

India

**Underweight** (no change)

**Highlighted Companies**

**Astec Lifesciences Ltd**

**REDUCE, TP Rs1073, Rs1703 close**

We forecast revenue growth at a 13% CAGR and PAT at 14.9% CAGR over FY21-24F for Astec Lifesciences. The uncertainty to earnings is high as its only product class SBI triazole sales are declining globally

**Heranba Industries Ltd**

**REDUCE, TP Rs436, Rs717 close**

Lack of production capacity, slow-growing market, rising raw material prices and intense competition faced by global leaders are headwinds for Heranba.

**UPL Limited**

**REDUCE, TP Rs754, Rs790 close**

Weather, currency and supply chain risks are business risks of UPL (company has no control over them) which makes its earnings volatile. Lack of new products and stagnant-to-declining nature of its old products are long-term business risks.

**Summary Valuation Metrics**

| P/E (x)                | Mar22-F | Mar23-F | Mar24-F |
|------------------------|---------|---------|---------|
| Astec Lifesciences Ltd | 56.65   | 42.54   | 33.74   |
| Heranba Industries Ltd | 22.27   | 24.66   | 24.73   |
| UPL Limited            | 18.31   | 16.69   | 14.21   |

| P/BV (x)               | Mar22-F | Mar23-F | Mar24-F |
|------------------------|---------|---------|---------|
| Astec Lifesciences Ltd | 8.45    | 6.69    | 5.37    |
| Heranba Industries Ltd | 4.39    | 3.74    | 3.26    |
| UPL Limited            | 2.51    | 2.19    | 1.9     |

| Dividend Yield         | Mar22-F | Mar23-F | Mar24-F |
|------------------------|---------|---------|---------|
| Astec Lifesciences Ltd | 0.11%   | 0.15%   | 0.18%   |
| Heranba Industries Ltd | 0.08%   | 0.07%   | 0.07%   |
| UPL Limited            | 1.43%   | 1.57%   | 1.85%   |

# Chemicals - Overall

## Agrochemicals - Changing dynamics

- Success of diamide insecticides, pricing pressure on amino acid herbicides & regulatory issue with dithiocarbates fungicides - landscape is changing rapidly.
- Diamide insecticides are fast replacing pyrethroids. Please note that 80% of insecticides sales growth in last nine years has been driven by diamides.
- We downgrade UPL to REDUCE; maintain REDUCE on Astec Life Sciences, Heranba, India Pesticides and Dhanuka Agritech. Top picks - Rallis and Bayer.

### Old success stories in agrochemicals are losing sheen

In past four years, amino acid-based herbicides (glyphosate and glufosinate) are facing headwinds. Glufosinate faces pricing pressure while in case of glyphosate it is regulatory action. Dithiocarbamate fungicides (primarily mancozeb) are also facing increased regulatory action because of its harmful impact on humans. Within insecticides, neonicotinoid (multiple Indian companies are present here), which is stagnant since the last decade, is also facing increased regulatory action. Diamides is the success story of last five years (primarily rynaxypyr or chlorantraniliprole), but Indian presence in this chemical class is limited to contract manufacturing. PI Industries as well as UPL do contract manufacturing of chlorantraniliprole for FMC. Access to new seed technology (particularly gene editing and GMO) is critical for success in coming decades. Unfortunately, none of the Indian companies are making any efforts in this direction. We like companies who have access to technology or are making efforts to diversify. In this regard, we like Bayer and Rallis. We downgrade our rating on UPL to REDUCE, and retain REDUCE rating on Astec Life Sciences, Heranba, India Pesticides, and Dhanuka Agritech.

### Multiple new chemical classes emerge with scant Indian presence

Multiple new classes of chemicals are emerging, but Indian companies lag across all agrochemicals development. In herbicides, it is PPO (last decade – 5.5% CAGR), HPPD (4.5% CAGR over CY12-20), and other ALS (2% CAGR over CY12-20). All these chemicals have scant presence of Indian companies. Similarly, among insecticides, its diamide (12% CAGR over CY12-20) and biologicals (5% CAGR over CY12-20). Indian companies like UPL and others are making some efforts in biologicals but their diamide presence is limited to doing contract manufacturing for FMC. Most Indian insecticide companies are in operating in the neonicotinoid class of chemicals which is facing increased regulatory action as well as sales stagnancy. In fungicides, SDHI strobilurin is fastest-growing. Indian presence in SDHI (succinate dehydrogenase inhibitor) is limited to making intermediaries for these chemicals (SRF does it). Arysta (part of UPL) also manufactures one chemical - carboxin - whose global sales fell at a 7% CAGR over CY12-20. Fastest-growing molecules in this segment are fluxapyroxad, benzovindiflupyr, bixafen, fluopyram, sedaxane and penflufen, which grew at 22%, 77%, 11%, 34%, 23% and 34% CAGR, respectively, over CY12-20, witnessed scant Indian presence.

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**Figure 1: We have downgraded UPL to REDUCE; Bayer and Rallis are only companies with ADD rating in our agrochemicals universe**

| Sr No. | Name of the company    | Target Price | Rating |
|--------|------------------------|--------------|--------|
| 1      | Astec Lifesciences Ltd | REDUCE       | 1073   |
| 2      | Bayer Cropscience Ltd  | ADD          | 6621   |
| 3      | Dhanuka Agritech Ltd   | REDUCE       | 704    |
| 4      | Heranba Industries Ltd | REDUCE       | 436    |
| 5      | India Pesticides Ltd   | REDUCE       | 287    |
| 6      | Rallis India Ltd       | ADD          | 355    |
| 7      | UPL Limited            | REDUCE       | 754    |

SOURCES: INCRED RESEARCH, COMPANY REPORTS

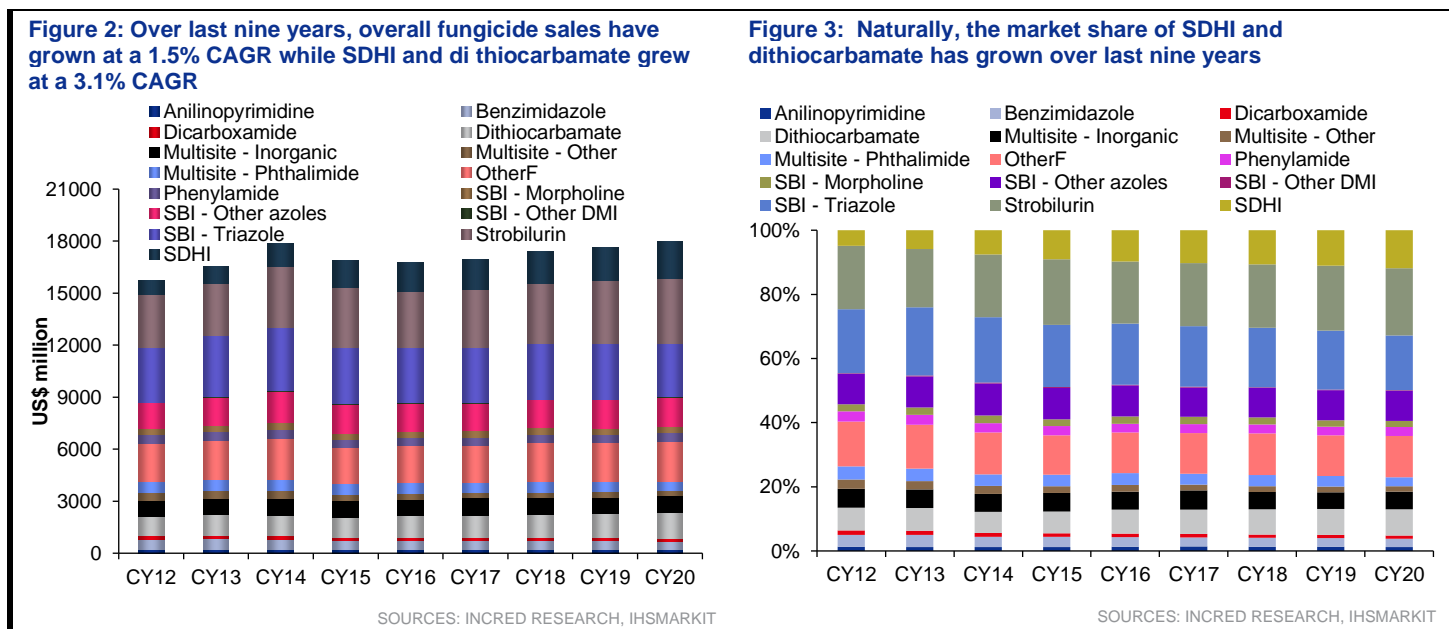
## Agrochemicals - Changing dynamics

Global agrochemicals market is in a flux. Increased regulatory oversight, changing weather patterns, and increased competitive pressure from the innovators is making life difficult for generic companies and their suppliers. The Covid-19 pandemic and increased supply chain disruption has only increased margin pressure for companies. We downgrade UPL to REDUCE and maintain REDUCE rating on Astec Lifesciences, Heranba and India Pesticides

### Fungicides - hyper growth of mancozeb is over

In the past few years, many Indian companies' growth, including that of UPL, was driven by mancozeb. The success of mancozeb against Asian rust disease led to the growth in sales of mancozeb at a scorching pace. However, changing crop patterns and increased usage of other multi-site fungicides take market share away from mancozeb.

