi.

There are around 420 registered biopesticide aids in the US, Mr McNally informed the audience. Around 75% of all US maize and cotton has at least one PIP trait. The use of biopesticides has been
trending up significantly with some 8 million lbs (3,629 tonnes) of ai of Bacillus thuringiensis, B firmus and gibberellic acid having been used in 2015. Among the crops that have a high percentage of treatment of biopesticides are: table grapes, 80% of which are treated with gibberellic acid; 45% of strawberries are treated with Bt; and 55% of mosquito larvicide treatments are biopesticides (Bt subs sp israelensis and B sphaericus).

Biostimulants
Mr McNally next talked about biostimulants, calling them a new and growing category of agricultural products comprising naturally occurring substances and microbes. They stimulate plant growth via improved nutrient and water use efficiency, protection from abiotic stress, and/or plant regulator activity. They are not considered to be fertilisers or pest control products.

The BPPD director cited studies that predicted that the global biostimulant market would exceed $4.5 billion by 2025. The market is expected to grow at a compounded annual growth rate of 13% over next decade. North America is the second-largest market globally with sales expected to reach $766 million by 2022.

Talking about regulatory issues concerning biopesticides, he said that one of the problems was the classification of plant regulators as pesticides under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) section 2 (u). That was a cause for confusion regarding some plant biostimulants that may be considered plant regulators under FIFRA. That is compounded by the fact that some product label claims may be considered plant regulator claims. The BPPD is working on guidance to clarify the types of ingredients, and associated claims, that are/are not considered plant regulators as defined in FIFRA section 2 (v).

He moved onto discuss modified mosquitoes, which are mosquito-related products intended to function as pesticides for mosquito population control purposes, and that are not intended to cure, mitigate, treat or prevent a disease. Genetic material in the form of microbial pesticides (Wolbachia spp) is incorporated into the mosquitoes. In October 2017, the US FDA finalised guidance that effectively transferred much of its authority to regulate genetically modified mosquitoes to the EPA, concluding that the GM insects are pesticide products and not “drugs” that fall under its regulatory authority. The FDA guidance explained that the EPA would be the primary federal agency providing oversight of GM mosquitoes that are “intended to function as pesticides by preventing, destroying, repelling or mitigating mosquitoes” for population control purposes.

Mr McNally next talked about RNAi, which could have possible pesticidal applications through direct pest control. The technique could be used to suppress resistance to chemical pesticides. In terms of application, they could be plant-incorporated protectants or may be spray-applied.

BPPD plan for fiscal year 2018-19
The BPPD plans to approve around 40 new ais in the next 18 months, which would be at more than double the typical annual output rate. He pointed out that emerging technologies and innovations in biotech were advancing in ways that presented policy and assessment challenges. These included: GM insects, a challenge that the BPPD is currently grappling with; gene editing (for instance, CRISPR), which will become the Division’s priority within months; gene drives for mosquito and rodent control, which will become high priority within 1-2 years; and non-PIP RNA interference technologies, an issue that the BPPD is seeking to resolve.

Other items on the BPPD’s agenda for the current fiscal year include progressing on its strategy for integrated vector management and coming out with guidance on biostimulants.

Biostimulant labelling
The need for creating a new regulatory pathway for biostimulants in the US was highlighted by Ohio State University’s Professor Matt Kleinhenz. He called for a clear, consistent and predictable process for market entry. An important part of that would be clarity on claims associated with biostimulants.

Professor Kleinhenz pointed out the need for labelling uniformity by advocating a common label for all US states so that there could be uniform regulations and enforcement at state and federal levels. That would create a level playing field as well as add credibility while promoting safety and consistency, which would in turn lead to global alignment of standards and practices to the largest possible extent, Professor Kleinhenz.
The Leading Manufacturer of Pyraclostrobin, Spirodiclofen and Spiromesifen, Registration Support with GLP Data!

**TECHNICAL**

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>Fungicide</th>
<th>Herbicide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyraclostrobin 98% Min. TC</td>
<td>Spirodiclofen 98% Min. TC</td>
<td>Spiromesifen 98% Min. TC</td>
</tr>
</tbody>
</table>

**FORMULATION**

- **INSECTICIDE**
  - Spirodiclofen 240 g/L SC
  - Spiromesifen 240 g/L SC
  - Abamectin 5% EC

- **FUNGICIDE**
  - Pyraclostrobin 25% SC
  - Pyraclostrobin 250g/L EC
  - Pyraclostrobin 25% WDG
  - Pyraclostrobin 5% + Metiram 55% DF
  - Pyraclostrobin 8.7% + Dimethomorph 12% WDG
  - Pyraclostrobin 13% + Boscalid 25% WDG
  - Pyraclostrobin 12.5% + Thiulfuramide 12.5% SC
  - Pyraclostrobin 23.7% + Epoxiconazole 14.3% SC
  - Pyraclostrobin 133 g/L + Epoxiconazole 50 g/L SC
  - Pyraclostrobin 15% + Difenconazole 25% SC
  - Thiulfuramide 240g/L SC

- **HERBICIDE**
  - Clethodim 24% EC
  - Cyhalofop-butyl 100 g/L EW
  - Flucarbazone-sodium 10% OD
  - Fluoroglycofen 10% EC
  - Formosafen 250 g/L SL
  - Glyphosate-ammonium 85% SP
  - Glyphosate-isopropylammonium 41% SL
  - Imazapic 240 g/L SL
  - Mesosulfuron-methyl 30g/L OD
  - Mesotricine 5% + Atrazine 20% OD
  - Nicosulfuron 40 g/L OD
  - Nicosulfuron 2.5% + Atrazine 22.5% OD
  - Quinazolopyr-ethyl 10% EC

---

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UPL recorded a sales rise of 7.6% to Rs 40,020 million ($583 million at the current rate) for its “agro activities” comprising agrochemicals and seeds in its first quarter ended June 30th. Agro activities made up 96.8% of consolidated quarterly sales, which went up by 11% to Rs 41,340 million ($602 million). Agrochemicals accounted for 86.4% of the company’s consolidated gross revenues for its fiscal year ended March 31st 2018.

A volume increase of 8% combined with a price rise of 1% and a positive 3% currency effect made up the growth. Consolidated international sales contributed 69.8% to consolidated quarterly business and increased by 10.8% to Rs 28,860 million. Domestic sales grew by 11.6% to Rs 12,480 million.

Earnings before interest, tax, depreciation and amortisation (EBITDA) on total sales for the quarter rose by 12.9% to Rs 8,470 million. Profit after tax increased by 2.4% to Rs 5,180 million.

UPL’s domestic market, India, was its largest sales region, making up 30.2% of consolidated revenues. Sales in the country grew by 11.6% to Rs 12,480 million. Sales of herbicides rose by 60% over the previous year. Widespread and timely rainfall in most parts of the country and a higher minimum support price by the government is expected to have a positive impact on input use, UPL says. But a decline of 10% in the cotton area and 15% in kharif (summer season) pulses area will impact growth.

### UPL’s results (Rs million)

<table>
<thead>
<tr>
<th>1st qtr ended June 30th</th>
<th>2017 ($ million)</th>
<th>% change</th>
<th>2018 ($ million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>37,230 (542.4)</td>
<td>+11.0</td>
<td>41,340 (602.3)</td>
</tr>
<tr>
<td>Domestic</td>
<td>11,180 (162.9)</td>
<td>+11.6</td>
<td>12,480 (181.8)</td>
</tr>
<tr>
<td>International</td>
<td>26,050 (379.5)</td>
<td>+10.8</td>
<td>28,860 (420.5)</td>
</tr>
<tr>
<td>Agro activities¹</td>
<td>37,210 (542.1)</td>
<td>+7.6</td>
<td>40,020 (583.1)</td>
</tr>
<tr>
<td>EBITDA²</td>
<td>7,500 (109.3)</td>
<td>+12.9</td>
<td>8,470 (123.4)</td>
</tr>
<tr>
<td>Profit after tax³</td>
<td>5,060 (73.7)</td>
<td>+2.4</td>
<td>5,180 (75.5)</td>
</tr>
</tbody>
</table>

¹ at the current rate; ² includes agrochemicals and seeds; ³ includes non-agrochemical sales; ⁴ earnings before interest, tax, depreciation and amortisation.
Latin America led growth, with sales rising by 17.2% to Rs 8,640 million. All the key countries contributed to the increase, with the exception of Colombia where the first rice season has been very poor due to a reduction in rice acreage of about 30%, UPL says. Advance order bookings in Brazil were “very encouraging”, which indicates that the market is not carrying excess inventory as was the case this time last year, it adds. Currency devaluation in Brazil, Colombia and Argentina is impacting business.

Consolidated sales in North America rose by 8.5% to Rs 7,390 million. Planting was delayed by 3-4 weeks as a result of dry weather, which affected pre-plant and pre-emergence herbicide business. The company points to high inventory of those herbicides in the distribution chain. Cotton planting is up by 10% over last year while the soybean and maize acreage is flat, UPL says.

Europe provided revenue growth of 10.8% to Rs 6,480 million. It was yet another successful sugar beet season with high in-season sales and low closing inventories, which augurs well for the next season too, the company says. It claims to have a “strong presence” in sugar beet with a very broad portfolio of herbicides. “After more than a year of dry weather around the Mediterranean, good rains were received and this improved the outlook for our business in Spain, southern France and Italy on fruits and vegetables,” UPL says. Northern Europe on the other hand had a very short spring, which affected wheat and all seed crops. Poor disease pressure led to a drop in fungicide consumption, with the trade channel carrying a significant amount of inventories.

