

High input prices protract high food prices, creating a double burden for import-dependent countries

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Introduction and overview

The increasing cost of food is heightening concern and distress throughout the world. The FAO Food Price Index reached a record nominal high in March 2022, before marginally falling in April. Most of all, the rising cost of producing food, driven by soaring prices of fertilizers, energy and other inputs, gives much cause for alarm as it increases consumer prices, imperilling food security. From another perspective, the spike in the price of inputs raises questions about whether the world's farmers can afford to buy them, to the extent that productivity and hence global food supply could be adversely affected in the 2022/23 season and beyond.

Generally, periods of high food prices are considered a boon for producers, especially in countries that supply the international market, raising the profitability of farmers. However, such periods tend to be short-lived when price incentives instigate a supply response, facilitated by continuous cropping seasons in the northern and southern hemispheres that bring food markets swiftly back into equilibrium. This has often been the case in the last two decades, but today, different forces are seemingly conspiring to protract the current crisis, casting doubt on whether supply responses can be both quick and sufficient.

Agricultural sectors are highly energy-intensive and largely depend on fossil fuels. Much of today's turmoil dates to 2021, when energy prices began to surge, adding to producer costs. But higher energy prices have far more deleterious effects, raising the cost of key nitrogen fertilizers, which are primarily manufactured from natural gas and are by far the most important agricultural nutrient in raising crop yields. Prices of nitrogen, N, in the form of urea or ammonium nitrate, reached record highs by the end of 2021. This price momentum carried into 2022, and the international prices of other important mineral fertilizers, such as phosphate, P, and potash, K, have

joined suit, reaching record peaks in April 2022. As the world's largest fertilizer exporter, the Russian Federation began tightening supplies to international markets soon after its invasion of Ukraine through the introduction of export restrictions that will be extended through to the 2023/24 season.

The upshot is that with no let-up in the current war, the margins of global food producers (crops and livestock) are being squeezed, now and seemingly into the foreseeable future, by higher input costs. Not only energy and fertilizers for crops and pastures, but seeds, feeds and pesticides are becoming more costly than ever, to the extent that farmers may reduce input applications or switch to crops that are less input-intensive. This, by way of lowering productivity, is likely to suppress exports of key foodstuffs (particularly wheat, rice and maize) to the international market, and to put at risk countries that are heavily dependent on imports to meet their staple food needs.

This Special Feature examines the implications of higher input prices on countries that are forced to import them in large quantities owing to a lack of productive endowments. Nor are major exporting countries immune from higher input costs, which could limit their capacity to supply international markets. That being said, the overall objective of the feature is to assess the prospects of whether a global supply response is possible, and whether it will be sufficient and swift enough to restore equilibrium to food markets. The analysis is facilitated by the Global Input Price Index (GIPI) – a summary metric introduced in the November 2021 edition of the Food Outlook report – and the new compilation of agricultural input import bills.

The main findings from the analysis are as follows:

- An all-time high GIPI, underpinned by record energy and fertilizer prices, points to exceptionally low prices for farmers in real terms and limited incentives to step up production in 2023 (see Section 2).
- For farmers to step-up production, real prices have to rise. This can materialize either through further rising output prices (FFPI) or falling costs/input

- prices (GIP) or, ideally, a combination of the two.
- Either record or high input prices fuelled sharp increases in agricultural input import bills in 2021 and price momentum is forecast to heighten bills further in 2022 (see Section 3).
 - Increases in agricultural input import bills do not imply an increased inflow of inputs. The bills are being driven by price rises at the expense of greatly reduced imports of inputs. Again, this bodes ill for a much-needed positive production response in 2023.

The findings do not augur well for a market-led supply response that could conceivably rein in further increases in food prices for the 2022/23 season and possibly the next. To conclude, Section 4 summarizes an FAO initiative to provide immediate respite from the crisis, especially for countries that are most exposed.

High input costs come at a time of record food import bills

Agricultural inputs are instrumental for ensuring that global food supplies meet the needs of a rising population. These inputs include fertilizers (derived from fossil fuels or mined from the earth), energy (mostly fossil fuel derivatives) for mechanized cultivation and rudimentary processing

of crops for basic consumption, feedstuffs for rearing livestock, pesticides, and seeds (clean or certified to ensure that crop can realize their full yield potential).