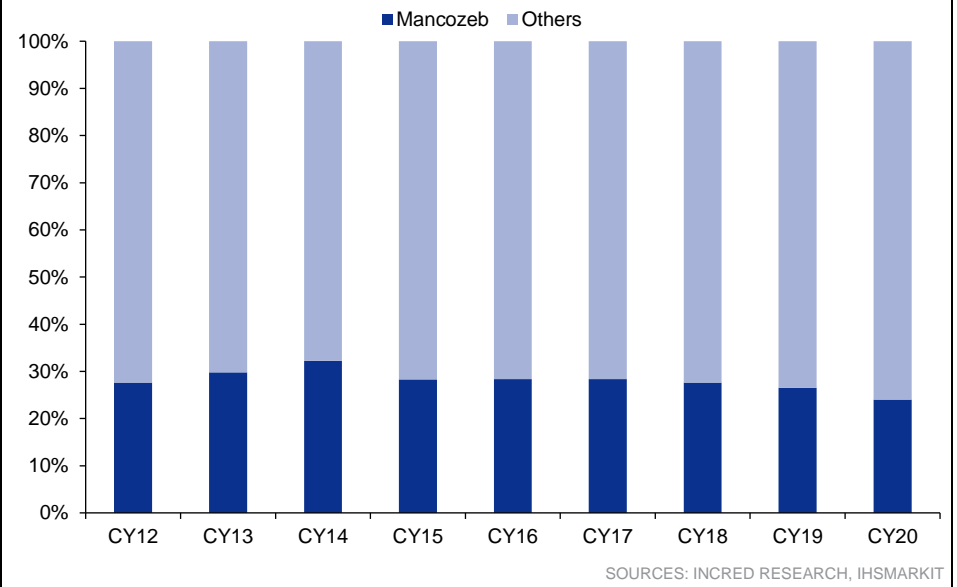
### Since past few years growth has been driven by old fungicides SDHI and strobilurins



### Growth in dithiocarbamate was driven by mancozeb

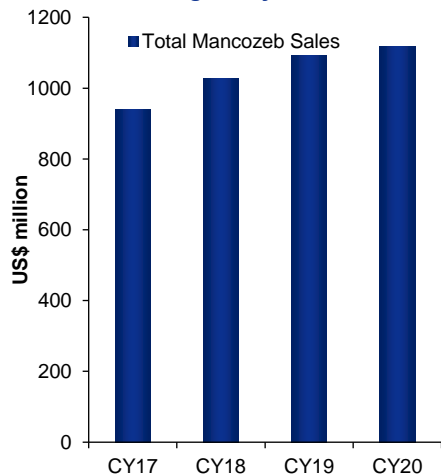
Dithiocarbamate fungicides are multi-site, non-systemic and non-selective products with contact and protective activity and are commonly known as EBDCs or ethylene bis dithiocarbamates. The products act via inhibition of fungal metabolism at many sites, as a result of which the risk of resistance or tolerance build-up is very low. They are used in a wide range of crop situations, mostly by foliar application, but also with some seed treatment usage. All the products in this segment are now off-patent and have commodity status, being manufactured by a number of companies around the world. In India, UPL is the major manufacturer of mancozeb. Apart from UPL, other companies like Coromandel international also make mancozeb.

**Figure 4: While mancozeb global sales grew at a 3.7% CAGR, other fungicide sales grew only at a 1.6% CAGR, driving overall growth at a 3.1% CAGR over CY12-20**

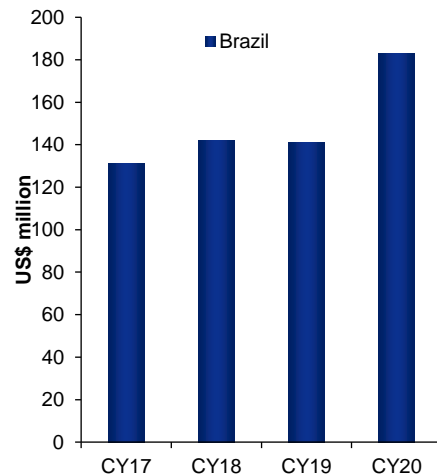


**Mancozeb’s success was driven by Asian rust impact on soybean in Brazil ➤**

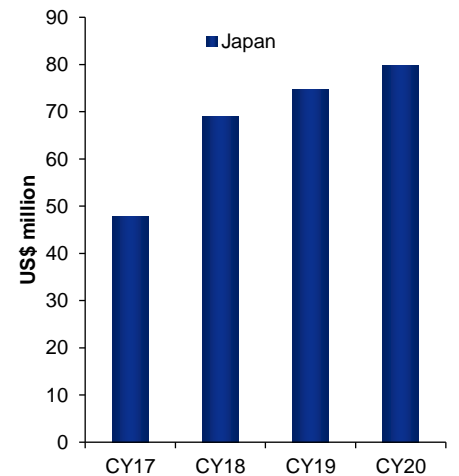
**Figure 5: Over last four years, overall mancozeb sales grew by US\$197m....**



**Figure 6: ...out of which Brazil accounted for US\$53m**



**Figure 7: ...and Japan accounted for US\$31m**

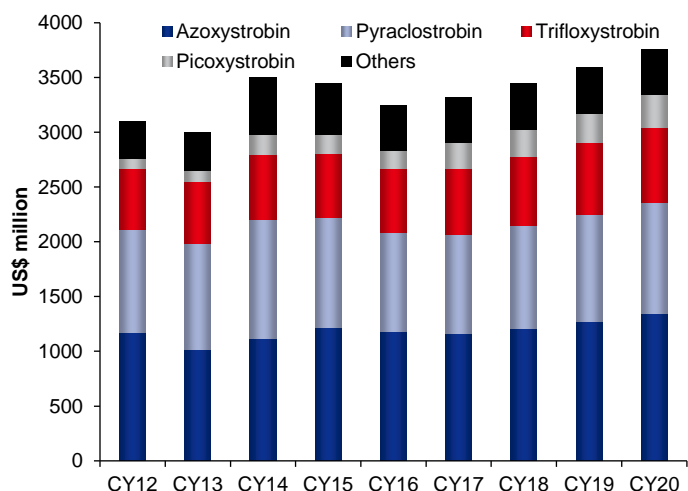


**UPL got the lion’s share in growing Brazil mancozeb market ➤**

UPL got the lion’s share in Brazil’s growing market for mancozeb. As per IHSMARKIT, it had nearly 50% market share in Brazil’s mancozeb market during CY20.

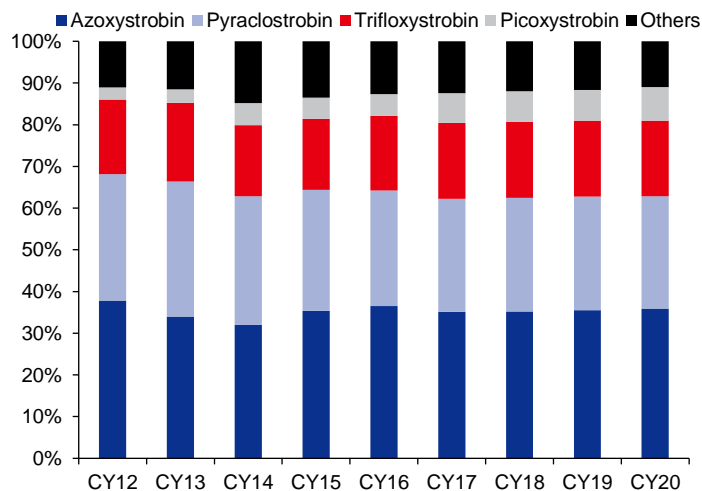
**Strobilurin is another important chemical class in fungicides >**

**Figure 8: Picoxystrobin is the most promising fungicide in strobilurin chemical class**



SOURCES: INCRED RESEARCH, IHSMARKIT

**Figure 9: Over the years, picoxystrobin has captured incremental space within fungicides and is growing at a 14.6% CAGR**



SOURCES: INCRED RESEARCH, IHSMARKIT

**Strobilurin is a relatively recent chemical class >**

Strobilurin was first introduced in 1996 with kresoxim-methyl from BASF, and closely followed by azoxystrobin from Zeneca (now Syngenta) in 1997. Since then, products from this group have rapidly gained market share in the fungicides segment due to their versatility, applications in a wide range of crop segments, broad spectrum of action, compatibility with other products, and low application rates.

**Figure 10: Strobilurin is a relatively recent chemical class - apart from Rallis, no other Indian company has a significant presence in this category**

|                 | Launch Date | Major Producers                              |
|-----------------|-------------|--|
| Azoxystrobin    | 1997        | Syngenta, FMC, and Various Chinese Producers |
| Pyraclostrobin  | 2002        | BASF   |
| Trifloxystrobin | 2000        | Bayer  |
| Picoxystrobin   | 2001        | Corteva                                      |
| Kresoxim-Methyl | 1996        | BASF, Adama, Rallis                          |
| Fluoxastrobin   | 2004        | Bayer  |
| Orysastrobin    | 2007        | BASF   |
| Dimoxystrobin   | 2004        | BASF   |
| Mandestrobin    | 2016        | Sumitomo Chemicals                           |
| Metominostrobin | 2000        | Sumitomo Chemicals                           |
| Pyraoxystrobin  | 2009        | Shenyang Research Institute                  |
| Enestroburin    | 2006        | Sinochem/ Shenyang Research Institute        |
| Coumoxystrobin  | 2010        |  |
| Fenamistrobin   | 2008        |  |

SOURCES: INCRED RESEARCH, IHSMARKIT

**Strobilurin class of chemicals developing resistance, which is a major headwind >**

Resistance now plays a significant role in development of the strobilurin market, initially in cereal segment, and now also in soybean. Powdery mildew resistance to kresoxim was reported relatively early after the product's introduction, and more recently septoria resistance to the group as a whole has been an issue. While most of the sales in cereals segment comes as a result of the greening impact and yield benefits that the products provide, the expenditure incurred by farmers for early season septoria control by other chemistries reportedly limits spending on later season strobilurin use, particularly in years of low cereal prices.

## With hardly any new molecules in the pipeline, manufacturers are increasingly selling their mixture with SBI triazoles and even dithiocarbamate ►

Various producers are trying different chemical mixtures with strobilurin - mostly SBI triazoles are used and sometimes even dithiocarbamate is tried out.

