How can green hydrogen help increase food security?

- The World Bank’s fertilizer price index remained stable in 2024, but still **higher than the pre-2020 level**
- Fluctuations in grey fertilizer prices **pose great risk on food security**
- **Domestic production of green fertilizers** in regions exposed to fertilizer imports could provide more control and stability in the food supply chain

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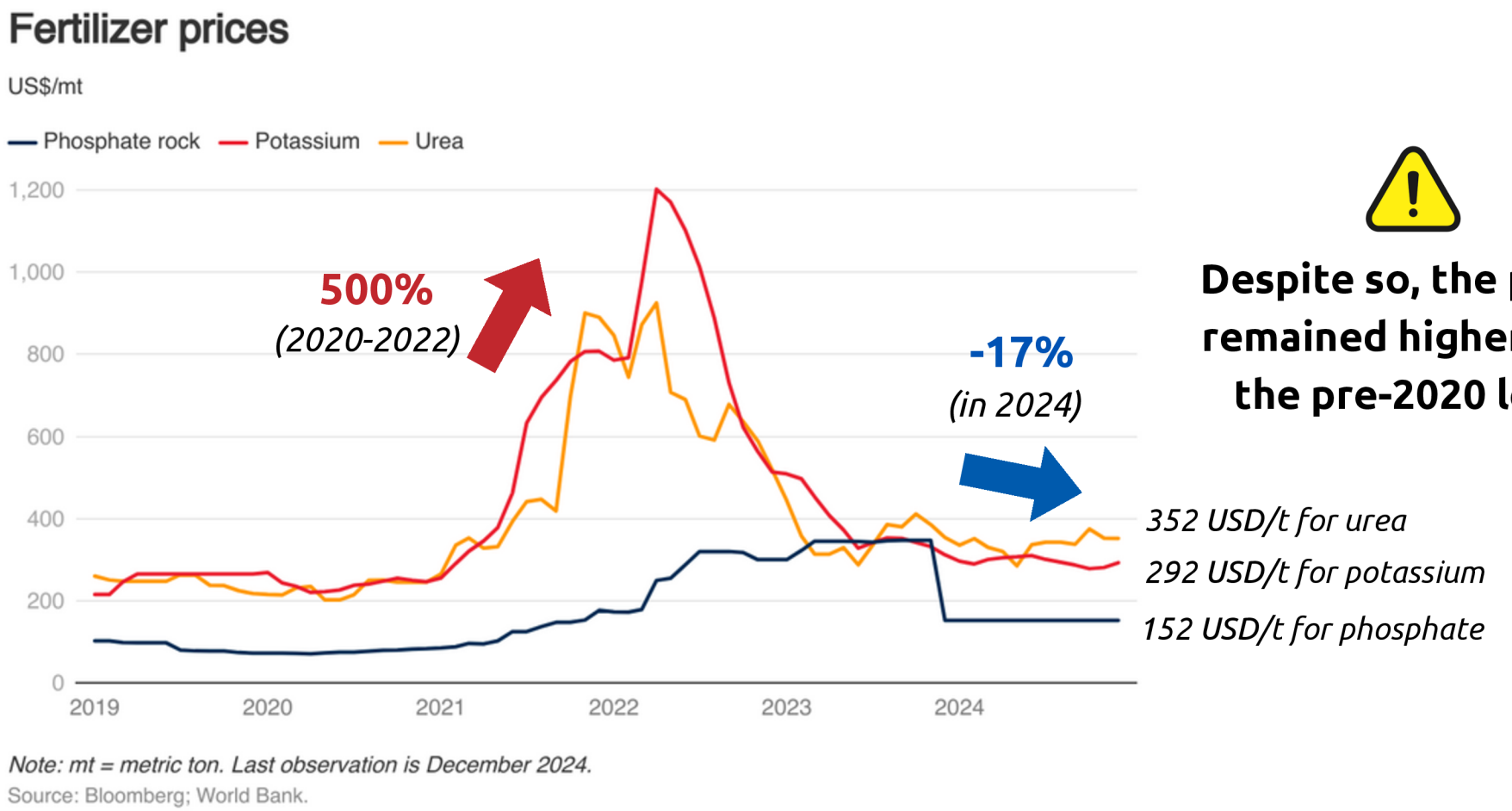
Stable yet higher fertilizer prices are the new norm

According to World Bank, fertilizer prices stabilized in 2024, recovering from major spikes over the past few years.



