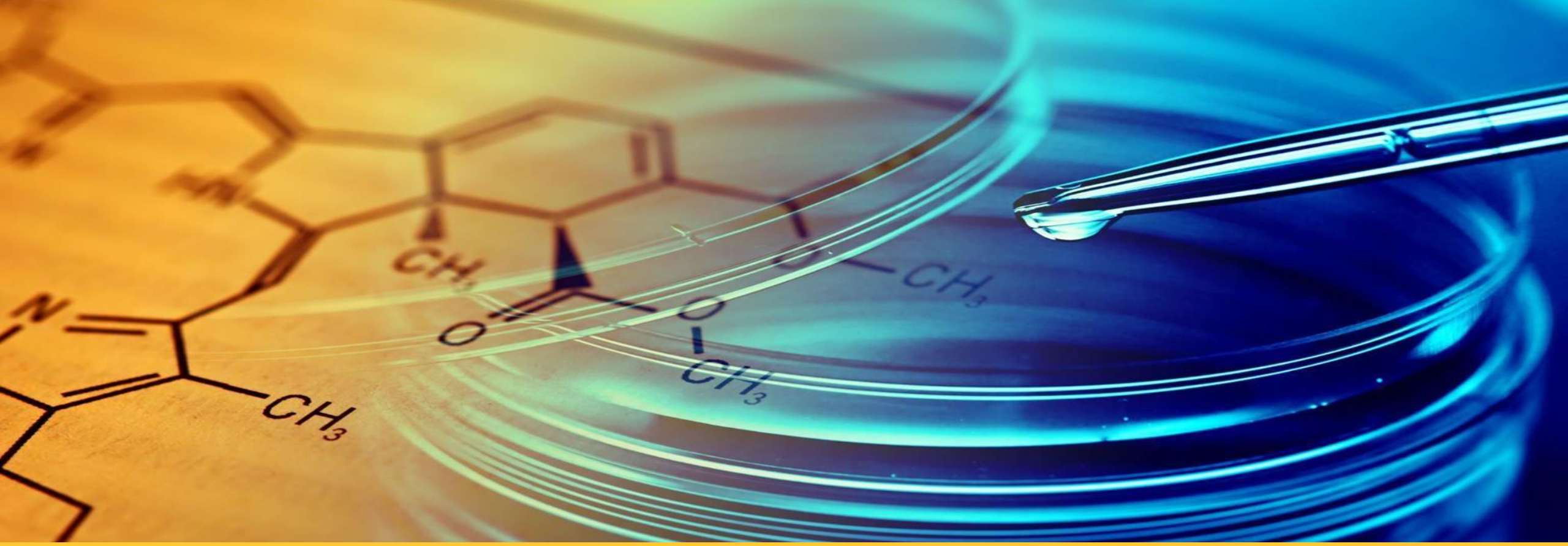


Shifting Innovation in Agrochemicals

New Molecules Discovery moving to China

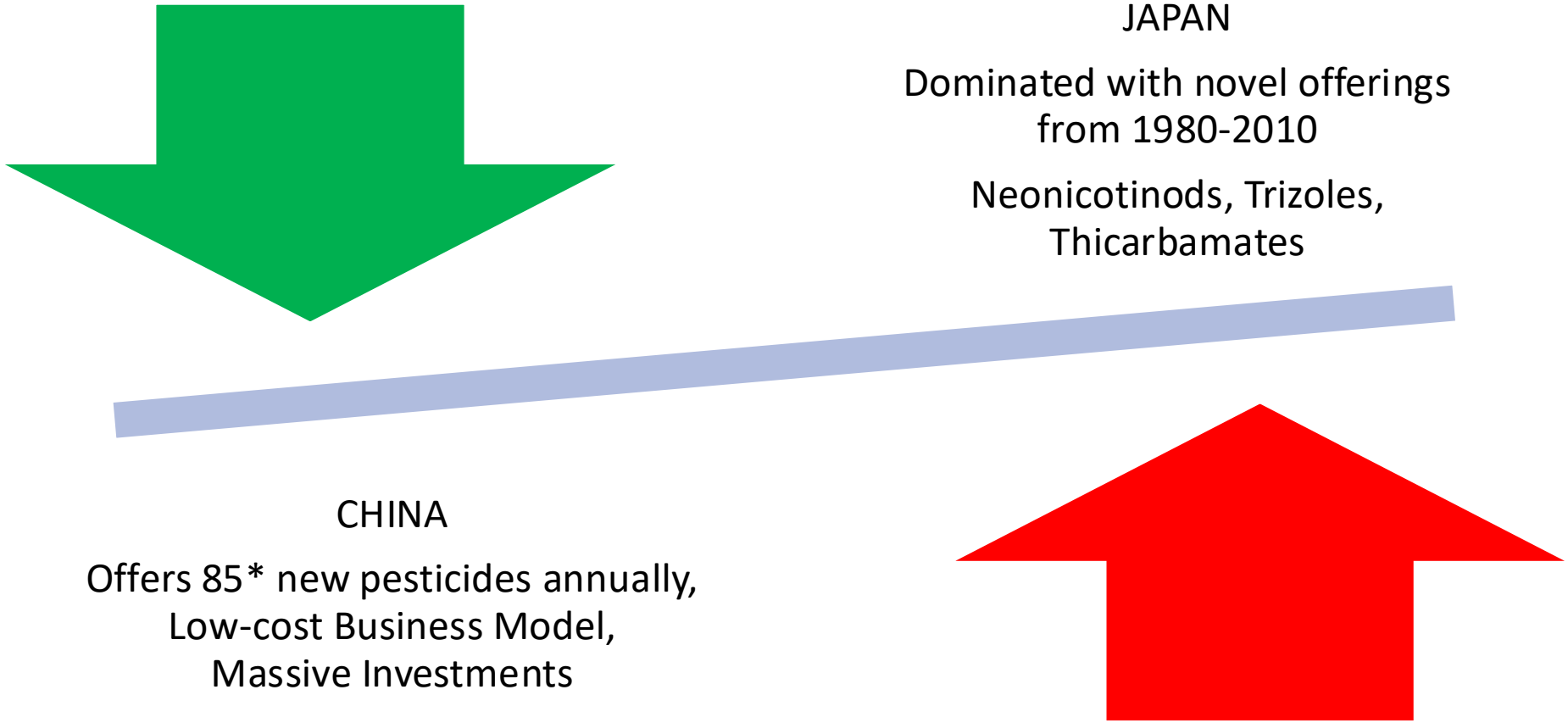
How China Acted Differently

Opportunity for India

WILLOWOOD®
Harvesting Dreams

A Tectonic Shift – Japan’s Legacy to China’s Dominance

Agrochemical innovation has been shifting from Japan's R&D leadership to China's speed and scaling up in new molecule discoveries.