Quarterly sales in the rest of the world moved up by 5.7% to Rs 6,350 million. UPL doubled its sales in Africa. Widespread rains in South-East Asia boosted sales of insecticides and fungicides in Indonesia, Vietnam and Philippines. Australia is reeling under severe drought conditions, which has affected business, the company notes.
In this golden season of picturesque fall, AgroChemEx (ACE) & CIFE & AgroTech are held in Shanghai World Expo Exhibition and Convention Center (SWECCC). Let me begin by extending, on behalf of CCPIA, my sincere welcome to all guests from afar.

As the most influential international event for agrochemicals, the exhibition has successfully been held for 18 sessions with the joint efforts of CCPIA and all partners, building the perfect platform for exchanges and cooperation for global agrochemicals industry. The exhibition boasts an area of more than 42,000 sqm, including over 800 exhibiting companies and attracting estimated 35,000 visitors from over 80 countries and regions worldwide. In ACE this year, there are several new international exhibitors, who are well-known enterprises from Spain, Poland, Russia, Vietnam and India, showing the latest products and advanced technologies. The exhibition assembles manufacturers in the upstream and downstream industry chain of pesticide and fertilizer production—raw material supply, TC and intermediates manufacturers, formulation processing, packaging equipment, new-type fertilizer, water-soluble fertilizer, crop protection device, agricultural aviation, etc. Domestic and foreign leading agrochemicals enterprises, global purchasers and traders are also gathering here to share one-stop international exchange purchasing platform.

To promote agricultural science and technology development, we pioneer “AgroTech Exhibition”, which concurrently happens with ACE, and especially set an exhibition area for leading agricultural drones and aviation adjuvants, whose grand appearance will present the development of agriculture aviation featuring with specialization, intelligence and normalization.

The theme of ACE 2018 is “promoting high-quality development through innovation, driving supply side reform through green road”. Meanwhile, a series of high-end conferences are also held, like international market exchange, industry development special sessions, conference of new products and technologies. Government officials of pesticide and fertilizer, industry experts, famous scholars and business representatives from China, USA, Switzerland, Peru and Southeast Asia, etc., are all gathering here to share latest market information and future development trend of industry from global strategic perspective.

October is the season of harvest in China. May global agrochemicals industry flourish. May all the friends participating in this exhibition gain fruitful achievement. May all the guests enjoy good health. May all go well with you!

Sun Shubao

Chairman of China Crop Protection Industry Association
AgroChemEx & CIFE & AgroTech 2018

16-18 October, 2018
Shanghai World Expo Exhibition & Convention Center

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- You can find the ideal supplier easily through our Procurement Matchmaking Program and Buyers Guide;
- You can share the successful experiences of procurement/sourcing in China.

<table>
<thead>
<tr>
<th>Date</th>
<th>Conference</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 October,2018</td>
<td>13th International Forum on Crop Protection</td>
</tr>
<tr>
<td>16 October,2018</td>
<td>13th China International Forum on Procurement and Service of Pesticides</td>
</tr>
<tr>
<td>17 October,2018</td>
<td>10th China Agrochemical Industry Summit (Sponsored by Fuhua Tongda)</td>
</tr>
<tr>
<td>17 October,2018</td>
<td>2018 China New Agrochemical Product and Technology Conference</td>
</tr>
<tr>
<td>17 October,2018</td>
<td>2018 Modern Agriculture Service Summit</td>
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</tbody>
</table>

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Arysta sales up 9% in second quarter

Platform Specialty Products’ agrochemical business, Arysta LifeScience, recorded an 8.8% increase in sales to $520.8 million in the second quarter of 2018. Business was boosted by organic growth in Latin America and North America, the company points out. Underlying growth of 10% added $46 million to revenues, with adverse currency effects reducing sales by $5 million.

Rising sales were driven by new products in Brazil and Mexico, along with herbicides and key seed treatment products in the US and Australia. Selling price increases in Brazil helped to offset the weaker Brazilian currency. Poor growing conditions, particularly in central Europe, adversely affected sales in Europe.

Adjusted earnings before interest, tax, depreciation and amortisation (EBITDA) grew by 6.7% to $109.4 million or by 6% on a constant currency basis. Currency factors added $1 million to adjusted EBITDA, with organic growth of $6 million. Price increases helped to moderate the impact of inflation in raw material costs due to both supply constraints and currency.

### Six months

Sales rose by 11.1% to $992.5 million in the first six months of the year, with organic and constant currency growth of 8%. Adjusted EBITDA grew by 5.9% to $204.8 million, with a 1% drop in constant currencies.

Last month, Platform agreed to sell Arysta to UPL in an all-cash deal for $4.2 billion, subject to certain adjustments. The divestment is expected to be completed in late 2018 or early 2019, subject to customary closing conditions and regulatory approvals.

### Arysta’s results ($ million)

<table>
<thead>
<tr>
<th>2nd qtr end June 30th</th>
<th>2017</th>
<th>% change</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>478.8</td>
<td>+8.8</td>
<td>520.8</td>
</tr>
<tr>
<td>Adjusted EBITDA¹</td>
<td>102.5</td>
<td>+6.7</td>
<td>109.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Six months</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>893.5</td>
<td>+11.1</td>
<td>992.5</td>
</tr>
<tr>
<td>Adjusted EBITDA¹</td>
<td>193.3</td>
<td>+5.9</td>
<td>204.8</td>
</tr>
</tbody>
</table>

¹ earnings before interest, tax, depreciation and amortisation.
The global market for conventional crop protection products grew by 2.5% to $54,219 million at the distributor level in 2017, according to figures from Phillips McDougall. There was a real term decline of 0.5%, removing inflation and currency fluctuation impacts. Preliminary figures released in March pointed to a 0.2% increase in nominal terms to $53,695 million.

Sales of all pesticides, including non-crop products, were 2.6% higher at $61,350 million. Non-crop pesticide sales grew by 2.9% to $7,311 million.

Phillips McDougall has revised estimates for crop protection and non-crop pesticide markets up including for previous years. The reason for that is national markets having been higher than previously stated, particularly for countries with a large generics sector, such as China and India.

In 2017, weak prices and high inventory levels continued in many markets and the strength of the US dollar limited dollar value growth, Phillips McDougall says. These negative impacts were, however, offset by improved glyphosate herbicide prices and a return to more favourable weather, especially in Asia. The increased price of glyphosate and other products emanating from China was the result of a crackdown on production in the country driven by a mandate imposed by the Ministry for the Environment requiring chemical companies to invest in costly pollution control and effluence treatment plants. In addition, prices were buoyed by the financial pressures to display improved profitability experienced by the increasing number of Chinese companies that are being listed on local stock markets.

**Category-wise break up**
Herbicides remained the dominant category

**Global agrochemical market ($ million)**

<table>
<thead>
<tr>
<th>Market segment</th>
<th>2016</th>
<th>% change</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop protection</td>
<td>52,882</td>
<td>+2.5</td>
<td>54,219</td>
</tr>
<tr>
<td>Non-crop pesticides</td>
<td>7,106</td>
<td>+2.9</td>
<td>7,311</td>
</tr>
<tr>
<td>Total agrochemicals</td>
<td>59,988</td>
<td>+2.6</td>
<td>61,530</td>
</tr>
</tbody>
</table>

Source: Phillips McDougall
globally, accounting for 42.9% of sales. The category grew by 3.2% to $23,230 million. Fungicides made up 28.6% of global sales. The category slipped by 0.7% to $15,487 million. Insecticide sales increased by 4.3% to $13,523 million. The category made up almost a quarter (24.9%) of global sales.

**Regional sales**

All regions experienced growth except Latin America.

The Asia/Pacific region was the biggest one in 2017, accounting for 30.1% of global sales. Business in the region grew by 7.7% to $16,307 million. Key country markets in the region, notably India, benefited from a return to favourable monsoon conditions, following dry period driven by the El Niño weather event, and strong growth in pulse crops, Phillips McDougall says. The markets of South-East Asia are also estimated to have performed well. Indonesia benefited from an import ban on rice and maize causing domestic crop prices to increase while product prices in Thailand increased due to a shortage of supply from China.

In Latin America, sales are estimated to have declined by 5% in 2017 to $12,664 million. The drop was largely attributable to Brazil which, despite decreasing for a third consecutive year, remains the largest single country market for crop protection sales. The decline was driven by: reduced pest and disease pressure; the rise in adoption of Monsanto’s genetically modified insect-resistant and herbicide-tolerant Intacta RR 2 Pro soybeans impacting insecticides; high levels of inventory at the dealer level, which is keeping the lid on prices despite the increase in the price of active ingredients originating from China.

Crop protection sales in the NAFTA region increased by 3.1% to reach $10,761 million. Growth was driven by increased planted areas of soybeans, canola and cotton, as well as improved conditions in California where the region showed some recovery following the drought experienced in 2016.

European crop protection sales increased by 2.6% to reach $12,377 million. Growth in Europe has been driven in recent years by eastern markets, particularly Russia, where the domestic agricultural economy continues to boom in response to the sanctions imposed by the EU, Phillips McDougall says. Sales in western markets during the year were, however, impacted by adverse weather and low pest and disease pressure.

In the rest of the world, which includes the Middle East and African region, sales increased by 8.3% in 2017 to reach $2,110 million. Growth can be attributable to improved sales in South Africa where favourable rainfall boosted acreages of maize and soybeans. This precipitation followed severe drought driven by El Niño. Similarly, improved rainfall in Turkey boosted crop production expectations and increased demand for crop protection products.

