

Navigating through the Multi National Mega Mergers

CPDA 2018 A&I Conference

San Antonio, Texas
Wednesday May 2nd 2018

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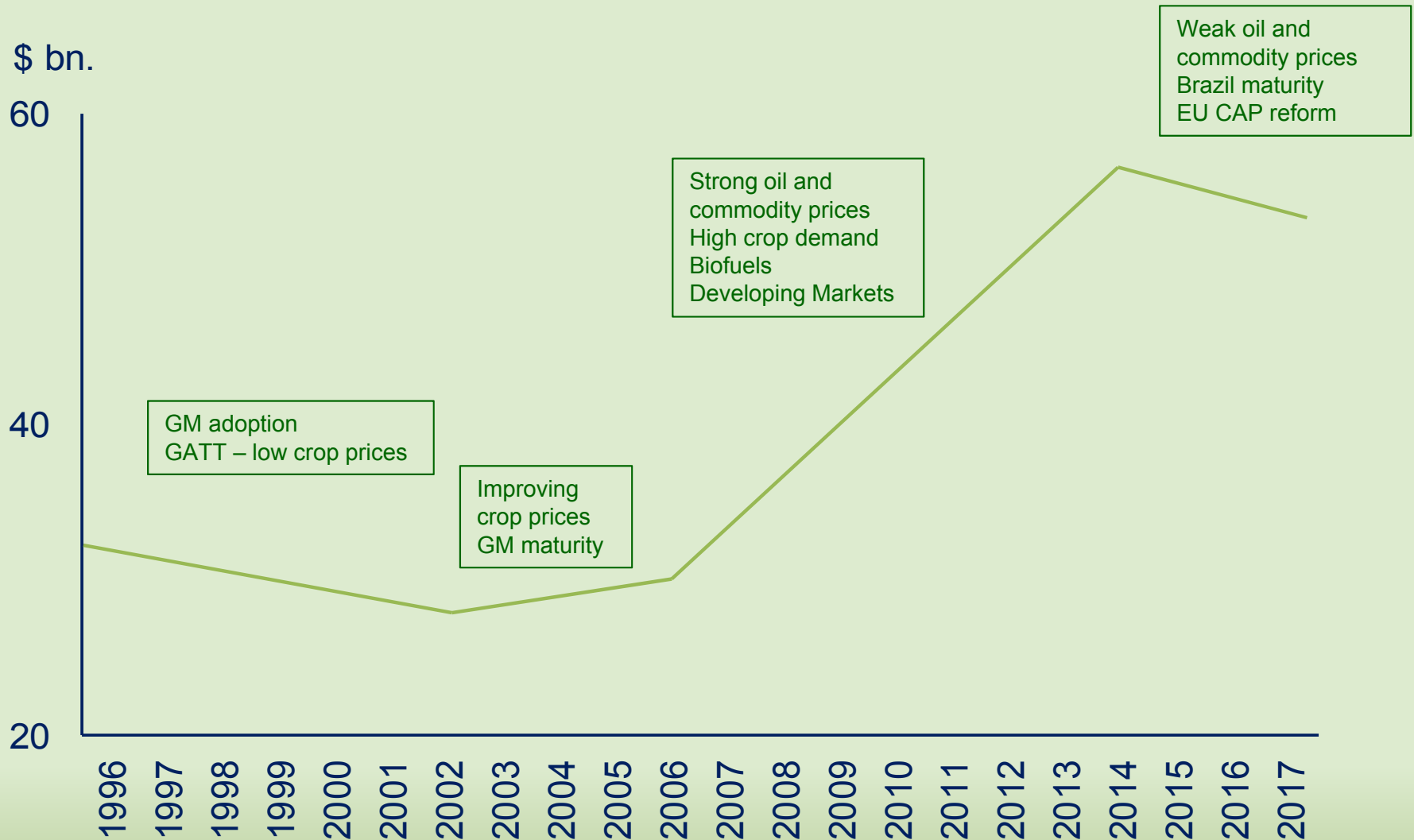
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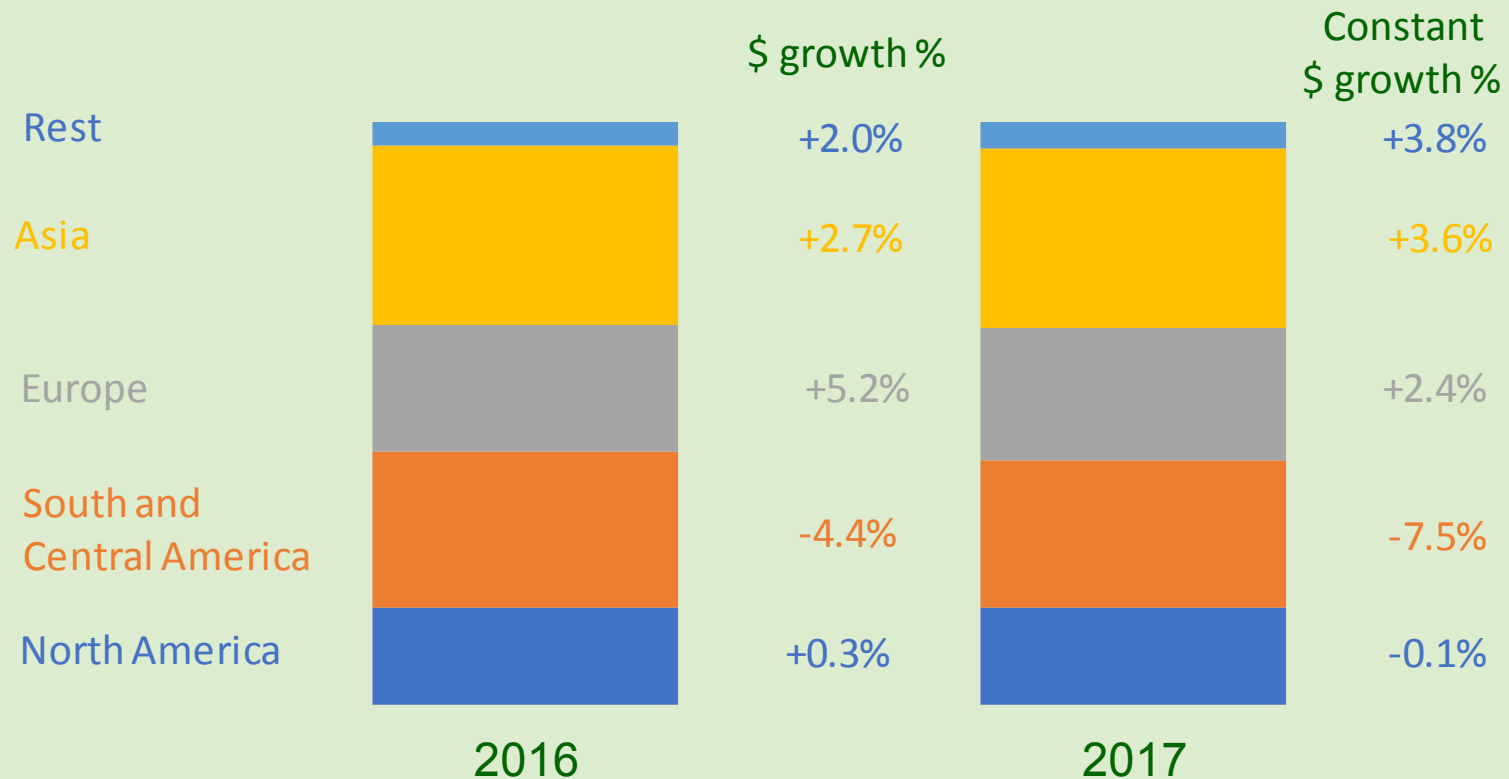
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Crop Protection Market Growth



Regional Crop Protection Markets - Preliminary



**World Market \$56.4 bn. up 1.0% in 2017
(-0.3% in constant dollar terms)**

Crop Protection Market 2017 – Key Factors

- Low crop prices depressing farm incomes
 - In many countries this resulted in farmers adopting the lowest cost options
 - Shift to generics
- Inventory
 - Carry over of stocks from previous years, and adoption of new products resulting in older chemistry remaining with distributors
- Pressure on agrochemical pricing
 - Driven by the move to lowest cost options and high inventory
- Crop areas and weather
- Weed, disease and pest resistance
- GM crops
 - Uptake of Enlist, Xtend and Intacta

Company Agrochemical Sales – Calendar Year 2017

Company	Calendar \$ growth 2017/2016%
UPL	14.2
FMC (Pro Forma)	11.3
Isagro	10.8
Monsanto	9.1
Adama	6.7
Amvac	4.7
BASF	4.0
DowDuPont	1.0
Aceto	0.5
Platform	0.1
Syngenta	-3.4
Bayer	-3.6

Calendar Year Agrochemical Growth 2017

Companies	Calendar 2017 % Change (\$)
Majors	0.6
Major Generics	7.3
Japanese	3.3
Indians	16.3
Distributors	1.5

- Majors** – Bayer, Monsanto, DowDuPont, BASF, FMC, Syngenta
- Major Generics** – Adama, Isagro, Platform, UPL, Amvac, Aceto
- Japanese** – Agro Kanesho, Kumiai, Nihon Nohyaku, ISK, Mitsui Chemical, Nippon Kayaku, Nippon Soda, Nissan, SDS Biotech, Sumitomo Chemical, Hokko
- Distributors** – ADM, Agrium, Bunge, Land O'Lakes, Cargill

Source : company reports

Traded Seed Market Growth



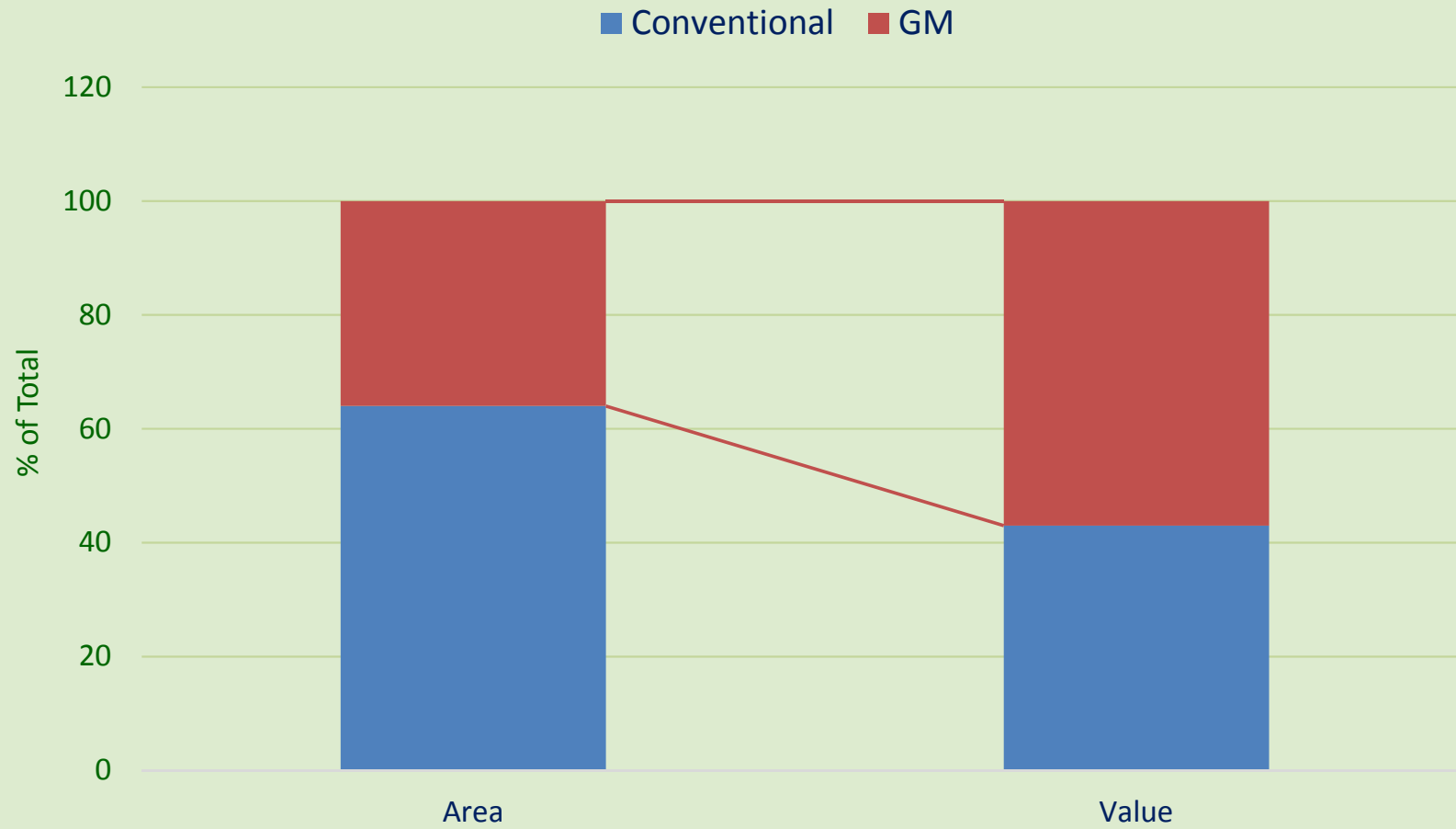
2002 – 2011: High average growth driven by the GM sector