* *https://www.tridge.com/news/china-takes-the-lead-in-agrochemical-innovat-gqguri*

Agrochemical Innovation– Then & Now

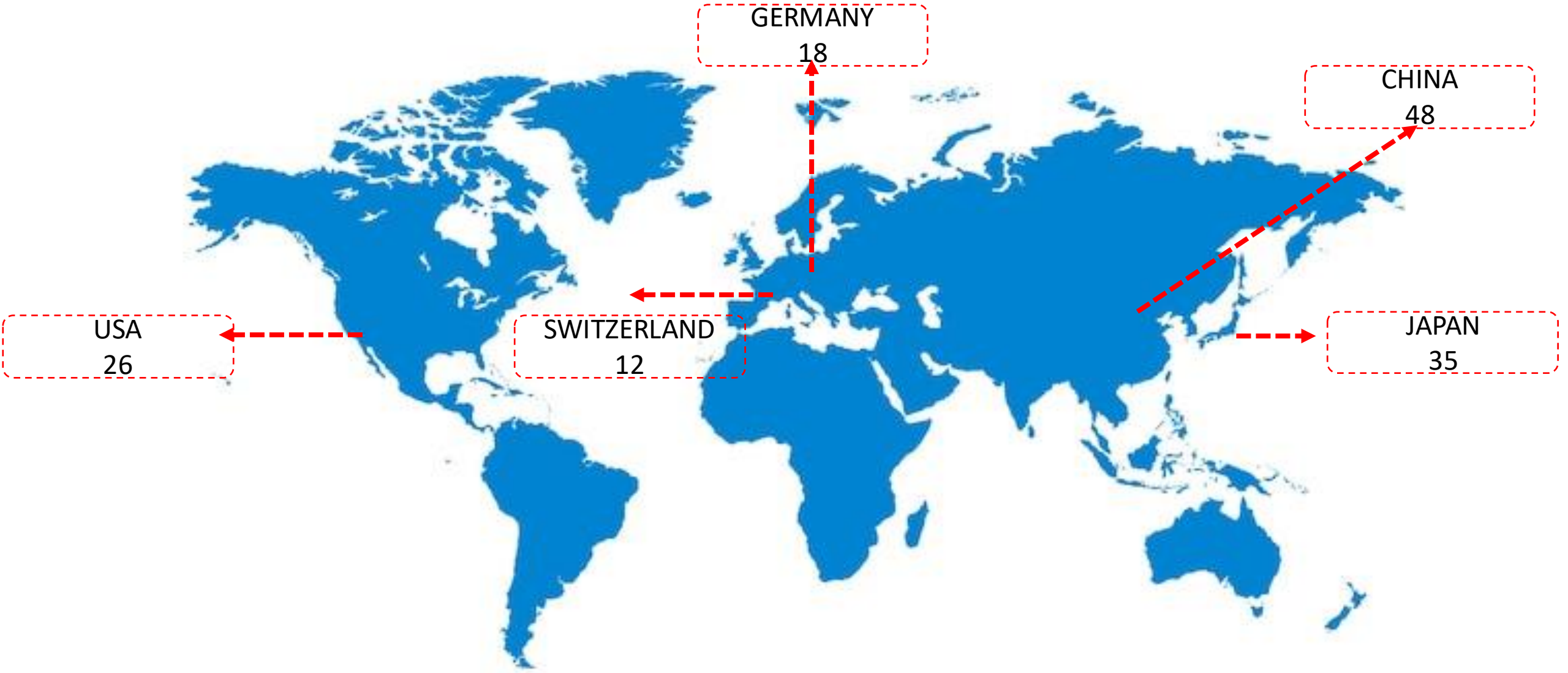
Then: Japan-Led Innovation

- Creative basic research
- Leading patents
- Disciplined R&D and International Trade Polices
- Breakthroughs like Buprofezin
- Japan pioneered (1980s-2010s)

Now: China Dominates Discovery

- High-risk tech like RNAi
- Scale-up ecosystems.
- Fueled by state plans, massive investment
- Originating 29 global actives via 14th plan subsidies
- China approves 85 new pesticides (67% bio)

32% of new molecules launched to be launched (2009-2025) from CHINA



China began investing heavily in sustainability more than a decade ago, and today they are reaping the benefits

WILLOWOOD®
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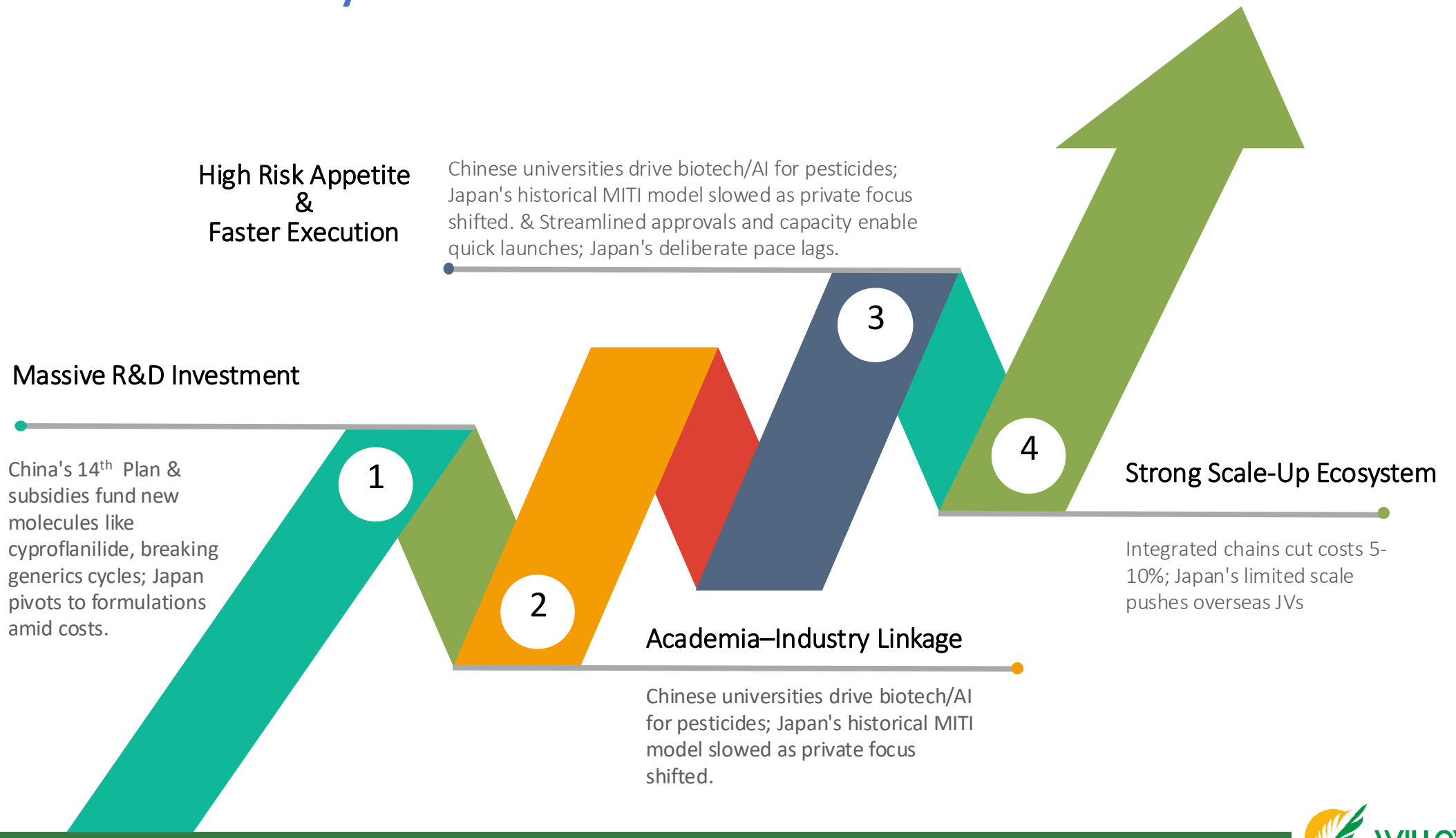
How China Acted Differently