1. In 2019, the UK-based agrochemicals company, Agform, launched its broad-spectrum fungicide, Oxe (azoxystrobin), in the UK.
2. In 2019, Nufarm launched its systemic fungicide, Tamiz (azoxystrobin + tebuconazole), in Brazil, for the control of rust disease, cercospora spp such as leaf spot.
3. In 2019, FMC applied to the US EPA to register F4412-1 (fluindapyr 10.5% + azoxystrobin 15.7%) for use on maize, soybeans, sorghum, wheat, triticale, and barley.
4. In 2019, UPL launched its triple action fungicide, Tridium (azoxystrobin + mancozeb + tebuconazole), in Brazil.
5. In 2019, Syngenta introduced the fungicide, Orondis Flexi (oxathiapiprolin 15 g/litre + azoxystrobin 155 g/litre),
6. In Feb 2020, Syngenta introduced the seed treatment, Vibrance RST (azoxystrobin + fludioxonil + metalaxyl-M + sedaxane), for use on rice in the US.
7. In Feb 2020, Syngenta debuted Oliva Top (azoxystrobin + difenoconazole), in Spain for olive groves, rice and covered and field fruit and vegetables.
8. In 2020, Syngenta launched three fungicides for US golf course turf including Posterity Forte (pydiflumetofen + azoxystrobin + propiconazole).
9. BASF's Obvious Plus seed treatment (fluxapyroxad, pyraclostrobin, thiophanate-methyl and metalaxyl) was launched in 2019.
10. In 2019, BASF launched Tessior (boscalid + pyraclostrobin), in Spain for the control of grapevine trunk disease.
11. In May 2020, BASF launched Melyra (mefentrifluconazole + pyraclostrobin), in China. This marked the first launch of a product containing mefentrifluconazole in the Asia Pacific region. Melyra is for professional tomato and grape growers, but the company is planning to expand the approved label to a wider array of crops, including apple and cucumber.
12. BASF received Canadian registration in 2021 for Veltyma (pyraclostrobin + mefentrifluconazole) for use on crops such as maize, potato, wheat and soybean. BASF also received Canadian registration for its seed treatment,
13. Vercoras (clothianidin + fluopyram + metalaxyl + fluxapyroxad + pyraclostrobin), for use on the company's genetically modified herbicide-tolerant canola. The product offers broad-spectrum control against seed and soil-borne diseases such as blackleg (*leptosphaeria maculans*) during critical early season infection, besides providing baseline protection against flea beetles (*phyllotreta cruciferae*).
14. BASF had plans to launch Ceriax Plus (pyraclostrobin + fluxapyroxad + epoxiconazole) in Russia in 2021.
15. BASF introduced Priaxor (fluxapyroxad + pyraclostrobin) in Spain in 2021 for the control of major foliar cereal diseases such as septoria spp, and leaf rust (*puccinia triticina*) on wheat, and brown rust (*puccinia hordei*) and ramularia leaf spot (*ramularia collo-cygni*) in barley. The product was launched for soybean in Argentina in 2020 for the control of Asian soybean rust (*phakopsora pachyrhizi*), brown spot, ring spot, frog eye spot and purple spot.
16. In 2017, Bayer gained approval for Fox-Xpro (bixafen + prothioconazole + trifloxystrobin) for use on cotton, barley, sunflower and soybean.
17. Also in 2017, Bayer launched Cripton Xpro (bixafen + prothioconazole + trifloxystrobin), in Argentina for use in cereals and peanut and Luna Sensation (fluopyram + trifloxystrobin), and in Canada for use on stone fruit, root vegetables, cucurbit vegetables, leafy petiole vegetables, brassicas and hops.

18. Bayer's Delaro Complete (fluopyram + prothioconazole + trifloxystrobin), received registration in eastern Canada in 2021 for use on maize, soybean and cereal crops. The product gained US EPA approval in 2020 for use on maize and soybean.
19. In 2017, DuPont launched Vessarya (picoxystrobin, benzovindiflupyr) in Brazil for use on cereals.
20. In Feb 2020, Corteva Agriscience trade-marked picoxystrobin as Onmira. It has been selected to give a consistent global brand to the Agrochemical intermediary in more than 15 picoxystrobin-based products, including Vassarya (picoxystrobin + Syngenta's benzovindiflupyr).
21. Corteva launched Viovan (picoxystrobin + prothioconazole) and Approach Power (picoxystrobin + cyproconazole) in Brazil in 2021 for use on soybean.

### **Strobulin or SDHI is not a multi-site fungicide but when mixed with SBI triazole its effectiveness goes up ►**

While Strobulin or SDHI is not a multi-site fungicide, but when is applied in a mixture with SBI triazole/ dithiocarbamate/ other azoles, its effectiveness goes up. SBI triazoles are also mixed with SDHI to increase their effectiveness.

### **Dithiocarbamate fungicide like mancozeb has lots of controversies surrounding it ►**

Dithiocarbamate fungicide like mancozeb has loads of controversies surrounding it. There are many groups who argue that it is proven to be cancerous but it is still in use. We have listed research papers below that have arguments on both sides:

1. [Factcheck \(Mostly False: "The pesticide mancozeb is a relatively harmless substance" – eufactcheck.eu\)](https://eufactcheck.eu/)
2. [Scandinavian Journal of Work, Environment & Health - Indicators of mancozeb exposure in relation to thyroid cancer and neural tube... \(sjweh.fi\)](https://www.sjweh.fi/)
3. [Transplacental Carcinogenic Potential of the Carbamate Fungicide Mancozeb \(researchgate.net\)](https://www.researchgate.net/)
4. [Federal Register :: Mancozeb; Pesticide Tolerances](https://www.federalregister.gov/)
5. [Mancozeb - OEHHA \(ca.gov\)](https://www.ca.gov/)
6. [Occupational Exposure to Pesticides With Occupational Sun Exposure Increases the Risk for Cutaneous Melanoma.](https://www.occupational-exposure.com/)
7. [Mancozeb.pdf \(ppqs.gov.in\)](https://www.ppgs.gov.in/)

### **Controversy around dithiocarmate along with effectiveness of other fungicide formulation will keep mancozeb sales under check ►**

Naturally, we are not competent enough to pass a judgement on the toxicity of mancozeb, but there is enough noise on this matter which can keep the growth of mancozeb and dithiocarbamate fungicides under check.

### **SBI triazoles also face lots of regulatory action ►**

1. [Side effects of the sterol biosynthesis inhibitor fungicide, propiconazole, on a beneficial arbuscular mycorrhizal fungus](https://www.sciencedirect.com/)
2. [International Symposium on Sterol Biosynthesis Inhibitors — Pharmaceutical and Agrochemical Aspects on JSTOR](https://www.jstor.org/)
3. [JoF | Free Full-Text | Triazole-Resistance in Environmental Aspergillus fumigatus in Latin American and African Countries | HTML \(mdpi.com\)](https://www.mdpi.com/)

**SBI triazoles as well as dicarbamate usage will be limited going ahead**

It appears that SBI triazoles and dicarbamate usage will be limited going ahead as there are regulatory headwinds across the board for them. On the other hand, strobilin and SDHI are doing well. The future belongs to strobilin and SDHI. SBI triazoles and dicarbamates can, at best, be mixture partners, thus limiting their growth potential.

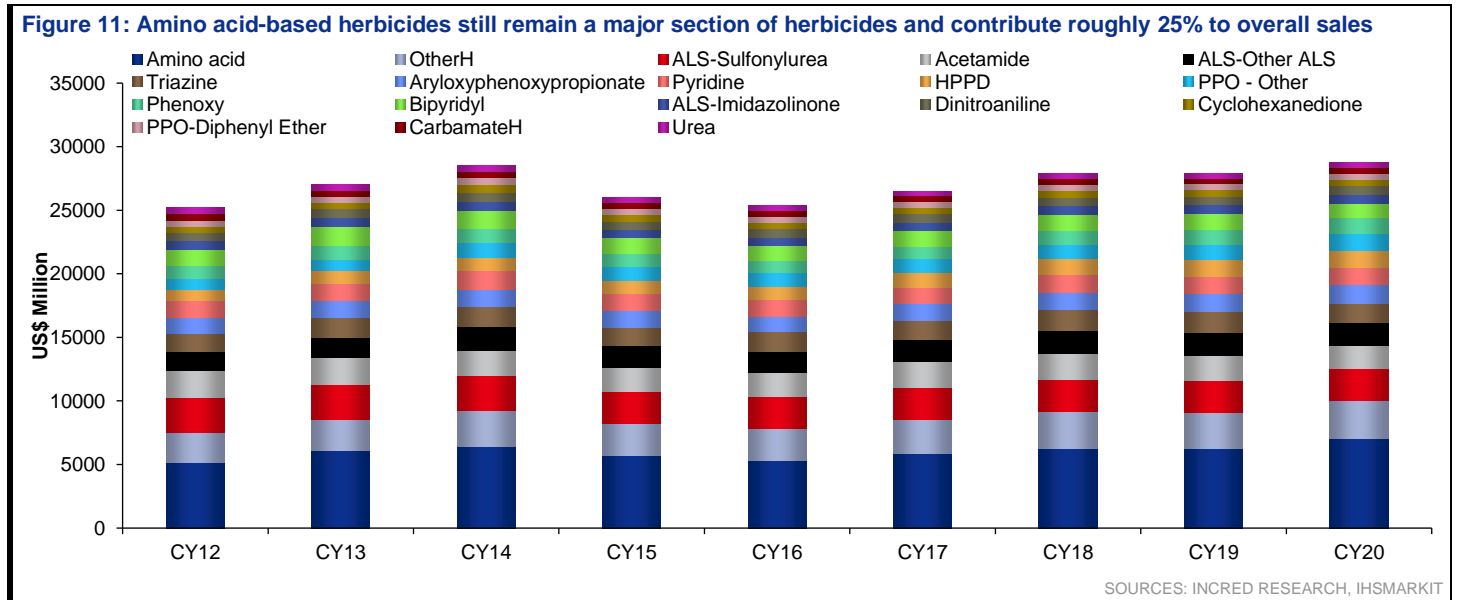
**Change in crop pattern of soybean is limiting soybean rust**

Asian rust attacks on soybean crops, which take place between Apr-Sep, are much more accentuated. Farmers are advised in Brazil to limit the planting during this season, which is another limiting factor for dicarbamate group of fungicides.

