



Agribusiness | Fertecon

# Animal Feed Phosphates Outlook to 2030

A study on the feed-grade phosphates market structure  
and future trends prepared by industry experts

Please find the contents and sample pages below. If you have any questions, or would like to speak to a member of our team about this report please use our [contact us](#) page.

## Contents

Executive Summary.....	9
1.1 Foreword: Welcome to Fertecon’s market outlook report for Feed Phosphates.....	9
1.2 Introduction: The Role of Feed-grade Phosphates .....	10
1.3 Potential competitors to feed-grade phosphates and their limitations .....	11
1.4 Feed-grade phosphates in the general context of dietary phosphorus.....	12
1.5 The supply side of the market: recent developments and a look at the future.....	16
1.6 Price outlook through to 2030 – key concepts and assumptions .....	20
2. Product Characteristics.....	23
2.1 Regulatory issues .....	23
3. Outlook for Supply and Trade .....	25
3.2 Regional Supply and Trade.....	28
4. A Review of Key Producers.....	46
4.1 Aliphos/EcoPhos, Belgium .....	46
4.2 Phosphea, France.....	46
4.3 Fosfitalia Group, Italy.....	47
4.4 Yara, Norway.....	47
4.5 PhosAgro, Russia.....	48
4.6 EuroChem, Russia .....	48
4.7 Mosaic, USA .....	49
4.8 Nutrien, Canada .....	49
4.9 J. R. Simplot, USA .....	50
4.10 OCP Group, Morocco .....	50
5. Outlook for Demand of Feed Phosphates .....	52
5.1 Demand Drivers .....	52
5.2 Global Feed phosphates Demand .....	57
5.3 Regional Demand.....	58
6. Country Level Supply-Demand Balance .....	69
6.1 Brazil .....	69
6.2 China .....	70
6.3 Egypt .....	72
6.4 Finland .....	73
6.5 France .....	74
6.6 Germany .....	75
6.7 Italy .....	76
6.8 Japan .....	77
6.9 Lithuania .....	78

6.10	Morocco .....	79
6.11	Netherlands .....	80
6.12	Peru .....	81
6.13	Poland .....	82
6.14	Russia .....	83
6.15	Saudi Arabia .....	84
6.16	South Africa .....	85
6.17	Spain .....	86
6.18	Thailand .....	87
6.19	Tunisia .....	88
6.20	Turkey .....	89
6.21	United States.....	90
6.22	Vietnam.....	91
<b>7.</b>	<b>Production Cost .....</b>	<b>92</b>
7.1	Methodology and Coverage.....	92
7.2	Production Processes.....	93
7.3	Assumptions for Individual Producers .....	94
7.4	Feed Phosphate Cost Curves for 2018 .....	106
<b>8.</b>	<b>Prices.....</b>	<b>111</b>
8.1	Introduction, Methodology and Coverage.....	111
8.2	Review of Marginal Cost .....	113
8.3	The Outlook for Feed Phosphate Prices to 2030.....	114
<b>9.</b>	<b>Statistical Appendix .....</b>	<b>118</b>
9.1	Introduction .....	118
9.2	Feed Grade Calcium Phosphate Capacity ('000 tonnes) .....	119
9.3	Feed-Grade Calcium Phosphates – Operating Rate (%) .....	127
9.4	Feed-Grade Calcium Phosphates – Production ('000 tonnes) .....	135
9.5	Feed Grade Calcium Phosphates – Exports ('000 tonnes) .....	143
9.6	Feed-Grade Calcium Phosphates – Imports ('000 tonnes).....	151
9.7	Feed-Grade Calcium Phosphates – Apparent Demand ('000 tonnes).....	159
9.8	Feed-Grade Calcium Phosphates – Benchmark Prices (US\$/t) .....	167

## List of Figures

Figure 1:	Total Digestible Phosphorus Demand by Species .....	13
Figure 2:	The Geography of Digestible Phosphorus by Species Class, 2018 .....	13
Figure 3:	Total Digestible Phosphorus Demand by Region .....	14
Figure 4:	Total Digestible Phosphorus Requirement Versus Feed-Grade Phosphate Demand .....	15
Figure 5:	The role of Feed-Grade Phosphates in the Overall Digestible Phosphorus Market.....	16
Figure 6:	Share of Global Production by Major Producing Countries, 2018 .....	17
Figure 7:	Feed-Grade Calcium Phosphate Production by Region, 2010-2030 .....	17
Figure 8:	DCP and MCP Cost Curves by Cost Entry, 2018.....	19