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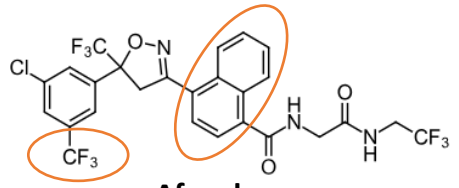
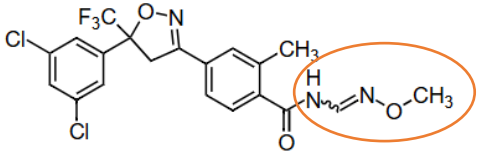
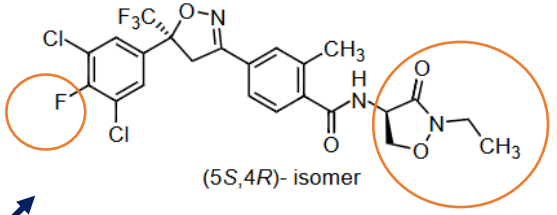
Isoxazoline Insecticides



Afoxolaner
Du Pont

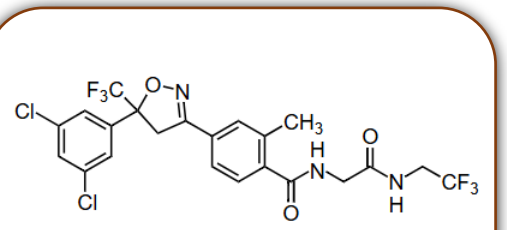


Fluxametamide
Nissan Chemical

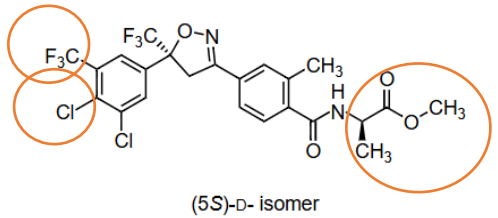


(5*S*,4*R*)- isomer

Isocycloseram
Syngenta

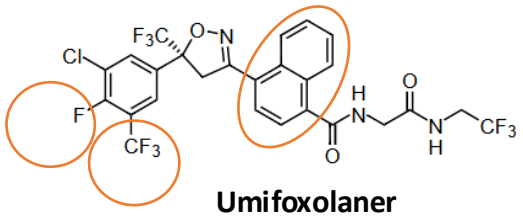


Fluralaner
Nissan Chemical

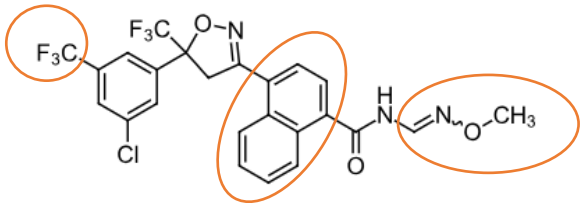


(5*S*)-D- isomer

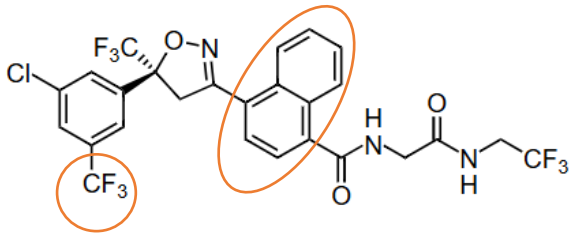
Isoflualanam
KingAgroot CropScience Co., Ltd. (China)



Umifoxolaner
Merial Inc., (US)



Nafoxametamide
Shandong Chengchuang Blue Sea Pharmaceutical Technology Co., Ltd.



Esafoxolaner
Merial Inc., (US)

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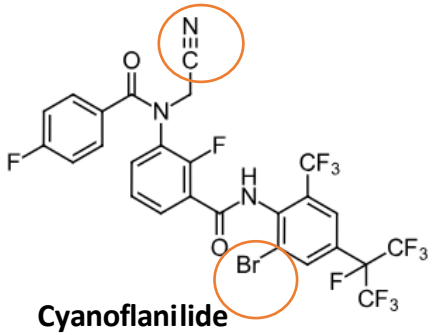
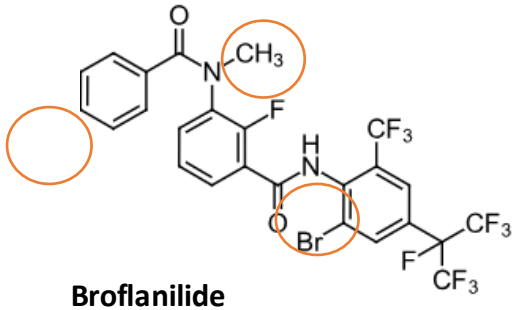
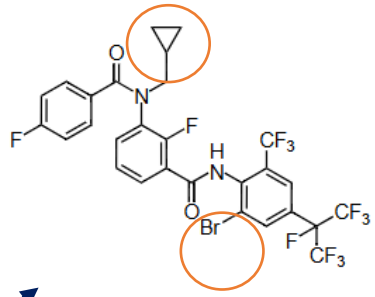
Meta-Diamide Insecticides



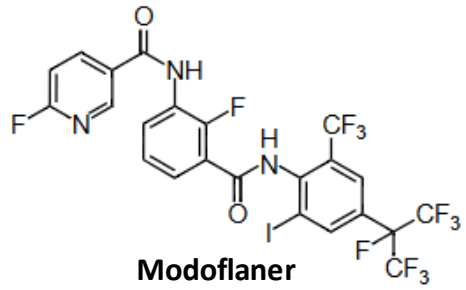
Cyanoflanilide
CAC Shanghai
China



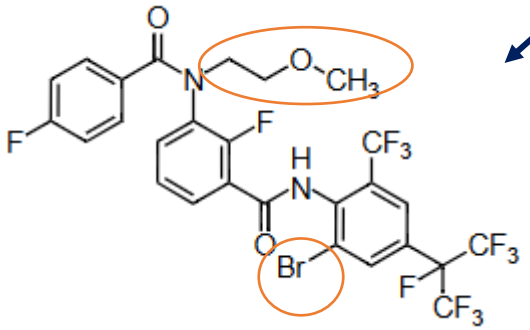
Broflanilide
Mitsui Chemicals Agro
Japan



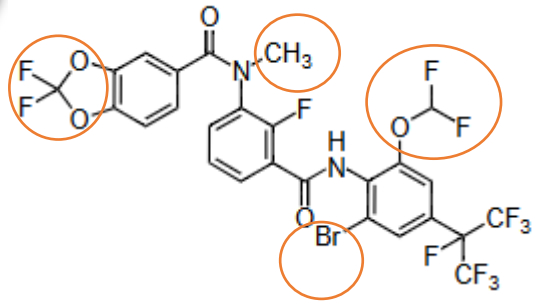
Cyproflanilide
CAC Shanghai
China



Modoflaner
Mitsui Chemicals Agro
Japan



Trioxyflanilide
Zhejiang Udragon Pesticides
and Chemicals Co. Ltd. (China)



Piperflanilide
Jiangsu Yangnong Chemical
Co., Ltd (China)