2011 – 2014: Fall in average growth rate due to pressure from lower commodity prices

2015 – 2016: A declining market as a result of market pressures and falling maize area

2017P: Rise in market value from increased uptake of new technology, overall adoption and increased GM maize areas

GM Area and Value Vs Conventional Seed - 2017P



Company Seed Sales – Year to End of June 2016 and 2017

	Year to end Q2 2016	Year to end Q2 2017	Growth %
Monsanto*	9.99	10.91	9.3
Dow DuPont	7.79	8.20	5.3
Syngenta	2.66	2.83	6.4
Bayer	1.50	1.66	11.1
Vilmorin	1.52	1.52	0.4
KWS	1.18	1.10	-6.8

* year to end July

North America

(-0.1% constant currency growth in 2017)

USA (-0.5% in 2017)

- Increased soybean area (+8.0%) but decrease in maize (-3.9%)
- Increased soybean production (+2.0%) and decrease for maize (-3.6%)
- Abnormally dry in south and south west, cold in northern plains, mid-west storms
- Good growing conditions in mid-west (no extreme heat), record corn and soybean yield
- Dry weather but high pest pressure in California
- Weak farm economy, farmers purchasing low-cost options
- Distributor inventory and agrochemical price pressure
- Cotton area up due to better relative profitability to other crops
- Good performance on cotton, peanuts, F&V and sugar crops
- Xtend adoption, but dicamba drift concern

Canada (+2% in C\$ in 2017)

- Excellent crop year in 2016, but limited potential in 2017.
- Weak wheat and canola prices
- Some dryness in the Prairies, but south east affected by rain
- Fungicides and Seed treatments doing well

Brazil

- El Nino weather pattern broken, early 2016/17 season better, but drought then returned
- Low prices limit soy area (+1.8%), but boost maize (+15.0%)
- Increase in soybean (+19.6%) and maize (+47.0%) production in 2016/17
- 2017/18 maize area down 6.8%, but soybean up 3.2% and cotton up 17.4%,
- Current production forecasts for 2017/18 negative for maize but positive for soybean
- Dry weather assisted 2016/17 harvest, but reduced disease and pest pressure
- High Agchem inventories remain an issue, particularly for fungicides (affected by Solatenol introduction)
- Real remains weak against the dollar, economy improved but farm liquidity remains an issue
- Increased adoption of glyphosate tolerant maize
- Low but improving glyphosate prices
- New product introductions stalled in registration system
- Helicoverpa problem boosted insecticide sales in 2013/14, but low pressure deflated 2014/15, and 2015/16, and dry weather held back 2016/17
- Intacta soybeans (B.t.) has reduced some Lepidoptera sprays on soybeans

Rest Latin America

Argentina

- Removal of tax on maize and wheat exports and reduction on soybeans improved farm profitability
- Crop protection market improved in both 2015/16 and 2016/17
- Improved early season weather in 2016/17, but dryness then returned
- Inflation remains high although farm economy improving
- Area shift from soybean (-13.0%) to maize (+23.1%) and wheat (+45.5%) planting in 2016/17
- Soybean production down (-6.5%), maize flat, but positive for wheat (+50.4%)
- 2017/18 soybean area down 6.7%, but maize up 3.5% and cotton 17.8%
- 2017/18 production badly affected by drought

Rest LAM

- Market performing well driven by improving wealth and increasing crop demand.
- Crop exports are driven by speciality crops, so are not so affected by the downturn in maize and soybean prices.
- High rainfall, flooding and mud slides affect Colombia, Chile and Peru in 2016/17

Mexico

- Growth registered in Mexico in 2017 although dryness in west an issue.
- Rains in Q3 befitted market performance
- Crop protection market driven by fruit & vegetables, no longer maize

Europe ***(+2.4% constant currency growth in 2017)***

- Low wheat and oilseed rape prices;
- EU-28 Key crop area decline: wheat (-1.5%), barley (-2.5%), but increase for oilseed rape (+3.3%)
- EU-28 increased production: wheat (+4.8%), barley (-2.1%) and oilseed rape (+6.6%)
- Mild winter gave grounds for optimism but spring slow to start, and
 - Summer cold/dryness was an issue in parts of northern Europe
 - Drought in Southern Europe and Ukraine
- Low disease and pest pressure in West Europe, but Central and East Europe better
- Improved economic conditions in Ukraine, but dry weather affects crop production
- 2015 EU Reform of Common agricultural policy reduced direct payment and crop areas in EU-15,
 - Ecological focus area removed 5% of land from production
 - Crop diversification requirements
 - Direct payments to central European member states increased.
- Agrochemical usage now banned on Ecological focus areas
- Stronger growth in developing East and Central European countries than in EU-15

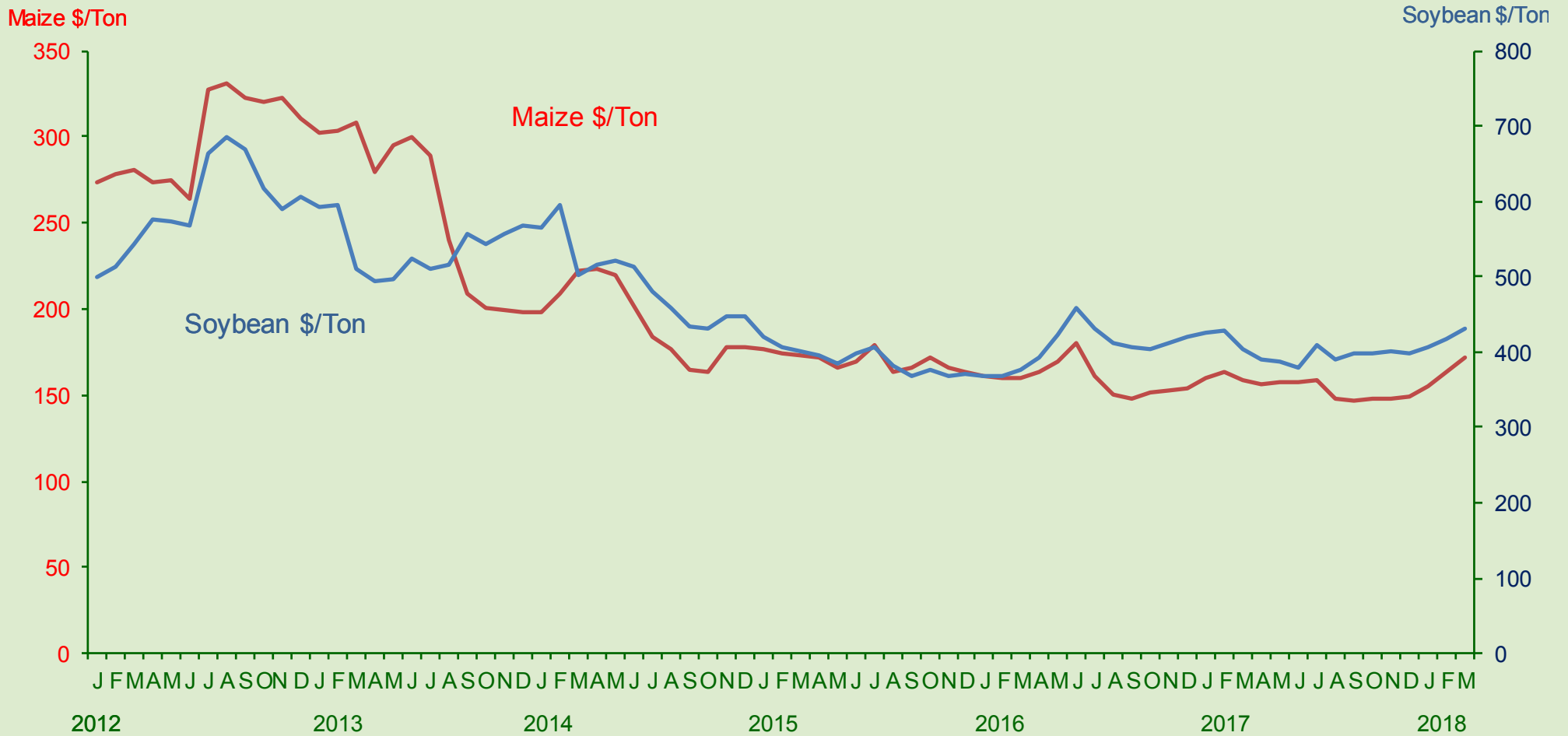
Asia

(+3.6% constant currency growth in 2017)

- Rice de-stocking by Thailand now complete, global rice prices now improving
- 2016 monsoon better, but far from optimal, so still room for recovery
- Good early monsoon season in India, but new sales tax delaying sales
- Positive rice markets in India, Thailand, Vietnam and Indonesia
- Drought returning to become a major issue again in Australia
- 'Zero Growth' policy in China, drought in the north, but flooding in the south, weak prices
- Palm oil prices improving
- Local currency growth anticipated in most Asian countries
- Still early in Asian crop/monsoon year