A focus on fertilizers

Nitrogen, arguably, is the most important nutrient for raising productivity in cereal crops. In the form of ammonium nitrate or urea, N is mainly derived from natural gas and hence is closely tied to the price of fossil fuel (see Figure 1). Prices of natural gas embarked on a rapid upsurge during early 2021 as countries reopened their economies with the easing of COVID-19 restrictions. When demand surged (mainly but not exclusively due to unusually high demand for electricity from gas-fired electricity plants), and natural gas suppliers failed to ramp-up production, prices for natural gas spiked in the second semester of 2021 and continued to remain at elevated levels in the first months of 2022. The invasion of Ukraine by the Russian Federation in February (the largest gas and fertilizer supplier in the world) put further pressure on prices, with N quotations mirroring the upward trend of natural gas.

Figure 2 shows the evolution of quotations for other primary nutrients, P and K, which have also reached multiyear highs in recent months. The upshot is that fertilizer prices, notwithstanding the costs of energy, pesticides, feeds and seeds, can significantly erode the

Figure 1. Natural gas prices driving urea-nitrogen prices

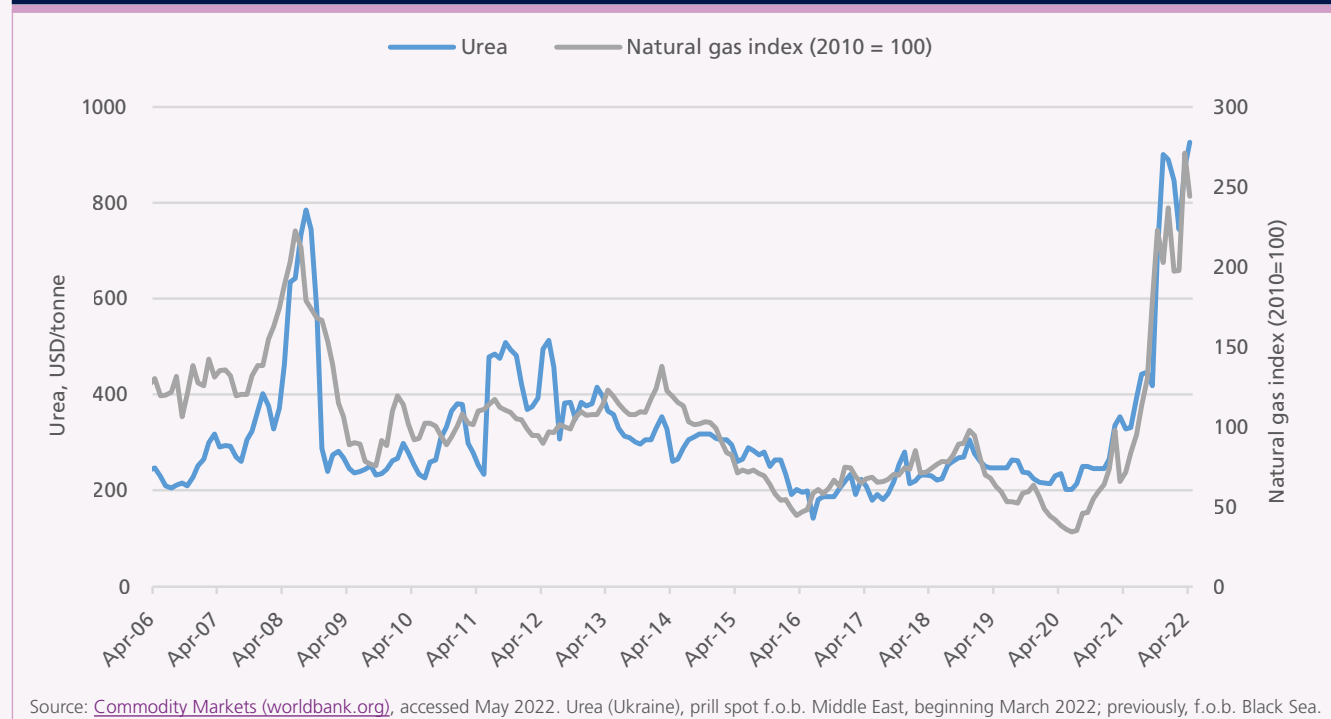
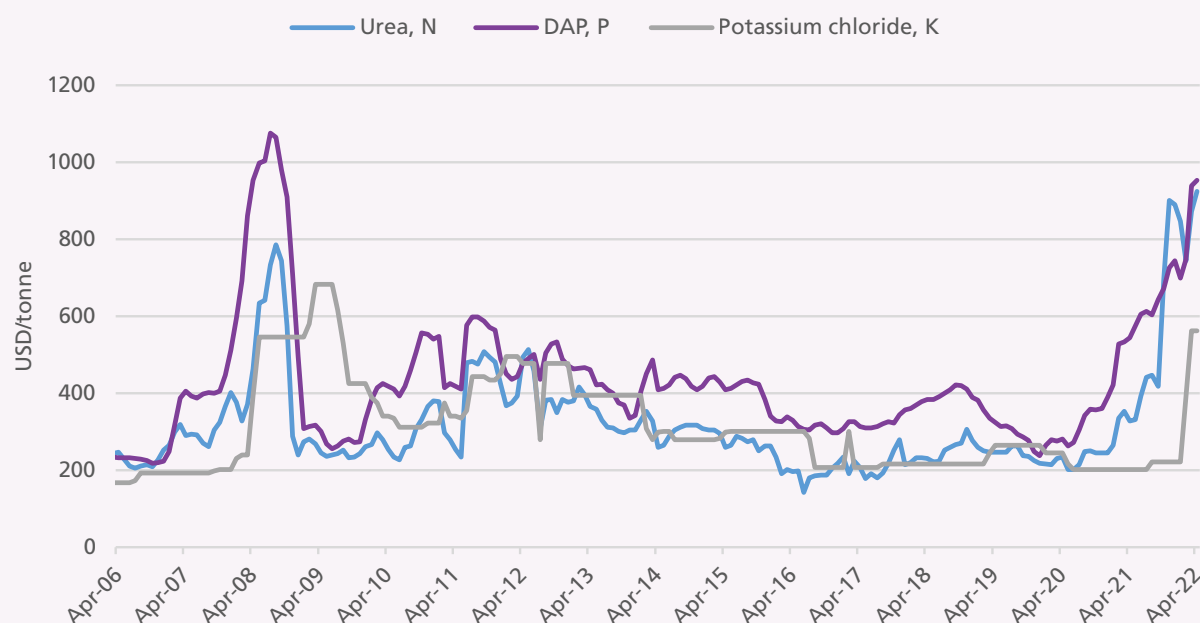