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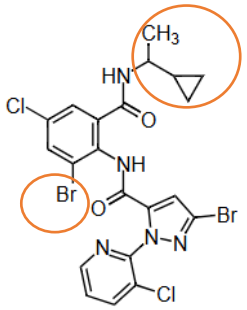
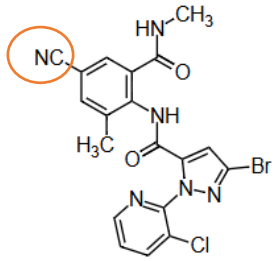
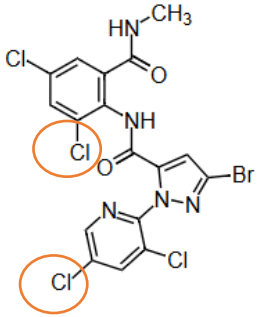
Diamide Insecticides



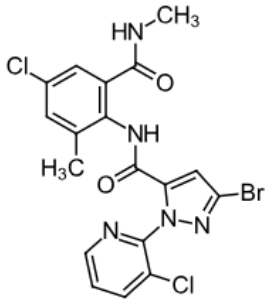
Cyclaniliprole
Ishihara Sangyo Kaisha, Ltd



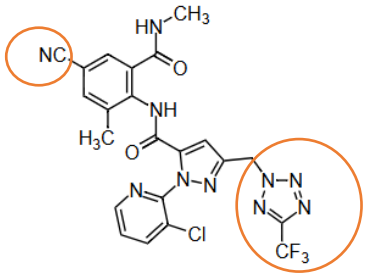
Cyantraniliprole
E. I. Du Pont de Nemours & Co.



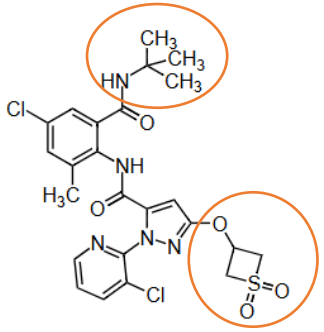
Tetrachlorantraniliprole
Sinochem International Crop Care Company Limited (China)



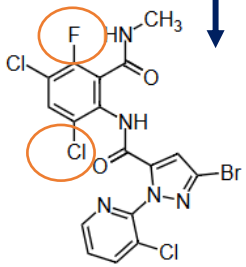
Chlorantraniliprole
E. I. Du Pont de Nemours & Co.



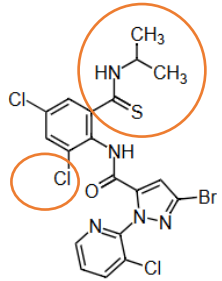
Tetraniliprole
2010 Bayer



Pioxaniliprole
PI Industries Ltd.

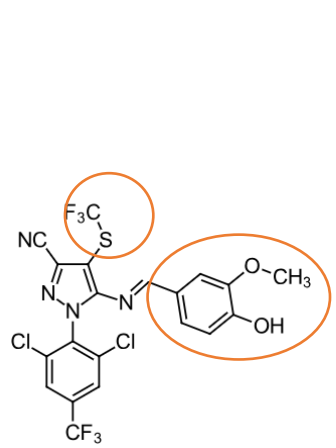


Fluchlordinilipro
Hailir Pharmaceutical Group Co., Ltd.

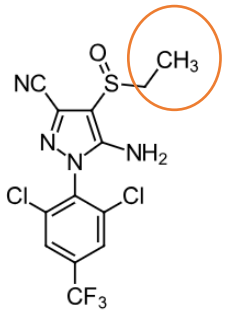


Tiorantraniliprole
Hangzhou Udragon Chemical Co., Ltd. (China)

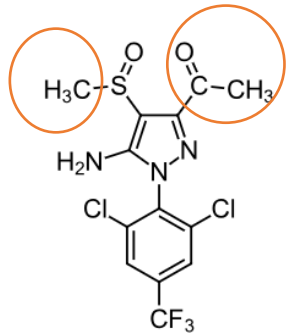
Pyrazole Insecticides : Phenylpyrazole Insecticides



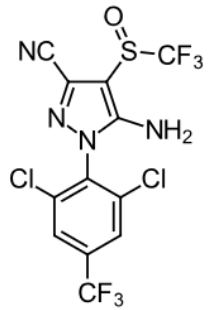
Vaniliprole
Rhone-Poulenc Agrochimie



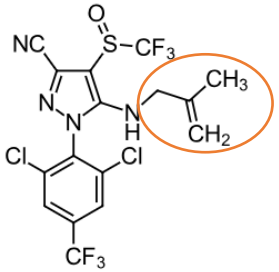
Ethiprole
Rhone-Poulenc Agrochimie



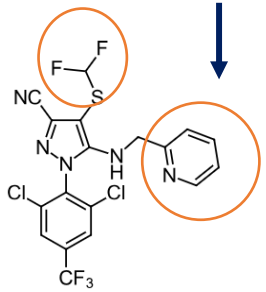
Acetoprole
Rhone-Poulenc Agrochimie



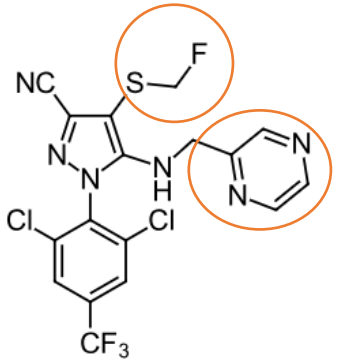
Fipronil
Rhône-Poulenc Agro, French company.



Flufiprole
Raiser Pesticide

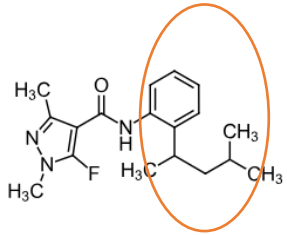


Pyriprole
Mitsubishi Chemical Corporation

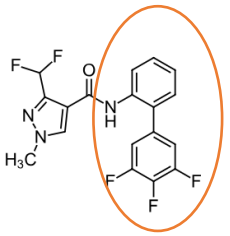


Pyrafluprole
Mitsubishi Chemical Corporation

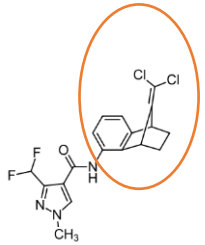
Pyrazolecarboxamide Fungicides



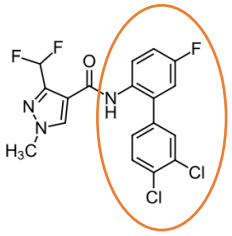
Penflufen
Bayer



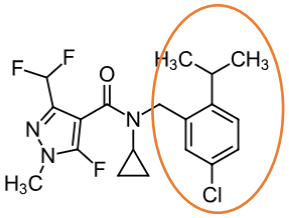
Fluxapyroxad
BASF



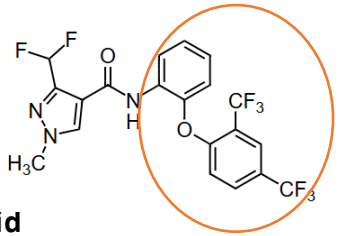
Benzovindiflupyr
Syngenta



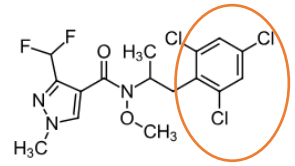
Bixafen
Bayer



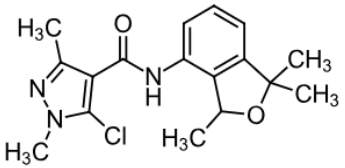
Isoflucypram
Bayer



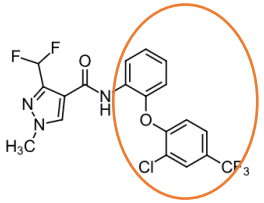
Fenopyramid
Central China Normal University



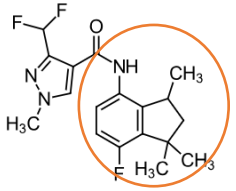
Pydiflumetofen
Syngenta



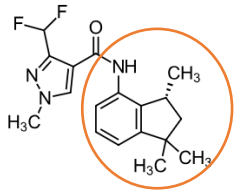
Furametpyr
Sumitomo Chemical Co., Ltd. Japan



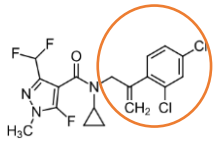
Flubeneteram
Dongguan Hec Tech R&D Co., Ltd., (China)



Fluindapyr
Isagro Ricerca S.r.l.