Crop Prices and Farmer Wealth

Maize and Soybean Prices

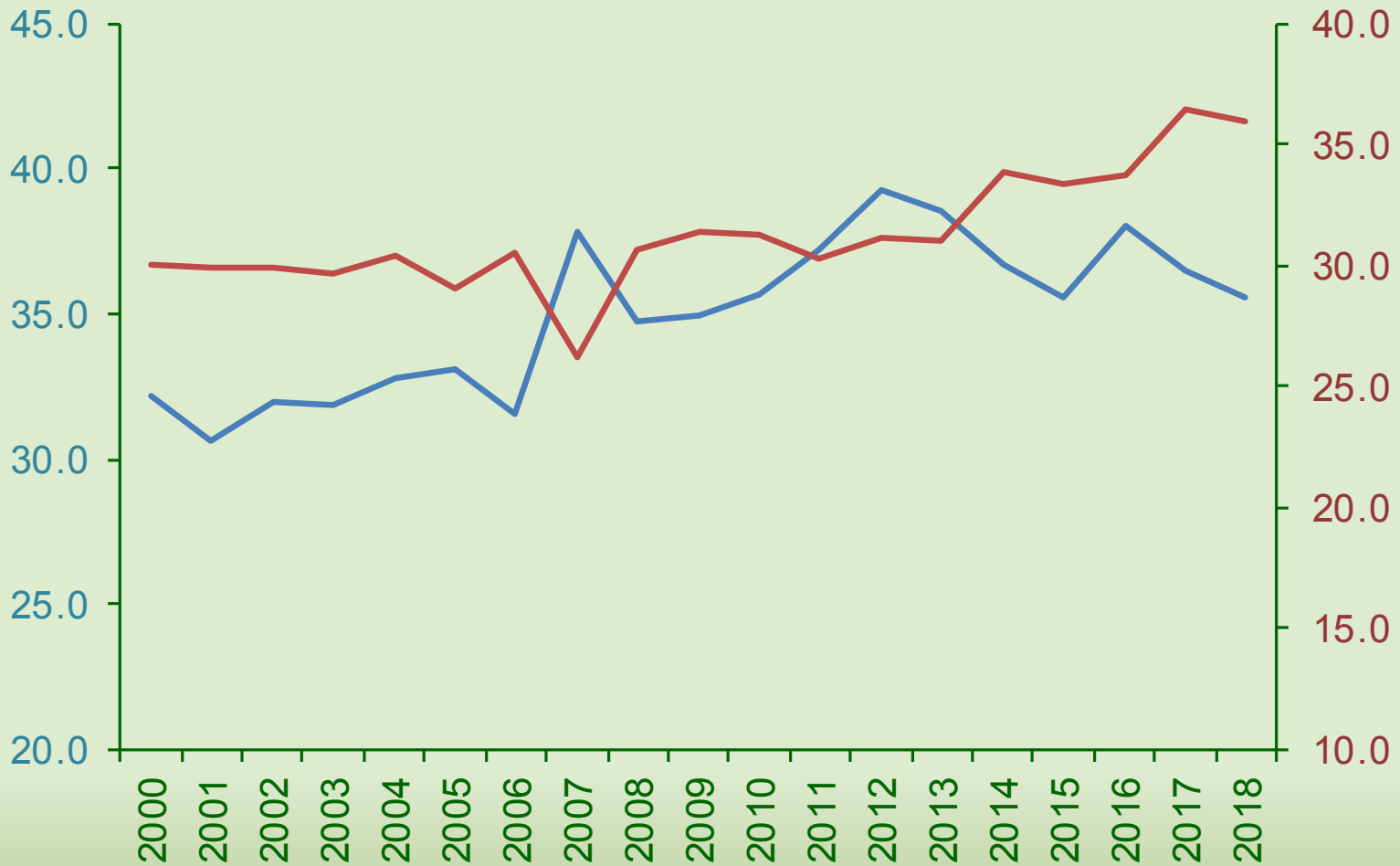


Source : FAO

US Maize and Soybean See Saw

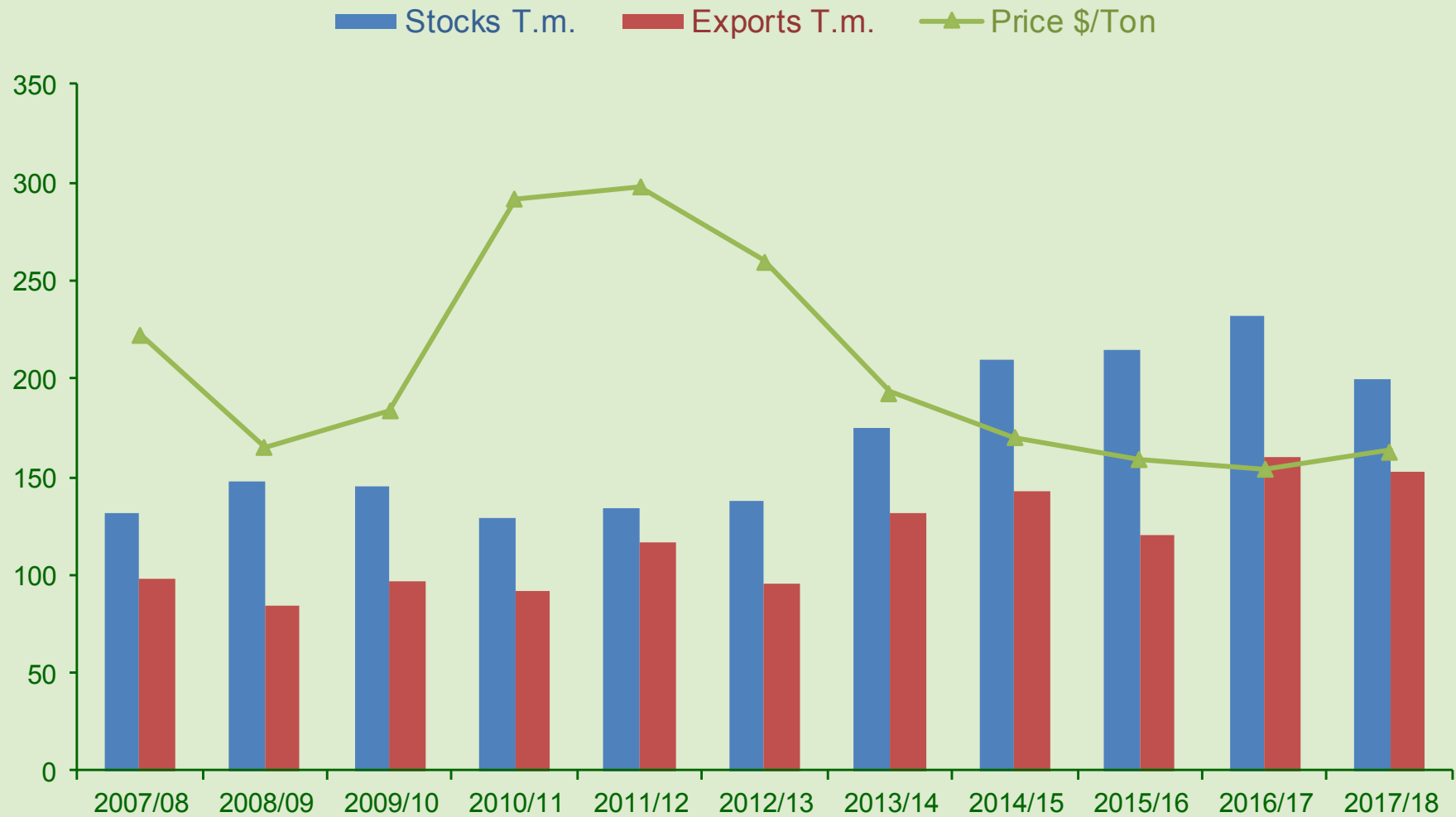
Corn Ha.m.

Soybean Ha.m.