Note: mt = metric ton. Last observation is December 2024.
Source: Bloomberg; World Bank.

Despite so, the prices remained higher than the pre-2020 level

Record fertilizer prices in 2021-22 were the result of a series of events:

Global supply chain disruption

China's export ban on fertilizers

Russia-Ukraine war

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The dual problem of fossil fuel-based fertilzers

Stabilized price signals are good. However, this does not fundamentally solve the problem of grey fertilizers.

Current synthetic fertilizers have two major issues:

The CO2 problem

Nitrogen-based (or “N-type”) fertilizer accounts for 10.6% of agricultural emissions

(≈ 2% of world GHG)

**Production of N-type fertilizer involves combining nitrogen from air with hydrogen from natural gas under high temperature and pressure to produce ammonia*

The Price problem

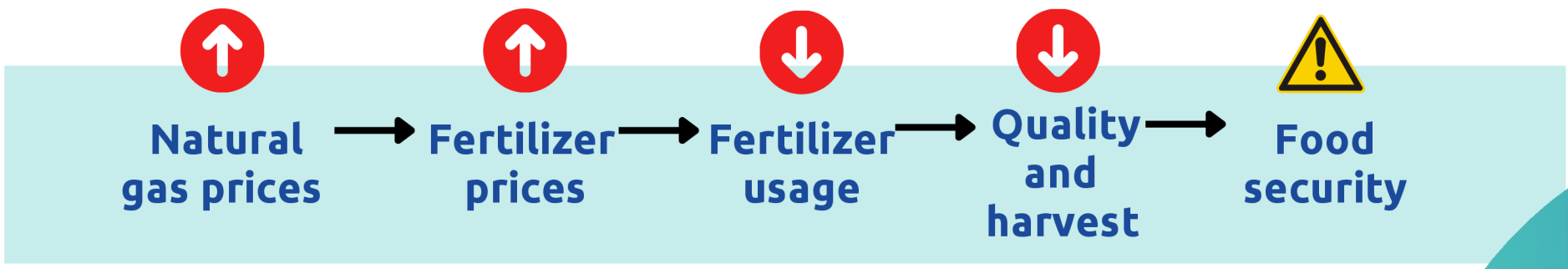
Fertilizers price heavily linked to highly-variable natural gas prices

2022 Price trends (vs.2021)

Natural gas price 355%

Urea price 62%

Thus, exacerbating climate change and jeopardizing food security...



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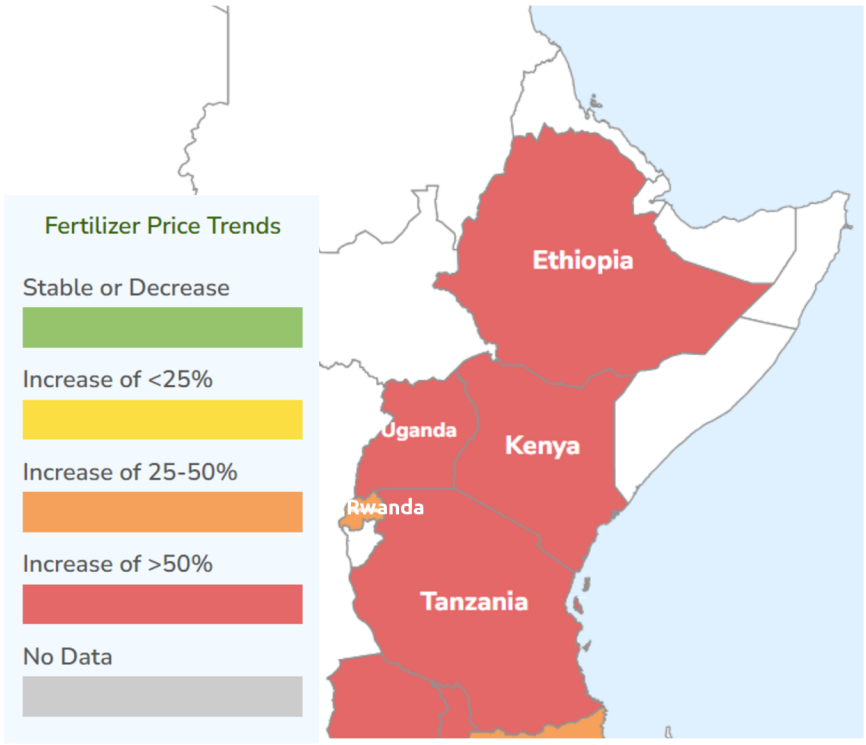
A correlation fertilizers & food security? The East African case study