Inpyrfluxam
Sumitomo Chemical Co., Ltd.



Enprocymid
Jiangsu Flag Chemical Industry Co., Ltd.

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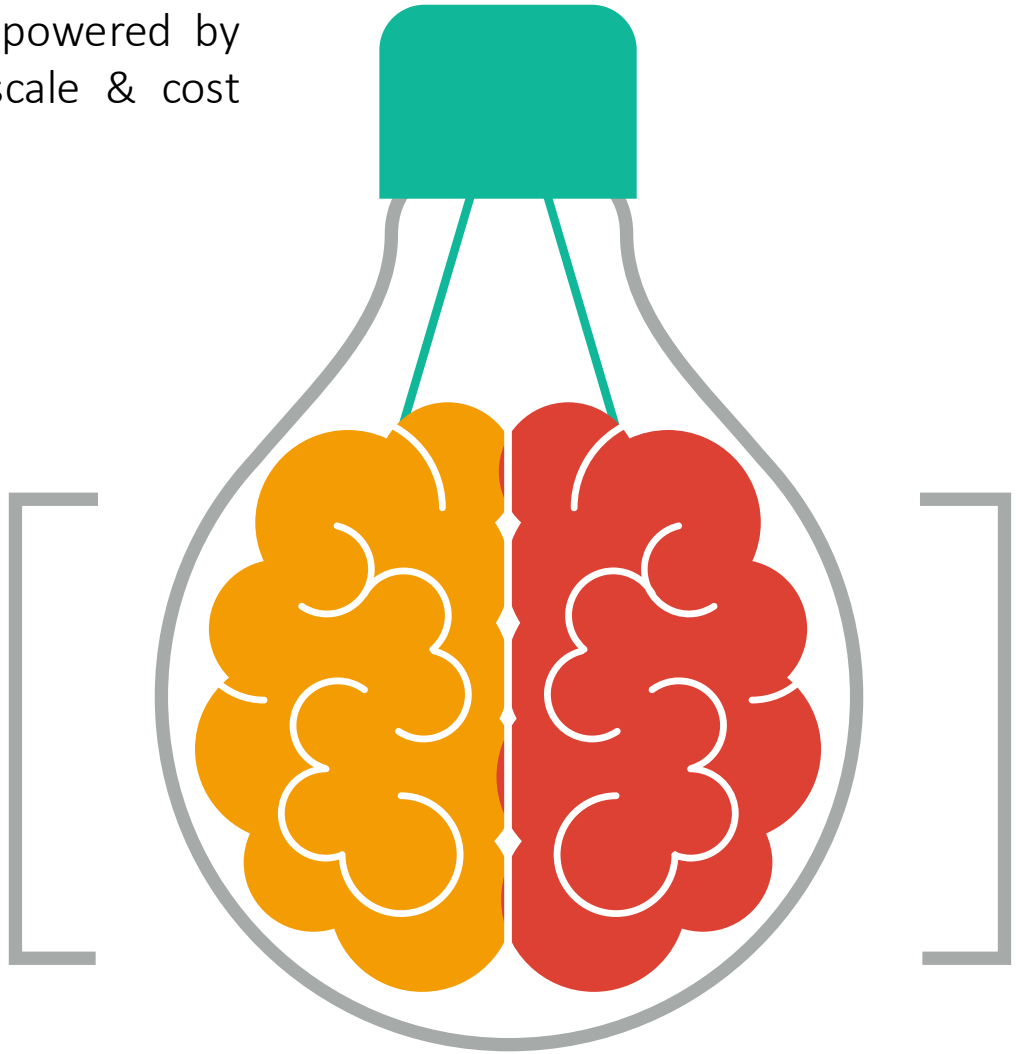
India needs to leverage on its Strengths

2nd largest Agro-chemcial Exporter powered by process chemistry, manufacturing scale & cost competitiveness.

INR 43,223 Cr Exports in FY 22-23



Strengths

1. Process chemistry optimizes generics and intermediates, slashing costs 20-30%.
2. Manufacturing scale with Gujarat clusters and 59 GLP labs drives $5.5B exports to 140+ countries
3. Cost competitiveness fuels "China+1," eyeing $14.5B by FY28

Gaps

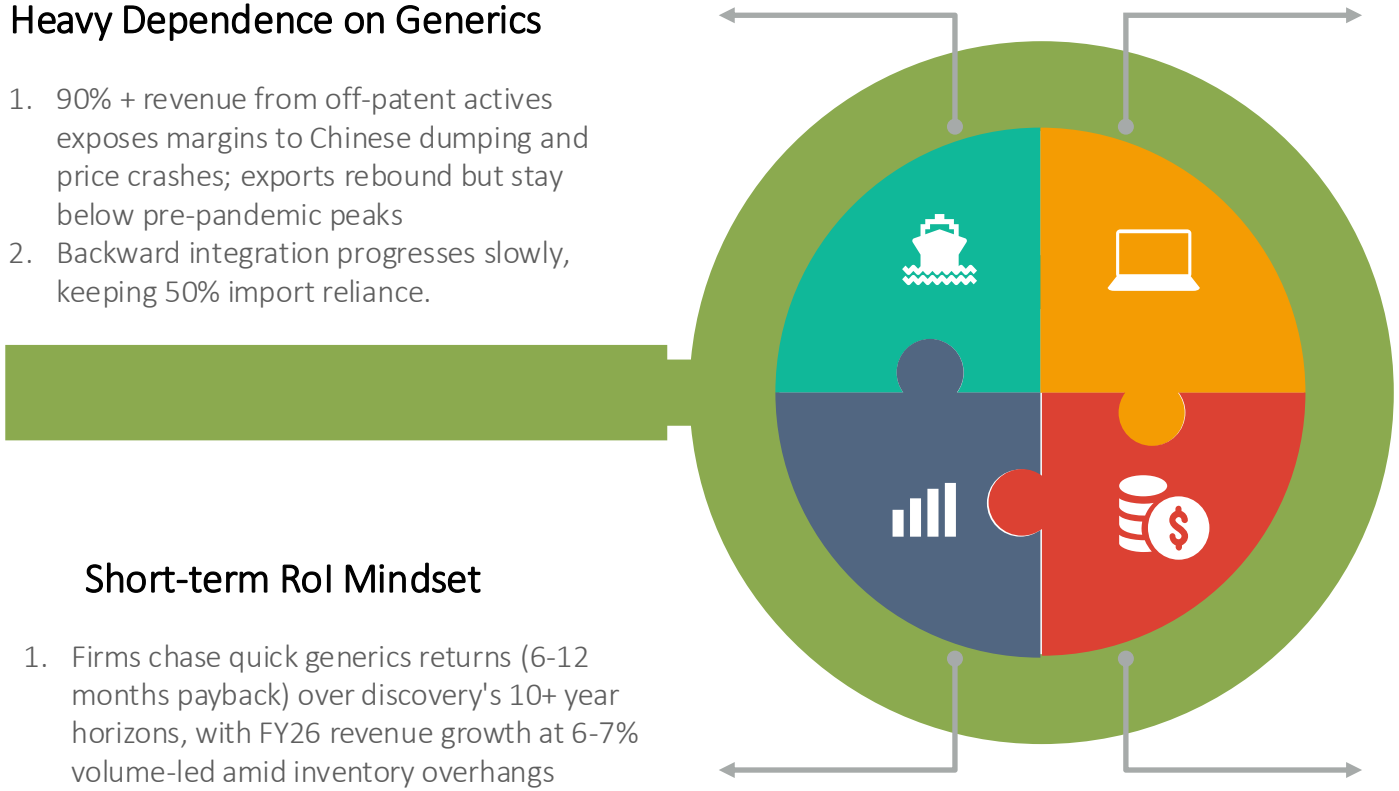
1. Limited new molecule discovery from 1-2% R&D spend vs. global 8-10%.
2. Risk-averse capital favors quick generics over 10-year innovation
3. Fragmented R&D (1,800 firms) lacks coordination, with regulatory delays