Figure 2. International fertilizer quotations



Source: [Commodity Markets \(worldbank.org\)](https://www.worldbank.org/), accessed May 2022. Urea (Ukraine), prill spot f.o.b. Middle East, beginning March 2022; previously, f.o.b. Black Sea; DAP (diammonium phosphate), spot, f.o.b. US Gulf; Potassium chloride (muriate of potash), f.o.b. Vancouver.

margins of producers, making the commercial cultivation of some crops unprofitable, and causing farmers to switch to less input-intensive crops. This scenario is being reported in the United States of America, where plantings of soybean – a crop that does not require nitrogen – is expected to reach record levels in 2022/23, largely at the expense of maize, which is very N-intensive.

Developments in markets for other inputs

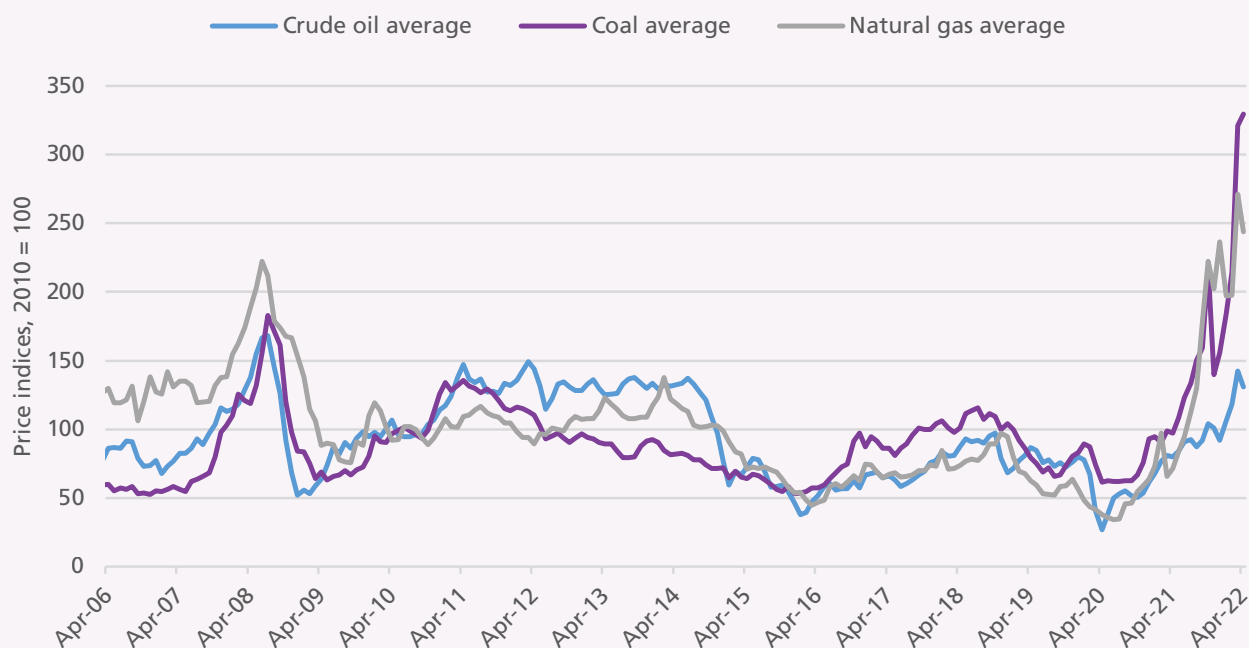
While analysts are paying a great deal of attention to the issue of fertilizers, these are not the only input required to produce crops. The dependence of agricultural sectors on fossil energy sources is increasing globally, either directly in the form of petroleum and petroleum derivatives (gasoline, diesel and lubricants), or indirectly through natural gas and coal to produce agricultural chemicals and ultimately electricity. In the case of the latter, electricity is the primary source required to manufacture feed ingredients, such as by crushing oilseeds to produce oil meals and milling grains to manufacture feedstuffs (e.g. pellets, flours and compound materials). When it comes to food processing, electricity also features heavily in the cost schedule. Electricity is used to mill cereals into flours, crush oilseeds into vegetable oils, produce processed meat and dairy products (e.g. milk powders) and dry, preserve and refrigerate many perishable foodstuffs. Higher energy prices also lead to higher transport, distribution and retail costs, which will again be