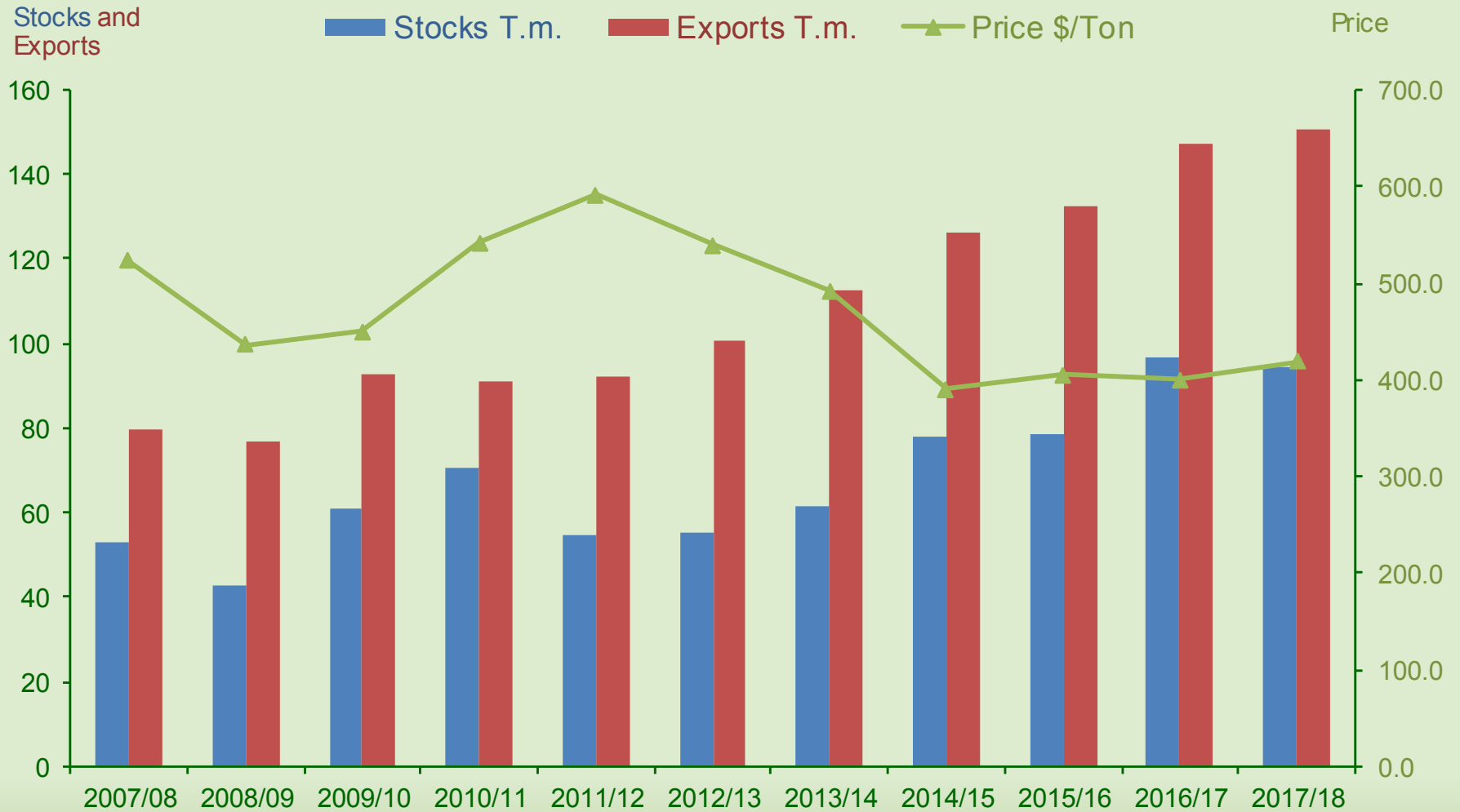
Source : USDA

Maize



Source : FAO and USDA

Soybean



Source : FAO and USDA

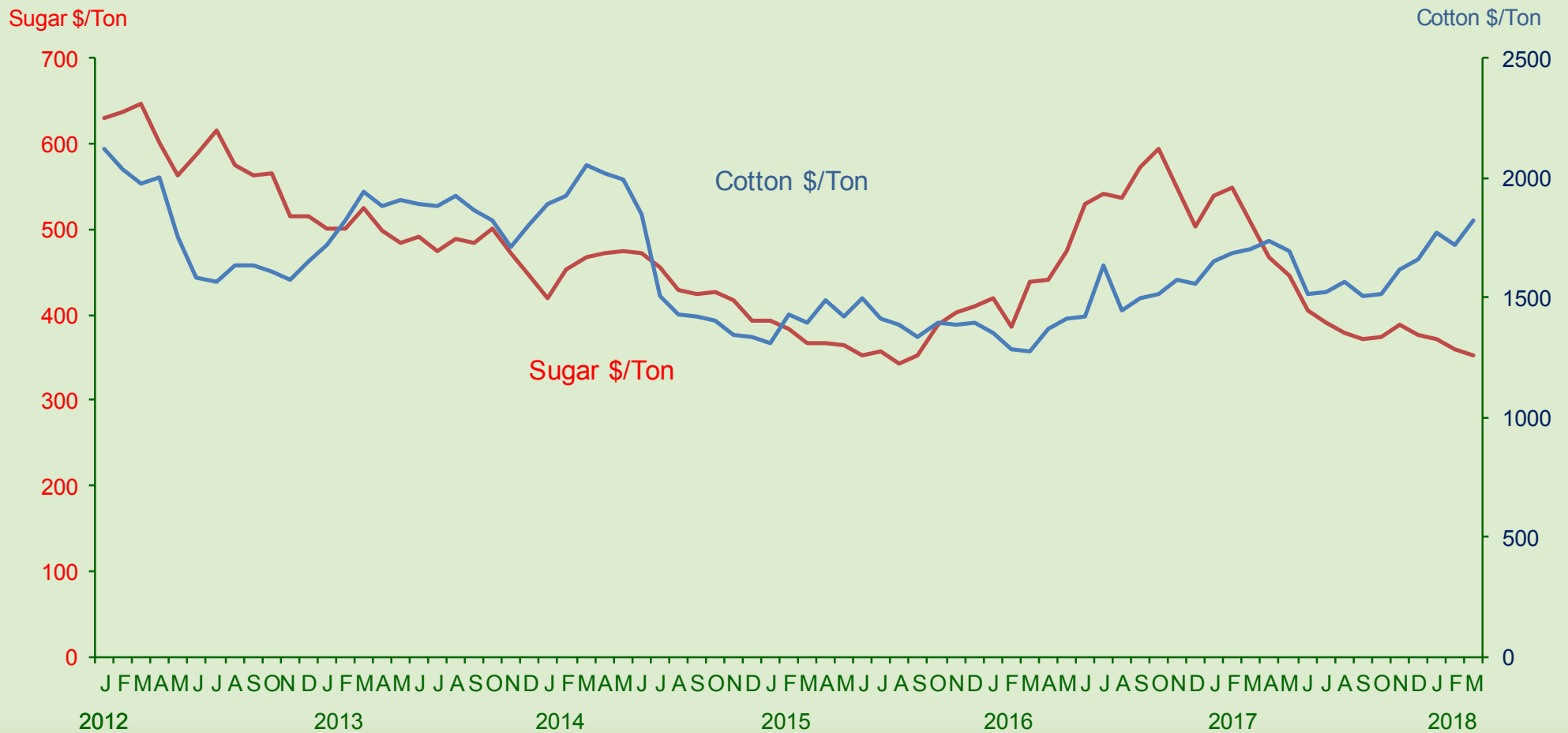
Maize and Soybean

	Planted Area (Ha m.)				Production (T. m.)			
	2015	2016	2017	2018	2015	2016	2017	2018
Maize								
USA	35.6	38.0	36.5	35.6	342.7	381.7	368.0	
Brazil	15.7	15.3	17.6	16.4	84.7	66.5	97.8	88.6
Argentina	6.0	6.9	8.5	8.8	33.8	39.8	39.5	33.0
Sum	57.3	60.2	62.6	60.8	461.2	488	508.3	
Brz + Arg	21.7	22.2	26.1	25.2				
Soybean								
USA	33.4	33.8	36.5	36.0	106.8	116.9	119.5	
Brazil	32.1	33.3	33.9	35.0	96.2	95.4	114.1	115.0
Argentina	19.8	20.7	18.0	16.8	61.3	58.8	55.0	40.0
Sum	85.3	87.8	88.4	87.8	264.3	271.1	288.6	
Brz + Arg	51.9	54	51.9	51.8				

For Brazil and Argentina 2018 is the 2017/18 crop season *Red=Estimate (drought in Argentina)*

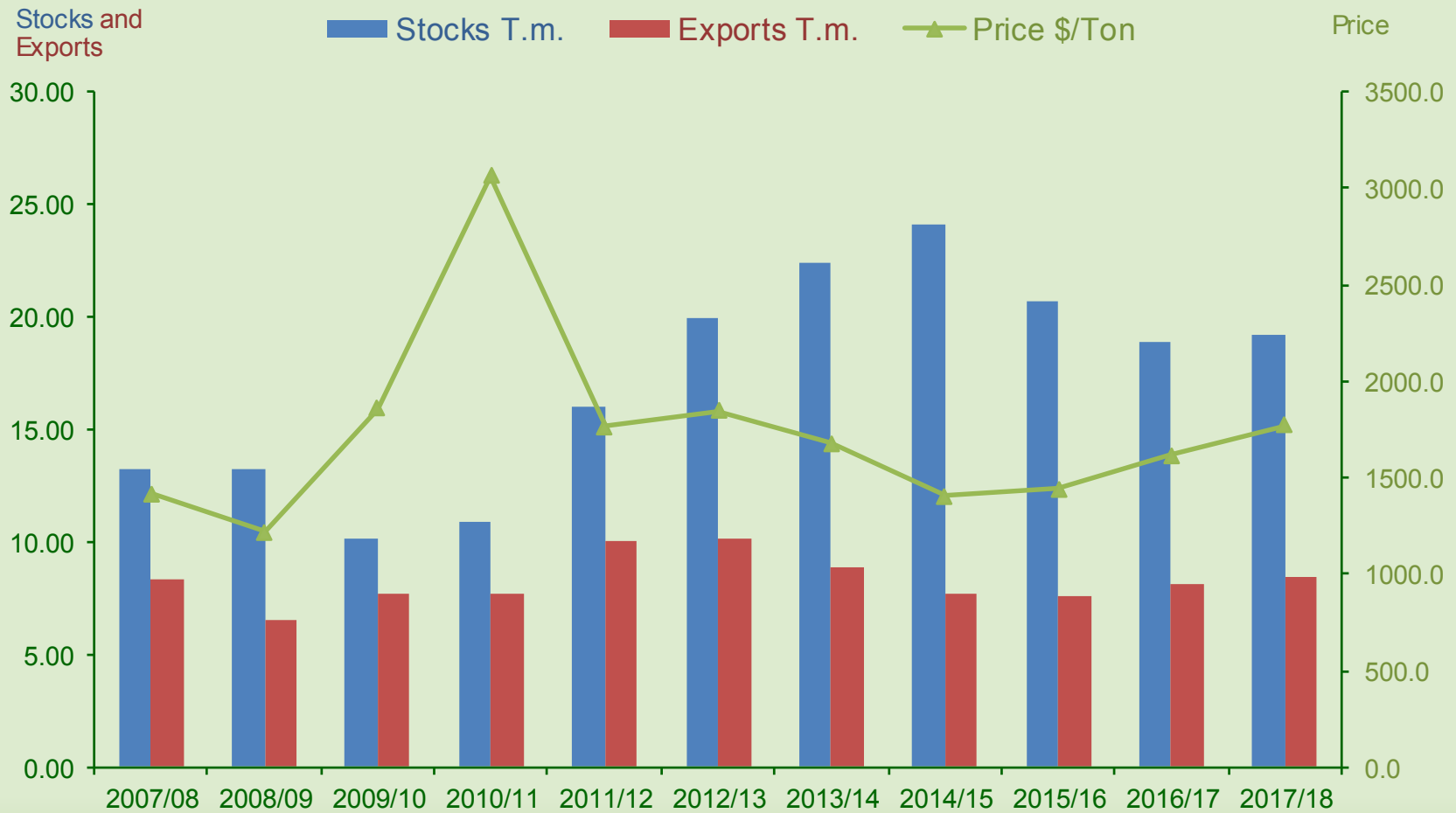
Source : Ministries of Agriculture

Sugar and Cotton Prices

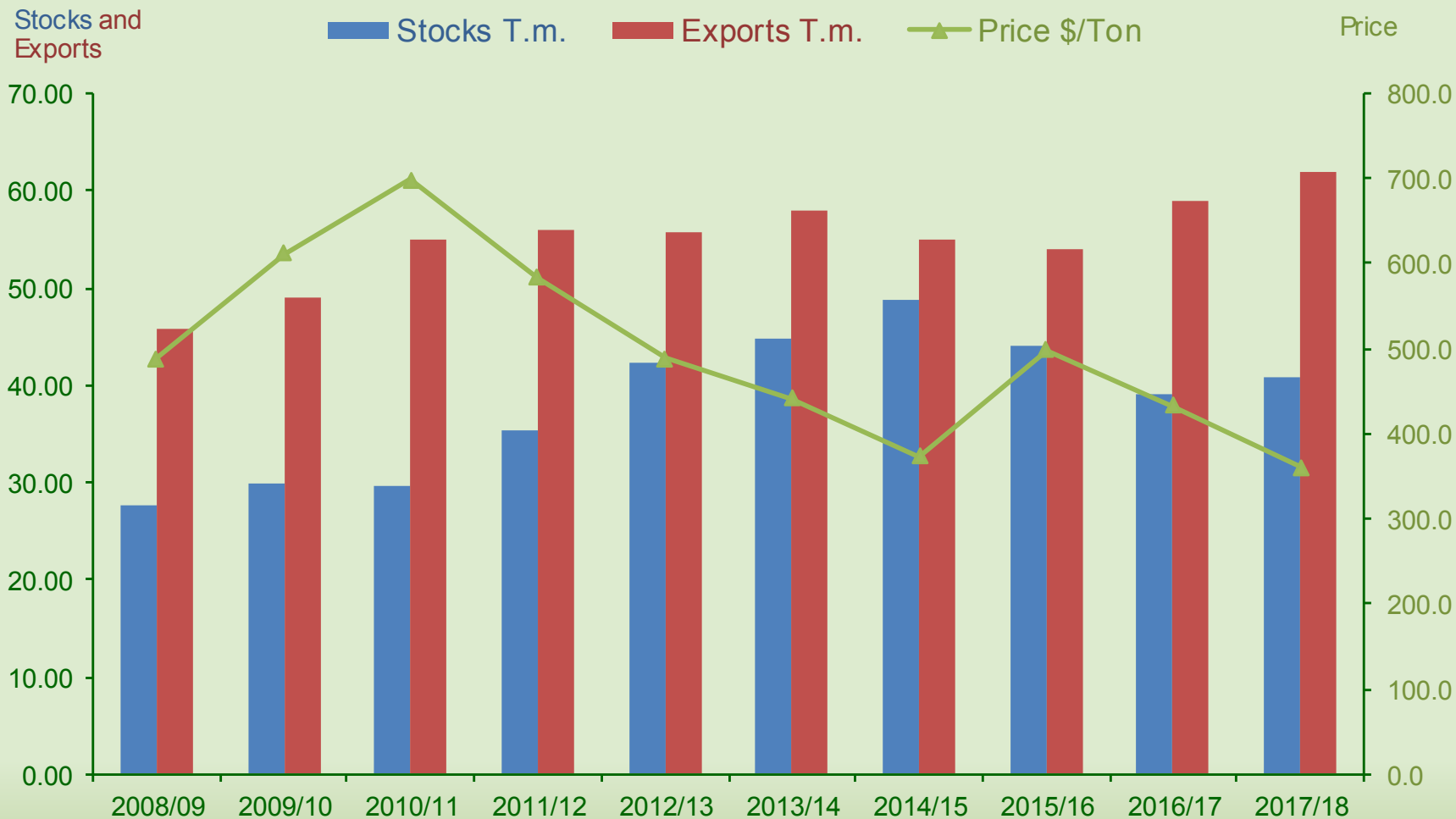


Source : USDA and Forexpros.com

Cotton

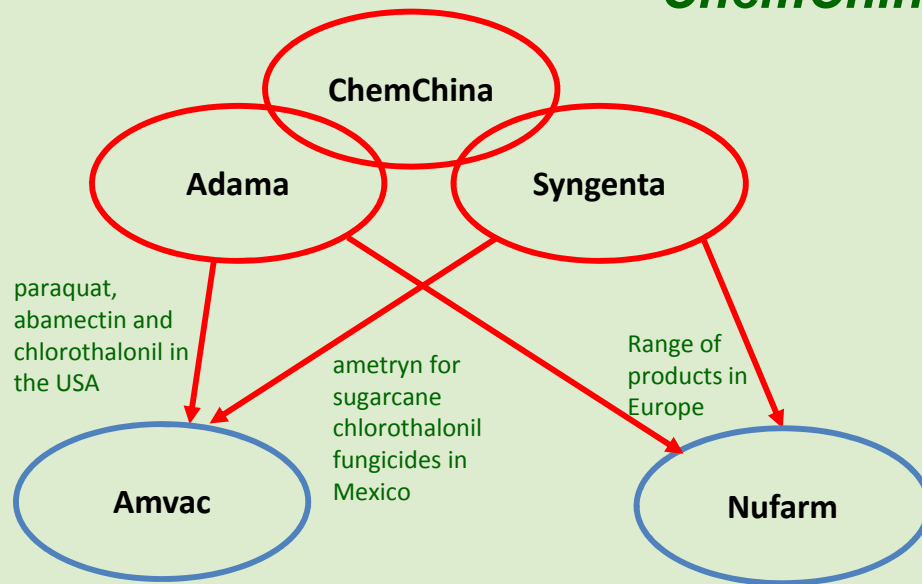


Sugar



Consolidation

ChemChina / Syngenta



- Largest acquisition by a Chinese Chemical organisation
- Key driver appears to be seeds
 - Chinese seed industry tightly state controlled
 - Potential exploitation of Chinese technology outside the country
 - Seeds stated as focus for further acquisitions