Figure 9:	Fertecon's long-term price forecast for feed-grade calcium phosphates through to 2030.....	21
Figure 10:	Global Calcium Phosphates Capacity Outlook by Region.....	26
Figure 11:	Global: Feed Phosphates Export by Region .....	28
Figure 12:	European Capacity Share, 2019 (%) .....	29
Figure 13:	Europe Feed Phosphates Production 2015-2030.....	30
Figure 14:	Europe Feed Phosphates Exports By Exporting Country.....	30
Figure 15:	Eurasia, Central Asia & Southern Asia Feed Phosphates Production 2015-2030.....	32
Figure 16:	Eurasia, Central Asia & Southern Asia Feed Phosphates Exports By Exporting Country .....	33
Figure 17:	Africa Feed Phosphates Production 2015-2030 ('000 tonnes).....	35
Figure 18:	Africa Feed Phosphates Exports By Exporting Country .....	36
Figure 19:	Middle East Feed Phosphates Production 2015-2030 .....	37
Figure 20:	Middle East Feed Phosphates Exports By Exporting Country .....	38
Figure 21:	Eastern & South-Eastern Asia Excluding China Feed Phosphates Production 2015-2030 .....	39
Figure 22:	Eastern & South-Eastern Asia Excluding China Feed Phosphates Exports By Exporting Country .....	40
Figure 23:	China Feed Phosphates Production 2015-2030 .....	41
Figure 24:	China Feed Phosphates Exports as Part of Global Trade .....	42
Figure 25:	United States Feed Phosphates Exports .....	43
Figure 26:	Latin America Feed Phosphates Production 2015-2030 .....	44
Figure 27:	Latin America Feed Phosphates Exports By Exporting Country .....	45
Figure 28:	Global Meat Consumption and population growth, historic and Forecast.....	52
Figure 29:	Developing Countries Meat Consumption Forecast .....	53
Figure 30:	ASF situation in Asia (August 2018 to October 2019) .....	55
Figure 31:	Monthly Pig Meat Import to China 2017-2019 .....	56
Figure 32:	DCP Cost Curve by Region.....	106
Figure 33:	DCP Cost Curve by Cost Component.....	106
Figure 34:	MCP Cost Curve by Region.....	108
Figure 35:	MCP Cost Curve by Cost Component.....	108
Figure 36:	DCP and MCP Cost Curves at FOB Point of Export .....	110
Figure 37:	DCP Price Benchmarks, 2012 to 2019 (\$/t DCP Product) .....	113
Figure 38:	MCP Price Benchmarks, 2012 to 2019 (\$/t MCP Product) .....	113
Figure 39:	MGA Price Benchmarks, Q4 2015 to Q4 2019 (\$/t P <sub>2</sub> O <sub>5</sub> ) .....	115
Figure 40:	Fertecon's long-term price forecast for feed-grade calcium phosphates through to 2030.....	116

## List of Tables

Table 1:	Feed Phosphates Price History and Forecast to 2030 (\$/t).....	22
Table 2:	Feed phosphates Material Classification and Typical Composition .....	23
Table 3:	Minerals and products derived thereof, defines the Compulsory declarations .....	23
Table 4:	Global Feed Phosphates Capacity by Region ('000 tonnes product) .....	25
Table 5:	Global Feed Grade Calcium Phosphates Capacity by Region ('000 tonnes product) .....	26
Table 6:	Global Feed phosphates Production by Region ('000 tonnes product) .....	27
Table 7:	Europe Feed Phosphates Capacity ('000 tonnes product) .....	28
Table 8:	Eurasia, Central Asia & Southern Asia Capacity ['000 tonnes].....	31
Table 9:	Russian Exports of MCP, 2018 (tonnes) .....	33

Table 10:	Africa Feed phosphates capacity ['000 tonnes] .....	34
Table 11:	Middle East Feed phosphates capacity ['000 tonnes].....	36
Table 12:	Eastern Asia, Southeast Asia Excluding China Feed phosphates capacity ['000 tonnes] .....	38
Table 13:	China Feed phosphates capacity ['000 tonnes] .....	40
Table 14:	North America Feed phosphates capacity ['000 tonnes] .....	42
Table 15:	Latin America Feed phosphates capacity ['000 tonnes] .....	43
Table 16:	Phospha Capacity by Plant 2019 ['000 tonnes/year] .....	47
Table 17:	MCP Production 2013-2018 ['000 tonnes/year] .....	48
Table 18:	Nutrien Capacity by Plant 2019 ['000 tonnes/year].....	50
Table 19:	Global Animal Count Forecast [million head] .....	54
Table 20:	Global Feed phosphates Apparent Demand by Region ['000 Tonne] .....	57
Table 21:	Europe Animal Count Forecast ['000 head] .....	58
Table 22:	Europe Feed phosphates Apparent Demand by Country ('000 tonnes) .....	59
Table 23:	Eurasia Animal Head Count [million head] .....	60
Table 24:	Eurasia Feed phosphates Apparent Demand by Country ('000 tonnes) .....	60
Table 25:	Africa Animal Head Count [million head].....	61
Table 26:	Africa Feed phosphates Apparent Demand by Country ('000 tonnes) .....	61
Table 27:	Middle East Animal Head Count [million head] .....	62
Table 28:	Middle East Feed Phosphates Apparent Demand by Country ('000 tonnes).....	62
Table 29:	Central & Southern Asia Animal Head Count [million head].....	63
Table 30:	Central & Southern Asia Feed phosphates Apparent Demand by Country ('000 tonnes) .....	63
Table 31:	Eastern Asia Animal Head Count [million head] .....	64
Table 32:	Eastern Asia Feed phosphates Apparent Demand by Country ('000 tonnes) .....	64
Table 33:	Europe Animal Head Count [million head].....	66
Table 34:	Oceania Feed phosphates Apparent Demand by Country ('000 tonnes).....	66
Table 35:	North America Animal Head Count [million head] .....	66
Table 36:	North America Feed phosphates Apparent Demand by Country ('000 tonnes) .....	67
Table 37:	Latin America Animal Head Count [million head] .....	67
Table 38:	Latin America Feed phosphates Apparent Demand by Country ('000 tonnes) .....	67
Table 39:	Brazil Animal Count Forecast ['000 head] .....	69
Table 40:	Brazil Feed Phosphates S/D Balance ['000 tonnes].....	69
Table 41:	China Animal Count Forecast ['000 head].....	70
Table 42:	China Feed Phosphates S/D Balance ['000 tonnes].....	71
Table 43:	Egypt Animal Count Forecast ['000 head].....	72
Table 44:	Egypt Feed Phosphates S/D Balance ['000 tonnes].....	72
Table 45:	Finland Animal Count Forecast ['000 head] .....	73
Table 46:	Finland Feed Phosphates S/D Balance ['000 tonnes].....	73
Table 47:	France Animal Count Forecast ['000 head] .....	74
Table 48:	France Feed Phosphates S/D Balance ['000 tonnes].....	74
Table 49:	Germany Animal Count Forecast ['000 head] .....	75
Table 50:	Germany Feed Phosphates S/D Balance ['000 tonnes].....	75
Table 51:	Italy Animal Count Forecast ['000 head].....	76
Table 52:	Italy Feed Phosphates S/D Balance ['000 tonnes].....	76
Table 53:	Japan Animal Count Forecast ['000 head].....	77