reflected in elevated consumer food prices. Figure 3 shows the upward momentum in fossil fuel prices, yet another reason for higher food prices.

Feed and seed production require the same sort of inputs as crops (fertilizers and energy), which is apparent in the parallel upward trend of their quotations. While indicative prices of seeds are seemingly volatile, much has to do with the seasonal demand that arises during planting periods. By contrast, synthetic pesticides, which require fossil fuels in both their formulation and production to varying degrees, have not shared in the trend of rising input prices. Given their relative high unit cost per hectare, an underlying reason could be a trade-off with pesticides for other inputs that are considered more important for productivity and profitability.

It is by no means a coincidence that the price of food is on the rise, owing to higher costs of production and the prospect of supply scarcity due to lower input use. The war in Ukraine is contributing significantly to both drivers of higher prices – the Russian Federation has imposed export restrictions on fertilizer, while prospects of Ukrainian shipments of grains and sunflower oil are circumscribed by the destruction or blockade of its major Black Sea ports. A growing number of countries have started to shield themselves from the inflationary effects of higher food prices as well as to safeguard their own food security by instigating export restrictions or outright bans, compounding the upward trend in international food prices.

Figure 3. Prices of non-renewable energy sources

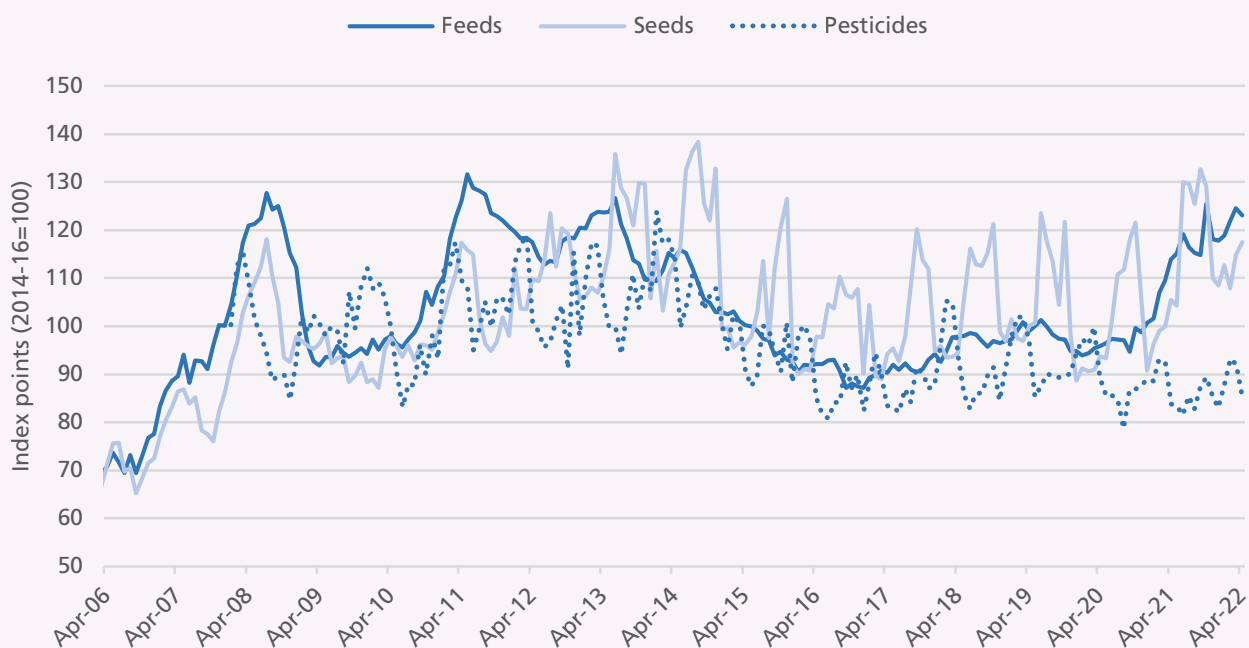


Source: [Commodity Markets \(worldbank.org\)](https://www.worldbank.org), accessed May 2022.

These factors limit the prospects for a substantial downturn in prices of internationally-traded foodstuffs. The benchmark indicator – the FAO Food Price Index (FFPI) – registered its highest monthly jump ever in March 2022, climbing by 13 percent from February to a record

160 points. In April 2022, the FFPI fell by 1 percent, but it remains at a critically high level. It must be stressed that, under normal circumstances, high food prices tend to accord high profit margins to farmers, motivating them to invest in productivity-raising initiatives that

Figure 4. Indicative prices of feeds, seeds and pesticides



Source: FAO (EST) and Trade Data Monitor (TDM), authors' calculations.

ultimately increase supply. However, these are not normal circumstances and a supply response to equilibrate markets can no longer be assured as long as fertilizers and other inputs remain too costly and scarce to procure (see Box 1).

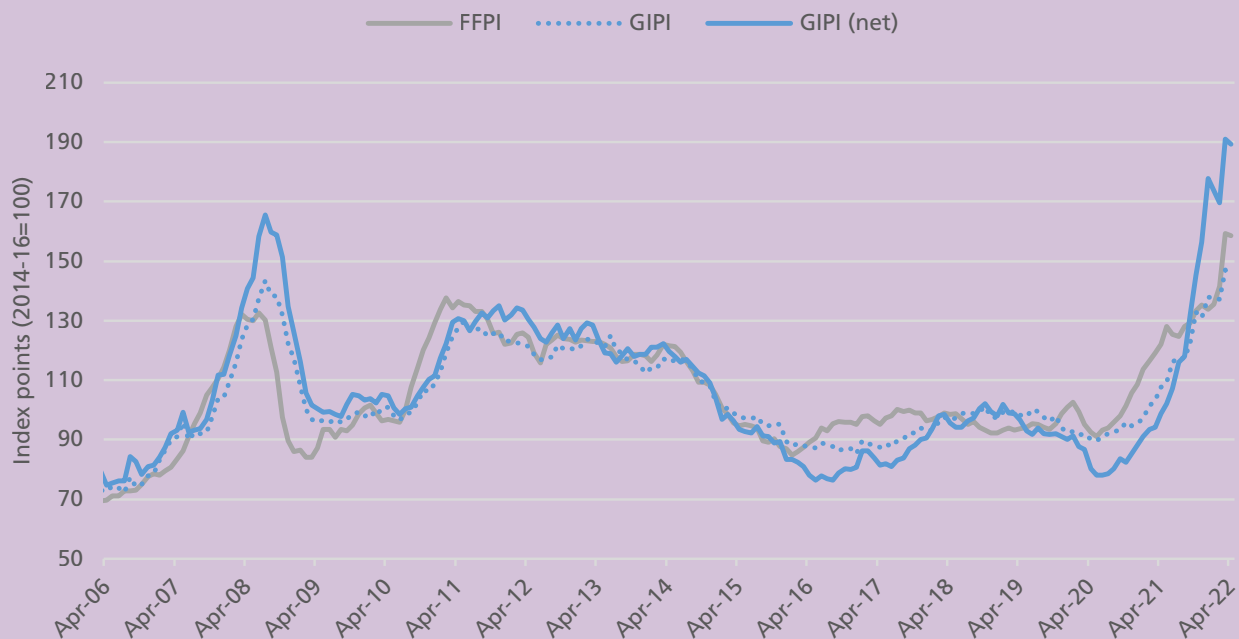
This situation is expected to pave the way to a largely price-driven record global food import bill of USD 1.8 trillion in 2022, surpassing last year's all-time high by around 3 percent (see Market Indicators section).