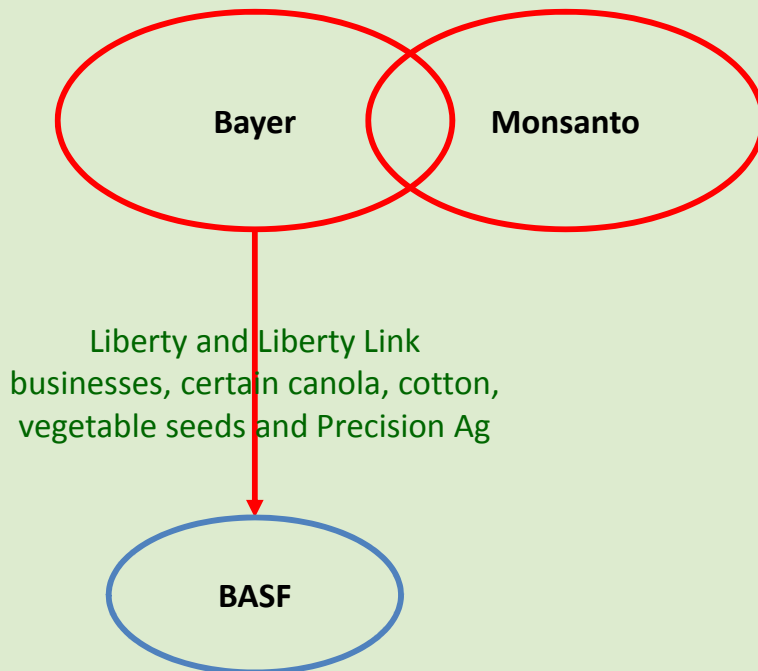
- Anti-trust activity
 - Repositioning of Adama under Sanonda did not satisfy anti-trust authorities
 - Creates anti-trust precedent for other Chinese companies
 - Requires divestment of some assets
 - Some already sold to Amvac
 - ametryn and chlorothalonil in Mexico from Syngenta
 - abamectin, chlorothalonil and paraquat in the USA from Adama
 - Range of products in Europe sold to Nufarm by Adama and Syngenta
- Syngenta provides ChemChina with complete GLP registration capability
 - Potential conduit for international registration of new Chinese agrochemicals and traits

Syngenta Acquisitions since purchase by ChemChina

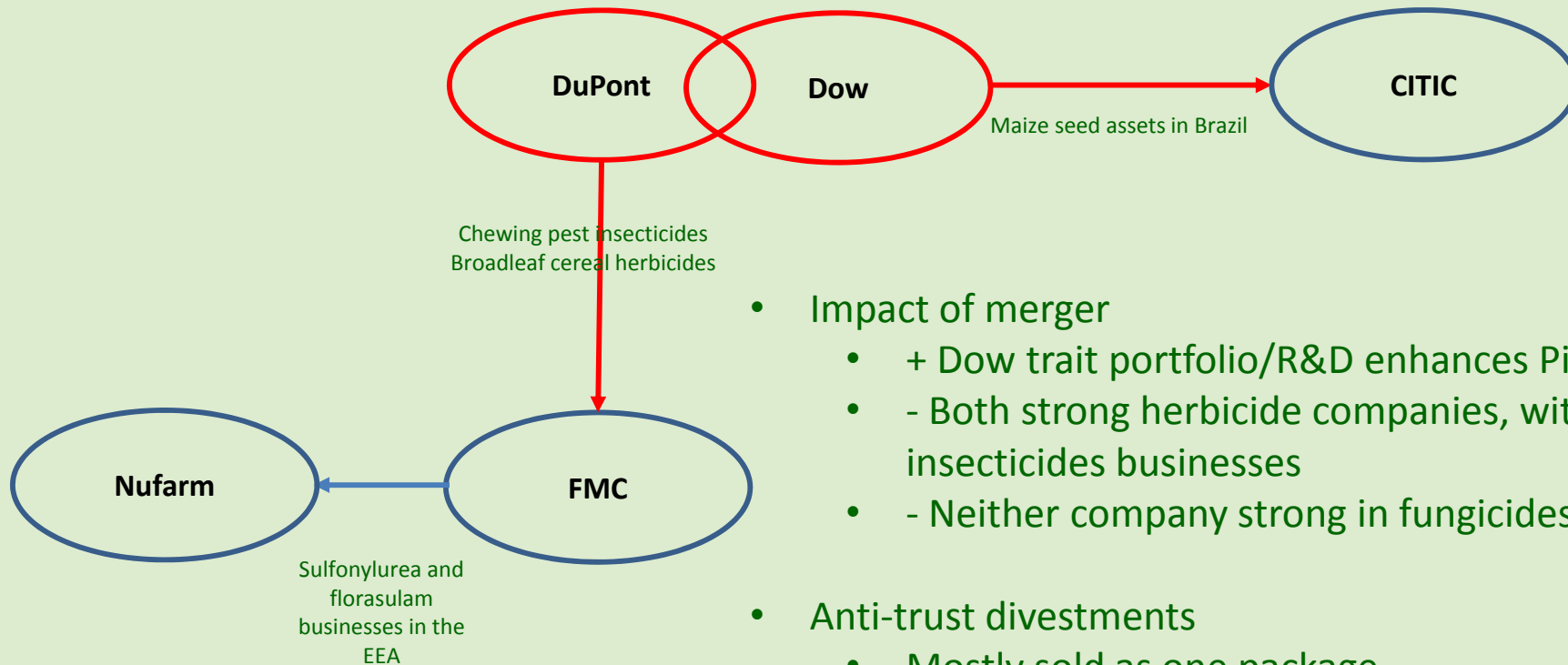
Year	Month	Company	Activity
2018	February	Nidera	S. American seed company
2018	February	FarmShots	Brazil precision Ag company
2018	March	Strider	US precision Ag company
2018	April	Abbott & Cobb	US Vegetable seeds

Bayer / Monsanto

- Creates the largest Agrochemical / Seed company worldwide
- Key driver appears to be Precision Ag
 - Exploitation of 'big data' to enhance crop protection marketing and seed development
- Previous Bayer seed focus – cotton, canola, vegetables
 - Expands position in the major maize and soybean sectors
- Anti-trust divestments (almost entirely to BASF)
 - Some cotton, canola and vegetable seed assets
 - Liberty Link
 - Glufosinate
 - Bayer Precision Ag assets



Dow / DuPont



- Impact of merger
 - + Dow trait portfolio/R&D enhances Pioneer seed
 - - Both strong herbicide companies, with growing insecticides businesses
 - - Neither company strong in fungicides
- Anti-trust divestments
 - Mostly sold as one package
 - Included R&D facilities and assets to sustain global R&D base
 - Precluded other R&D companies from bidding
 - chlorantraniliprole / cyantraniliprole

Other beneficiaries of recent industry consolidation

Acquisitions	Divestments
FMC	
DuPont R&D facilities and Research leads (but not products in development)	
chlorantraniliprole and cyantraniliprole	
DuPont broadleaf cereals herbicide business	Florasulam and sulfonylurea businesses in the EEA to Nufarm
Nufarm	
Florasulam and sulfonylurea businesses in the EEA from FMC	
Range of products from both Syngenta and Adama in Europe (ca \$195 m in sales)	
Further consolidation into Sumitomo	
Amvac	
Paraquat, abamectin and chlorothalonil in the USA from Adama	
Ametyrn for sugarcane and chlorothalonil fungicides in Mexico from Syngenta	
Grupo Agricentre (Central American and Caribbean distribution)	
OHP (non-crop agrochemical business in USA)	

Agrochemical Sales 2016

Pre and Post consolidation and anti-trust divestments/acquisitions

Company	2016 (\$ bn.)	Merged Companies	2016 (\$ bn.)
Syngenta	9.9	Syngenta Adama	12.6
Bayer	9.5	Bayer Monsanto	12.4
BASF	6.2	BASF	6.7
Dow AgroSciences	4.6	Dow DuPont	5.9
Monsanto*	3.5	FMC	3.8
Adama	2.9	Nufarm	2.4
DuPont	2.9	UPL	2.2
FMC	2.3	Sumitomo Chemical	2.0
UPL	2.2	Arysta LifeScience	1.8
Nufarm	2.1	Albaugh	1.0
Sumitomo Chemical	2.0	Kumiai Chemical	0.5
Arysta LifeScience	1.8	Sipcam Oxon	0.5
Albaugh	1.0	Amvac	0.3
Kumiai Chemical	0.5		
Sipcam Oxon	0.5		