Table 54:	Japan Feed Phosphates S/D Balance ['000 tonnes] .....	77
Table 55:	Lithuania Animal Count Forecast ['000 head] .....	78
Table 56:	Lithuania Feed Phosphates S/D Balance ['000 tonnes] .....	78
Table 57:	Morocco Animal Count Forecast ['000 head] .....	79
Table 58:	Morocco Feed Phosphates S/D Balance ['000 tonnes] .....	79
Table 59:	Netherlands Animal Count Forecast ['000 head] .....	80
Table 60:	Netherlands Feed Phosphates S/D Balance ['000 tonnes] .....	80
Table 61:	Peru Animal Count Forecast ['000 head] .....	81
Table 62:	Peru Feed Phosphates S/D Balance ['000 tonnes] .....	81
Table 63:	Poland Animal Count Forecast ['000 head] .....	82
Table 64:	Poland Feed Phosphates S/D Balance ['000 tonnes] .....	82
Table 65:	Russia Animal Count Forecast ['000 head] .....	83
Table 66:	Russia Feed Phosphates S/D Balance ['000 tonnes] .....	83
Table 67:	Saudi Arabia Animal Count Forecast ['000 head] .....	84
Table 68:	Saudi Arabia Feed Phosphates S/D Balance ['000 tonnes] .....	84
Table 69:	South Africa Animal Count Forecast ['000 head] .....	85
Table 70:	South Africa Feed Phosphates S/D Balance ['000 tonnes] .....	85
Table 71:	Spain Animal Count Forecast ['000 head] .....	86
Table 72:	Spain Feed Phosphates S/D Balance ['000 tonnes] .....	86
Table 73:	Thailand Animal Count Forecast ['000 head] .....	87
Table 74:	Thailand Feed Phosphates S/D Balance ['000 tonnes] .....	87
Table 75:	Tunisia Animal Count Forecast ['000 head] .....	88
Table 76:	Tunisia Feed Phosphates S/D Balance ['000 tonnes] .....	88
Table 77:	Turkey Animal Count Forecast ['000 head] .....	89
Table 78:	Turkey Feed Phosphates S/D Balance ['000 tonnes] .....	89
Table 79:	United States Animal Count Forecast ['000 head] .....	90
Table 80:	United States Feed Phosphates S/D Balance ['000 tonnes] .....	90
Table 81:	Vietnam Animal Count Forecast ['000 head] .....	91
Table 82:	Vietnam Feed Phosphates S/D Balance ['000 tonnes] .....	91
Table 83:	Western and Northern European Production Cost Assessment, 2019 (\$/t) .....	95
Table 84:	Southern Europe Cost Assessment, 2019 (\$/t) .....	96
Table 85:	Eurasia and Eastern European Cost Assessment, 2019 (\$/t) .....	97
Table 86:	Africa Cost Assessment, 2019 (\$/t) .....	98
Table 87:	Middle East Cost Assessment, 2019 (\$/t) .....	99
Table 88:	China Cost Assessment, 2019 (\$/t) .....	101
Table 89:	Asia excluding China Cost assessment, 2019 (\$/t) .....	102
Table 90:	North America Cost Assessment, 2019 (\$/t) .....	103
Table 91:	Latin America Cost Assessment, 2019 (\$/t) .....	105
Table 92:	Correlations between fob Feed Phosphate Price Points, 2010 – 2019 .....	116
Table 93:	Correlations between DCP Price Points, 2010 - 2019 .....	116
Table 94:	Correlations between MCP Price Points, 2010 – 2019 .....	116
Table 95:	Feed Phosphates Price History and Forecast to 2030 (\$/t) .....	117

# Executive Summary

## 1.1 Foreword: Welcome to Fertecon's market outlook report for Feed Phosphates.

This edition marks the first multi-client study prepared by Fertecon analysts on this subject. This felt almost like an obvious subject matter choice given our team's significant joint experience on feed phosphate markets, which complements our typical analysis focussing on fertilizer-grade phosphate products and their upstream raw materials (phosphate rock, phosphoric acid, sulphur, ammonia).