**Crop protection product sales by region ($ million)**

<table>
<thead>
<tr>
<th>Region</th>
<th>2016</th>
<th>% change</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia/Pacific</td>
<td>15,141</td>
<td>+7.7</td>
<td>16,307</td>
</tr>
<tr>
<td>Latin America ²</td>
<td>13,331</td>
<td>-5.0</td>
<td>12,664</td>
</tr>
<tr>
<td>Europe</td>
<td>12,063</td>
<td>+2.6</td>
<td>12,377</td>
</tr>
<tr>
<td>NAFTA</td>
<td>10,437</td>
<td>+3.1</td>
<td>10,761</td>
</tr>
<tr>
<td>Middle East/Africa</td>
<td>1,948</td>
<td>+8.3</td>
<td>2,110</td>
</tr>
<tr>
<td><strong>Total (world)</strong></td>
<td><strong>52,882</strong></td>
<td><strong>+2.5</strong></td>
<td><strong>54,219</strong></td>
</tr>
</tbody>
</table>

¹ calculated from 2017 growth/decline figure; ² excluding Mexico. Source: Phillips McDougall.
The opening debate at this year’s Agchem Forum drew strong comments on the vexed issue of Brexit, and the impacts on agrochemical regulations from the UK’s impending exit from the EU.

Faster active ingredient approvals in the UK and competition for continuing member states’ approval processes are potential long-term benefits for the crop protection industry arising from Brexit, Bayer Crop Science’s Janet Williams, who is also chair of the UK Crop Protection Association (CPA), suggested. Ms Williams is among a list of persons to be consulted on the Brexit negotiations. Arysta LifeScience’s Mike Carroll doubted that there would be much change with the UK being forced by political considerations to accept regulatory alignment with the trading bloc.

The Forum was welcomed by news that France had banned the use of five neonicotinoid insecticides. The ban, effective September 1st, covered the insecticides: imidacloprid, clothianidin, thiamethoxam, thiacloprid and acetamiprid. Dr Carroll suggested that although it was not welcome, it was not entirely a surprise. He labelled the generalising from an ai to a whole class of chemistry as politically expedient, saying that reading across from one active substance to a whole class of chemistry regardless of the data is not a very scientific way to regulate plant protection products. Ms Williams complained that there was no evidence to suggest that thiacloprid had any adverse effect on bees. Both noted that the French had instigated the EU action that led to the product approvals for outdoor uses of three of the insecticides to be rescinded.

The case provided an appropriate backdrop to a potential UK switch to an agrochemical registration system removed from the principles followed in the EU.

The UK and EU are in negotiations of a post-Brexit withdrawal agreement on their future relationship. Those negotiations are fraught with indecision, vacillation and sometimes fierce rejections of each other’s stance, and increasing uncertainty and anxiety, particularly in the UK. The UK is scheduled to leave the EU at midnight Central European Time on March 30th next year. There would be a 21-month implementation phase preliminarily agreed assuming a deal on a future relationship between the parties, a deal that is far from certain to be reached.
Ms Williams stressed that the negotiations were tense and any outcome unpredictable. The UK is set to publish technical papers on “chemicals and agri-food” detailing the consequence of a “no deal” scenario at the end of this month. Agrochemicals have apparently been removed from the chemicals tranche and placed in agri-foods.

The position on a deal is required by an EU Council of Ministers meeting next month or an emergency one in November. Beyond that, legislation in the UK Parliament would be too late to be passed in anticipation of the exit.

Ms Williams posited scenarios with four leading to no deal, one an orderly UK exit and a further two leading to renegotiations.

UK post-Brexit regime
Ms Williams said that industry in the UK hoped that Brexit would lead to the adoption of a risk-based system for the registration of pesticides. But when asked whether her hope was backed by expectation, she was more circumspect. “Probably not for a long time; not within my regulatory lifetime.”

“There are over 27,000 pieces of legislation to be ‘lifted and shifted’ from the EU legislation and once this is complete, a review of the new UK legislation can start,” she said.

She complained of an over-precautionary and politically influenced EU system that could allow the UK to “become a leader in innovation in agriculture throughout the world”. Misuse of the precautionary principle in the EU was making products unavailable, Ms Williams commented. The EU’s aggressive caution had resulted in a sharp fall in the region’s share of expenditure on new product developments, dropping from 33% in the 1990s to 7%.

Dr Carroll was more phlegmatic. “[The UK] won’t [adopt a risk-based approach] because Ireland will not accept a hard border [with the UK’s Northern Ireland] and therefore the regulatory systems on the island of Ireland will have to be identical.” Avoiding a physical border at the UK’s only land frontier with Ireland is the EU’s primary set condition for a deal on a future relationship with the UK. The UK is demanding that all parts of the UK have the same regulatory systems. One system on the island of Ireland, and one system across the UK would result in complete alignment between the UK and the EU.

“Put another way, the six counties of Ulster [Northern Ireland] under UK law cannot have a vastly different regulatory process to the other 26 counties of Ireland as it would undermine the EU’s Single Market and the Customs Union.” Dr Carroll also noted that any trade deal between the EU-27 and the UK on food and agricultural products would require virtually the same regulatory process.

Ms Williams conceded that the UK granting fast approvals while the Irish maintained a hazard approach and slow approvals, and the likely need for a physical border between the Republic and Northern Ireland was a potentially fatal problem to the UK’s hopes. “I met Irish colleagues a couple of weeks ago and they are very concerned about that. They want to continue to mutually recognise UK approvals”. She suggested that the UK could produce an assessment and provide it to Ireland, and the latter become zonal rapporteur for the concerned ai in the EU’s central zone.
Dr Carroll was unconvinced. The Arysta executive also cautioned that the EU was no more or less susceptible to politics and NGO pressure than other jurisdictions. However, he noted that given the “byzantine structure” of the EU review and approval process, strange things can happen on a more regular basis almost by accident and glyphosate herbicide was a perfect example of this. The EU re-approved glyphosate last year, but for only five years and after lengthy appeals and opposition form many member states.

Nevertheless, Ms Williams saw “opportunities” from the UK’s withdrawal from the EU.

“The UK voted against [EU agrochemical registration Regulation] 1107, as it did not agree with the use of hazard criteria,” she noted. “This is a genuine opportunity to develop a risk-based programme.” The Bayer executive also speculated that work-sharing and joint reviews could be established with other jurisdictions such as “the QUAD” with Australia, Canada, New Zealand or the US.

The countdown
Ms Williams gave an update at the event of the pesticide industry’s Brexit issues and how they were developing.

“The UK CPA’s position is that we must ensure that the UK’s protection levels for human health, wildlife and the environment be maintained, while ensuring access to existing chemistry and innovation,” she said. The Association also insists that the UK not adopt national regulatory requirements, even if it were to consider some existing ones, and avoid any disruption to ongoing evaluations. “The UK has confirmed that existing approvals will be recognised as continuing post-Brexit. Ms Williams cited UK Minister for the Environment and pro-Brexit politician Michael Gove as claiming that there would be “no reduction of environmental standards”; while there would be a copy and paste of EU legislation via the UK’s Great Repeal (of EU legislation) Bill.

The UK has said that it wants to get growers’ access to new pesticide products and aims “as quickly as possible” with a “more efficient” implementation of the EU’s intended collaborative system of harmonised processes.

Both sides see trade as the key negotiation, and a major issue for pesticides is the system of maximum residue limits (MRLs). “Will there be a move towards the UK adopting Codex MRLs, or EU – which it will do initially – or even adopting national limits, or even a flexible mix?” Ms Williams asks.

The UK’s pesticide competent authority, the Chemicals Regulation Directorate (CRD), has committed to completing all EU work ahead of schedule, as early as December. That includes work on five new ai dossiers for which it is aiming to get the draft assessment report ready, several ai renewals for which it is working to pass onto another member state, and its work as zonal rapporteur in the central zone for many new products and reapprovals, which it has committed to finishing.

Meanwhile, industry has been submitting national applications to the UK outside of the EU system since October last year. Such processes take 12-18 months. There are 83 applications in the system awaiting other zonal rapporteurs to complete evaluations before the 120-day period for mutual recognition can start. “CRD has committed to continue doing that, but industry has to weigh up whether to make a national application – the process of which lasts a year – or wait when some evaluations by other member states are unfinished after five years.”

Impact on EU
There was more unanimity on the potential impacts upon the EU’s regime from Brexit.

“The UK is clearly the most efficient competent authority in the EU in pesticide evaluation,” Ms Williams said, citing a 2016 European Commission report. “Without the UK, we anticipate that evaluations will take longer and the EU will be lagging the rest of the world in providing innovative new products to their farmers and growers.”

Dr Carroll agreed. “The UK CRD was the most efficient regulator and did much of the regulatory heavy lifting in the EU particularly for formulations – it will have a major adverse effect on the EU regulatory system for plant protection products and a tragic loss of a rational regulator.”

Reassignment of some work that the UK was to complete as part of work sharing and mutual recognition has yet to be done to another member state. Ms Williams also noted that the UK’s influence at the Standing Committee on Plants, Animals, Food and Feed has diminished with the country either abstaining on votes or being increasingly ignored.

The European Crop Protection Association sought to keep the UK involved in the evaluation process and lobbied the Commission for it but “that [eventuality] is looking extremely unlikely”.