Kaleidoscopic Review- to set the next platform

Indian agrochemical companies grapple with core challenges that perpetuate **generics dependency and stifle innovation**. Overcoming **short-term ROI mindset, heavy generics reliance, limited long-term R&D funding, and talent migration is essential for global leadership.**

Heavy Dependence on Generics

1. 90% + revenue from off-patent actives exposes margins to Chinese dumping and price crashes; exports rebound but stay below pre-pandemic peaks
2. Backward integration progresses slowly, keeping 50% import reliance.



Talent Migration

Chemists migrate to pharma/IT for higher pay; weak academia-industry ties leave R&D understaffed despite growing scientist pool. Retention demands incentives amid global demand

Short-term RoI Mindset

1. Firms chase quick generics returns (6-12 months payback) over discovery's 10+ year horizons, with FY26 revenue growth at 6-7% volume-led amid inventory overhangs
2. This avoids high-risk projects despite Rs 4,000 crore industry R&D investments

Limited Long-term R&D Funding

1. R&D at 1-2% turnover (vs. 5-10% global) reflects investor preference for capex/debt reduction; capex hits Rs 5,500 crore but prioritizes capacity over molecules.
2. High gestation deters funding amid regulatory delays.

Need for an Indigenous Innovation Pipeline

India must build its own agrochemical innovation pipeline to mitigate supply chain vulnerabilities and align with global sustainability demands. Dependence on China exposes it to disruptions, while shrinking proprietary pipelines worldwide creates urgency for self-reliance.

Supply Chain Risk Concentration

1. Over 70% of active ingredients come from China, vulnerable to export bans, price volatility, and logistics shocks as seen in past shortages.
2. Domestic pipelines ensure stable supplies for India's $5.5B exports and low 0.6 kg/ha usage rate

Geopolitical Uncertainty

US-China tensions, EU sanctions, and India's anti-dumping duties (e.g., pretilachlor) heighten risks; "China+1" strategies favour India but require proprietary tech for premium positioning

MRL & Sustainability Pressure

Stricter Maximum Residue Limits (MRLs) in EU/US demand low-residue, biopesticide innovations; generics fail here, while India's bio-approvals lag global standards

Shrinking Global Pipeline

Big 6 firms (Corteva, Syngenta) cut discovery amid 10–12 years timelines and $200-800M costs; patent cliffs open generics, but new actives dry up, pushing India to fill the void

India should focus on an Integrated Approach

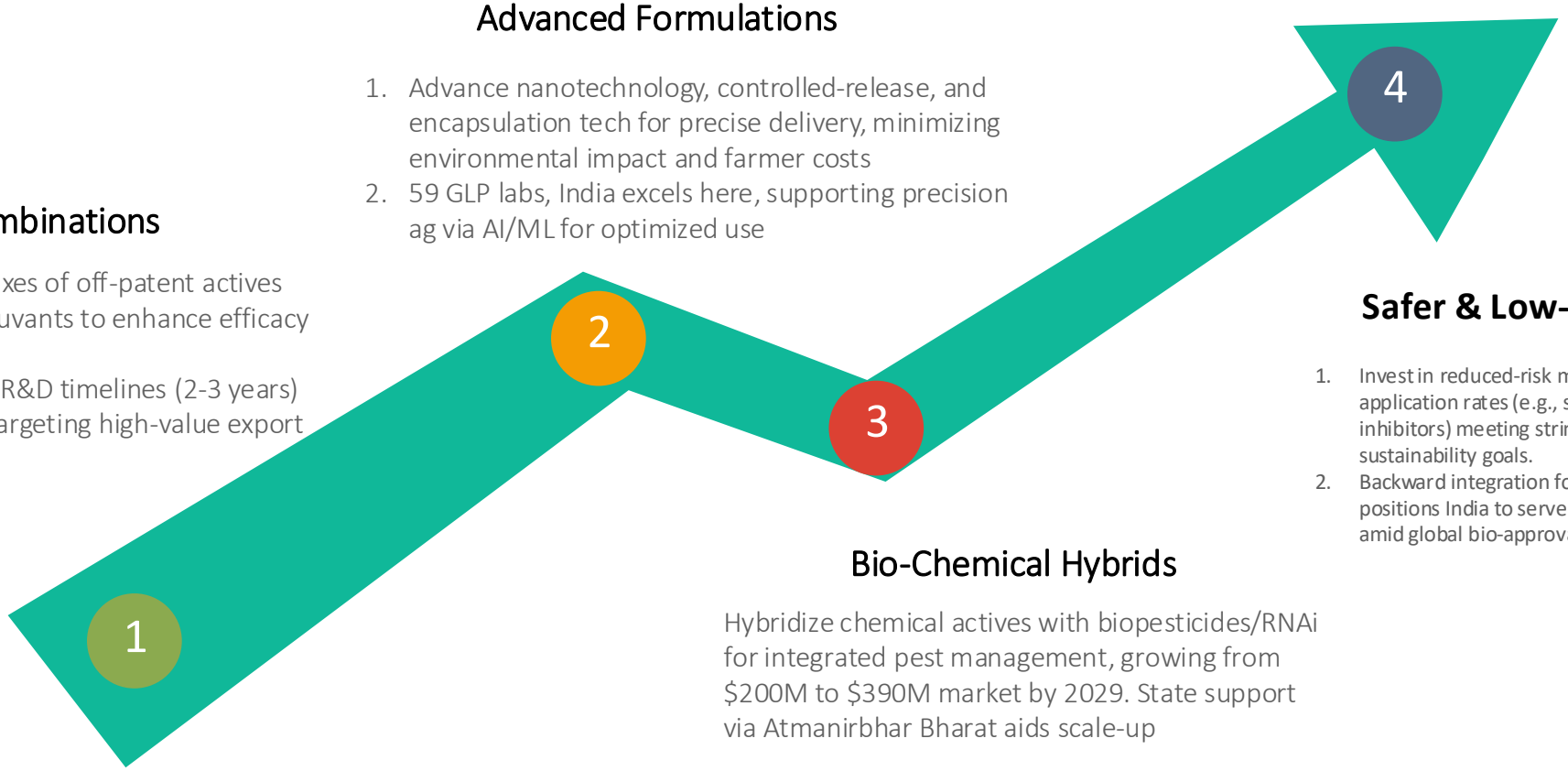
India should prioritize innovations that leverage its process chemistry strengths while addressing global demands for sustainability and efficacy. Focus areas include novel combinations, safer low-dose actives, advanced formulations, and bio-chemical hybrids to bridge gaps in new molecule discovery