**Herbicides- there's price war as new products are rare**

We haven't seen any significant new product development in this agrochemicals sub-section. Over the last 10 years, 18 new products have been introduced whose combined sales stood at US\$756m in CY20 or around 3% of overall sales. The amino acid-based herbicides still lead the pack (glyphosate and glufosinate) but most of the new products are in HPDD (4-hydroxyphenylpyruvate dioxygenase). Amino-based herbicides are facing regulatory action in many parts of the world which is limiting their usage/growth. Almost all successful products are now generic and so the selling point is the development of herbicide-tolerant seeds on which standalone generic agrochemical companies (without the ability to develop seeds) don't stand against big companies like Bayer/ Syngenta. Generic players like UPL will keep facing the price heat on the product side.

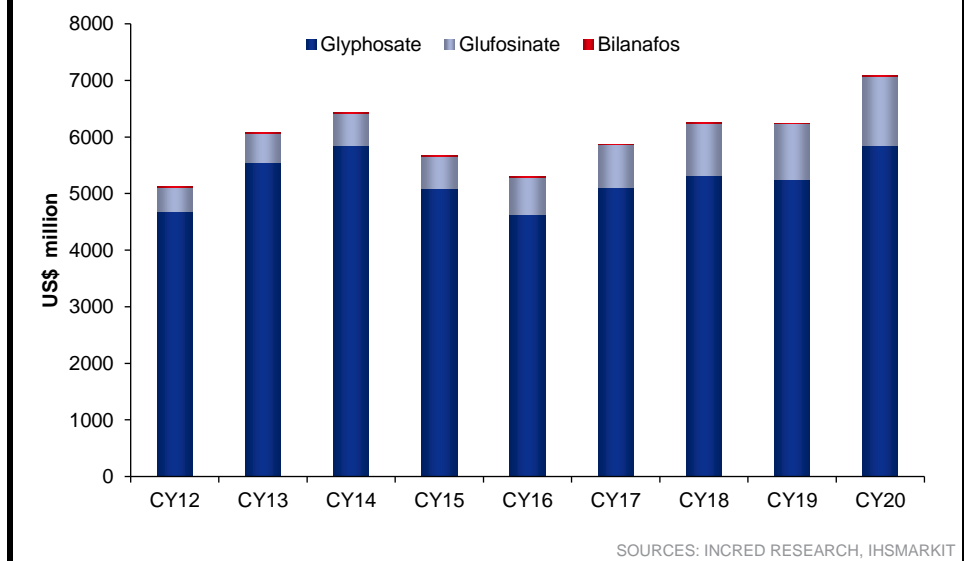
**Amino acid still remains the major product class in herbicides**



**However, amino acid blocker herbicide, particularly glyphosate, is facing multiple headwinds in the form of regulatory action in USA**

In USA, it is taking the shape of a class action suit which can result in multi-billion dollar losses for the parent company.

**Figure 12: Glyphosate, the major amino acid blocking herbicide, contributed ~83% to overall herbicide sales in this class**



1. In Feb 2019, a federal judge in the US state of California rejected Bayer legacy company Monsanto's bid to defend against hundreds of lawsuits. In Mar 2019, a federal jury concluded that Monsanto's glyphosate was likely a substantial factor in causing a California man to develop cancer. In Mar 2019, a US federal jury ordered Bayer legacy company Monsanto to pay this California man more than US\$80m in damages, concluding that the company had failed to warn him of the potential cancer risk from Roundup.
2. As on 11 Jul 2019, Bayer witnessed an increase of over a third in the number of plaintiffs seeking damages for exposure to glyphosate. The number of plaintiffs reached 18,400. In Nov 2019, Bayer confirmed the scale of the reported surge in US lawsuits from plaintiffs seeking damages.
3. As on 11 Oct 2020, the number of lawsuits filed stood at approximately 42,700. In Mar 2020, the US EPA was hit with a pair of lawsuits challenging its decision to re-register the herbicide, glyphosate. Filed by environmentalists and farmworker advocates, the complaints alleged that the agency's review of the widely used herbicide had violated federal pesticide law as well as the Endangered Species Act.
4. In Apr 2020, Bayer settled a class action lawsuit contesting the marketing of Roundup. The company agreed to a US\$39.6m nationwide settlement regarding the claims, which includes the removal of certain statements from product labels. By 14 Apr 2020, Bayer announced that lawsuits involving approximately 52,500 plaintiffs had been served in the US in connection with glyphosate-based Roundup herbicide products.
5. In Jun 2020, Bayer announced it had settled several major legacy Monsanto litigations out-of-court including with tens of thousands of plaintiffs for the alleged link between Monsanto's Roundup and cancer. Pending agreement of the courts, the Roundup settlements could total between US\$10.1bn - US\$10.9bn.
6. The headline Roundup deal is among a series of agreements that will substantially resolve major outstanding Monsanto litigation, Bayer stated. They include the US Roundup litigation, as well as the dicamba drift, for which it has settled for US\$400m, and polychlorinated biphenyl (PCB)-contaminated water litigations with payments totalling US\$820m. The combined settlements could total US\$12bn. The glyphosate litigation settlement covers about three-quarters of the some 125,000 filed and unfiled claims, around 90,000 litigants.
7. On 20 Jul 2020, a California appeals court upheld a state jury verdict that found Bayer-owned Monsanto failed to warn consumers of the potential cancer risks from Roundup. However, the court did reject the plaintiffs request



to reinstate the original US\$289m verdict, instead reducing the damages from US\$78m to US\$20.4m.

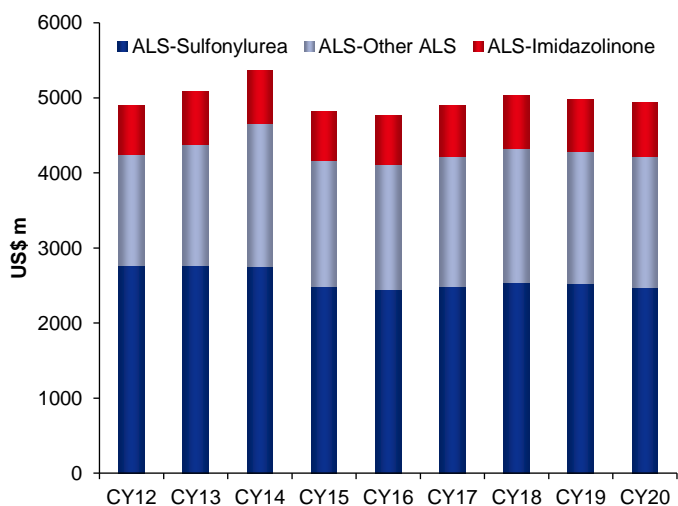
8. In Sep 2020, US environmentalist organisation, Center for Biological Diversity (CBD), filed a lawsuit against the USDA, alleging that the department worked on behalf of Bayer to influence Thailand in reversing a 2019 ban on the herbicide, glyphosate. The lawsuit, filed on 16 Sep at the US District Court for the District of Columbia, seeks the release of records concerning USDA’s interaction with Bayer and other companies that stood to benefit from Thailand scrapping its plan.

**Glufosinate can benefit from the predicament of glyphosate but Indian company UPL lacks the seed to go with glufosinate ➤**

The increased regulatory and legal pressure on glyphosate is good news for glufosinate. However as always, the key for selling any herbicide is the development of resistant seeds. UPL and other generic players have no advantage here. The margins on glufosinate are likely to keep coming down over the period. Glufosinate-tolerant seeds are sold under Liberty ready brand by Bayer.

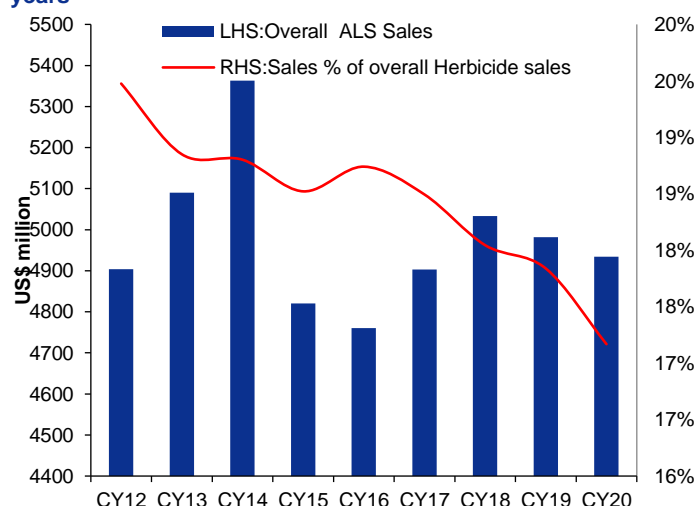
**ALS-sulfonylurea, ALS-other ALS and ALS-imidazolinone are other prominent groups of old herbicides ➤**

**Figure 13: ALS-based herbicide sales stood at US\$ 5bn in CY20**



SOURCES: INCRED RESEARCH, IHSMARKIT

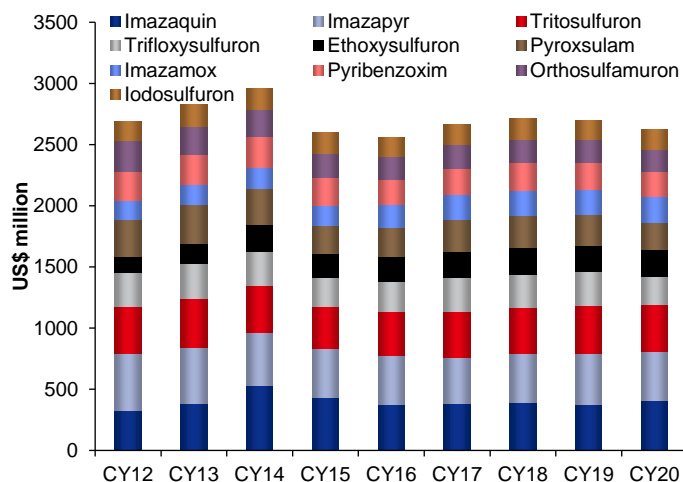
**Figure 14: However, clearly in growth terms, it's a laggard as percentage share has come down by 231bp over the last nine years**