“Industry is concerned that the remaining member states have already been slow, and will likely get slower [in processing applications].” The sector is seeking greater resources to be added to other member states, some of which Ms Williams reports have been made. However, the Bayer executive has suggested to her central zone team to treat the UK as a fourth zone, and dared the CRD to “beat the rapporteur”, a challenge it was keen to take on. “So, competition may be on its way.”

The anticipated implementation period is represented as a “stand still” phase.

One industry concern is that no national approval of new ais is to be allowed from the date of Brexit until the end of the period at midnight on January 1st 2021. “Industry will be challenging this point,” Ms Williams added. Furthermore, the UK will be required to immediately transfer all relevant documents related to 1107/2009, and EU biocidal products Regulation (528/2012), and be barred during the transition from acting as lead authority.
ED cut-off criteria that shook EU agchem sector take new turn

The crucial and thorny issue of applying endocrine disrupting (ED) properties as cut-off criteria while assessing pesticides in the EU filled the conference room and took up a full quarter of this year’s major European regulatory conference, the Agchem Forum. Toxicologists, regulators and industry representatives gave often detailed presentations on the updated guidance for applicants and regulators. The new ED criteria are based on WHO definition of an endocrine disruptor.

The updated ED criteria will apply from November 10th of this year to all new and ongoing applications. Until November 10th, pending applications for which the conclusion is to be finalised by then, the interim criteria in place since the coming into force of Regulation 1007/2009 will apply. For pending and ongoing applications that will not be completed by that date, the European Food Safety Authority (EFSA) requires an updated assessment during the “normal” stop the clock – including an indication of further required data to complete the ED assessment. Among the concerns that topped the agenda was the anticipated – and even incalculable - timelines of such assessments. If the ai is then considered an ED, the applicant may submit an assessment under Article 4(7) Regulation 1107/2009, under which an ai could be approved for up to five years on the basis that it is necessary to control a serious danger to plant health which cannot be contained by other available means.

Dimitra Kardassi, EFSA scientific officer, launched the extended debate. She was followed by Dr Maristella Rubbiani, head of unit, dangerous preparation and mixtures, at the Italian Instituto Spueriore di Sanita, Pierre-Francois Chaton and Adeline Cavelier, both of the French competent authority, the Anses; Ira koval, senior toxicologist and regulatory affairs specialist at the consultancy, Charles River; and, representing an industry and ECPA perspective, Ivana Fegert, vice-president, regulatory toxicology, BASF.

Confusing changes
Debate chair and Arysta LifeScience’s Mike Carroll questioned whether regulators were making regulation up as they went along in parallel with the research on the
as-yet-barely developed ED science. The Anses’ Adeline Cavelier said that things had certainly improved. “We now have guidance, and we have to be aware of scientific developments. But, we have better and more accurate criteria than those of the recently applied interim procedures,” he said. He also expects further improvement and “hopefully in ecotox, that will include use of vertebrate studies”.

Dr Rubbiani said that the regulation remained new and as yet unclarified even with the guidance. She complained that member states felt they were at an “impasse”. Her own department as rapporteur member state was recently obliged to return to an applicant after an assessment of a dossier that had not assessed on the new ED issues, as they had not been required while finalising the dossier. The practicalities of meeting deadlines without data has left her department feeling “very upset.” This practicality would likely require using the stop the clock procedure “probably for a long time” and cause cost increases for applicants and regulators alike.

Dr Fegert reminded the audience of the ongoing reapprovals programme, which is running behind schedule. “It is very difficult to deal with such a huge workload, reaccessing about 70% of existing approved compounds, and then you get such a request – of course not a surprise as we knew the guidance document was coming – but still we have to apply it and with further regulatory amendments coming and with companies’ compounds at different stages, it’s difficult to know what we submit to member states, and even they are not sure.”

The new EU guidance was issued in June on how to identify agrochemicals and biocides with ED properties, based on new criteria. It covers endocrine modes of action caused by estrogen, androgen, thyroid and steroidogenic (EATS) modalities.

Adverse effects observed for EATS-mediated parameters drive the assessment, as they provide information on adversity and endocrine activity, Dr Kardassi told the audience. In other words, they would be indicative of endocrine mode of action (MoA), as Dr Koval stressed. If such parameters were sufficiently investigated and no adversity identified, then the ED criteria would not be met, Dr Kardassi noted.

The guidance document describes how to gather, evaluate and consider all relevant information for the assessment, conduct an MoA analysis, and apply a weight of evidence approach to establish whether the ED criteria are fulfilled, she explained.

When adverse effects and/or endocrine activity are identified, the MoA analysis is necessary to demonstrate the biologically plausible link between the two. If the MoA analysis supports the biological plausibility of the link between the observed adverse effects and endocrine activity for at least one MoA among those postulated, the substance is considered to meet the ED criteria. If the biological plausibility of the link between the endocrine activity and the adverse effect(s) is not demonstrated for any of the postulated MoAs, the ai is considered not to meet the ED criteria.
Repetition between those making presentations emphasised the points that the guidance demands a “weight of evidence” approach be applied to determining whether a chemical has ED properties.

**Comments and studies**

Dr Kardassi reported that two consultations on the final guidance produced 3,500 comments. That brought “significant” redrafting, she said. That largely focused on how to apply an assessment strategy for human health and the environment, and a better definition of a sufficient dataset for performing the ED assessment; and where possible, how to consider the non-EATs modalities.

Dr Rubbiani noted that prior to setting criteria, the European Commission carried out a “comprehensive” impact assessment to analyse different options for defining the criteria for ED identification. The 2014 published assessment gained 27,000 responses and was republished in 2016.

EU citizens remain highly concerned on EDs, she noted. “Science is fast moving on the issue, and the uncertainty has amplified those concerns.” She raised doubts. “Questions remain open on the applicability of basic toxicology principles to EDs (for instance, can a safe threshold be fixed for EDs?),” she started. She also raised the issue of mixtures, that further development of testing methods was needed and that implementation lagged for some of the legislative measures the issue covers.

Different approaches are being run among regulated areas, such as pesticide legislation, that of biocides, cosmetics among others. Dr Rubbiani called for harmonisation of the ED identification across all relevant regulatory frameworks.

“The roadmap should therefore stress on the urgent need for clarification on how to deal with substances that may be identified as EDs under the biocides and plant protection products regulations or under REACH [EU Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation] as substances of very high concern,” she commented. She also saw uncertainty for setting safe thresholds of EDs.

The roadmap initiative will take stock of progress achieved, Dr Rubbiani said. But she also identified further requirements. They included among others: cut ED chemical mixture exposure by replacing substance by substance approach and include all possible sources of exposure to multiple chemicals, enhance public awareness of the chemicals, including of professionals from doctors to farmers; improve European leadership for safer substitution and promotion of “innovative solutions”; and monitor health and environmental effects of single, groups and mixtures of EDs to evaluate all sources of exposure.

She cited major themes in feedback from NGOs, regulators and industry. Feedback from NGOs included highlighting the importance of focusing on combination effects from exposure to mixtures of EDs from various sources; to see a clear plan to speed up ED identification in various legislations; and that the identification of EDs should be harmonised in EU legislation, as it happens with other hazardous chemicals under the EU Classification, Labelling and Packaging (CLP) Regulation.

Member state comments included a call from Germany for the development and amendment of new and existing adequate test methods; a strategy to fill scientific knowledge gaps and define a strategy with verifiable aims and milestones. From Italy: to define the level of evidence that is sufficient to trigger action; to develop a consistent testing and assessment strategy for ED chemical, ensuring the adequate power to predict hazards for health/ environment; and to use same criteria for hazard identification throughout the different regulatory schemes.

Dr Rubbiani also noted that the Belgian Senate had elaborated and adopted a report containing 72 recommendations to reduce the exposure of ED chemicals.

Further research, appropriate linkage between science and regulation, and development of testing methods are part of the recommendations of the country’s Senate. Dr Rubbiani said that did not go far enough and listed among other required actions the development of testing methods with endpoints sensitive to low dose, and appropriate labelling rules.

“Denmark, Sweden and France have already elaborated ambitious national strategies,” she noted.
The following actions are already promoted in those countries: research programmes carried out by specific research centres; legislation and regulation to reduce the use of hazardous chemicals; monitoring programmes & controls; taxes on ED chemicals to encourage the use of substitute products and financial support for their development; the launch of an ecolabel including ED criteria; and awareness campaigns.

Industry regulatory experience with applying the criteria and guidance is not available and will only be so once the relevant regulatory evaluations are conducted, Dr Rubianni noted.

Two scientists from the Anses made an interesting presentation to an attentive, if silent, audience of a case study on a pesticide’s reapproval process with France as competent authority.

“From our point of view, tables proposed in the guidance are examples, that is, they can be slightly modified, but the following information should always be presented.” Adeline Cavelier went on to list: separate lines of evidence for endocrine activity (in vitro mechanistic, in vivo mechanistic...), and adversity (EATS-mediated, sensitive to, but not diagnostic of EATS), general toxicity; and species tested, exposure duration, route of exposure, doses/concentration, observed effects (positive and negative), likely endocrine modality and conclusion on the assessment of line of weight evidence.

Time consuming
Their general conclusions following their work were that: the new guidance would improve consistency in assessments; elements requested in the guidance document be included in submitted dossiers by applicants; and the generation of further data “to be considered only when necessary”. A question on how long assessments could take with further requests for data went unanswered.

Dr Ira Koval stressed: “Applicants should generate all the information needed to enable a conclusion.” She warned that the evaluation of ED properties, if performed according to the guidance, is a very time- and effort-consuming exercise.