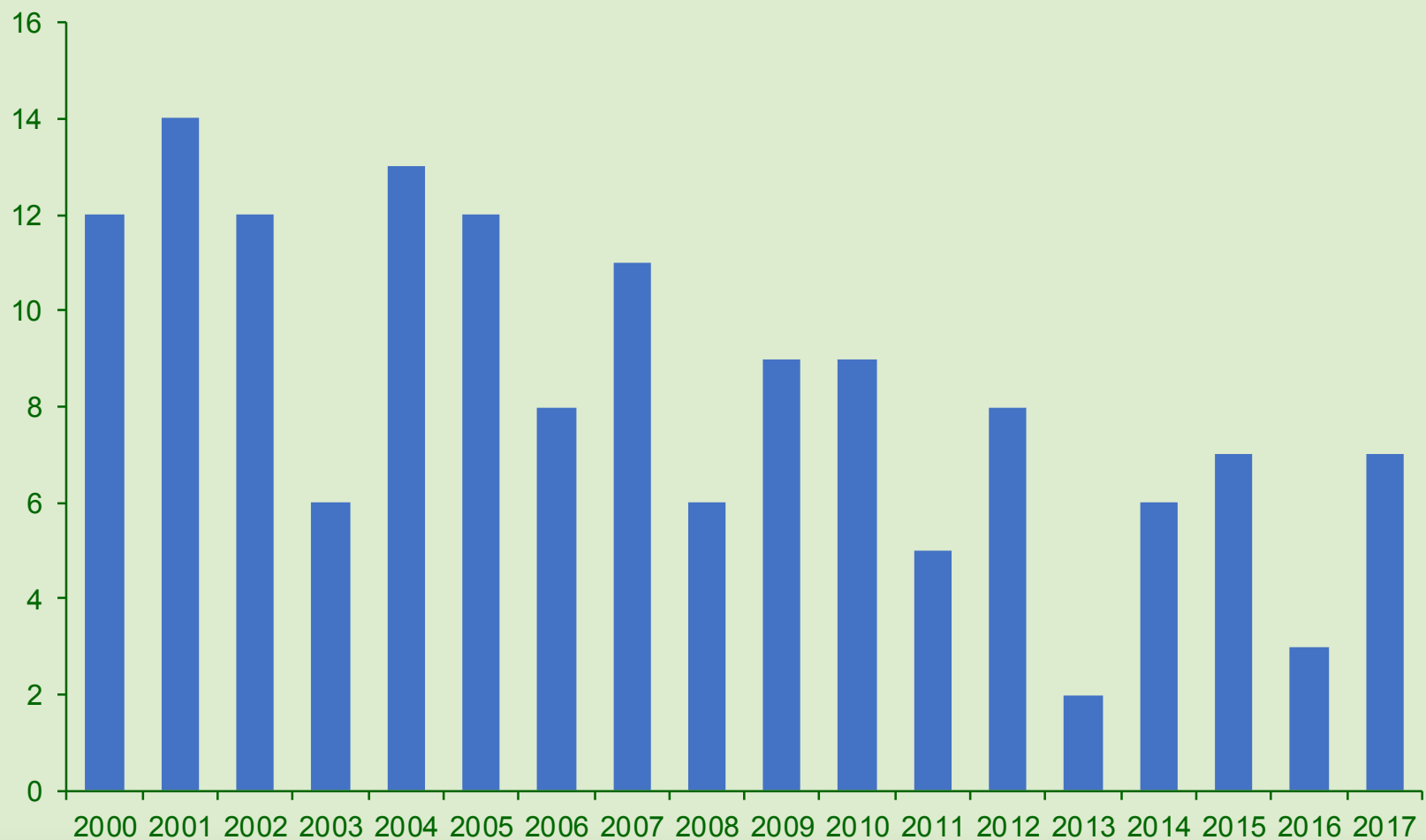
Seed Sales 2016

Pre and Post consolidation and anti-trust divestments/acquisitions

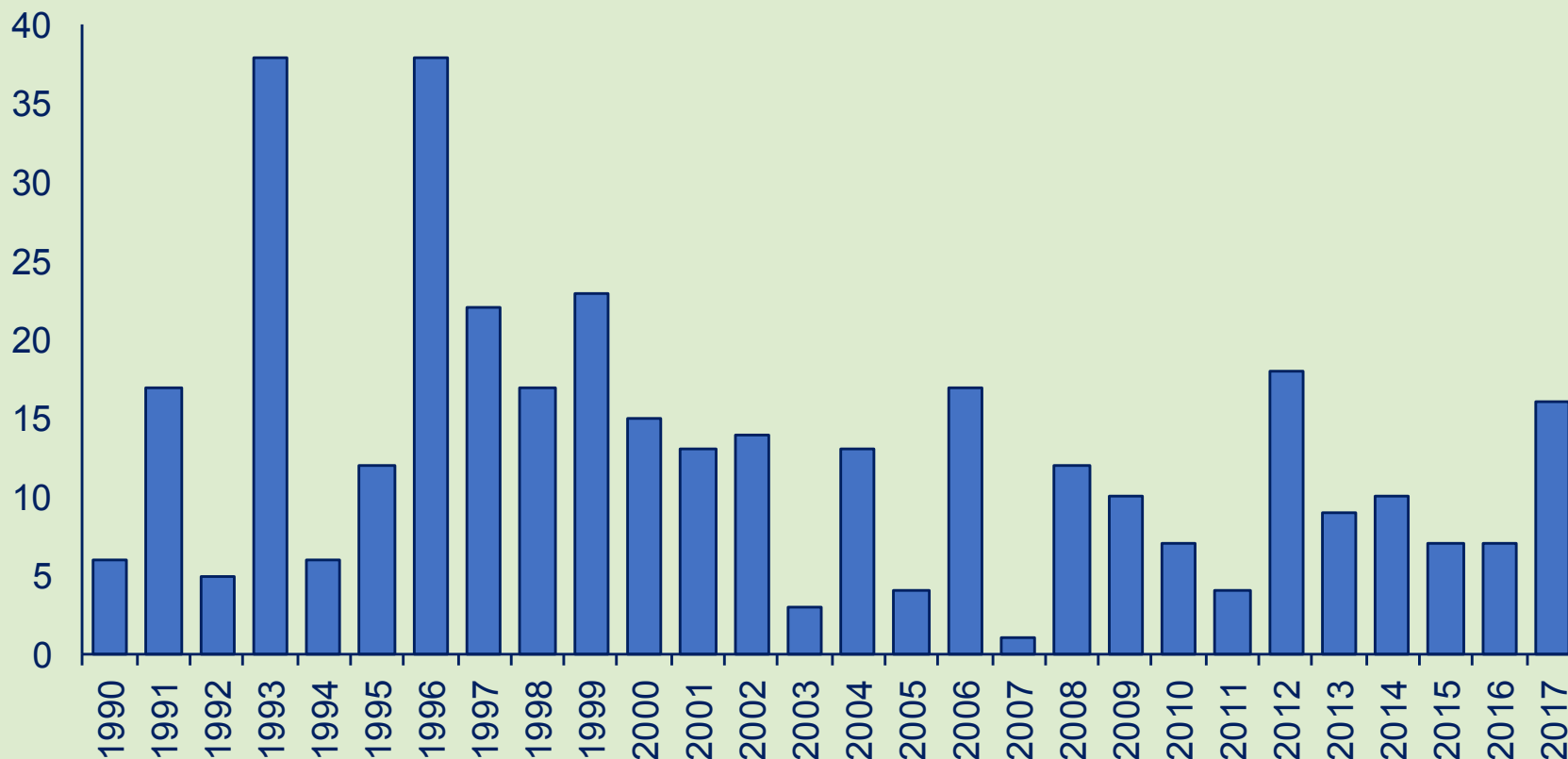
Company	2016 (\$ bn.)	Merged Companies	2016 (\$ bn.)
Monsanto	10.4	Bayer Monsanto	10.5
Pioneer	6.7	Dow DuPont	7.9
Syngenta	2.7	Syngenta	2.7
Dow	1.5	Vilmorin	1.5
Bayer	1.5	BASF	1.4
Vilmorin	1.5	KWS	1.2
KWS	1.2	Agrilant genetics	0.6
Agrilant genetics	0.6	DLF	0.5
DLF	0.5	Takii	0.4
Takii	0.4	Sakata	0.4
Sakata	0.4		

Technology

New Agrochemical Active Ingredient Introductions



Active ingredients granted IUPAC common names



Granting of IUPAC name normally corresponds with active ingredients entering development

Source : *Compendium of pesticide common names,*

Key Factors affecting Agrochemical R&D

- Shift in emphasis
 - US companies focused more on seed
 - Increasing share of new AgChems from Asia
- Regulation
 - Neonicotinoids – need for new sucking pest insecticides
 - EU product substitution / endocrine disruption
 - Potential action against triazoles
 - Shift to other 'azole' chemistry
- Resistance
 - Strobilurins –
 - Asian rust, Frogeye leaf spot (soybeans),
 - Septoria (cereals)
 - Shift in market to SDHIs (pyrazole carboxamides)

Focus of Current R&D

	Fungicide	Fungicide	Insecticide	Insecticide
	SDHI	Conazole	Sucking pest	Ryanodine
Bayer	isoflucypram	prothioconazole	flupyradifurone	tetraniliprole
BASF		mefentrifluconazole ipfentrifluconazole	afidopyropen	
Dow/DuPont	(fenpicoxamid)		sulfoxaflor	triflumezopyrim
Syngenta	benzovindiflupyr pydiflumetofen		spiropidion	
FMC	fluindapyr		cyantraniliprole	chlorantraniliprole

In R&D, In co-development, recently introduced/acquired

Source : Compendium of pesticide common names,
Company reports

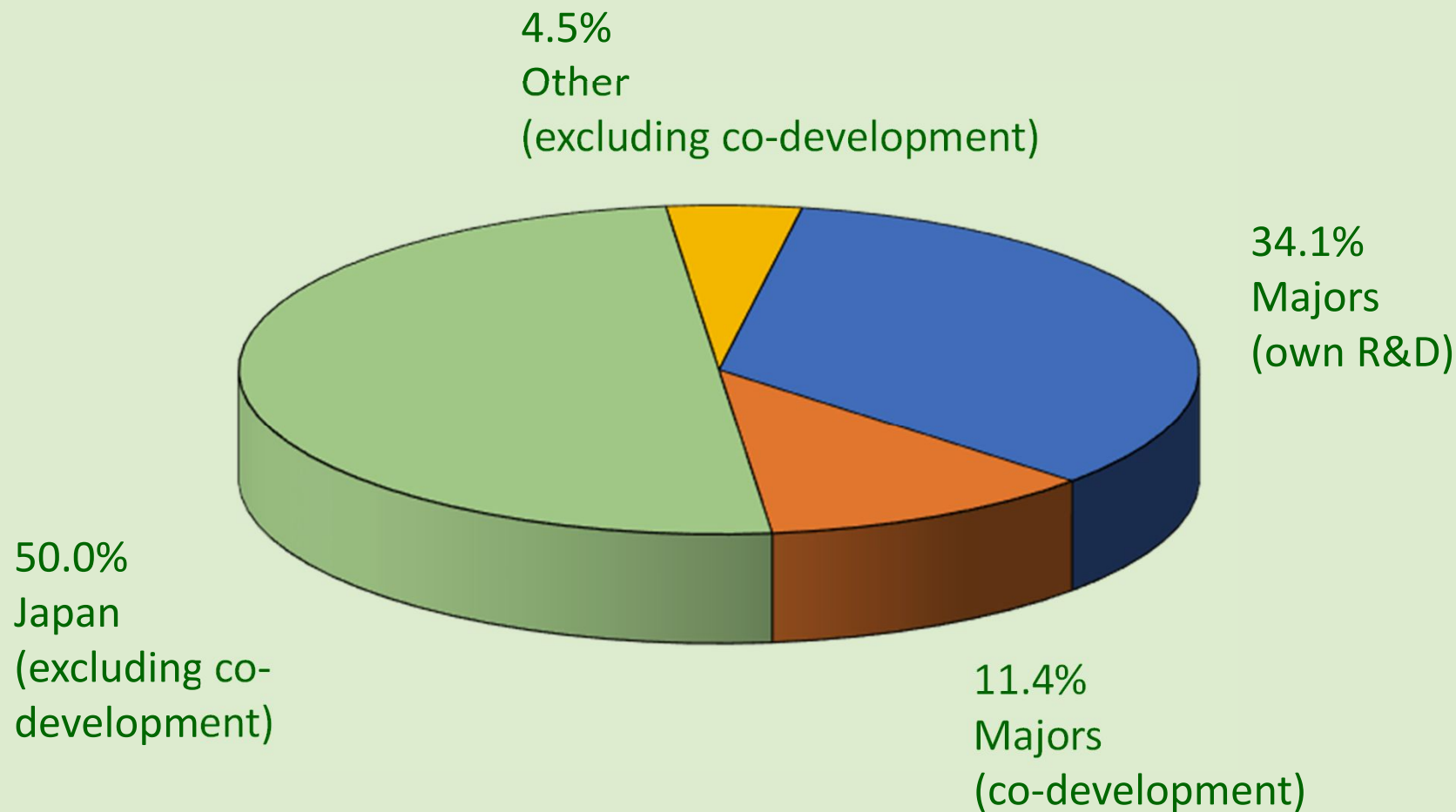
Agrochemical R&D - Majors

Company	Herbicide	Insecticide	Fungicide
Bayer		tetraniliprole	isoflucypram
Syngenta		spiropidion	pydiflumetofen
BASF	trifludimoxazin	afidopyropen	mefentrifluconazole
		broflanilide	ipfentrifluconazole
Dow/DuPont		tyclopirazoflor	fenpicoxamid
		dicloromezotiaz	florypicoxamid
		fluazaindolizine	
		triflumezopyrim	
FMC			fluindapyr

Inward licenced

Source : *Compendium of pesticide common names, Company reports*

Shift in Emphasis – Share of Products currently in Development



Source : *Compendium of pesticide common names, Company reports*

Key factors in Seed R&D

- **Herbicide tolerance**
 - Enlist (2,4-D), Xtend (dicamba), HPPD tolerance (isoxaflutole, mesotrione)
 - Enlist introduced on US cotton
 - Xtend introduced on US cotton and soybeans
 - HPPD licenced to 45 soybean seed companies in the USA, licences in Canada are awaited
- **Insect resistance**
 - Expansion into soybeans
 - Intacta (Monsanto), Conkesta (Dow)
 - Intacta gaining share in Brazil resulting in Pioneer inward licencing the technology
 - 2 gene B.t. soybeans from Dow (Conkesta) and Monsanto (Intacta 2 Xtend, scheduled for 2020 in Brazil)
 - SmartStax Pro, RNAi corn rootworm stacked with B.t. (introduction expected in 2019)