The market for feed-grade phosphates is considerably smaller in size (on a phosphate basis) compared to fertilizer-grade products: we estimate about 3.5 million tonnes P<sub>2</sub>O<sub>5</sub> for feed-grade compared to 48 million tonnes for fertilizer-grade phosphates). Nonetheless, there are three main aspects which we felt were of particular interest when we chose to undertake this effort:

- Fertecon has long been part of Agribusiness Intelligence, a business unit covering all aspects of the agricultural value chain "from farm to fork" – this business unit has now become IHS Markit Agribusiness, our current home. Thanks to this integration, we have direct access to industry experts, proprietary market intelligence and data projections for various aspects of the livestock industry – both for the short and long term. This gives us confidence that our forecasts for market fundamentals are uniquely rooted in expert knowledge, and therefore we hope these will be a useable reference for our readership in their business activities.
- The markets for feed-grade and fertilizer-grade phosphates share many features: companies involved in either of these two industries are in many cases also significant players in the other; common macro-drivers such as food demand, population growth, climate change, circular economy, or precision agriculture are common across industries; also, from a supply point of view, much of the value chain is common across feed-grade and fertilizer-grade phosphates. This significant overlap allows for knowledge transfer across the two markets, mutually reinforcing our analytical offering on each of these two industries – and importantly providing a holistic view of phosphate markets based on common assumptions.
- While relatively small in size, the market for feed-grade phosphates is a very important driver of merchant demand for phosphoric acid in various areas, notably in Europe, Turkey, Southeast Asia, Brazil, Mexico to name some of the most important markets. This is of particular interest in today's market conditions, with many companies aiming at investing either in additional merchant phosphoric acid capacity (for which the feed industry would be an important demand-side factor) or directly in feed-grade phosphate capacity. Feed-grade phosphate producers are also important contributors to import demand for phosphate rock.

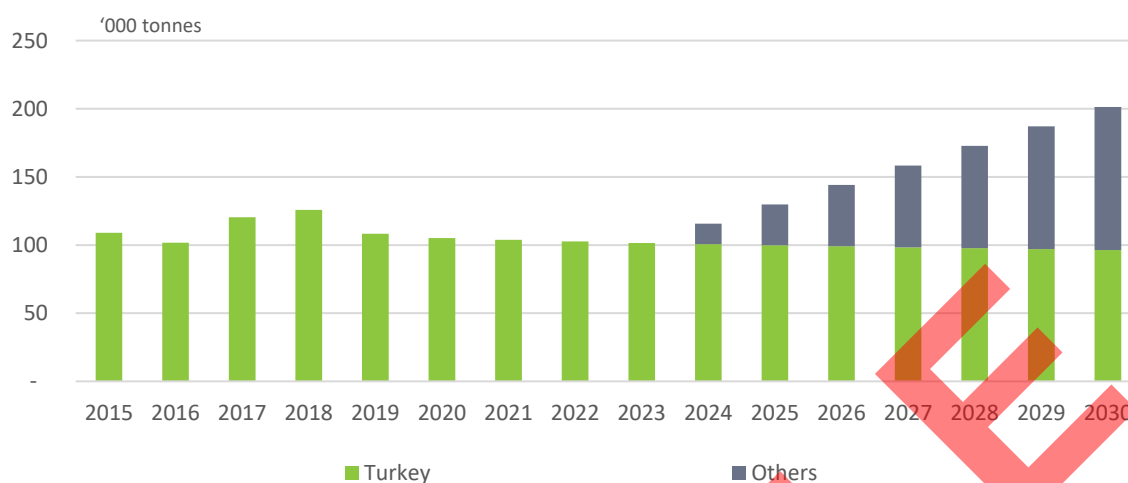
This report aims at being a first step towards a more comprehensive Fertecon offering of market intelligence services for the feed phosphate industry. We hope that this study will prove to a broad audience that Fertecon has the capability of performing good-quality, insightful analysis on this market, encouraging us to progressively add more regular and even deeper tools for players exposed to this fascinating industry.

Thanks for your attention and we wish you an interesting read.

The Fertecon Team

### 3.2.4.2 Regional Trade

**Figure 20: Middle East Feed Phosphates Exports By Exporting Country**



Data: Fertecon

Turkey is currently the only regular exporter of feed phosphates in the region, active primarily in the Mediterranean market (Italy, Egypt) but also in the Middle East (notably Iran for MCP) and Southern Asia (MCP to Bangladesh). This is almost a requirement for local companies, who can stabilize production rates against the seasonality of domestic demand for various feed phosphates.