EFSA guidance on submission of scientific peer-reviewed open literature should be followed, while each piece of information has to be assessed for its relevance and reliability, she noted.

She warned that the reporting should be exhaustive, precise with consistency in naming, as well as being thorough.

The guidance that the available data fulfill the criteria of “sufficiently investigated” that Dr Kardassi had previously explained may impact those dossiers submitted prior to the definition of new criteria and the publication of the guidance document. That may result in additional studies being requested.

The guidance explains that when an adverse effect is EATS-mediated, the ED criteria are met by default. “A biologically plausible link is established as the plausibility is high. The level of empirical support and biological plausibility would need to be very strong” to show otherwise, the Charles River associate cautioned.

If an alternative non-endocrine MoA cannot be developed due to the lack of data, based on the guidance, the substance should be considered an ED disruptor, she warned. Substances which cause adverse effects on reproduction or on the thyroid will probably be considered ED “by default”.

Industry perspective
BASF’s Ivana Fegert presented an ECPA view.

She echoed the opinions of regulator comments earlier in the day. “I have to agree with the others [previous presenters] that it is an extremely time-consuming exercise,” she said of the ED assessment process. The “complex” process can lead to reassessment of issues. “You have to go back to the studies, you cannot simply refer back to your dossier because you do not have all the details there, but rather you must go back to each single study.”

Dr Fegert reported that her team was assessing two substances to “very tight” deadlines, and are “struggling” to put into the forms all the required information. “November 10th is the due date. After that you have to submit all the information which is the case for all AIR-4 compounds from January next year,” she warned.

Dr Fegert noted that the Commission had intended to get new ED criteria set by December 2013, only to find the issue so complex that it was delayed by “almost five years”. However, she pointed out that an April 2018 amendment laid out that a substance would be found to have ED properties if it met all of three criteria: it shows an adverse effect in an intact organism or its progeny; it has an endocrine MoA; and the adverse effect is a consequence of the endocrine MoA.

Industry concerns
The legal text requires that “all elements” of the ED criteria be met, noting the three listed above. Therefore, where any one of these criteria are not met, the only legal conclusion should be that the substance is not an ED.

The guidelines have been updated to include thyroid parameters. “But this update has come since the publication of the guidance document, and no one has these studies prepared at least for the older compounds,” Dr Fegert complains. “This came about a month ago [early August].”

Another concern is the assumption of a pre-established link between “adversity and endocrine modality”, she notes. “This results in an unjustifiably low threshold for the identification of EDs.”

There is also a fear that guidance “gives the impression” of repeated need for new data requirements. “There is a disconnect between the concept of weight of evidence [from available data] evaluation and the focus on a select number of specific apical higher-tier studies, while attempting to meet the definition of ‘sufficient data’ as provided in the guidance runs the risk of leading to a huge amount of animal testing with no or minor improvement in human health.”

Ultimately, the guidance requires an unreasonable burden of proof to demonstrate that a substance is not an ED. “And that contradicts the legal text of the criteria where available data are used to determine if a substance is an ED.”

The Agchem Forum took place in Barcelona, Spain on September 5th-6th.
Dr Lars Huber (senior manager regulatory affairs, head of biorationals, fertiliser and IPM) from German regulatory consultancy SCC writes about problems encountered in the implementation of IPM in the EU under the EU sustainable pesticide use Directive (2009/128).

The implementation of integrated pest management (IPM) in the EU has officially been in progress since 2009 based on Article 14 of the EU sustainable use Directive (SUD) 2009/128 as part of the EU 2006 “thematic strategy on the sustainable use of pesticides”. SUD was published simultaneously with EU agrochemical registration Regulation (1107/2009) concerning the placing of plant protection products on the market and Regulation 1185/2009 concerning statistics on pesticides. According to the SUD, IPM is mandatory for all professional users from 01 January 2014 onwards.

Besides the introduction of IPM (Article 14), providing a definition of IPM (Article 3) and stating the general principles of IPM (Annex III), IPM in the EU is mainly to be implemented on member state level, largely via the so called national action plans (NAPs). According to Article 4 of the SUD, the “member states shall adopt national action plans to set up their quantitative objectives, targets, measures and timetables to reduce risks and impacts of pesticide use on human health and the environment and to encourage the development and introduction of IPM and of alternative approaches or techniques in order to reduce dependency on the use of pesticides”. Introduced in 2009, implementation of NAPs and IPM is constantly monitored and by December 14th 2018 “the Commission shall submit to the European Parliament and to the Council a report on the experience gained by member states on the implementation of national targets established” to be “accompanied, if necessary, by appropriate legislative proposals”.

“IPM means careful consideration of all available plant protection methods and subsequent integration of appropriate measures that discourage the development of populations of harmful organisms and keep the use of plant protection products and other forms of intervention to levels that
are economically and ecologically justified and reduce or minimise risks to human health and the environment. IPM emphasises the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms;” as defined by the SUD. This definition varies only slightly from the UN FAO definition.

Despite this very clear definition - and similar definitions used for decades - perception, interpretation and implementation of IPM seem to vary hugely. Considering the European legislative and regulatory framework of IPM, the term “integrated” has to be especially emphasised. Based on the concept of risk-based assessments for plant protection active ingredients, categorised as basic substances, low-risk substance and conventional ais and lacking a separate class of “biopesticides”, the EU IPM definition highlights the “careful consideration of all available plant protection methods”.

Available plant protection methods include non-chemical mechanical, physical and biological methods as well as agronomic cultivation techniques such as crop rotation, resistant/tolerant cultivars, fertilisation, irrigation and drainage, hygiene measures, use of ecological infrastructures inside and outside the production sites and, of course, not excluding chemical plant protection products, especially if they are categorised as low risk.

Integrating all plant protection methods, the aim of IPM, as described in the definition, is to “keep the use of plant protection products and other forms of intervention to levels that are economically and ecologically justified and reduce or minimise risks to human health and the environment”. Compared with the FAO definition, the EU IPM definition refers not only to economic considerations but also to ecological aspects. At first glance, “economically justified” seems to refer to decisions on business level such as yield reductions or reduced quality parameters for harvested goods or any other business related issues such as putative higher labour costs. But in the case of IPM as an agricultural concept, the direct economic aspects not related to business issues are also of huge importance.

Examples for negative impacts of non-IPM methods are manifold. One of the best known example is the enormous damage in viticulture and pomiculture caused by spider mites in the second half of the nineteenth century. Adverse effects of chemical fungicides used for control of powdery and downy mildews on the populations of predatory mites led to massive outbreaks of spider mites, which afterwards had to be controlled for decades by the intensive use of miticides. Spider mite based damages caused by the use of organic chemicals and intensive use of miticides were completely obliterated by introduction of IPM strategies such as the use of fungicides not harmful to predatory mites. The decade-long discussion on the introduction of pesticides not harmful to predatory mites is currently mirrored for example by similar discussions on resistance issues and management as well as various other topics.

An example for a more indirect economic effect to be considered in the economic considerations of IPM is the protection of groundwater. As highlighted in the Dutch National Action Plan (NAP) for the sustainable use of plant protection products, the bulk of groundwater-based drinking water in the Netherlands is used without any additional water treatment, thus saving enormous costs for the Dutch economy. As shown, “economically justified” in the EU definition of IPM covers many issues on business as well as economic level. These being only examples, the combined reference to “economically and ecologically justified” considerations includes one of the main features of IPM, often forgotten, mainly the emphasis on management of pest populations, not their elimination. Costs for elimination of a pest, as targeted in conventional, non-IPM pest control systems are high, economically as well ecologically, and in many cases, more than disproportionate to the results. The disadvantage of IPM in this context is not its being less effective but more complex and thus more difficult to implement.

Initial indications on problems and delays in the implementation of and possible future legislative proposals in IPM can be derived from a Commission assessment of NAPs and two audit series on sustainable pesticide use conducted between 2012 and 2016, as well as fact-finding visits.
from the Commission to some member states in 2017. The 2017 report clearly shows that progress and shortcomings vary hugely between the different targets of the SUD as well as between member states. Whereat huge progress could be observed for several objectives of the SUD such as training and certification, other targets obviously fall short compared to the aims set out by the SUD. This is especially true for the “promotion of low pesticide-input farming and the creation by member states of necessary conditions for implementation of IPM”.

One of the main challenges regarding the implementation of the principles of IPM seems to be the current lack of appropriate control instruments as well as clear rules and guidance according to member state authorities. Whereas more than 30 crop-specific guidance documents for implementation of IPM in agricultural practise are currently available in Poland, only two respective guidelines are in place in Germany, one for sugar beets and one for gardening, landscaping and sports ground construction. German authorities refer to the voluntary character described in the SUD to “encourage professional users to implement crop or sector- specific guidelines for integrated plant protection” whereas “public authorities and/or organisations representing particular professional users may draw up such guidelines”.

Besides this current lack of appropriate control instruments as well as clear rules and guidance, many national authorities have identified the lack of sufficient non-chemical low risk pesticides that would broaden the range of IPM tools available to growers as another major hurdle for implementation of IPM.

Problems and issues in this regard are manifold. Some criteria for low risk aias were revised by EU Regulation 2017/1432, amending Annex II of Regulation 1107/2009 accordingly but for micro-organisms, for example, there are still many open questions regarding a possible low risk status for a specific strain. The lack of low-risk substances and products available, the reasons and possible solutions, were subjects of intensive political discussions in the recent past (eg motion for a European Parliament resolution on technological solutions for sustainable agriculture in the EU (2015/2225(INI))27; and European Parliament resolution of 15 February 2017 on low-risk pesticides of biological origin (2016/2903(RSP))28). In addition to efforts to foster low risk substances and products on an EU wide level, for example, by establishing a faster approval process, there are already several national actions ongoing to promote registration of low risk plant protection products. But to achieve real progress, harmonised rules and efforts would be required.