Box. Summarizing global trends in agricultural input prices and their implications

The Global Input Price Index of FAO was introduced in the last edition of Food Outlook (November 2021). It is an aggregate input price index, with subcomponents consisting of energy, feeds, fertilizers, seeds, and now pesticides. These subcomponents are weighted by their relative utilization or 'consumption' shares, which in turn are derived from FAOSTAT commodity balances. The initial quantities are converted into values, applying corresponding import unit values (IUVs) from a trade intelligence provider – Trade Data Monitor. Given the time lag in reporting by FAOSTAT and the fact that data are annual, a Laspeyres construct was employed to derive the GIPI.

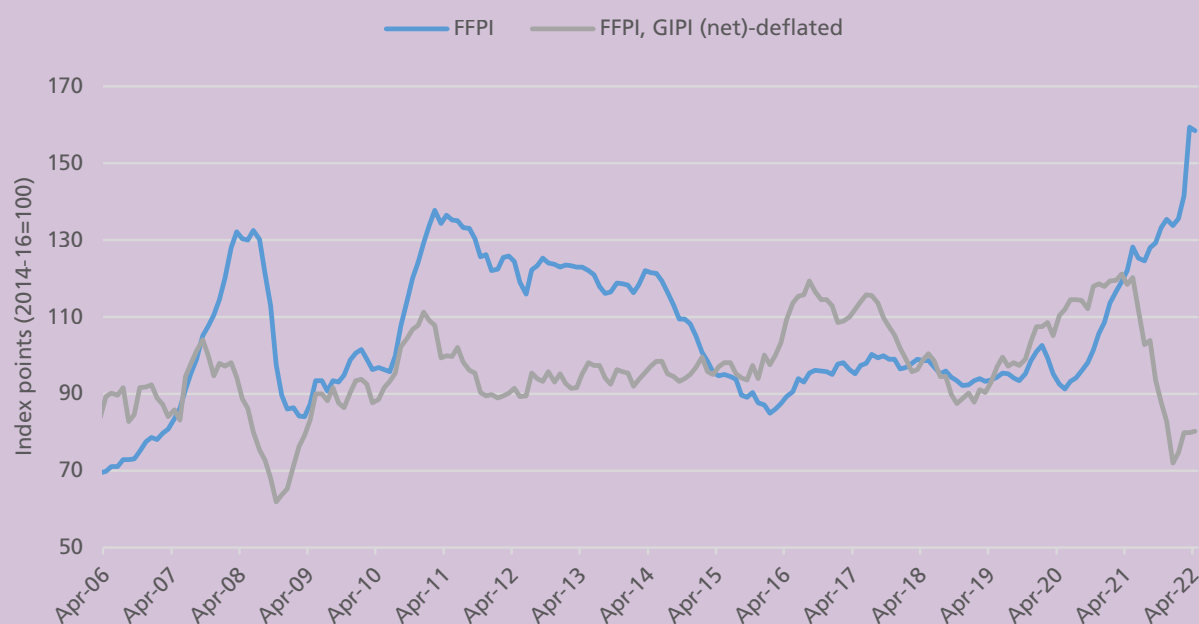
A more holistic picture of the input price trends is provided by the GIPI through the weighted contributions of the index's constituents. A 'net GIPI' has also been constructed in parallel from which feeds and seeds are removed, owing to the fact that these inputs are produced by agriculture, requiring energy, fertilizers and pesticides and thus do not contribute to cost increases in the GIPI.

Box Figure 1. Comparing trends in the FFPI, GIPI and GIPI (net), 2014-2016 = 100



Source: FAO (EST) and Trade Data Monitor (TDM), authors' calculations.

The three indices presented in Box Figure 1 track each another closely. While input prices underpin the cost of food production, growing demand for food from international markets may also translate into growing demand for inputs. A telling development in the past 12 months has been an average **monthly growth rate in the net GIPI that far outstrips the growth rate in food prices** – 6 percent (net GIPI) compared to 2 percent (FFPI). It is worth noting at this stage that the FFPI is also published in real terms, but the deflator employed is the 'manufactures unit value' (MUV). This deflator, while relevant for assessing the terms-of-trade in agriculture with respect to manufactured goods, provides little guidance to farmers on incentives to cultivate less or more and of which crop. By deflating the FFPI with the net GIPI, it is possible to infer the 'real' prices received by farmers. This enables an assessment of whether the much-needed supply response may or may not materialize.

Box Figure 2. 'Real' output prices of food.

'Source: FAO (EST) and Trade Data Monitor (TDM), authors' calculations'.