Source : Company reports

Emerging Technologies

- **Precision Agriculture**
 - Major concern from Agchem majors is financial return
 - Key driver of the Bayer Monsanto deal
 - Utilisation of 'big data' for marketing sales purposes
 - What will this mean for distribution?
 - Much activity in Europe, but not being pulled into 'big data'
- **Biologicals**
 - Limited entrepreneurial market but seeing strong growth at present
 - Increasing regulation may limit smaller companies
 - Bio-stimulants to be registered as fertilisers in EU from 2019
- **Soil microbes (microbiome)**
 - Crop / soil interaction for enhanced yield

Market Outlook

- Crop Production / stocks likely to remain high
 - Improved seed quality
 - Further GM adoption
- Need for crop diversification in the Americas to break the corn soybean seesaw
- Volume growth in Developing markets
 - Central / East Europe
 - Developing Latin America
 - East Asia
- R&D
 - Further regulatory pressure on older chemistry
 - Less new chemistry being introduced
 - Resistance drives need for new solutions
- Distribution
 - Impact of Precision Ag / 'big data'
 - New purchasing/delivery options
 - Farmers seeking best service but lower cost options
- GM
 - CRISPR speeds up new trait development
 - RNAi provides new mode of pest/disease control
 - EU adoption?
- Holistic view to crop protection
 - Seed/traits
 - Chemistry
 - Biologicals/Bio-stimulants
 - Soil microbiology
 - Precision agriculture

Appendices

GM Traits – Recent Introductions

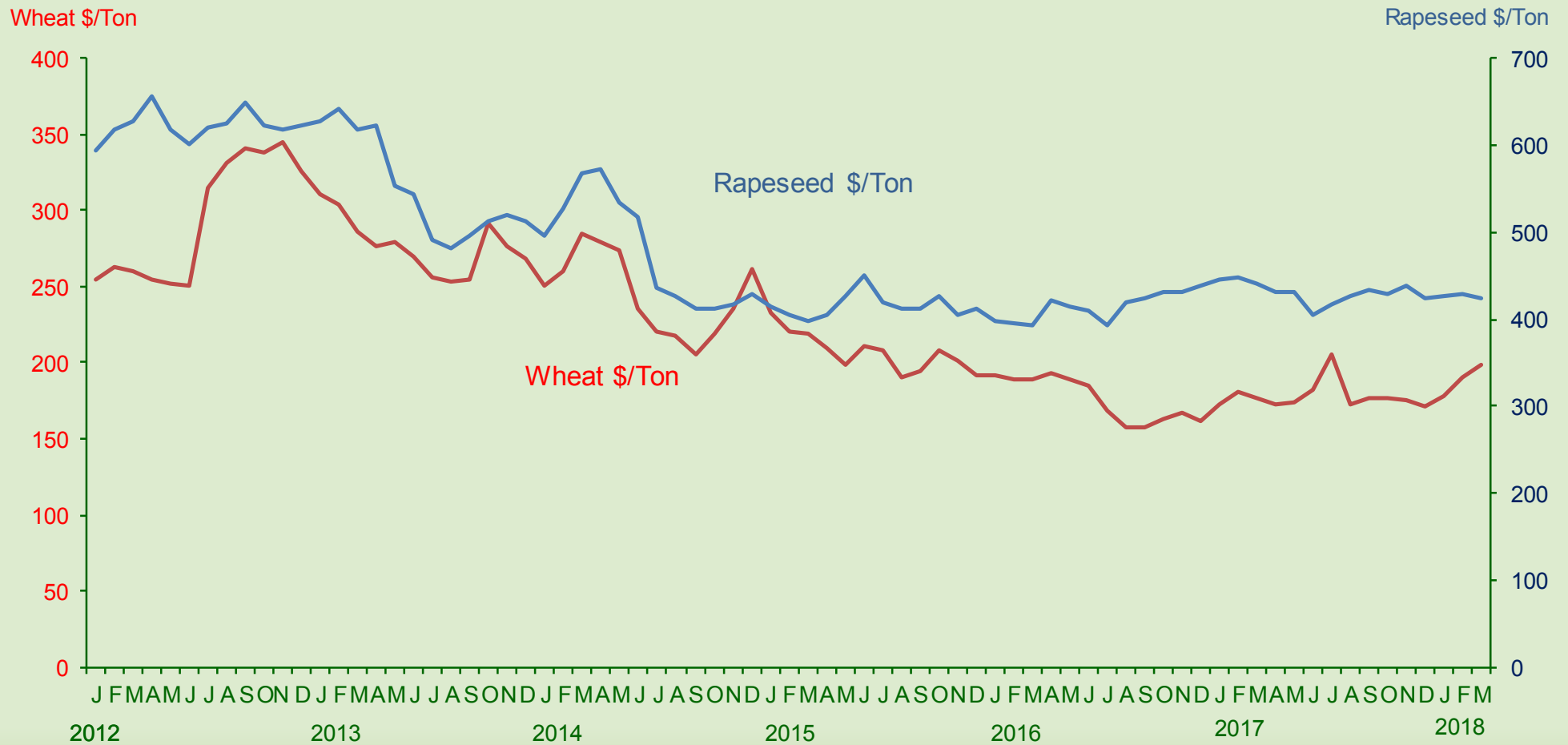
Year	Crop	Company	Trait / Product
2016	Cotton	Dow	Enlist WideStrike 3 Cotton
2016	Soybean	DuPont Pioneer	Pioneer soybeans with Roundup Ready 2 Xtend
2016	Alfalfa	Monsanto	HarvXtra (reduced lignin)
2016	Cotton	Monsanto	Genuity Bollgard III
2016	Soybean	Monsanto	SDA Omega-3
2016	Soybean	Monsanto	Vistive Gold
2016	Soybean	Monsanto	Genuity Roundup Ready 2 Xtend
2017	Cotton	Bayer	TwinLink Plus
2017	Maize	Dow	PowerCore Ultra
2017	Maize	DuPont Pioneer	Qrome (IR triple stack, two modes of action)
2017	Canola	Monsanto	Genuity TruFlex Roundup Ready + Liberty Link
2017	Canola	Monsanto	Genuity TruFlex Roundup Ready

GM Traits in Development

Year*	Crop	Company	Trait / Product
2018	Canola	Bayer	Dual HT 1
2018	Sunflower	DowDuPont	Omega-9 Reduced Saturate Sunflower
2018	Canola	DowDuPont	Optimum GLY
2018	Canola	DowDuPont	Optimum GLY + Liberty Link
2018	Maize	Monsanto	3rd Gen Weed Control (dicamba/glufosinate/glyphosate)
2018	Soybean	Syngenta	Multiple mode herbicide tolerance
2018	Soybean	Bayer	Balance GT
2019	Canola	Bayer	Improved oil
2019	Canola	Bayer	Herbicide Tolerant Ogura Hybrid
2019	Rice	Bayer	Insect resistance
2019	Soybean	Bayer	HPPD tolerance + Glufosinate (MGI)
2019	Maize	Monsanto	Genuity SmartStax Pro
2019	Soybean	Syngenta	MGI (HPPD + glufosinate)
2020	Canola	Bayer	Herbicide tolerance (MS11)
2020	Canola	Bayer	Dual HT 2