While we don't include any specific projects in our base-case capacity scenario, the Middle East is an area where we are confident more capacity could arise in order to meet growing international demand via international trade.

### 3.2.5 Southeast Asia and Eastern Asia excluding China

#### 3.2.5.1 Regional Supply

Table 12: Eastern Asia, Southeast Asia Excluding China Feed phosphates capacity ['000 tonnes]								
Country	Company	Location	2017	2018	2019	2020	2025	2030
Japan	Katakura & Co-op Agri Corp	Akita	32	32	32	32	32	32
	Nitta Gelatin		5	5	5	5	5	5
	Onoda Chemicals	Onoda	70	70	70	70	70	70
	Toyo Denya Kogyo	Kochi	20	20	20	20	20	20
	Tsuno Rice		3	3	3	3	3	3
<b>Japan Total</b>			<b>130</b>	<b>130</b>	<b>130</b>	<b>130</b>	<b>130</b>	<b>130</b>
Malaysia	Malaysia Phosphates Additives MPAS	Lumut	30	30	30	30	30	30
		Samalaju, Bintulu	0	0	0	0	100	100
<b>Malaysia Total</b>			<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>130</b>	<b>130</b>
South Korea	Daljay Chemical Co.	Incheon	40	40	40	40	40	40
<b>South Korea Total</b>			<b>40</b>	<b>40</b>	<b>40</b>	<b>40</b>	<b>40</b>	<b>40</b>



DCP. In 2014 the company acquired the feed phosphates activities of a Spanish company Ercros. With two additional production plants in Cartagena and Flix. Following the acquisition, the company changes its name from Timab to Phospha. Phospha also owns marketing rights for MCP exports out of the Prahovo plant in Serbia, managed by Elixir Group.

The company operates three plants in Western Europe and two in Tunisia

**Table 16: Phospha Capacity by Plant 2019 ['000 tonnes/year]**

Plant	Capacity	Products
Saint-Malo, France	200	MCP, DCP, MDCP, MAG 26, NEOPHOS
Flix, Spain	100	DCP
Cartagena, Spain	100	DCP
Gabès I & II, Tunisia	170	MCP, DCP
<b>Total</b>	<b>570</b>	

Source: Fertecon, 2019 and Phospha<sup>5</sup>

### 4.3 Fosfitalia Group, Italy

Fosfitalia Group s.p.a is a sizeable Italian producer of inorganic feed phosphates. The company was established in 1975 and operates two plants, one in Forli, with 125,000 tonnes per year capacity and one in Ravenna with a capacity of 120,000 tonnes. One of the most important advantages is the location of the company's premises in Ravenna Port which provides efficient delivery of raw materials and export activities.

Fosfitalia produces a wide range of phosphate products distributed all around the world:

- Dicalcium Phosphate 17% and 18% P.
- Monocalcium Phosphate, 20% P.
- Monocalcium Phosphate F, 22.5% P (Fine).
- Monocalcium Phosphate G, 22.5% P (Granular).