SOURCES: INCRED RESEARCH, IHSMARKIT

**Only two new herbicides have been launched in ALS group over the last decade ➤**

**Figure 15: ALS group overall sales have been pretty stagnant over last nine years**



SOURCES: INCRED RESEARCH, IHSMARKIT

**Figure 16: Only one molecule, ethoxysulfuron, is still in patent period within top 20 molecules in this class**

| Name               | CY20   | Launch date |
|--------------------|--------|-------------|
| Imazaquin          | 410.00 | 2009        |
| Imazapyr           | 395.00 | 1991        |
| Tritosulfuron      | 385.00 | 1997        |
| Trifloxysulfuron   | 230.00 | 2000        |
| Ethoxysulfuron     | 225.00 | 2007        |
| Pyroxosulam        | 222.00 | 1985        |
| Imazamox           | 205.00 | 1984        |
| Pyribenzoxim       | 205.00 | 2005        |
| Orthosulfamuron    | 180.00 | 2002        |
| Iodosulfuron       | 165.00 | 1987        |
| Azimsulfuron       | 150.00 | 2001        |
| Tribenuron         | 144.00 | 1985        |
| Foramsulfuron      | 144.00 | 1991        |
| Flazasulfuron      | 133.00 | 1998        |
| Prosulfuron        | 113.00 | 1998        |
| Pyrazosulfuron     | 106.00 | 1997        |
| Penoxsulam         | 102.00 | 1985        |
| Florasulam         | 101.00 | 1984        |
| Metsulfuron        | 95.00  | 1985        |
| Pyriminobac-Methyl | 88.00  | 2002        |

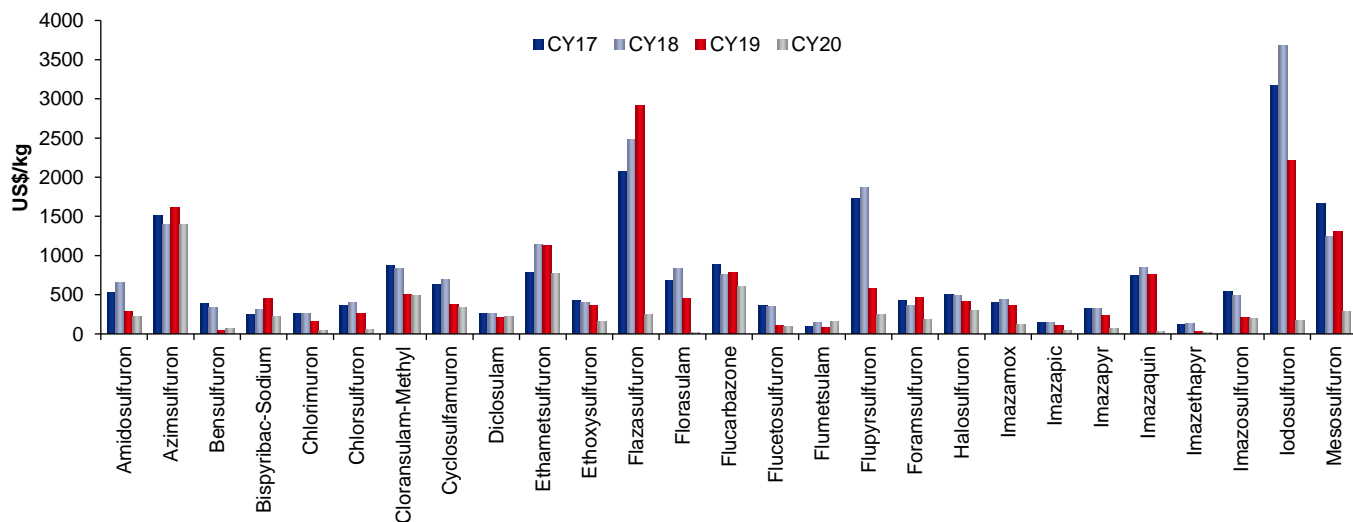
SOURCES: INCRED RESEARCH, IHSMARKIT

**UPL is not present in any of high-growth ALS chemicals space ➤**

UPL sells pyrazosulfuron, metsulfuron, triasulfuron and sulfosulfuron. The growth of these four chemicals since last nine years has been at 3%, 5%, -2% and -8% CAGR, respectively.

**Like prices of most herbicides, prices of ALS-based herbicide are also falling ➤**

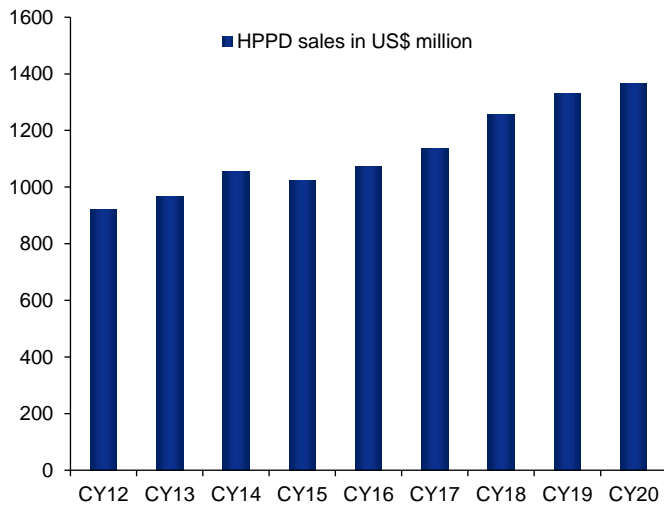
**Figure 17: Prices of major ALS herbicide chemicals are falling, in line with other herbicides**



SOURCES: INCRED RESEARCH, COMPANY REPORTS

**HPPD is a high growth area of herbicides but Indian companies have a negligible presence in this area ➤**

**Figure 18: HPPD herbicide sales have been increasing at a 4% CAGR over the last nine years – the highest growth area in herbicides**



SOURCES: INCRED RESEARCH, IHSMARKIT

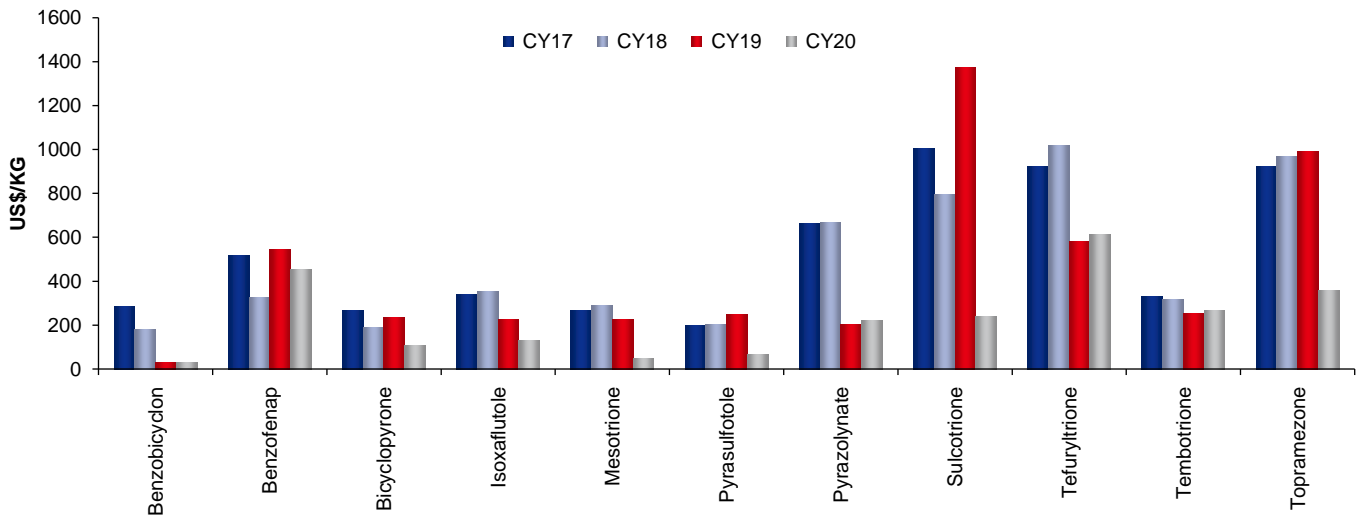
**Figure 19: Despite being generic players, most Indian companies are not present in these herbicides**

| Chemical Name      | Launch date |
|--------------------|-------------|
| Mesotrione         | 2001        |
| Tembotrione        | 2007        |
| Isoxaflutole       | 1996        |
| Topramezone        | 2006        |
| Pyrasulfotole      | 2007        |
| Bicyclopyrone      | 2015        |
| Benzobicyclon      | 2001        |
| Tolpyralate        | 2017        |
| Tefuryltrione      | 2008        |
| Sulcotrione        | 1990        |
| Pyrazolynate       | 1979        |
| Fenquinotrione     | 2018        |
| Fenpyrazone        | 2020        |
| Tripyrasulfone     | 2020        |
| Benzofenap         | 1990        |
| Lancotrione-sodium | 2019        |
| Pyrazoxyfen        | 1985        |