Novel Combinations

1. Develop synergistic mixes of off-patent actives with bio-agents or adjuvants to enhance efficacy and reduce resistance
2. These require shorter R&D timelines (2-3 years) versus full discovery, targeting high-value export markets like EU/US

Advanced Formulations

1. Advance nanotechnology, controlled-release, and encapsulation tech for precise delivery, minimizing environmental impact and farmer costs
2. 59 GLP labs, India excels here, supporting precision ag via AI/ML for optimized use



Bio-Chemical Hybrids

Hybridize chemical actives with biopesticides/RNAi for integrated pest management, growing from $200M to $390M market by 2029. State support via Atmanirbhar Bharat aids scale-up

Safer & Low-Dose Actives

1. Invest in reduced-risk molecules with lower application rates (e.g., succinate dehydrogenase inhibitors) meeting stringent MRLs and sustainability goals.
2. Backward integration for cost-effective synthesis positions India to serve "green" premium segments amid global bio-approval growth

Building Blocks of Indian Innovation Ecosystem

Patient Capital

Attract long-term funding via Rs 1 lakh crore RDI Fund, PLI schemes, and PPP to overcome risk aversion (R&D at 0.62%), enabling high-risk discovery and scale-up. Venture funds for biotech hybrids vital for 10+ year horizons

Industry-Academia Collaboration

Adopt "triple helix" model (academia-industry-government) for trust-based MoUs, targeting eco-friendly agrochemicals; CSIR labs and BIRAC fund joint projects, raising market translation from 33% failure rate.

Pilot & Scale-Up Plants

Establish facilities like Novopor's Vizag SEZ pilot plant for agrochemical process optimization and commercialization, bridging lab-to-market with safety/environmental safeguards. Government support for demonstration plants accelerates this.

Strong IP Strategy

Strengthen patent enforcement, Regulatory Data Protection (RDP), and SOPs for benefit-sharing to boost commercialization (currently 0.4% vs. 5% global), protecting novel formulations and hybrids.

Integrated R&D

Consolidate fragmented efforts via public-private partnerships (PPP) and mission-mode projects like CSIR-IICT's off-patent process development for 47 molecules by 2026, shortening timelines from 2-3 years. Firms like PI Industries exemplify patent-backed, end-to-end R&D for sustainable solutions.

Coherent & Cohesive Approach– Role of Indian Companies

India must transition from cost-focused generics to value-driven innovation through proactive roles by companies in restructuring operations and culture. This involves dedicated teams, fixed R&D budgets, and long-term incentives to build sustainable pipelines

Shift from Cost to Value

Companies like UPL and PI Industries lead by backward integrating for key actives, reducing China dependency while developing premium formulations and biopesticides for higher margins. This moves beyond low-cost exports to branded, sustainable products meeting global MRLs and resistance challenges.

Dedicated Innovation Teams

Form cross-functional units focused on novel combinations and hybrids, as PI Industries does with end-to-end R&D centers collaborating globally. These teams prioritize climate-resilient solutions like slow-release formulations, accelerating field trials via GLP labs.

Fixed R&D Budgets

Commit 5-8% of turnover to ring-fenced R&D (up from 1-2%), mirroring Japanese models, with JVs like Sumitomo-Mahindra funding discovery. PLI schemes and Rs 1 lakh crore RDI Fund support consistent investment despite short-term pressures.

Long-term Incentives

Link executive pay to innovation milestones (patents, new launches) and offer ESOPs for R&D staff to curb talent migration. Tax breaks for 10+ year projects and PPPs foster risk appetite, as urged at AgroChem Summit 2025.

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Need – Strong Government Policies

Government plays a pivotal role in bolstering India's agrochemical innovation through targeted policies accelerating R&D, IP protection, and domestic manufacturing. Initiatives like PLI schemes and tax incentives aim to elevate the sector from generics to global leadership.

Role of Government & Policy

Strong Make in India Enforcement

PLI scheme targets intermediates/actives to cut Chinese imports (70%), with PCPIR policy attracting FDI via clusters; anti-dumping duties protect local production. Enforcement boosts self-reliance to $14.5B exports by FY28.

R&D Grants

Rs 1 lakh crore Anusandhan National Research Foundation (ANRF) and BIRAC funds support PPP for new molecules; Croplife urges Budget 2025-26 allocation for extension and green tech. PLI for critical actives offers 10-20% incentives.

Faster Patent Processing

Streamline IP via expedited examinations and data exclusivity (proposed 5-10 years for test data), addressing AgroChem Summit 2025 calls to boost commercialization from 0.4%. Digital platforms cut timelines from 4-5 years.