Interestingly, some of the recent, very important achievements regarding low risk aias and products and thus IPM are unduly regarded critically by some stakeholders. One example are some of the implications of the new European and Mediterranean Plant Protection Organisation (EPPO) guidance PP 1/296 (1) on the principles of efficacy evaluation for low-risk aias. The possible reduced level in effectiveness of low risk aias. and products compared with conventional chemical plant protection products often are the cause for criticism and derision. The respective EPPO guideline lists several examples of cases in which a reduced effectiveness may be acceptable such as the “use over a wider range of growth stages of the crop, greater compatibility with cultural practices or other plant protection measures, lower probability of resistance or important as part of a resistance management strategy, fewer undesirable effects (eg on beneficial organisms) or no need for specific mitigation measures”, all benefits in themselves.

But even without special additional circumstances that allow for reduced effectiveness, the keyword is already incorporated in the designation of the concept -- integrated. No user familiar with the concept of IPM or low risk substances would opt for management/ control of a certain pest using only one method with a reduced effectiveness condoning yield losses or loss of harvest. Integration of several methods and/or plant protection products, each maybe with only partial effectiveness, in total sums up to efficacy levels similar or higher than for a conventional, non-low risk plant protection product. In this context, the acronym IPM could also stand for “intelligent pest management”.

The effectiveness of IPM strategies is proven on a daily basis in agricultural practice, also under the even more strict organic farming rules. Non-availability of herbicides in organic farming without adverse effects on growing, yield or revenues, like in perennial crops in organic farming, is only one example. Integrated strategies for the control of mildews in viticulture including general plant health measures, appropriate soil cultivation and fertilisation, avoiding untimely release of nitrogen, defoliation of the berry zone and appropriate use of plant protection products allow for reduced use or total abnegation of chemical, non-low risk plant protection products, depending on climatic conditions. Despite this, there is an alarming tendency in EU to quit organic farming. The reason cited the most is the lack of suitable (low risk) aias. and products and methods allowed in organic farming. The extremely low number of low risk aias and products in EU at the moment (only 12 approved aias according to the EU pesticide database, as on September 17th 2018) is also criticised by many member states and judged as one of the major hurdles not only for organic farming but also for implementing IPM on a broader scale more thoroughly.

Besides the lack of suitable low risk plant protection products, many reasons for the insufficient implementation of IPM are mentioned and discussed but, most interestingly, the regulatory process of aia approval and product authorisation is very rarely mentioned in this context. One of the very few examples is Article 4 of the SUD that states that “the national action plans shall also include indicators to monitor the use of plant protection products containing active substances of particular concern, especially if alternatives are available. [Furthermore,] member states shall give particular attention to the plant protection products containing active substances
approved in accordance with Council Directive 91/414/EEC of July 15th 1991 concerning the placing of plant products on the market which, when subject to renewal of approval under Regulation (EC) No 1107/2009 will not fulfil the criteria relevant for approval laid down in Annex II (Procedure and criteria for the approval of active substances, safeners and synergists), points 3.6 to 3.8 (ecotoxicology, fate and behaviour in the environment, Impact on human health) of that Regulation”.

Regulations and guidance directly concerned with the approval of ais or the authorisation of plant protection products such as Regulation 1107/2009 or Regulations 283/2013 or 284/2013, setting out the data requirements for ais and plant protection products, are conspicuous by the absence of the term IPM. Considering the total of data requirements, one of the very few exceptions are the guidance and data requirements for efficacy whereas the importance allocated to IPM is very limited. EPPO guideline PP 1/296 (1) on the principles of efficacy evaluation for low-risk plant protection products, for example, states that in the biological assessment dossier and/or dRR “a description of the product's fit within a cropping system and its benefits in relation to alternatives may be provided, for example compatibility within an IPM system”. For a general agricultural principle of pest management and plant protection product use, in place since 2009, mandatory for all professional plant protection product users and one of the priorities in the Common Agricultural Policy (CAP), this more than moderate consideration in the ais approval and product authorisation process may also be a valid reason why IPM implementation in practical agriculture drags behind the established scientific benefits of IPM by decades.

To draw an overall conclusion on the complex issue of IPM is not feasible within the scope of this article. Perhaps one of the most important questions in regard to IPM, its current and future implementation in the agricultural practise as well as its regulatory and legislative frameworks, is the topic of incentives. Why, with certain exceptions, should a farmer organisation take the pain of voluntarily developing IPM guidelines? Why, with certain exceptions, should a farmer voluntarily take care about comprehensive implementation of IPM, also accepting possible additional expenditures by realising the overall socio-economic aims attributed to IPM? Why, with certain exceptions, should a manufacturer of plant protection ais and products voluntarily adapt products to IPM requirements, for example, carrying out respective regulatory efficacy trials incorporating IPM spray schedules? All of this without or with only very few incentives? The answer is: unlikely.

In the scope of the 2018 reporting of Commission to the European Parliament and to the Council on the status of implementation of SUD and possible future legislative acts, several proposals to amend problems and pitfalls of SUD will have to be discussed. On a national level, there are already several procedures in place in certain member states that could be used as examples for procedures on EU level. Based on the experiences in Italy, for example, a harmonised EU certification system for IPM, similar to organic farming could be a valuable incentive to all stakeholders. Certification systems allow for additional possibilities, for example, in regard to marketing and sales as well as higher and more stable prices for means of production as well as agricultural goods.

But, without doubt, a more thorough implementation of IPM is necessary to implement the additional goals of CAP and Circular Economy and not also to miss the possibilities inherent in next generation technologies such as integrated, digital and precision farming.

Dr Lars Huber is senior manager regulatory affairs, head of biostimulants, fertiliser and IPM at SCC.
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Best R&D Pipeline
- Corteva Agriscience (DowDuPont)
- FMC Agricultural Solutions
- Jiangsu Yangnong Chemical
- Marrone Bio Innovations

Best Formulation Innovation
- BASF (Selontra rodent bait)
- BASF (Seltima capsule suspension)
- Exosect (Entostat lean formulation technology)
- FMC Agricultural Solutions (3RIVE 3D formulation technology)
- Soyuzagrochim (Phospholipid nanoemulsion of AgroStimul)
- Syngenta (Ampexio WG Pepite)
- Willowood Chemicals (Triazophos 20% WG)

Best New Biological Product (Biopesticide)
- BetaTec Hop Products (Hop extracts)
- Eastman Chemical/Eden Research (Cedroz)
- Ecospray Limited (Nemguard)
- Marrone Bio Innovations (Venerate)
- Seipasa (Seican)

Best New Biological Product (Biostimulant)
- Mahindra Agri Solutions (Tarma & Spurt technology)
- Organica Biotech (Magic gro)
- Plant Health Care (ProAct)
- Sea6 Energy (LBD)
- Soyuzagrochim (AgroStimul)

Best New Crop Protection Product or Trait
- Corteva Agriscience (DowDuPont) (Rinskor)
- Corteva Agriscience (DowDuPont) (IPD072Aa)
- Ecospray (Nemguard)
- STK bio-ag technologies (Regev)
- Syngenta Crop Protection (Miravis Duo)

Best Innovation in Digital Farming Technology
- Agro Farm Ventures
- Ashland
- Cropin Technology Solutions

Best Application Technology Innovation
- Ashland (Agrimer M-DCA)
- Atens (Covenant)
- FMC Agricultural Solutions (3RIVE 3D)
- Willowood Chemicals (Soil capsulator)

Best Stewardship Programme
- Arysta LifeScience (ProNutiva)
- BASF (BASF Living Acres Monarch Challenge)
- BASF India (Suraksha Hamesha)
- Corteva Agriscience (DowDuPont) (Brazil & Paraguay Agricultural Initiatives)
- CropLife Asia (Chanthaburi Pollinator Project)
- European Crop Protection Association (TOPPS Water Protection)
- FMC Agricultural Solutions (FMC Pakistan Integrated Stewardship)
- Syngenta India (Supporting growers in adversity)
Best Public Outreach Programme
- Adama Agricultural Solutions Canada (Thank a retailer)
- Bayer Crop Science Division (Transparency in Crop Science)
- China Crop Protection Industry Association (Using pesticides safely and scientifically)
- Corteva Agriscience (DowDuPont) (Plant Sciences Symposium Series)
- CropLife Asia (Pan-Asia Farmers Exchange Program)
- CropLife Latin America (Say no to illegal pesticides)
- European Crop Protection Association (WithOrWithout campaign)
- UPL (UPL Zeba – a starch based super absorbent polymer)

Best Industry Collaboration
- Corteva Agriscience/ Eli Lilly/ Indiana Biosciences Research Institute
- CropLife Asia/ GiZ
- Marrone Bio Innovations/ Evogene
- Marrone Bio Innovations/ Groundwork BioAg

Best Marketing Campaign
- BASF (Fly with BASF)
- Corteva Agriscience (DowDuPont) (MaxIn.MaxOut.)
- CropLife America (#GiveACrop)
- CABB Group (CABB ChemCreations)
- Seiposa (Pirecris – Trust the leader’s efficacy)
- STK bio-ag technologies (Timorex Gold for bananas in Brazil)
- Syngenta Crop Protection (Elatus marketing campaign in Europe)
- UPL (Choice is yours)