It can be seen that the real output prices of food fell by more than 20 percent from the index base by April 2022 (2014–2016=100). Despite this fall being less, in relative terms, than during the food (price) crisis of 2006–2008, the slump in real prices then lasted for around six months. Given the circumstances of the world today and the uncertainty that they bring, it is impossible to rule out further and more protracted declines in real output prices. It could be many more months, arguably the entire 2022/23 season and beyond, before input prices, especially for energy and fertilizer fall to a level that bolsters real food prices. Only then can we anticipate a supply response that restores equilibrium to international food markets.

In sum, real prices faced by farmers are not high and rising as the MUV-deflated FFPI series may suggest, but rather low and falling. Farmers are therefore not incentivised to step up production, which points to a prolonged phase of high food prices.

Agricultural input import bills

Not every country can meet food requirements from its productive endowments, necessitating purchases from international markets. The same holds true for inputs. Agricultural input import bills can be constructed using the same methodology as for food input bills and are similarly highly relevant for measuring the global burden, as well as the burden for vulnerable country groups, of importing necessities. Arguably, imports of inputs are of more critical importance, since they can generate enormous savings by bolstering productive capacity. These savings are manifest in the reduced need to expend scarce foreign exchange reserves on food imports and in the macroeconomic benefits accruing from improved balance of payments positions.

Table 1 presents world agricultural input import bills and the same country groups listing for food imports, for the current year and preceding three years. In reporting on trade, countries are not required to document the activity sector for which the import/export is destined, hence feed inputs (mostly grain-based materials) are excluded since they can be used for direct human consumption as well as for livestock.

The world bill for imported agricultural inputs in 2022 is currently forecast as USD 348 billion, which would represent a 21 percent increase from 2021. In that year, international quotations for inputs, especially for energy and fertilizers, rose sharply, driving the global bill upwards by 58 percent from 2020. These two inputs constitute the lion's share of the value of global trade in agri-inputs, accounting for,

Table 1. Import bills for total inputs and input type by region (current USD billion)

Input category	World				Developed				Developing			
	2019	2020	2021	2022*	2019	2020	2021	2022*	2019	2020	2021	2022*
EnergyAg	113.4	77.5	125.2	145.8	17.8	11.2	18.8	25.2	95.6	66.3	106.4	120.7
Fertilizers	77.2	70.1	107.4	145.7	30.3	27.1	42.0	56.8	46.9	43.0	65.4	88.9
Pesticides	38.8	44.2	45.7	47.5	19.0	23.0	22.4	23.2	19.8	21.2	23.3	24.4
Seeds	7.1	7.5	8.5	9.1	4.0	4.2	4.2	4.9	3.1	3.3	4.2	4.2
Total	236.4	199.3	286.8	348.1	71.1	65.4	87.4	110.0	165.3	133.9	199.4	238.1
	LDCs				NFIDCs				SSA			
	2019	2020	2021	2022*	2019	2020	2021	2022*	2019	2020	2021	2022*
EnergyAg	5.4	4.0	6.1	6.6	14.8	10.2	16.8	18.3	11.6	6.6	11.6	13.3
Fertilizers	3.4	3.6	4.3	5.0	6.8	6.5	8.6	8.2	3.8	3.7	5.4	5.4
Pesticides	1.2	1.2	1.5	1.5	3.1	3.4	3.5	3.7	2.3	2.6	2.8	2.9
Seeds	0.1	0.1	0.2	0.1	1.2	1.3	2.0	2.1	0.2	0.4	0.2	0.2
Total	10.1	8.9	12.1	13.3	25.8	21.4	30.9	32.4	17.9	13.3	20.0	21.8

Source: FAO (EST) and Trade Data Monitor (TDM), authors' calculations* **Forecast based on early 2022 data.**

historically and currently, well over 80 percent of the world bill. Table 1 further shows that developing¹ regions are by far the largest importer of agricultural inputs, led by energy and fertilizers, and dwarfing the value of imported inputs in developed countries.

In developing regions, net food-importing developing countries (NFIDCs), many of which are in Africa (44 out of the 77 classified countries), saw a notable rise in their input bills in 2021. Again, energy and fertilizers dominated their import schedule, leading to a more than 50 percent increase in their total import bill from 2020 to 2022. In percentage terms, sub-Saharan Africa (SSA) saw an even sharper rise in the input bill, with a rise in excess of 60 percent between 2020 and 2022. This represents a double burden for these countries, with higher expenditures on both food and agricultural inputs.

To assess the factors driving higher input import bills – whether greater volume or a rise in prices or their interaction – a decomposition of changes (2022 over 2021) in import bills is presented in Table 2. At the global level, price effects dominate volume effects, meaning that the world is paying much more for agricultural inputs relative to any increase in imported quantities. In many cases, and of concern, countries are paying more in 2022 (green cells in the price column) but receiving less volume of agricultural inputs than they did in 2021 (red cells in the volume column), especially of energy and fertilizers.