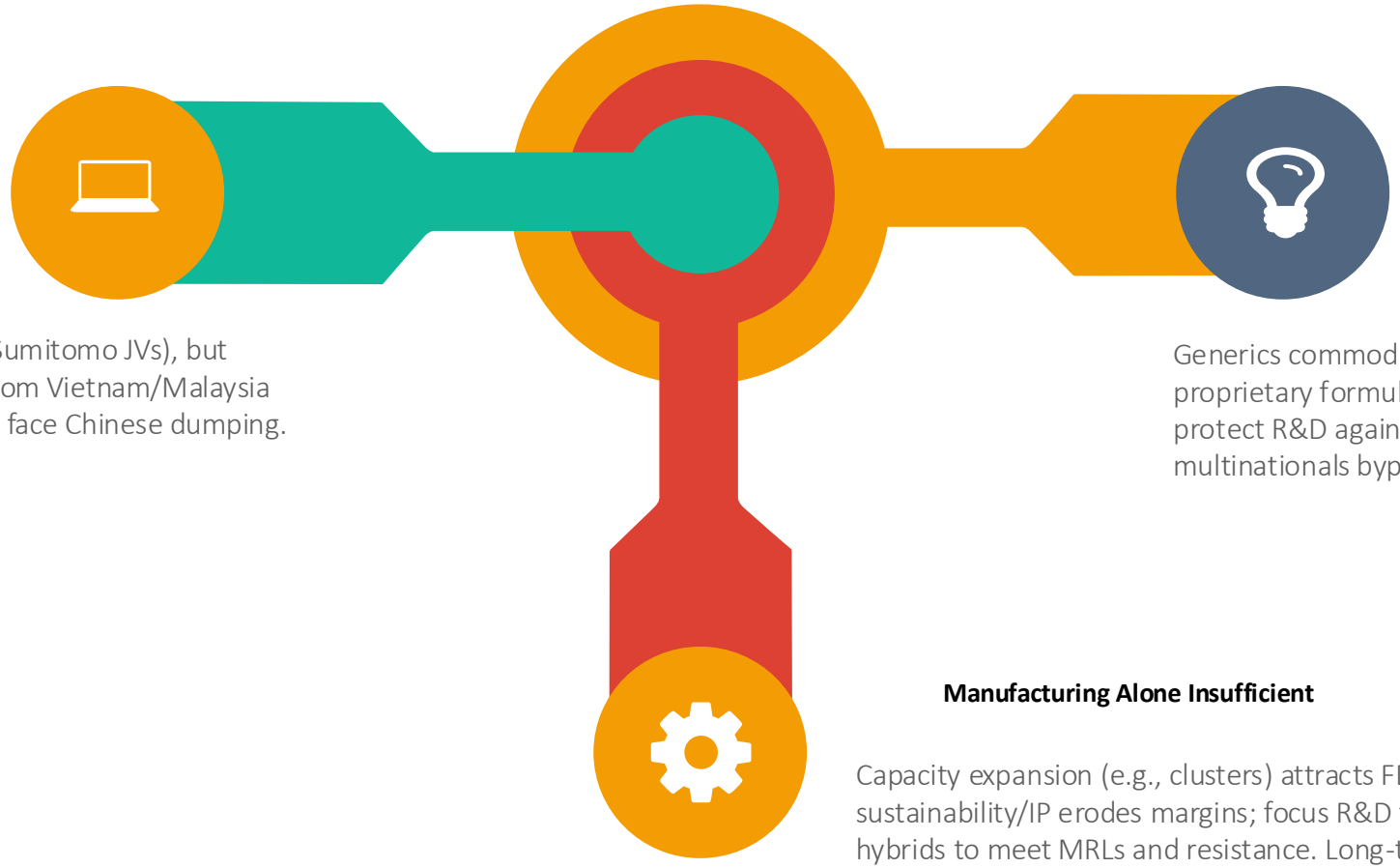
Tax Incentives

200% weighted deduction on R&D expenses (for firms with Rs 50cr assets/Rs 10cr spend), GST cut from 18% to 12%, and uniform 10% customs duty urged to spur investment. These enhance affordability for farmers and exports.

China plus One– A Reality Check

Not Automatic Advantage

India gains from diversification (e.g., Sumitomo JVs), but infrastructure lags and competition from Vietnam/Malaysia limit gains; exports hit $5.5B peak yet face Chinese dumping. PLI helps, but execution needs speed.



Requires Innovation + IP

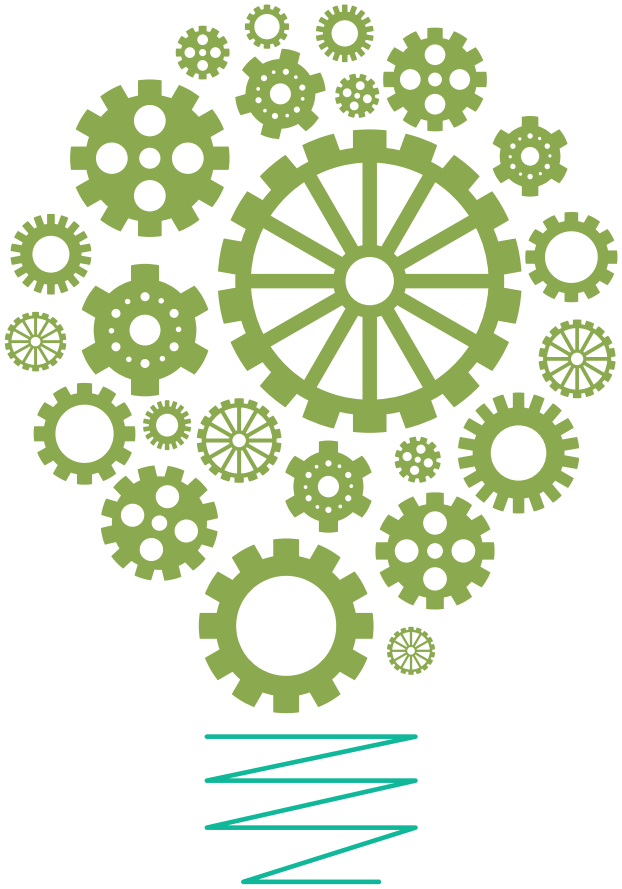
Generics commoditize India; value capture demands proprietary formulations, data exclusivity, and RDP to protect R&D against free-riding. Without IP, multinationals bypass for China despite "Plus N" trends.

Manufacturing Alone Insufficient

Capacity expansion (e.g., clusters) attracts FDI, but lacks sustainability/IP erodes margins; focus R&D for bio-hybrids to meet MRLs and resistance. Long-term investments in quality/reliability essential for trust

Source- https://timesofindia.indiatimes.com/blogs/voices/decoding-china-plus-one-for-the-indian-chemical-sector/

CDMO– as an Innovation Enabler



Early Exposure to Pipelines

CDMOs gain first-mover access to patented molecules and advanced intermediates from majors like Bayer/Syngenta, building expertise in next-gen actives. Indian flexibility and IP respect attract outsourcing, as China faces environmental/data issues.

Risk Sharing Model

Outsourcing shares capex risks (Rs 500-600cr plants), allowing focus on R&D/marketing; multinationals gain faster market entry via pan-India units. Revenue visibility from long-term contracts stabilizes amid volatility.

Co-Development Opportunities

Joint projects with innovators for custom synthesis/formulations accelerate off-patent innovation, with firms like Bharat Rasayan breaking China's monopoly on generics campaigns. This fosters tech transfer for bio-hybrids and precision ag products.

Scale-Up Learning

"Lab-to-ton" capabilities (e.g., Navin Fluorine) teach gram-scale to commercial processes, enhancing internal innovation for hybrids and low-dose actives. Global standards prepare for $100B export ambitions by 2030

Future Innovation Trends

02 Climate Resilient Solutions

Ensuring Yield & Quality

04 AI- driven discovery

Reduced costs, Accelerated Timelines

06 R&D

Shift from generics to novel combinations

01 Low MRL products

Food Security & Safety

03 Embracing Biologicals

Micro Power, Macro Impact
Pest control to Pest Management

05 Govt. Support/ PPP

Training
Capacity Building
Transfer of Technology

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The Big

Follower or Innovator

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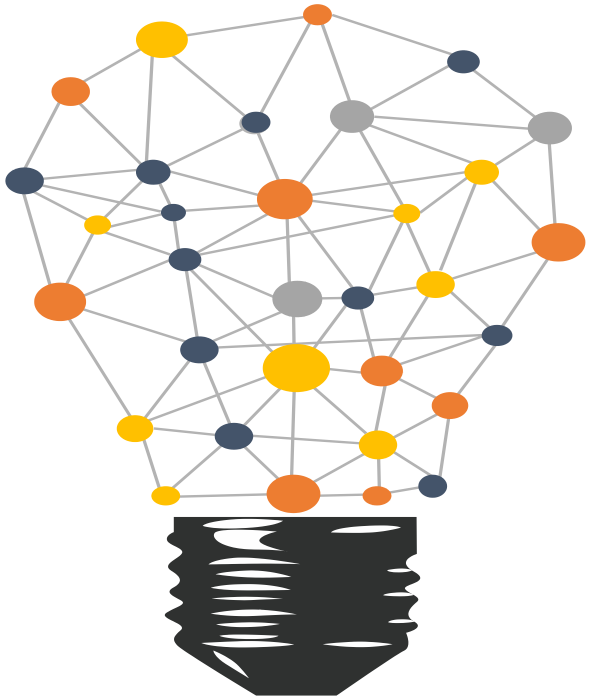

Innovation is now the
“survival strategy”

Next Shift can be from CHINA to INDIA
India has Talent & Scale, it needs Vision, Patience & Courage