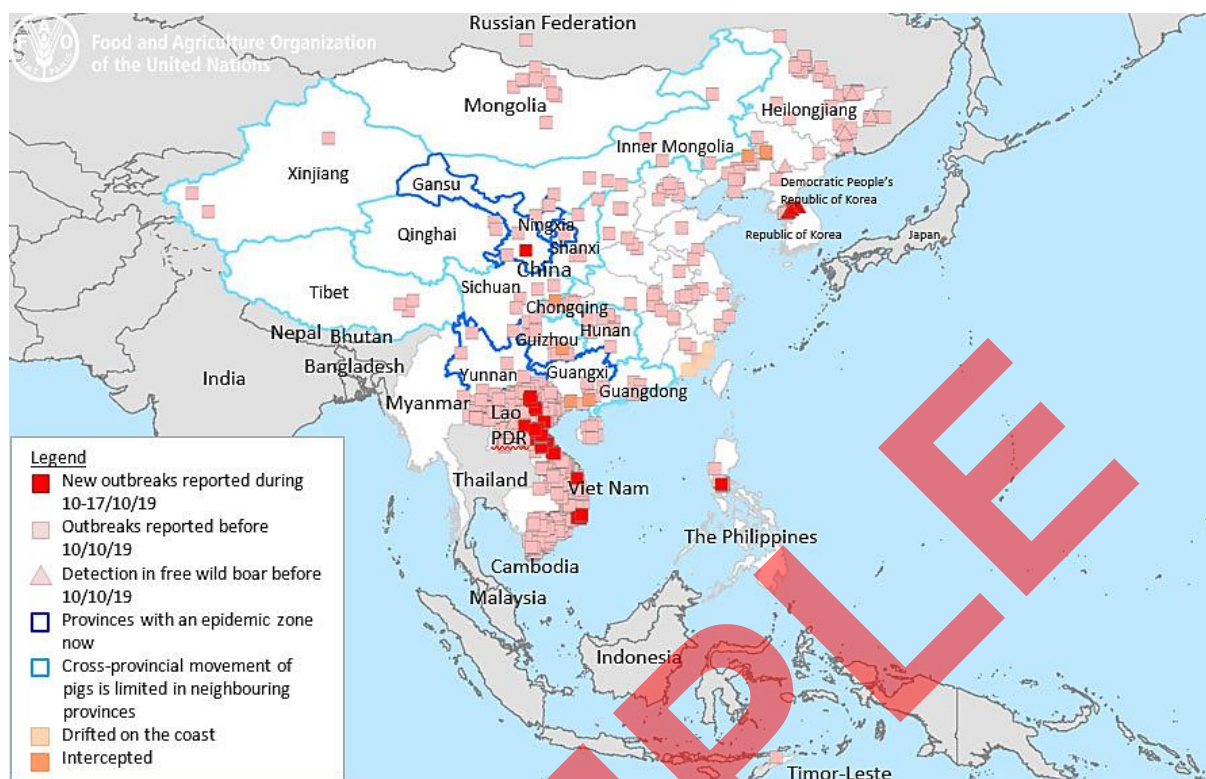
### 4.4 Yara, Norway

Yara International ASA provides environmental and industrial solutions in Norway<sup>6</sup> and internationally. It operates through three segments: Crop Nutrition, Industrial, and Production. The Crop Nutrition segment offers nitrogen-based fertilizers. It also sells phosphate- and potash-based fertilizers sourced from third parties. It provides its products

<sup>5</sup> <https://phospha.com/our-company/phospha-in-facts-figures/>

<sup>6</sup> "Yara International (yar.ol) Company Profile & Facts." Insert Name of Site in Italics. N.p., n.d. Web. 23 Oct. 2019  
<https://finance.yahoo.com/quote/YAR.OL/profile>

Figure 30: ASF situation in Asia (August 2018 to October 2019)



Source: FAO<sup>14</sup>

Official FAO-led monitoring<sup>15</sup> efforts are undertaken in close cooperation with local authorities and China's Ministry of Agriculture and Rural Affairs (MARA). While official sources confirm a rapid spread of the disease, both the speed and severity of the spread could prove more pronounced than currently assumed. For instance, reports by government officials, industry sources and news media suggest that around 20% of China's pig inventories had already been culled in the first few months of 2019, amid fears of ASF spreading more rapidly. IHS Markit's experts suggest numbers around the low-30% level.

The effect of ASF will be felt even more since pork is the preferred meat in China. For this reason, demand does not always respond directly to changes in prices, which may see a sustained increase as a result. To avoid soaring pork prices, with potential impacts on the overall consumer price level and general inflation, China may have to turn further to the world market to cover some of its domestic production shortfalls. To what extent is a question that is impossible to answer precisely but given the size of China's meat market and the production shortfall now caused by ASF, repercussions for the global meat markets could be significant.

As can be seen from the figure below, China has already started to increase its import of pig meat to fulfil domestic deficiency. Thus, the consumption of feed phosphates could shift accordingly from China to the meat exporting countries. With US-China trade tensions still very much in play, Germany and Spain (and other European countries)

<sup>14</sup> FAO – Food Outlook, May 2019

<sup>15</sup> FAO – Food Outlook, May 2019

Guatemala	9	16	7	14	14	14	14	15	0.65%
Venezuela	60	56	32	13	13	14	13	13	-0.34%
Dominican Republic	23	18	12	13	13	14	16	19	3.03%
Cuba	11	11	5	11	11	11	12	12	0.88%
Costa Rica	6	8	11	9	9	9	9	10	1.03%
Paraguay	4	6	8	9	10	10	15	19	6.80%
Others	26	24	26	26	26	27	32	38	3.05%
Total	780	929	878	685	715	748	910	1075	3.82%

Source: Fertecon

In 2018 the region's livestock headcount amounted to 25% of the world's total cattle, 9% of pigs, 16% of poultry, and 4% of the world's sheep and goat count. At 685,000 tonnes of feed phosphates consumption in 2018, the region's volume was only about 10% of the global market. Animal numbers are forecast to grow, mainly in cattle, pigs, and poultry at a modest rate.

Much of the region's livestock farming (particularly for cattle) is farmed by extensive means, with very low "load rates" (i.e. animals per hectare). While this gets some positive recognition in Argentina and Uruguay – both proud producers of grass-fed cattle – this also means that relatively larger swathes of land need to be dedicated to livestock farming, and therefore cannot be used for other means. Brazil in particular is aiming at minimizing land dedicated to grazing, as its agricultural economy is much more prone to intensive farming techniques and would welcome shorter rotation cycles.

The general expectation for Brazilian livestock farming to start concentrating into larger operations is one of the major drivers of our bullish demand forecast for feed phosphates: demand currently sits well below agronomically sound levels, and the country's extensive land area makes it less prone to intensive competition against alternative products like phytase or DDGS on a national level.

It should also be noted however that this might be an optimistic assumption: large-scale international companies such as ADM, Bunge, Cargill, Dreyfus, COFCO all play a significant role in the Brazilian agricultural economy. Many of these – particularly those exposed also to the US market, have a big knowledge base when it comes to phytase and DDGS, and would therefore not be subject to barriers to entry should they feel investment in this direction could be remunerative. AB foods, for example, is both a calcium phosphate and phytase producer and is the owner of AB Mauri in Brazil – offering significant synergies across the overall agricultural value chain.