SOURCES: INCRED RESEARCH, IHSMARKIT

**HPPD prices are also on the decline ➤**

**Figure 20: Like all other herbicides, prices of HPDD herbicides are also facing headwinds**



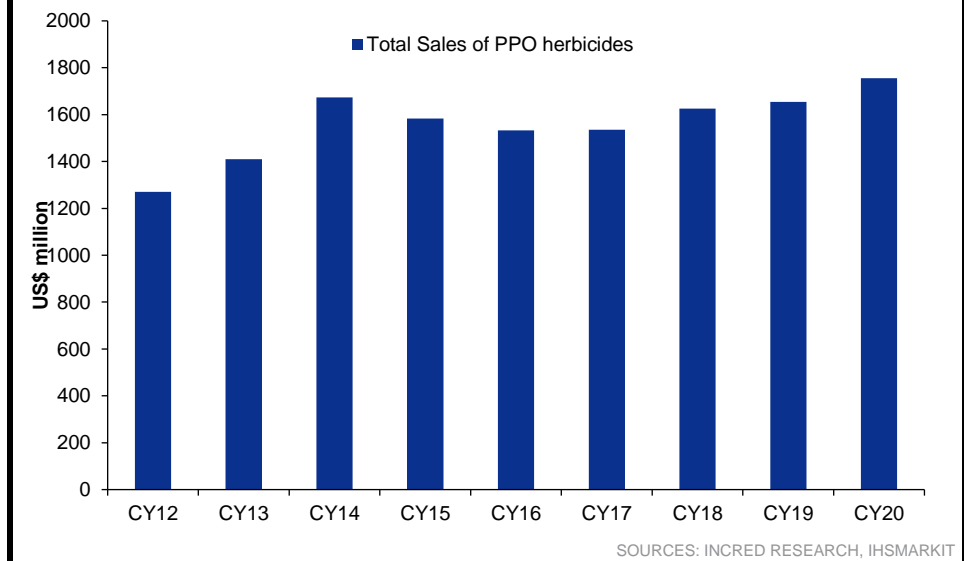
SOURCES: INCRED RESEARCH, IHSMARKIT

**PPO (protoporphyrinogen oxidase) group of herbicides is another growth area for agrochemical majors ➤**

There are two group of herbicides in the broader class PPO- diphenyl ethers and PPO others. The overall growth rate in this segment has been ~4% CAGR over CY12-20.

1. Diphenyl ether herbicides act via inhibition of protoporphyrinogen oxidase (PPO), an enzyme involved in chlorophyll biosynthesis. Most of the herbicides in this class are active following post-emergence application for the control of broadleaf weeds across a wide range of crop usages.
2. In broad PPO others segment, multiple research and development or R&D efforts are going on, but unfortunately Indian companies are nowhere to be seen.

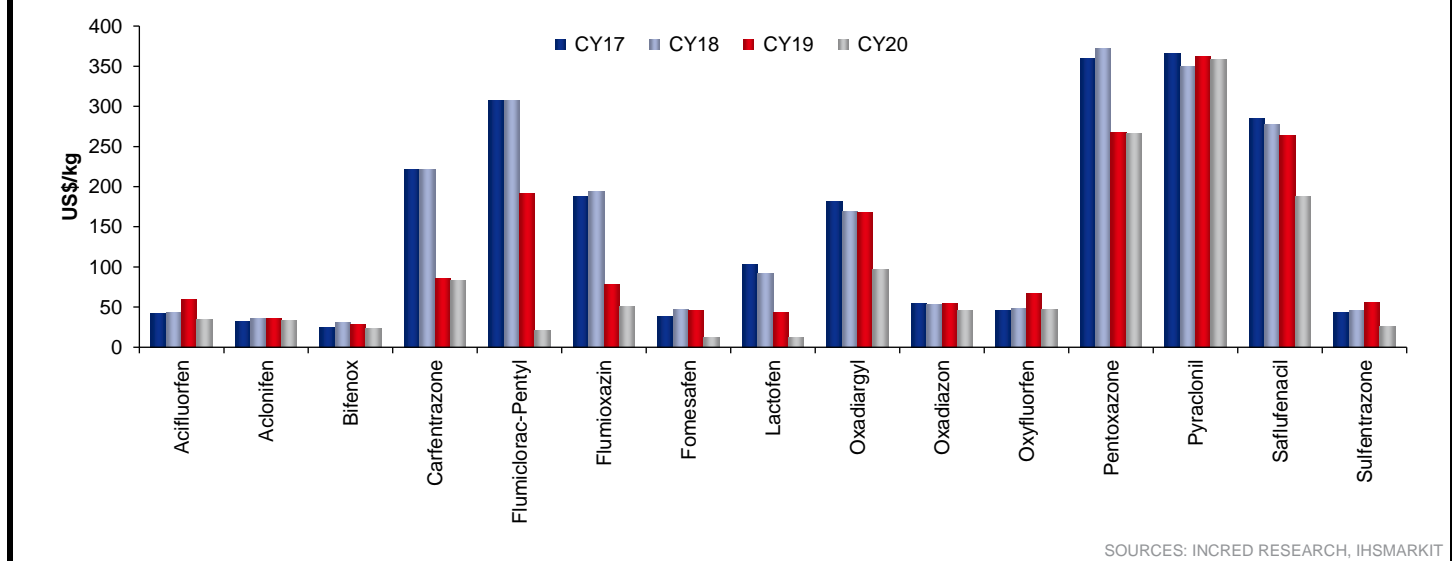
**Figure 21: Overall sales of PPO-diphenyl ether and PPO-others groups are growing at a 4% CAGR**



The presence of a major Indian company like UPL is limited to Acifluorfen, which is soybean and peanut herbicide. Please note that acifluorfen sales have declined at a 8% CAGR over 2015-20.

**Pricing is still volatile for this group of herbicides ➤**

**Figure 22: The pricing for this group of herbicides is also quite volatile**



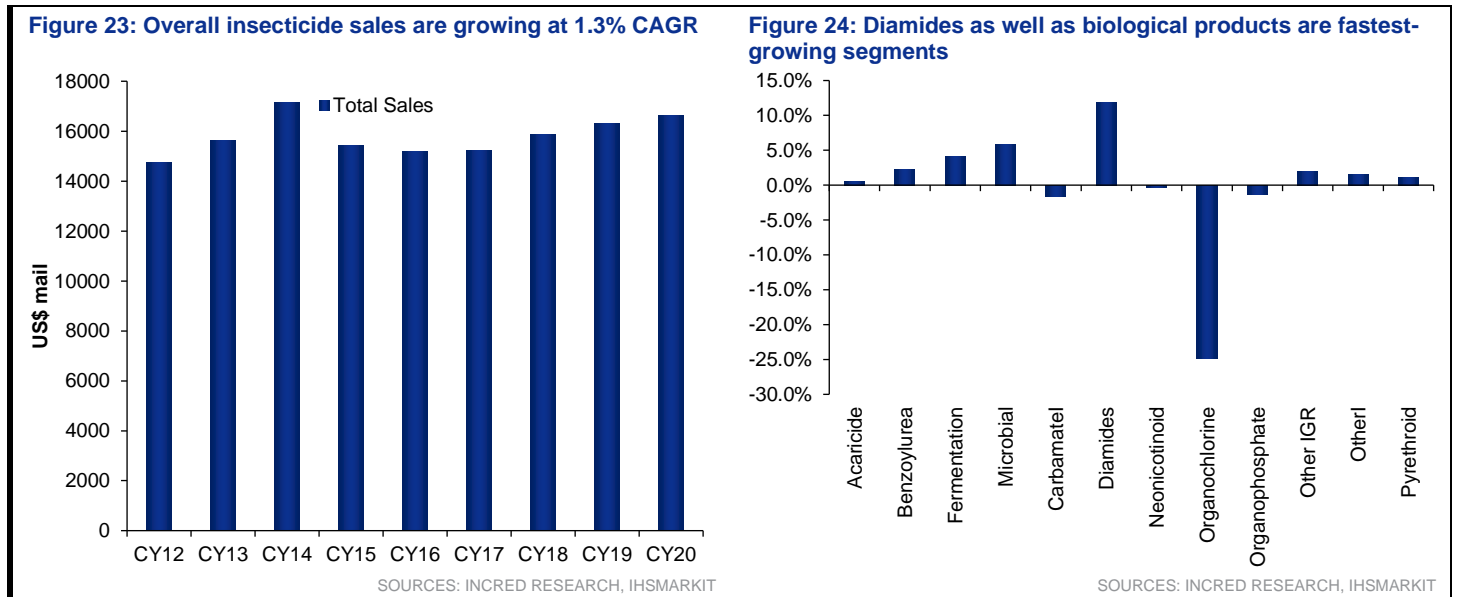
**There is some innovation in PPO group, but none of the Indian names are present in this group ➤**

- 2021:** Irifludimoxazin (BAS 850 H/tirexor) from BASF is a PPO inhibitor under development for usage in maize, soybean, citrus, pome and others against a range of ryegrass, broad-leaved, and resistant weeds including key species such as pigweed (amaranthus spp.) and ragweed (ambrosia spp.). The ai (agrochemical intermediary) is described as having the potential to be used in a synergistic fashion with saflufenacil. The ai also reportedly has potential to be used in BASF's PPO herbicide tolerance trait system currently under development.
- 2021-22:** Cyclopyranil (KY-1211) from Kyoyu Agri is a novel PPO-other herbicide under development for the control off grass and broad-leaved weeds in rice production. It also has a very good control effect on rosegrass, quinoa and amaranth in upland crops. The mode of action is assigned based on