Best Packaging Innovation
- Corteva Agriscience (DowDuPont) (Lumigen System Keg)
- Willowood Chemicals (Soil capsulator)

Best Company from an Emerging Region
- Limin Chemical
- Sichuan Leshan Fuhua Tongda Agro-chemical Technology
- Willowood Chemicals

Best Supplier
- Gharda Chemicals
- Jiangsu Yangnong Chemical
- Lier Chemical
- Limin Chemical
- Zhejiang Xinan Chemical Industrial Group (Wynca)

Best Supporting Role
- CABB Group
- Compliance Services International
- HTP Digital
- Nutrichem Laboratory
Agrow’s Crop Protection Leaders’ Forum
(to be held in conjunction with Agrow Awards 2018)

14.00 Registration and networking refreshments

14.30 Global crop protection market: an in-depth analysis
  • Mega M&As, their impact on the industry and on Agrow’s Top 20
  • Global agribusiness outlook
  • Crop protection market outlook for 2018

15.55 Tea/coffee and networking break

16.25 Interactive panel discussion: Crop protection industry trends, opportunities, threats and predictions
  • Impacts of mega M&As on: the crop protection industry, farmers and the regulatory as well as political environment
  • Impact of previous successful as well as failed M&As on the industry
  • Glyphosate and other controversies that are impacting the industry
  • Emerging trends

17.15 End of Crop Protection Leaders’ Forum

19.00 Agrow Awards Ceremony
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Address</th>
<th>Telephone</th>
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<tr>
<td>Agro Dragon Group</td>
<td>9F Shuangge Mansion, No.438, Pudian Road, Pudong New Area, Shanghai 200122, China</td>
<td>+86 215 1172566</td>
<td><a href="http://www.agrodragon.com">www.agrodragon.com</a></td>
</tr>
<tr>
<td>Anhui Fengle Agrochemical Co., Ltd</td>
<td>No. 4 Chuanye Road, Hefei City, 230031, P.R China</td>
<td>+86 551 65360940</td>
<td><a href="http://www.fengle-agrochem.com">www.fengle-agrochem.com</a></td>
</tr>
<tr>
<td>Anhui Guangxin Agrochemical Co., Ltd.</td>
<td>Cojijasan Pengcun Village, Xinhang Town, Guangde, Anhui, 242235, China</td>
<td>+86 215 0817211</td>
<td><a href="http://www.chinaguangxin.com">www.chinaguangxin.com</a></td>
</tr>
<tr>
<td>Anhui Huaxing Chemical Co., Ltd.</td>
<td>No. 6 Hongfeng road, Hefei City, Anhui Province, 230088, P.R. China</td>
<td>+86 551 65848156</td>
<td><a href="http://www.huaxingchem.com">www.huaxingchem.com</a></td>
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<tr>
<td>CAC Group Co., Ltd</td>
<td>No. 785 China Zhai North Road, Changning District, Shanghai, 200335, China</td>
<td>Tel: +86 216 2398696</td>
<td><a href="http://www.cacch.com">www.cacch.com</a></td>
</tr>
<tr>
<td>Eastchem Co., Ltd.</td>
<td>Floor 26, Haoyuan Mansion, No.266, Middle Tongjiang Road, Changzhou, Jianshu, China</td>
<td>+86 519 68786699</td>
<td><a href="http://www.eastchem.net">www.eastchem.net</a></td>
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<tr>
<td>Fuhua Tongda Agro-Chemical Technology Co., Ltd.</td>
<td>Qiaogou Town, WuTongqiao District, 614800 China</td>
<td>+86 216 8865055</td>
<td><a href="http://www.fuhua-tongda.com">www.fuhua-tongda.com</a></td>
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<tr>
<td>Golden Harvest Chemical Co., Ltd.</td>
<td>Rm 10C Top Boss Bldg, 159 Handan Road, Shanghai, PR China</td>
<td>+86 216 5520181</td>
<td><a href="http://www.goldenharvest-chem.com">www.goldenharvest-chem.com</a></td>
</tr>
<tr>
<td>Guangxi Tianyuan Biochemistry Co., Ltd.</td>
<td>Kaifeng City, Henan Province, Weishi County Industrial Development Zone, China</td>
<td>+86 771 2310509</td>
<td><a href="http://www.gxty.com">www.gxty.com</a></td>
</tr>
<tr>
<td>Hailir Pesticides And Chemicals Group Co., Ltd.</td>
<td>2nd Floor, Hailir Mansion, No.216, Guocheng Road, Chengyang District, Qingdao, 266109, China</td>
<td>+86 216 032 5568</td>
<td><a href="http://www.hailir.cn">www.hailir.cn</a></td>
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<tr>
<td>Hangzhou Udragon Chemical Co., Ltd.</td>
<td>No.172,ZhangjiadunRoad, Tangxi Development Zone, Hangzhou, Zhejiang, China</td>
<td>+86 571 89287689</td>
<td><a href="http://www.udragon.cn">www.udragon.cn</a></td>
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<tr>
<td>Hebei Veyong Bio-Chemical Co., Ltd.</td>
<td>China</td>
<td>+86 311 85915963</td>
<td><a href="http://www.veyong.com">www.veyong.com</a></td>
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<td>Hubei Sanonda Co., Ltd.</td>
<td>No. 93 Beijing East Road, Jingzhou City, Hubei Province, 434 001, China</td>
<td>+86 071 68314802</td>
<td><a href="http://www.sanonda.cn">www.sanonda.cn</a></td>
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<tr>
<td>Hunan Halli Chemical Industry Group Co., Ltd.</td>
<td>No.251, 2nd section, Furong(M) road, Changsha, Hunan, China</td>
<td>+86 731 8554047</td>
<td><a href="http://www.hnhlc.com">www.hnhlc.com</a></td>
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<tr>
<td>Jadesheen Chemical Co., Ltd.</td>
<td>901, No.299 North Tongdu Road, Jiangyin, Jiangsu, 214440 P.R. China</td>
<td>+86 510 86005061</td>
<td><a href="http://www.jadesheen.com">www.jadesheen.com</a></td>
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<td>Jiangsu Changlong Chemicals Co., Ltd.</td>
<td>No. 1229, Changzhou New District, Jiangsu Province, the Yangtze River Road, 213033, China</td>
<td>+86 519 68867715</td>
<td><a href="http://www.jschanglong.com">www.jschanglong.com</a></td>
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<tr>
<td>Jiangsu Changqing Agrochemical Co., Ltd.</td>
<td>1 Jiangling Road, Putou Town, Jiangsu District, Yangzhou City, Jiangsu, 225218, China</td>
<td>+86 514 86421237</td>
<td><a href="http://www.jscq.com">www.jscq.com</a></td>
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<td>Jiangsu Fengshan Group Co., Ltd.</td>
<td>1903 Central International Plaza, 105-6 North Zhongshan Road, Nanjing, China</td>
<td>+86 258 6558671</td>
<td><a href="http://www.fschem.com">www.fschem.com</a></td>
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<tr>
<td>Jiangsu Flag Chemical Co., Ltd</td>
<td>Changfenghe Road, Nanjing Chemical Industry Park, Luhe District, Nanjing, 210047, P.R. China</td>
<td>+86 255 8375015</td>
<td><a href="http://www.flagchem.com">www.flagchem.com</a></td>
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<tr>
<td>Jiangsu Good Harvest-Weien Agrochemical Co., Ltd.</td>
<td>Laogang,Qidong city Jiangsu China(Binjiang chemical industry park, Qidong, 226221, China</td>
<td>+86 513 8388555</td>
<td><a href="http://www.good-harvest.cn">www.good-harvest.cn</a></td>
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<tr>
<td>Jiangsu Huifeng Agrochemical Co., Ltd.</td>
<td>No. 92 People's Road, Dafeng City in Jiangsu Province, 224100, China</td>
<td>+86 515 83252118</td>
<td><a href="http://www.hfagro.com">www.hfagro.com</a></td>
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## China Company List