Increased animal numbers, improved farm practice, and higher domestic availability through production expansions are going to support higher consumption reaching over one million tonnes by 2030, annual compound growth of 3.8%.

## 7. Production Cost

### 7.1 Methodology and Coverage

This chapter presents an assessment of cash costs incurred by key global producers of feed-grade calcium phosphates. We focussed our research efforts on producers with a stronger connection to international markets, either because regularly active on export markets or because of their role in determining import requirements in their domestic/regional markets.

All of the cost estimates provided are generated by Fertecon's in-house bottom-up model.

The cost curves presented cover about 90% of DCP capacity excluding China, and 75% of MCP capacity excluding China. Only Chinese producers heavily active in export markets are included in our assessment, accounting for about 1 million tonnes/year DCP capacity and 0.9 million tonnes/year for MCP.

For plants with the flexibility of producing both DCP and MCP, we have included the full plant capacity in both curves – in other words, the cost curves for DCP and MCP are not additive, as this will result in the double-counting of capacity for flexible units.

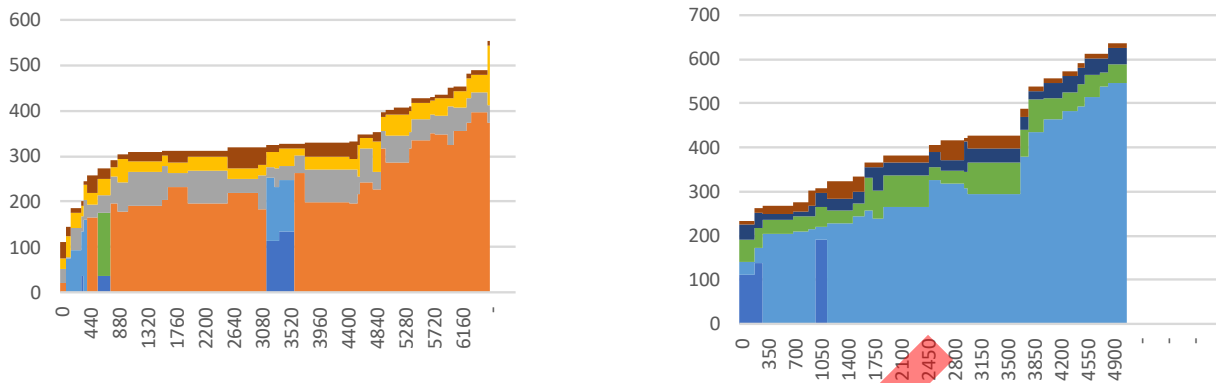
Each production unit around the world follows specific processes that have been developed in many cases by progressive adaptation and continued improvements that are specific to each site. Details of these processes constitute an important component of each company's intellectual property and are covered by commercial secret. In the absence of visibility on these finer details, our analysis focusses instead on key components such as raw material pricing, freight costs, and costs related to key utilities such as labour, power, fuel, and process water. Our cost estimates do not include some important items such as licensing costs, financing costs, or interest charges required to support working capital flows.

For integrated producers, raw materials are transferred at cost, while producers known to purchase raw materials are charged raw materials at market prices. A full review of assumptions for each plant is presented in the following sections.

Hydrochloric acid is transferred at zero price for plants receiving HCl directly from other operations at the same chemical complex (e.g. from SOP production). While it could be argued that some of the HCl available is indeed sold to external customers at market price, our assumption is that feed phosphate production was required in order to balance the outflow of hydrochloric acid in the first instance, and therefore it remains a necessary addition to avoid disposal costs.

While raw materials are transferred at plant-specific rates which factor in site-specific process flows and logistics, utilities (i.e. wages, electricity, fuel) are transferred at rates in line with national averages.

Figure 36: DCP and MCP Cost Curves at FOB Point of Export



As shown, inland logistics to port can be relatively significant in some cases, however they remain a relatively small component of total export costs. Differences in other sales costs can have a stronger impact on the overall competitiveness of individual producers, somewhat protecting even high-cost producers in their domestic market – at least in the short term.

Figure 37: DCP Price Benchmarks, 2012 to 2019 (\$/t DCP Product)