East Africa is heavily dependent on fertilizer imports, having almost all of its inorganic fertilizers imported.



Source: Africa Fertilizer Watch (June 2022)

Fertilizer price

Crop yield

Food insecurity

2022 in East Africa

+161% *(vs. 2021)* in Ethiopia

+100% *(vs. 2021)* in Kenya

-21% in Ethiopia

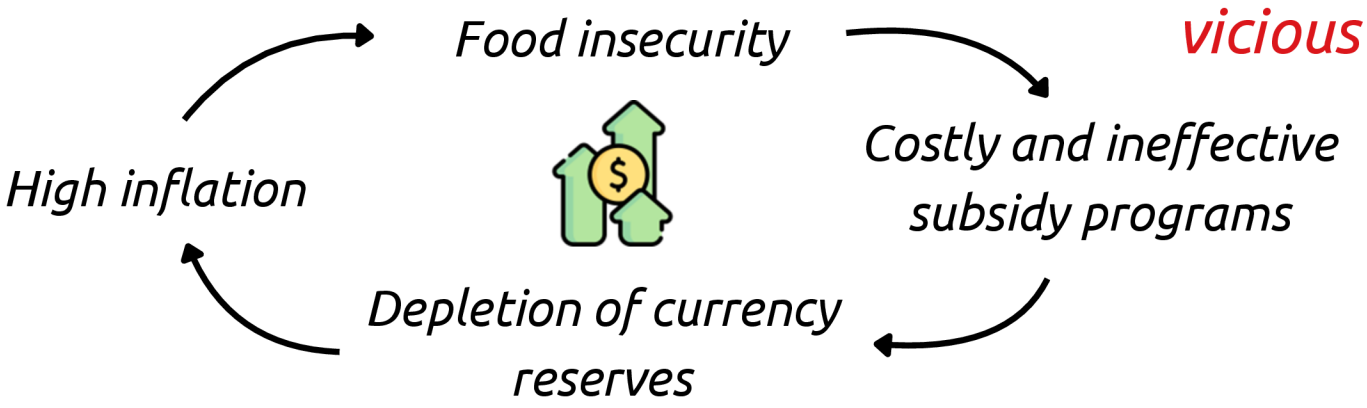
-12% in Kenya

(due to fertilizer underuse)

+6 to 7 mn people suffering from food shortage

Source: World Bank, UN, Economist Intelligence, AGRA

...creating an economic vicious cycle



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A momentum for green fertilizers

Grey fertilizers are likely to remain more expensive than before:

*"The (fertilizer price) index is projected to decline further in 2025 before stabilizing in 2026; however, **it is expected to remain above 2015-19 levels** due to robust demand and export restrictions, particularly from China." -World Bank*

This means that producing green fertilizers domestically in regions with **high fertilizer imports** and **strong renewable potential** could benefit from:

Harnessing renewable energy potential

Better crop outputs using fertilizers

Less exposure to market volatility

Achieving socio-economic prosperity

Potential candidates are...

88%

82%

35%

% indicates fertilizer import-to-consumption ratio in 2022

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Yamna, green molecules producer, is developing several green hydrogen and derivatives projects worldwide

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