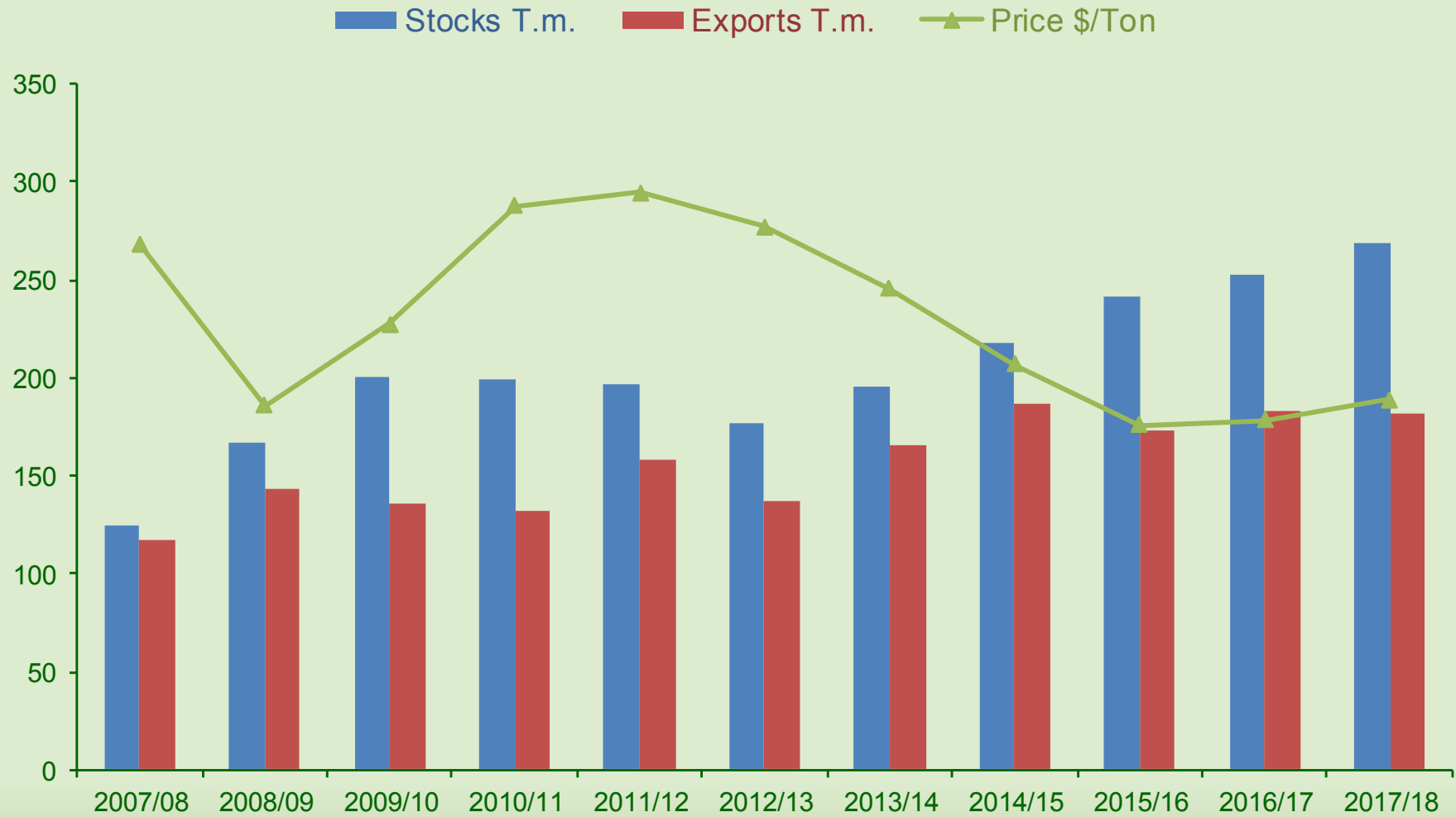
* Estimated year of introduction

Wheat and Rapeseed Prices



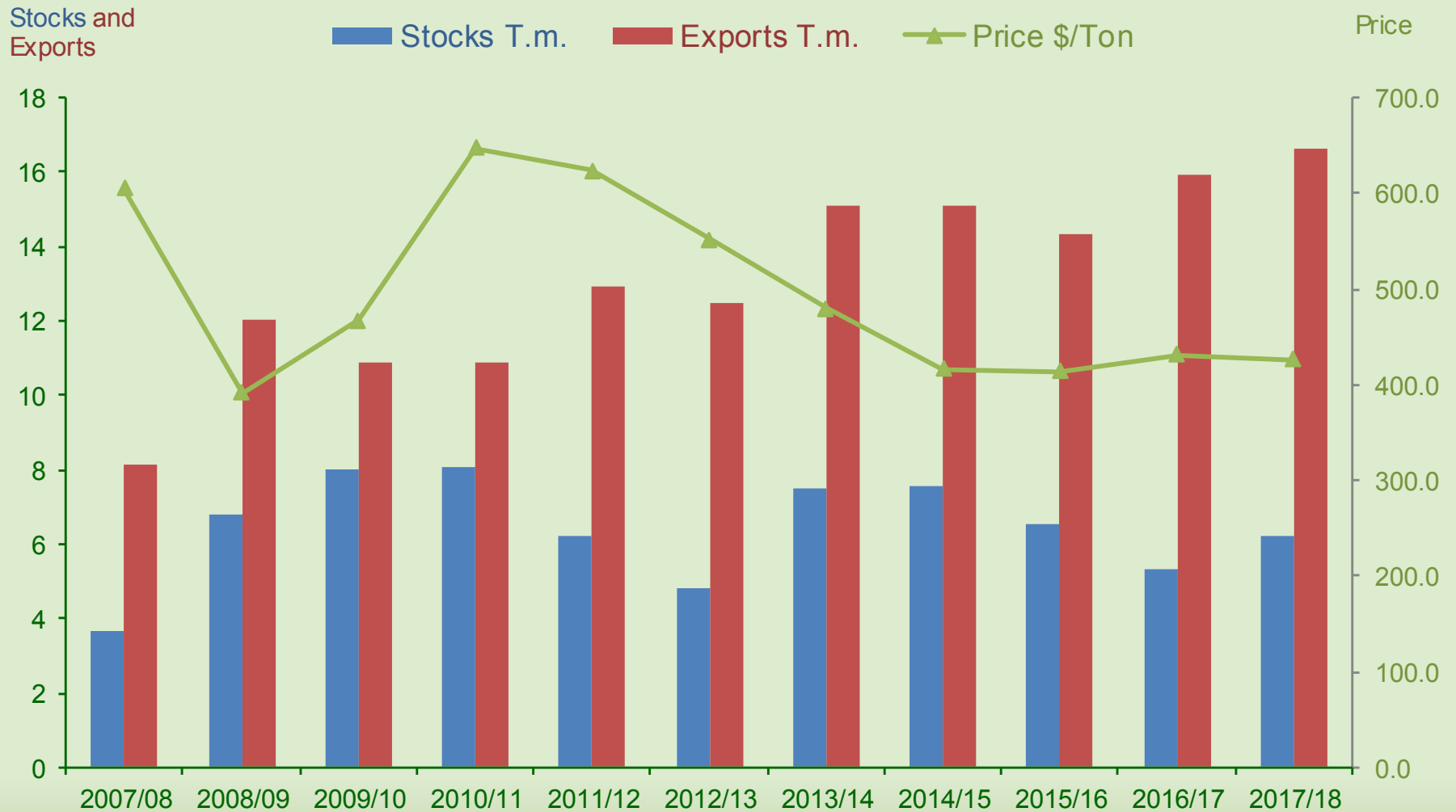
Source : FAO

Wheat



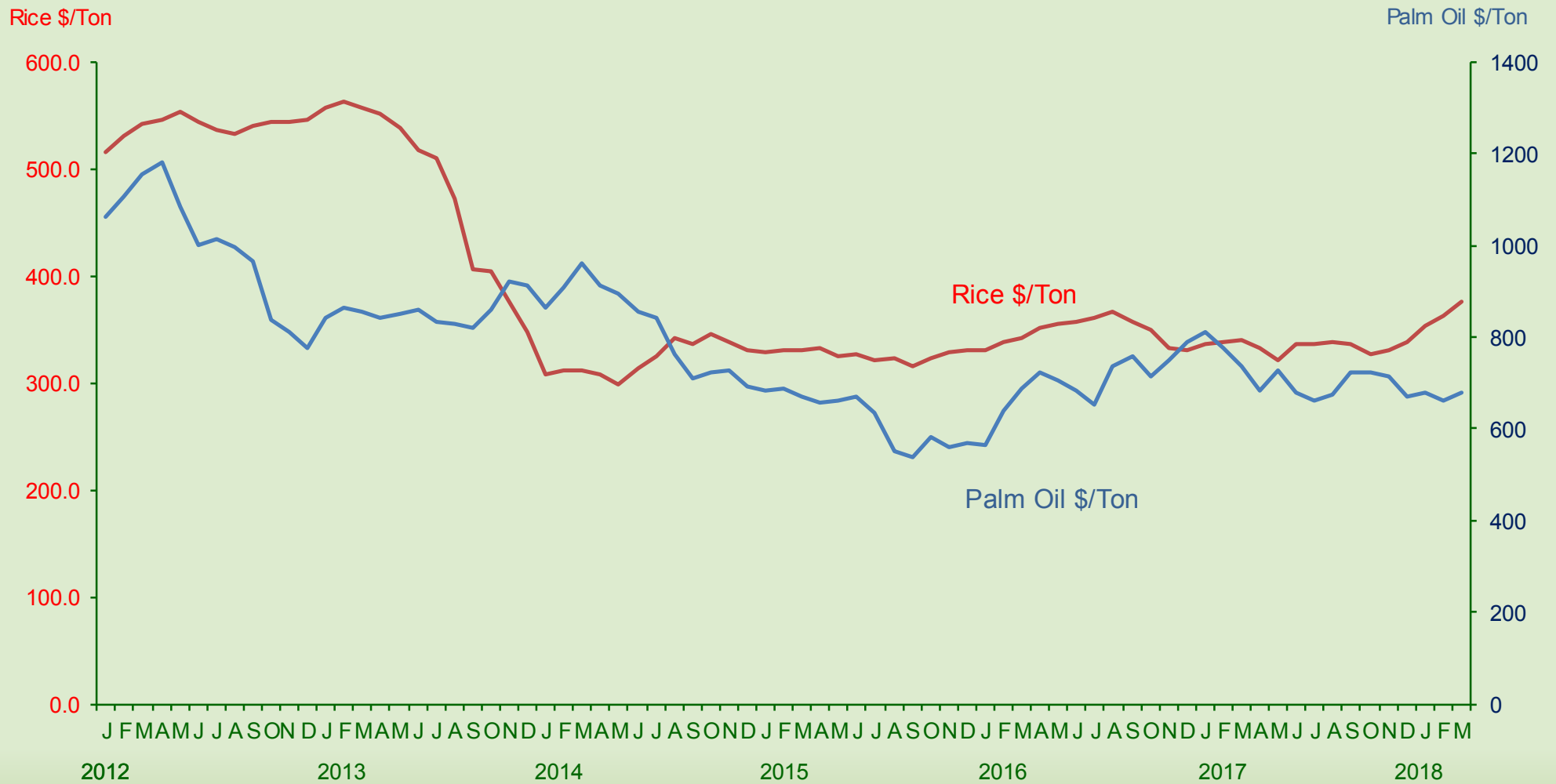
Source : FAO and USDA

Oilseed Rape



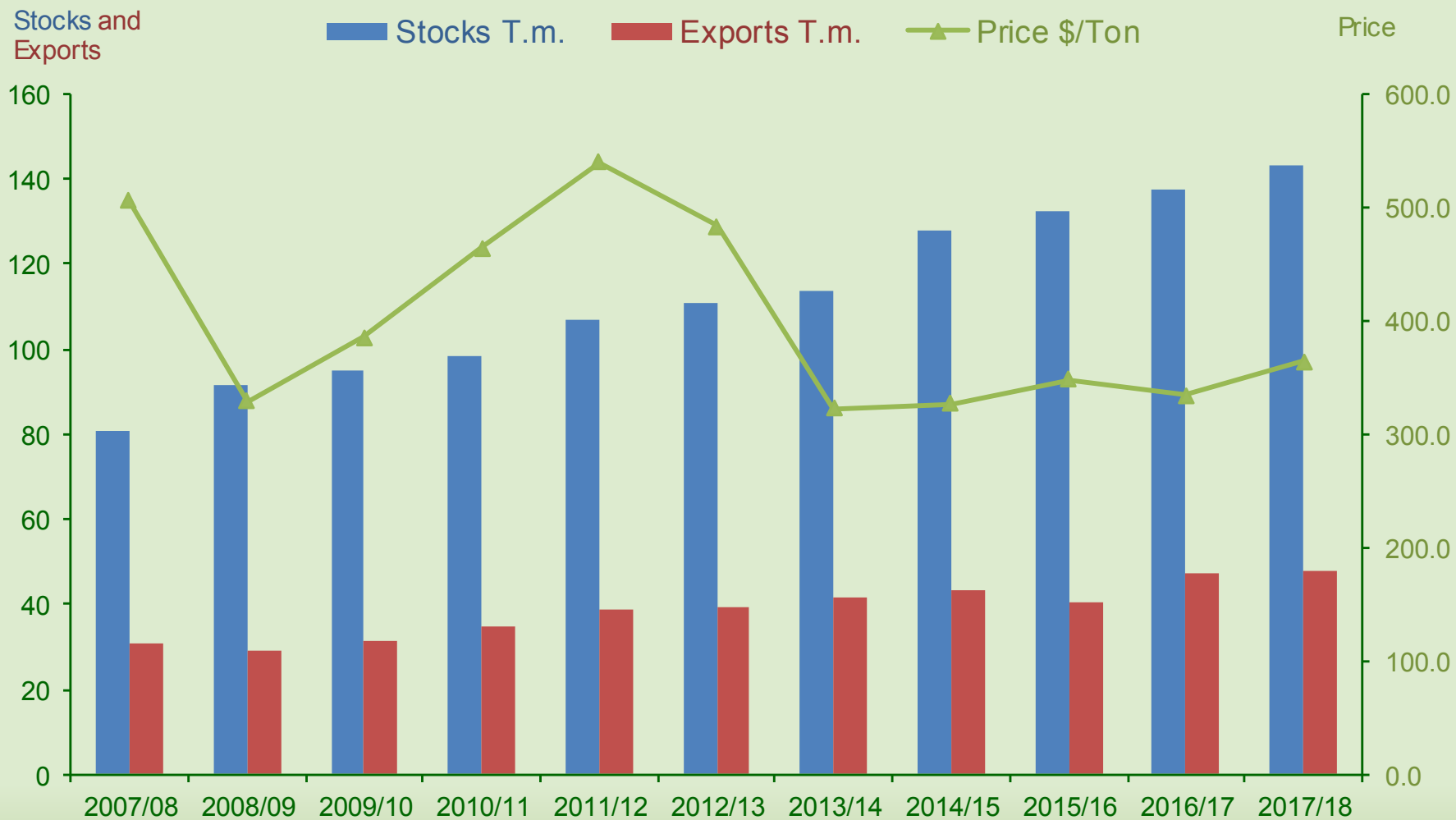
Source : FAO and USDA

Rice and Palm Oil Prices



Source : FAO

Rice



Source : FAO and USDA

R&D - Japan

Company	Herbicide	Insecticide	Fungicide
Sumitomo		fluhexafon	inpyrfluxam
		oxazosulfyl	pyridachlometyl
			metyltetrapole
Ishihara	tolpyralate	cyclaniliprole	
	SL-1201		
	lancotrione-sodium		
Kumiai	fenquinotrione		dichlobentiazox
Meiji Seika		afidopyropen	fenpicoxamid
		flupyrimin	
Mitsui Chemicals Agro	cyclopyrimorate	broflanilide	quinofumelin
Nihon Nohyaku		pyriprole	pyraziflumid
		benzpyrimoxan	
		acynonapyr	ipflufenoquin
Nissan Chemical		fluxametamide	pyrapropoyne
Agro-Kanesho			aminopyrifen

Out licenced

Source : *Compendium of pesticide common names, Company reports*