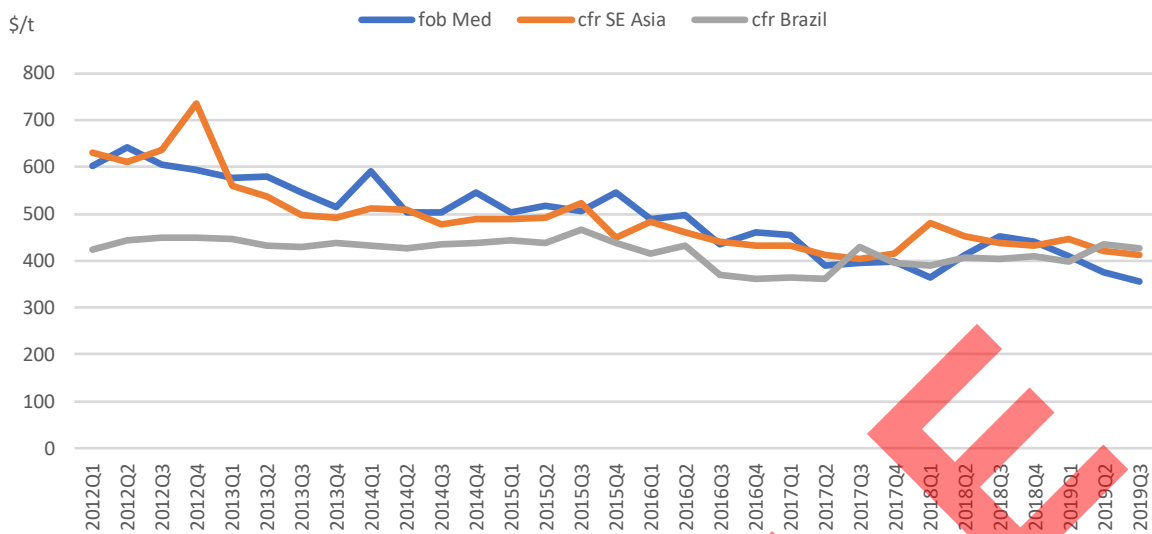
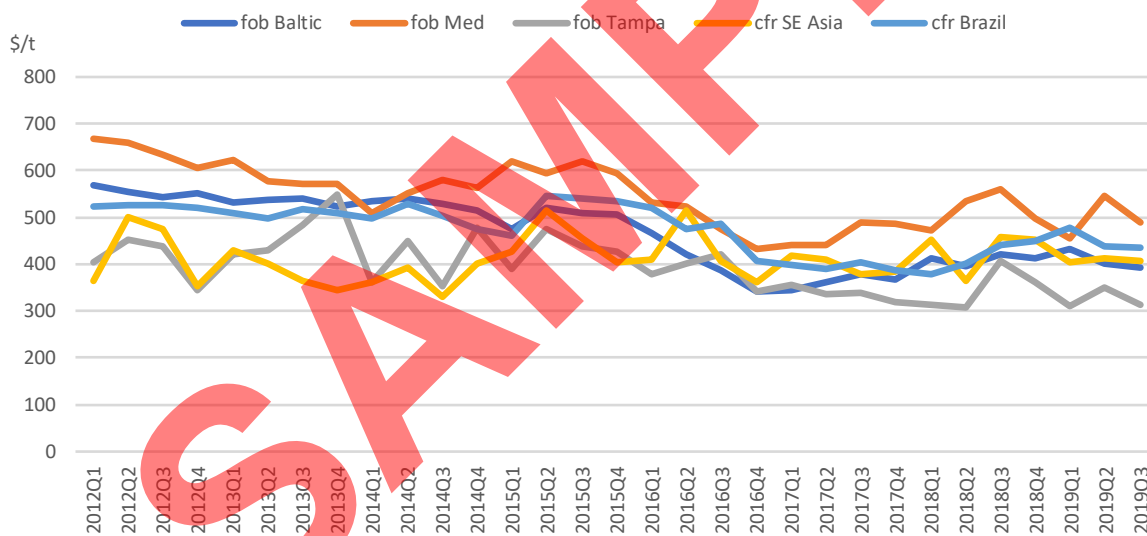


Figure 38: MCP Price Benchmarks, 2012 to 2019 (\$/t MCP Product)



## 8.2 Review of Marginal Cost

When thinking about long-term price forecasts, it is important to try and identify the development in the industry’s marginal cost of production. This could change for a variety of reasons: strong demand growth for example could make some idled capacity necessary to meet demand irrespective of its cost, or similarly sharp decreases in demand could make some high-cost suppliers redundant in the market and decrease marginal cost. Clearly each plant’s cost will also have its own internal dynamic, following for example changes in input costs.

Sub-region	Country	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Eastern Europe	Czech Republic	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Eastern Europe	Estonia	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Eastern Europe	Hungary	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Eastern Europe	Latvia	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Eastern Europe	Lithuania	198	174	200	200	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Eastern Europe	Poland	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Eastern Europe	Romania	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Eastern Europe	Slovakia	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Eastern Europe	Other Eastern Europe	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Eastern Europe	Unspecified Eastern Europe	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Undefined	Other Europe	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Undefined	Unspecified Europe	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Eurasia	Armenia	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Eurasia	Azerbaijan	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Eurasia	Belarus	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Eurasia	Georgia	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Eurasia	Moldova	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Eurasia	Russia	447	492	466	480	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Eurasia	Ukraine	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Eurasia	Other Eurasia	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Eurasia	Unspecified Eurasia	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Northern Africa	Algeria	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Northern Africa	Egypt	75	75	75	75	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Northern Africa	Libya	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Northern Africa	Morocco	67	93	119	74	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Northern Africa	Tunisia	173	145	111	150	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Northern Africa	Other Northern Africa	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Northern Africa	Unspecified Northern Africa	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Western Africa	Benin	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Western Africa	Burkina Faso	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Western Africa	Cape Verde	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Western Africa	Cote d'Ivoire	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Western Africa	Gambia	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Western Africa	Ghana	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit
Western Africa	Guinea	0	0	0	0	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit	Omit