Pesticides are an exception, especially in SSA, where volume effects invariably outweigh price effects, meaning that countries are getting more of the input for a lower

price. A plausible explanation for the buck in trend is that the desert locust upsurge, which afflicted Eastern Africa and nearby regions, demanded huge amounts of pesticides, for which the FAO campaign provided assisted procurement in the form of price subsidies. No discernible global trend emerges for seeds, which constitute a minor cost in the import schedule of many countries.

The analysis in this section suggests that higher agricultural input import bills do not necessarily translate to higher domestic availability of inputs. On the contrary, this is clearly a fallacy since countries are generally paying more for fewer inputs.

How to address higher food import bills? FAO's proposal for a Food Import Financing Facility (FIFF)

Rapidly rising costs of imported food could result in lower food availability and compromised access to food in poor and food import-dependent countries, eventually resulting in a further increase in hunger and malnutrition. It is therefore proposed to allow eligible countries to offset some of the extra costs to cope with rapidly rising food import bills. Such an intervention – known as a Food Import Financing Facility (FIFF) – would be particularly important for low-income countries in the context of a probable continuation of the current upward trend in global food prices.

As a first step, eligible countries would be limited to net food importers. Drilling-down, the intersection between net trade positions and income levels identifies the countries eligible for FIFF funding. The resulting list of beneficiary countries is finally ranked by the change in (realized) food imports per capita between 2020 and

¹ The aggregates for developed and developing regions have been maintained in this issue of Food Outlook for statistical purposes. Maintaining these particular groupings allows to provide comparable estimates of the size and composition of food import bills to those computed in last year's edition of this report.

Table 2. A decomposition of changes in agricultural import bills for total inputs and input type by region (current USD billion/million), 2022* over 2021.

Input category	World				Developed				Developing			
	Price effect	Volume effect	Mixed effect	Observed change	Price effect	Volume effect	Mixed effect	Observed change	Price effect	Volume effect	Mixed effect	Observed change
<----- USD billion ----->												
EnergyAg	21.5	-0.8	-0.1	20.6	5.9	0.3	0.2	6.4	15.5	-1.1	-0.3	14.2
Fertilizers	44.6	-3.7	-2.7	38.2	19.3	-2.7	-1.8	14.8	25.2	-1.0	-0.8	23.4
Pesticides	-0.6	2.4	-0.1	1.8	-0.5	1.4	-0.1	0.8	-0.1	1.1	0.0	1.0
Seeds	0.2	0.5	0.0	0.6	0.3	0.4	0.0	0.7	-0.1	0.2	-0.1	0.0
Total	65.6	-1.5	-2.8	61.3	24.9	-0.7	-1.6	22.6	40.6	-0.8	-1.2	38.6
<----- USD million ----->												
Input category	LDCs				NFIDCs				SSA			
	Price effect	Volume effect	Mixed effect	Observed change	Price effect	Volume effect	Mixed effect	Observed change	Price effect	Volume effect	Mixed effect	Observed change
EnergyAg	497	-84	94	508	1 219	129	229	1 577	1 000	1 507	-842	1 665
Fertilizers	422	227	23	673	437	-523	-338	-424	678	-382	-211	86
Pesticides	-7	17	-10	0	5	188	-5	188	-24	131	-6	101
Seeds	-24	-20	8	-37	-28	232	-67	136	-3	48	-21	24
Total	888	140	115	1 144	1 633	26	-181	1 478	1 651	1 304	-1 080	1 875

Source: FAO (EST) and Trade Data Monitor (TDM), authors' calculations* **Forecast based on early 2022 data.**

2021. Based on their income and net food importing status, 61 countries would be eligible to tap into the FIFF, easing access to food for 1.77 billion people worldwide.

The final design for the practical implementation of the FIFF is likely to be determined by numerous factors that pertain to the nature and the conditionality of the Facility's financing instruments. Conditionality could be designed as an 'automatic stabilizer' to contain the funding needs of the facility. For example, eligibility could be linked to a commitment to devote a certain percentage of public expenditure to promoting sustainable agricultural productivity to help ensure lower food import requirements

in future and cap future funding needs. The FIFF would promote domestic food availability and provide food access and support to the livelihoods of rural communities.

Based on the current design, full compensation of the increase in the food import bill between 2020 and 2021 would require financing of a maximum USD 25.3 billion. While FAO has developed the proposal and can monitor its implementation, the actual funding, however, will be in the hands of an international finance organization, such as the International Monetary Fund (IMF).