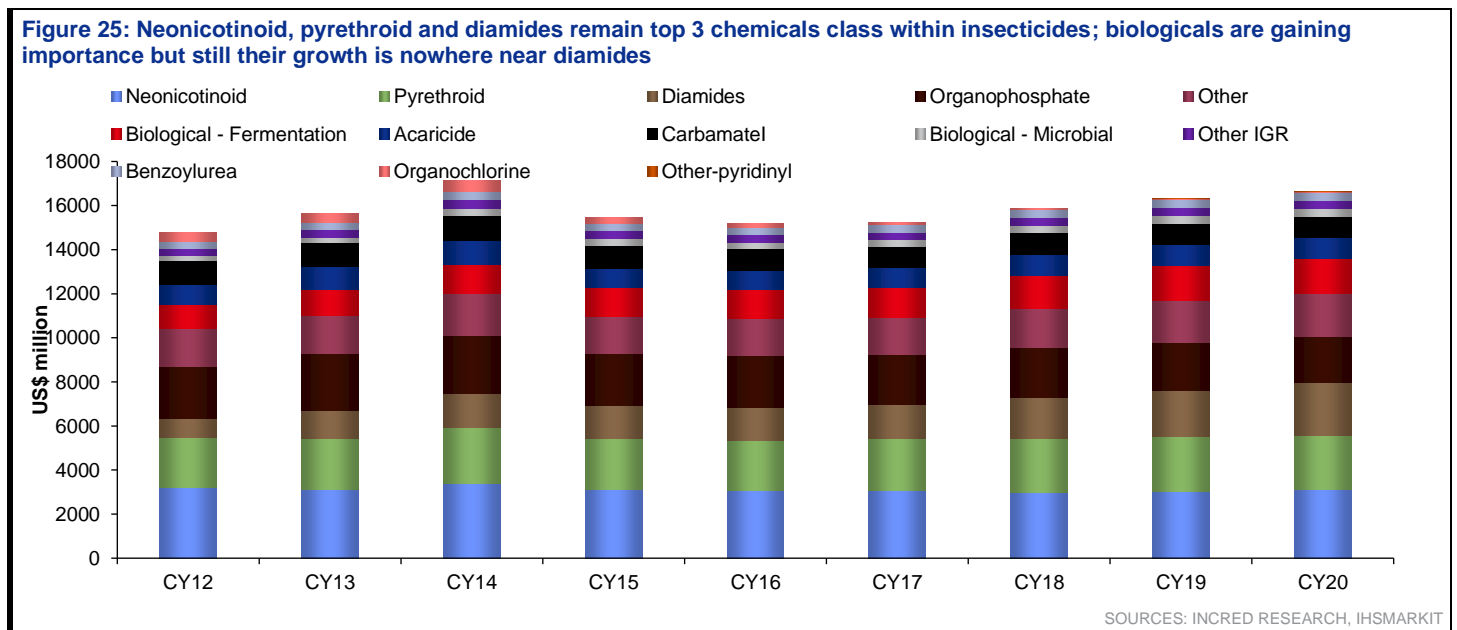
- structural similarity to pyraclonil. Peak sales are estimated to be around US\$50m.
3. **2025-2030:** Novel PPO herbicide anticipated for launch in 2025-30. Co-developed with Sumitomo Chemical for use in corn, soybean, and F&V.
  4. **2020:** Cyclopyrimorate (SW-065) from Mitsui Chemicals Agro features a novel mode of action indicated as being a homogentisate solanesyltransferase inhibitor. Weed spectrum is indicated as being for broad-leaved weeds and sedges in cereal and rice production.
  5. **2021:** Bixlozone (F9600) from FMC is indicated to be a novel mode of action in cereals. Weed spectrum is indicated as being against broad-leaved weeds and grasses in cereal production as well as a range of other crops including canola, rice, cotton, sugarcane and F&V.
  6. **2021-22:** Cyclopyranil (KY-1211) from Kyoyu Agri is a novel PPO-other herbicide under development for the control of grass and broad-leaved weeds in rice production. It also has a very good control effect on rosegrass, quinoa and amaranth in upland crops. The mode of action is assigned based on structural similarity to pyraclonil. Peak sales are estimated to be around US\$50m..
  7. **2023:** Tetflupyrolimet from FMC is a new herbicide with a novel mode of action, which was identified as being through the inhibition of DHO dehydrogenase in the de Novo pyrimidine biosynthesis pathway. Selectivity has been demonstrated in field trials when used in the production of both direct seeded indica rice and transplanted japonica rice. The ai controls herbicide resistant grass weeds in rice, whilst also having activity against some sedges and broad-leaved weeds. Peak sales are likely to be around US\$300m.
  8. **2024:** Dimesulfazet (NC-653) from Nissan Chemicals is a trifluoromethansulfonanilide and has the potential to be a very long chain fatty acid elongation inhibitor (VLCFAE-I) as trifluoromethansulfonanilides such as mefluidide and perfluidone have been reported to inhibit a very-long-chain fatty acid synthesis. The sulfonamide moiety could also indicate some structural relationship to benzofluor, cloransulam, diclosulam, dimesulfazet, florasulam, flumetsulam, metosulam, perfluidone, profluazol, pyrimisulfan and triafamone, which would indicate the possibility of an ALS inhibition modality. Launch is currently anticipated for 2024F in Japan, with peak sales likely around US\$25m.
  9. **2025:** Epyrifenacil (S-3100) is a novel PPO herbicide under development by Sumitomo Chemicals targeted at corn, wheat, barley, rice, sorghum, soybean, cotton, sugar beet, peanut, sunflower, canola, flowers and ornamental vegetables against a wide range of broad-leaved weeds and grasses.
  10. **2027:** Beflubutamid (resolved) FMC-herbicide 2 single resolved isomer of FMC's beflubutamid, with claimed higher biological activity compared to racemic beflubutamid on key EU weed species. The ai is broad spectrum PDS-type herbicide for pre- and early post-emergence control of broad-leaf weeds and some grasses. The resolved form of beflubutamid is reported by the company to be a new mode of action for resistance management in several regions and segments. Likely to be positioned in rice, cereals, maize and soybean.

## Insecticides- anaemic growth

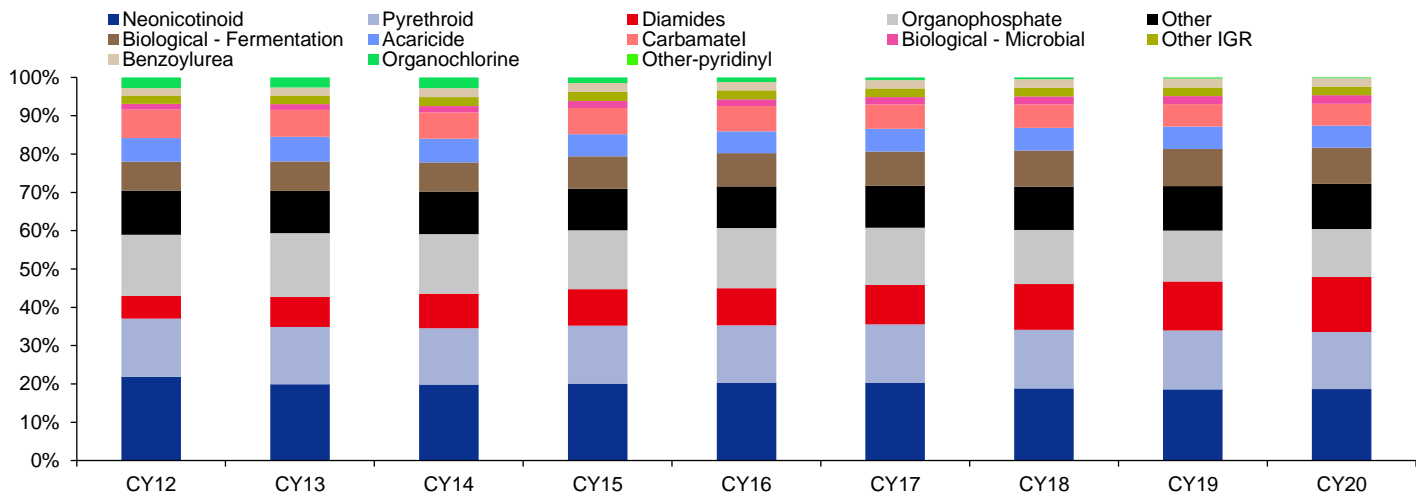
Overall growth in global insecticides market has been at a 1.3% CAGR over CY12-20. However, biological products is the fastest-growing segment in insecticides.



## Diamides – fastest-growing chemical in insecticides segment ➔



**Figure 26: Over the last nine years, diamides has been a fastest growth area in insecticides - almost 80% of growth has been driven by diamides**

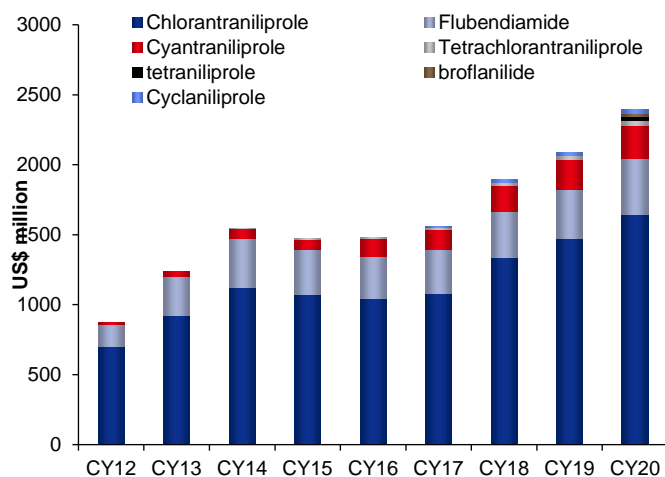


SOURCES: INCRED RESEARCH, IHSMARKIT

**Within diamides, chlorantraniliprole is the fastest-growing insecticide ➤**

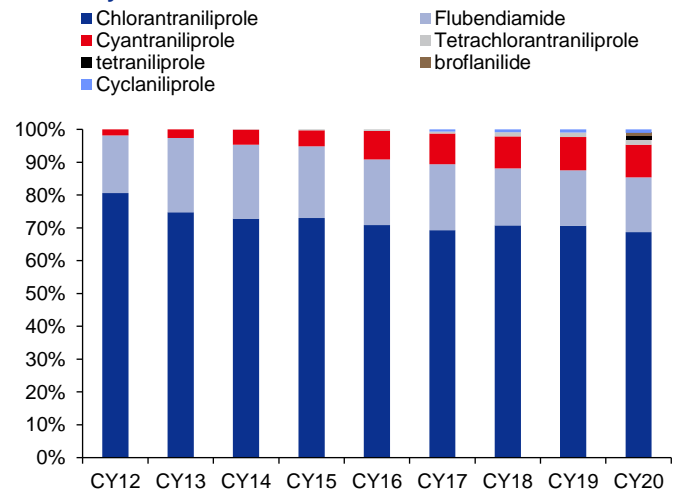
Diamides comprise chlorantraniliprole, flubendiamide, cyantraniliprole, tetrachlorantraniliprole, tetraniliprole, broflanilide and cyclaniliprole. Within these molecules, chlorantraniliprole sales crossed US\$1bn in CY15 and the rest are well below even a half billion-dollar mark. Tetraniliprole, broflanilide and cyclaniliprole are relatively new molecules with one-to-two years in market.