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<th>Company Name</th>
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<tr>
<td>Jiangsu Institute Of Ecomones Co., Ltd.</td>
<td>95 Huanyuan N. Road, Economic Development Zone, Jintan, Jiangsu 213200, China</td>
<td>+86 519 82824504</td>
<td><a href="http://www.jsmone.com">www.jsmone.com</a></td>
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<tr>
<td>Jiangsu Kesheng Group Co., Ltd.</td>
<td>No. 888, Yanchan Road, Jianhu County, Jiangsu, 224700, China</td>
<td>+86 515 86267666</td>
<td><a href="http://www.kesheng.com">www.kesheng.com</a></td>
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<tr>
<td>Jiangsu Lanfeng Biochemical Co., Ltd.</td>
<td>NO.120, Xinyi Xin'anlu, Jiangsu Province, 221400, China</td>
<td>+86 516 88923437</td>
<td><a href="http://www.jslanfeng.com">www.jslanfeng.com</a></td>
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<tr>
<td>Jiangsu Sevencontinent Green Chemical Co., Ltd.</td>
<td>Dongsha Chemical Zone, Zhangjiagang, Jiangsu Province, China</td>
<td>+86 512 58609901</td>
<td><a href="http://www.sevencontinent.com">www.sevencontinent.com</a></td>
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<tr>
<td>Jiangyin Suli Chemical Co., Ltd.</td>
<td>7-1, Runhua Road, Lingang Street, Jiangyin City, Jiangsu, 214444, China</td>
<td>+86 510 86631388</td>
<td><a href="http://www.suli.com">www.suli.com</a></td>
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<tr>
<td>Jiangsu Sword Agrochemicals Co., Ltd.</td>
<td>No.1008 Guanhua Road (east), Jianhu, Jiangsu, 224700, China</td>
<td>+86 515 86252132</td>
<td><a href="http://www.swordchem.com">www.swordchem.com</a></td>
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<td>Jiangsu Tianrong Group Co., Ltd.</td>
<td>147 Pingling East Rd. Lianyungang City, Jiangsu Province, China</td>
<td>+86 519 7299384</td>
<td><a href="http://www.jstrgf.com">www.jstrgf.com</a></td>
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<td>Jiangsu Yangnong Chemical Co., Ltd.</td>
<td>39 Wenfeng Road, Yangzhou Jiangsu, China</td>
<td>+86 514 85889958</td>
<td><a href="http://www.yangnong.net">www.yangnong.net</a></td>
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<tr>
<td>Jiangsu Yongan Chemical Co., Ltd.</td>
<td>Xuehang Chemical Industrial Park, Lianshui County, Jiangsu Province, 223400, China</td>
<td>+86 507 87065196</td>
<td><a href="http://www.yachemical.com">www.yachemical.com</a></td>
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<tr>
<td>Jiangyin Milagro Chemical Co., Ltd.</td>
<td>RM 1205 Kaisa Plaza, 1091 East Renmin Road, Jiangyin, Jiangsu, China</td>
<td>+86 510 80618091</td>
<td><a href="http://www.milagrochem.com">www.milagrochem.com</a></td>
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### China Company List

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<td>Jingbo Agrochemicals Technology Co., Ltd.</td>
<td>Economic Development Zone, Boxing County, Shandong Province, China</td>
<td>+86 543 2510800</td>
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<tr>
<td>JRB Packaging Co., Ltd.</td>
<td>No. 268, Huangpu River Road, Kunshan City, Jiangsu Province Economic and Technological Development Zone, 215300, China</td>
<td>+86 512 57718695</td>
<td><a href="http://www.jrbpack.com">www.jrbpack.com</a></td>
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<tr>
<td>King Quenson Industry Group Ltd.</td>
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<td>+86 755 86612760</td>
<td><a href="http://www.kingquenson.com">www.kingquenson.com</a></td>
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<td>Kingtai Chemicals Co., Ltd.</td>
<td>9F, Huarong Times Mansion Hi-tech Development Zone, Binjiang, Hangzhou, China</td>
<td>+86 571 87110716</td>
<td><a href="http://www.kingtaichem.com">www.kingtaichem.com</a></td>
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<td>Lianhetech</td>
<td>8 Yongjiqiao Road, Huaygan Economic Development Zone, Taizhou City, Zhejiang Province, 318020, China</td>
<td>+86 576 8427 5170</td>
<td><a href="http://www.lianhetech.com">www.lianhetech.com</a></td>
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<td>Lier Chemical Co., Ltd.</td>
<td>Economic and Technical Development Zone, Mianyang, Sichuan, 621000, P.R.China</td>
<td>+86 816 2547206</td>
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<td>Limin Chemical Co., Ltd.</td>
<td>Economic Development Zone, Xinyi Jiangsu Province, China</td>
<td>+86 516 88923527</td>
<td><a href="http://www.chinalimin.com">www.chinalimin.com</a></td>
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<tr>
<td>Maxunitech Inc.</td>
<td>No. 603, Binkang Road, Hangzhou, Zhejiang Province 310052, P.R. China</td>
<td>+86 571 28007880</td>
<td><a href="http://www.maxunitech.com">www.maxunitech.com</a></td>
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<tr>
<td>Nanjing Essence Fine-Chemical Co., Ltd.</td>
<td>9th floor, No. 58 Nanhu Road, Nanjing, 210017, China</td>
<td>+86 258 6518999</td>
<td><a href="http://www.essencechem.com">www.essencechem.com</a></td>
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<td>Nanjing Red Sun Co., Ltd.</td>
<td>No. 589 Zhushan Road, Jiangning District, Nanjing 211112, China</td>
<td>+86 258 7151768</td>
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<td>Nantong Jiangshan Agrochemicals&amp;Chemicals Co., Ltd.</td>
<td>No. 35 Yaogang Road Nantong Jiangsu Province, 226006, China</td>
<td>+86 513 83513131</td>
<td><a href="http://www.jsac.com">www.jsac.com</a></td>
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<tr>
<td>Noposion Agrochemicals Co., Ltd.</td>
<td>113 Iron Kong Reservoir road, Shenzhen Bao'an District, 518102, China</td>
<td>+86 755 29977288</td>
<td><a href="http://www.noposion.com">www.noposion.com</a></td>
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<td>Nutrichem Company Limited</td>
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<td>+86 108 2819999</td>
<td><a href="http://www.nutrichem.cn">www.nutrichem.cn</a></td>
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<tr>
<td>Qingdao Hansen Biologic Science Co., Ltd.</td>
<td>5th Floor, District A, No.3 Building, Shilaoren Technical Innovation Park, No.143, Zhuzhou Road, Laoshan District, Qingdao, 266101, China</td>
<td>+86 532 85766777</td>
<td><a href="http://www.qdhansen.com">www.qdhansen.com</a></td>
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<td>Psyche Chem Group</td>
<td>Room 906, 555 Nanjing Road (West), Shanghai 200040, China</td>
<td>+86 216 136 7911</td>
<td><a href="http://www.psychem.com">www.psychem.com</a></td>
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<td>Shandong Binnong Technology Co., Ltd.</td>
<td>No. 518, Yongxing Road, Binbei Town, Binzhou City, Shandong Province, China</td>
<td>+86 543 3368839</td>
<td><a href="http://www.binnong.com">www.binnong.com</a></td>
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<td>Shandong Cynda Chemical Co., Ltd.</td>
<td>Floor 6, Building D, In-hi tech Square, No. 2008 Xinhua Street, Jinan, Shandong, China</td>
<td>+86 531 88873317</td>
<td><a href="http://www.cynda.cn">www.cynda.cn</a></td>
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<td>Shandong Huayang Science And Technology Co., Ltd.</td>
<td>China</td>
<td>+86 800 8607399</td>
<td><a href="http://www.huayang.com">www.huayang.com</a></td>
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<td>Shandong Luba Chemical Co., Ltd.</td>
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<td>+86 531 81795399</td>
<td><a href="http://www.lubachem.com">www.lubachem.com</a></td>
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<tr>
<td>Shandong Qiaochang Chemical Co., Ltd.</td>
<td>China</td>
<td>+86 543 2226170</td>
<td><a href="http://www.qiaochang.com">www.qiaochang.com</a></td>
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<tr>
<td>Shandong Vicome Greenland Chemical Co., Ltd.</td>
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<td>+86 400 618 6178</td>
<td><a href="http://www.greenlandchem.com">www.greenlandchem.com</a></td>
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<td>Shandong Weifang Rainbow Chemical Co., Ltd.</td>
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<td>+86 531 88875225</td>
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<tr>
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<td>+86 755 82389033</td>
<td><a href="http://www.sinoagrochem.com.cn">www.sinoagrochem.com.cn</a></td>
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<td><a href="http://www.sinochemagro.com">www.sinochemagro.com</a></td>
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<td><a href="http://www.eagro.net">www.eagro.net</a></td>
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<td>+86 571 85270003</td>
<td><a href="http://www.tide-china.com">www.tide-china.com</a></td>
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<td><a href="http://www.trustchem.com">www.trustchem.com</a></td>
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<tr>
<td>Yifan Biotechnology Group Co., Ltd.</td>
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<td>+86 577 86636638</td>
<td><a href="http://www.chinayifan.com">www.chinayifan.com</a></td>
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<td>Yongnong Biosciences Co., Ltd.</td>
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<td>+86 575 82728868</td>
<td><a href="http://www.yongnongbiosciences.com">www.yongnongbiosciences.com</a></td>
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<tr>
<td>Zhejiang Biok Chemical Co., Ltd.</td>
<td>Rm.1558 ,Beijing New Century Office Building,No.6 Southern Road, Capital Gym,Beijing,P.R.China</td>
<td>+86 106 8492166</td>
<td><a href="http://www.biokchemical.com">www.biokchemical.com</a></td>
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<tr>
<td>Zhejiang Heben Pesticide&amp;Chemicals Co., Ltd.</td>
<td>Yanjiang Industrial Area, Lucheng District, Wenzhou City, Zhejiang Province, China</td>
<td>+86 577 55882935</td>
<td><a href="http://www.hb-p.com">www.hb-p.com</a></td>
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<td>Zhejiang Jinfanda Biochemical Co., Ltd.</td>
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<tr>
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<td>2303# Taihu Avenue, Chanxiong County Economic Development Park, Zhejiang, China 313100</td>
<td>+86 572 6121387</td>
<td><a href="http://www.zschem.com">www.zschem.com</a></td>
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Sichuan Leshan Fuhua Tongda Agro-Chemical Technology Co., Ltd., specializes in glyphosate and glufosinate manufacturing, with current annual Glyphosate 95% Tech production capacity of 120,000 Mt (glycine route) and Glufosinate 95% Tech capacity of 10,000 Mt. It is the largest producer in China and the second largest world-wide. Fuhua is projecting Dicamba and 2,4-D in capacity of 5,000 Mt/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.
Worldwide services to agricultural businesses

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www.syntechresearch.com