**Figure 27: Chlorantraniliprole is the biggest molecule in diamide class of insecticides...**



SOURCES: INCRED RESEARCH, COMPANY REPORTS

**Figure 28: ...although its share within diamides has declined over the years as new molecules were launched**



SOURCES: INCRED RESEARCH, COMPANY REPORTS

**Diamides segment is a candidate for faster future growth as well ➤**

1. The diamide segment grew by +14.7% to US\$2,391m in 2020. The fastest-growing segment in 2020 was diamides, driven by FMC's chlorantraniliprole and cyantraniliprole as well as Bayer/Nihon Nohyaku Flubendiamide. Key to the segment's fast growth during the year has been FMC's successful new product launches and continued penetration of recent introductions, both by FMC and through a number of licencing deals with third parties such as Hokko, Syngenta and Dhanuka Agritech.
2. Chlorantraniliprole is also deemed to be one of the more effective ais against fall armyworm.

3. Both chlorantraniliprole and cyantraniliprole benefited from the continued recovery in Brazil during 2020, the single largest country market for the actives.
4. The increased adoption of seed treatment technologies in developing markets stands both as a current driver and future growth opportunity for diamides.
5. The class unique mode of action, excellent efficacy and the ongoing action against neonicotinoids continues to benefit this group of ais.
6. The ongoing use of diamides to control fall army worm is also a key for the success of this class in 2020.
7. The diamide class vastly outperformed the wider industry. In Asian rice markets, fall armyworm pressure is a major driver of growth, given that the class has been shown to be amongst the most efficacious classes for control of what is a particularly challenging infestation.

### **Diamides are a risk for sales growth of pyrethroids ►**

In the recent past, we have seen sporadic success of pyrethroids to control fall armyworm in China. However, chlorantraniliprole (also called rynaxypyr) is a better and proven chemical to control infestation of fall armyworm.

### **Multiple Indian companies are active in insecticides ►**

Approximately 30% of UPL's products fall in insecticide category. Heranba is present in pyrethroids, and PI Industries does CRAMS of chlorantraniliprole for FMC. Even UPL has started contract manufacturing of CRAMS. Hence, insecticides are very important for Indian companies.

### **However, Indian companies are not present in fastest-growing diamides space ►**

While UPL and PI Industries are doing CRAMS for rynaxypyr, they are not manufacturing any diamides of their own. Dhanuka and other companies can buy rynaxypyr from other manufacturers and sell it as a formulation as well. However, sadly no Indian company has taken any lead here.



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|                     |           |           |         |          |                  |
|---------------------|-----------|-----------|---------|----------|------------------|
| <b>Score Range:</b> | 90 - 100  | 80 – 89   | 70 - 79 | Below 70 | No Survey Result |
| <b>Description:</b> | Excellent | Very Good | Good    | N/A      | N/A              |

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## Corporate Governance Report of Thai Listed Companies (CGR). CG Rating by the Thai Institute of Directors Association (Thai IOD) in 2021, Anti-Corruption 2021

**ADVANC** – Excellent, Certified, **AMATA** – Excellent, Certified, **ANAN** – Excellent, n/a, **AOT** – Excellent, n/a, **AP** – Excellent, Certified, **ASP** – Excellent, n/a, **AWC** – Excellent, Declared, **AU** – Good, n/a, **BAM** – Very Good, Certified, **BAY** – Excellent, Certified, **BBL** – Excellent, Certified, **BCH** – Very Good, Certified, **BCP** – Excellent, Certified, **BCPG** – Excellent, Certified, **BDMS** – Excellent, n/a, **BEAUTY** – Good, n/a, **BEM** – Excellent, n/a, **BH** – Good, n/a, **BJC** – Very Good, n/a, **BLA** – Very Good, Certified, **BTS** – Excellent, Certified, **CBG** – Very Good, n/a, **CGET** – n/a, n/a, **CENDEL** – Excellent, Certified, **CHAYO** – Very Good, n/a, **CHG** – Very Good, n/a, **CK** – Excellent, n/a, **COM7** – Excellent, Certified, **CPALL** – Excellent, Certified, **CPF** – Excellent, Certified, **CPN** – Excellent, Certified, **CPNREIT** – n/a, n/a, **CRC** – Excellent, Declared, **DELTA** – Excellent, Certified, **DDD** – Excellent, n/a, **DIF** – n/a, n/a, **DOHOME** – Very Good, Declared, **DREIT** – n/a, n/a, **DTAC** – Excellent, Certified, **ECL** – Excellent, Certified, **EGCO** – Excellent, Certified, **EPG** – Excellent, Certified, **ERW** – Very Good, Certified, **GFPT** – Excellent, Certified, **GGC** – Excellent, Certified, **GLOBAL** – Excellent, n/a, **HANA** – Excellent, Certified, **HMPRO** – Excellent, Certified, **HUMAN** – Good, n/a, **ICHI** – Excellent, Certified, **III** – Excellent, Declared, **INTUCH** – Excellent, Certified, **IRPC** – Excellent, Certified, **ITD** – Very Good, n/a, **IVL** – Excellent, Certified, **JASIF** – n/a, n/a, **JKN** – n/a, Certified, **JMT** – Very Good, n/a, **KBANK** – Excellent, Certified, **KCE** – Excellent, Certified, **KEX** – Very Good, Declared, **KKP** – Excellent, Certified, **KSL** – Excellent, Certified, **KTB** – Excellent, Certified, **KTC** – Excellent, Certified, **LH** – Excellent, n/a, **LPN** – Excellent, Certified, **M** – Very Good, Certified, **MAKRO** – Excellent, Certified, **MC** – Excellent, Certified, **MEGA** – Very Good, n/a, **MINT** – Excellent, Certified, **MTC** – Excellent, Certified, **NETBAY** – Very Good, n/a, **NRF** – Very Good, Declared, **OR** – Excellent, n/a, **ORI** – Excellent, Certified, **OSP** – Excellent, n/a, **PLANB** – Excellent, Certified, **PRINC** – Very Good, Certified, **PR9** – Excellent, Declared, **PSH** – Excellent, Certified, **PTT** – Excellent, Certified, **PTTEP** – Excellent, n/a, **PTTGC** – Excellent, Certified, **QH** – Excellent, Certified, **RAM** – n/a, n/a, **RBF** – Very Good, n/a, **RS** – Excellent, Declared, **RSP** – Good, n/a, **S** – Excellent, n/a, **SAK** – Very Good, Declared, **SAPPE** – Very Good, Certified, **SAWAD** – Very Good, n/a, **SCB** – Excellent, Certified, **SCC** – Excellent, Certified, **SCGP** – Excellent, Declared, **SECURE** – n/a, n/a, **SHR** – Excellent, n/a, **SIRI** – Excellent, Certified, **SPA** – Very Good, n/a, **SPALI** – Excellent, Certified, **SPRC** – Excellent, Certified, **SSP** – Good, Certified, **STEC** – Excellent, n/a, **SVI** – Excellent, Certified, **SYNEX** – Very Good, Certified, **TCAP** – Excellent, Certified, **THANI** – Excellent, Certified, **TIDLOR** – n/a, Certified, **TISCO** – Excellent, Certified, **TKN** – Very Good, n/a, **TOP** – Excellent, Certified, **TRUE** – Excellent, Certified, **TTB** – Excellent, Certified, **TU** – Excellent, Certified, **TVO** – Excellent, Certified, **VGI** – Excellent, Certified, **WHA** – Excellent, Certified, **WHART** – n/a, n/a, **WICE** – Excellent, Certified, **WORK** – Good, n/a.

- CG Score 2021 from Thai Institute of Directors Association (IOD)

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### Recommendation Framework

#### Stock Ratings

Definition:

|        |   |
|--------|---|
| Add    | The stock's total return is expected to exceed 10% over the next 12 months.                     |
| Hold   | The stock's total return is expected to be between 0% and positive 10% over the next 12 months. |
| Reduce | The stock's total return is expected to fall below 0% or more over the next 12 months.          |

*The total expected return of a stock is defined as the sum of the: (i) percentage difference between the target price and the current price and (ii) the forward net dividend yields of the stock. Stock price targets have an investment horizon of 12 months.*

#### Sector Ratings

Definition:

|             |  |
|-------------|--|
| Overweight  | An Overweight rating means stocks in the sector have, on a market cap-weighted basis, a positive absolute recommendation.  |
| Neutral     | A Neutral rating means stocks in the sector have, on a market cap-weighted basis, a neutral absolute recommendation.       |
| Underweight | An Underweight rating means stocks in the sector have, on a market cap-weighted basis, a negative absolute recommendation. |

#### Country Ratings

Definition:

|             |  |
|-------------|--|
| Overweight  | An Overweight rating means investors should be positioned with an above-market weight in this country relative to benchmark. |
| Neutral     | A Neutral rating means investors should be positioned with a neutral weight in this country relative to benchmark.           |
| Underweight | An Underweight rating means investors should be positioned with a below-market weight in this country relative to benchmark. |