Overview

# Global Perspectives

# Agriculture and Bioenergy

**Berlin, 19 January 2007**

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Overview

# Overview

1. What is the overall environment for the long-term outlook?
2. How do demand and consumption patterns change?
3. Where are the main export markets and what prospects?
4. Bioenergy

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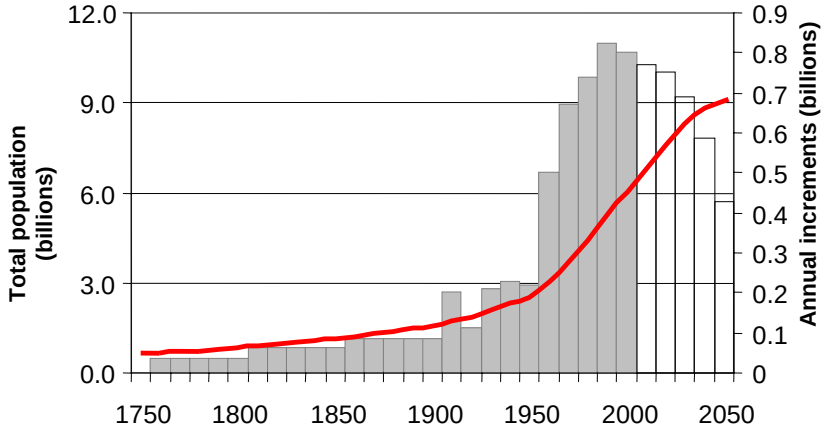
Assumptions

# World population: 1750 – 2050

## Further growth, but at drastically declining rates




Source: UN, 2003

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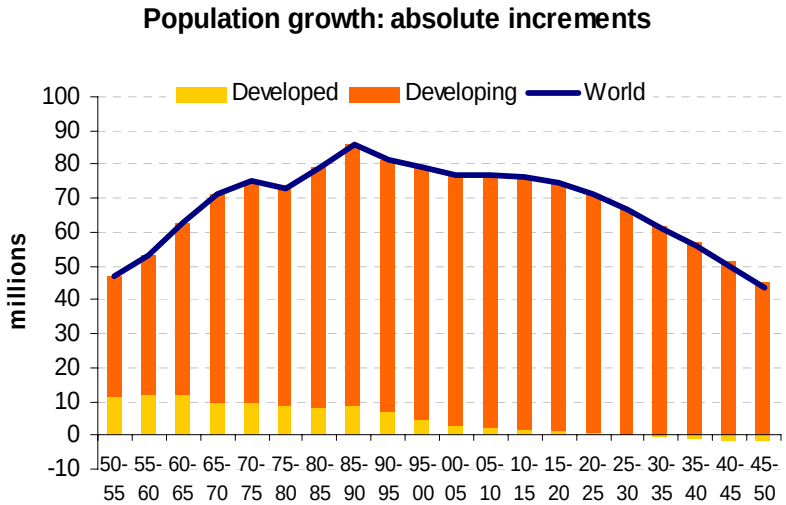
Assumptions

## Population growth is concentrated in developing countries

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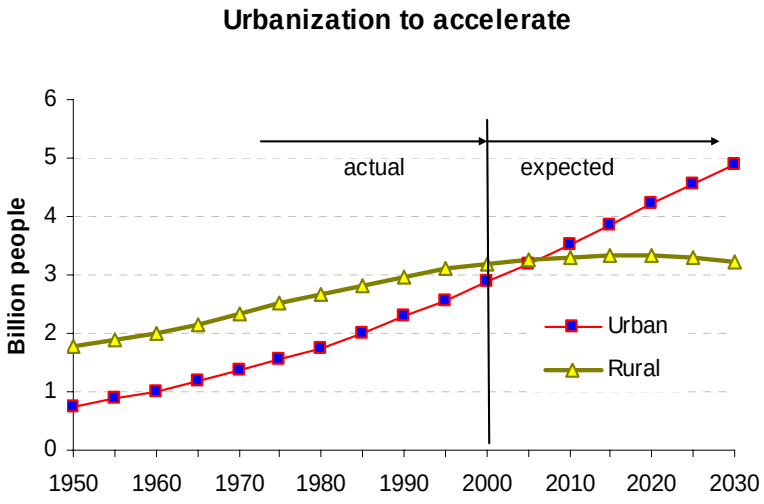
Assumptions

# Urban and Rural Population – 1950-2030

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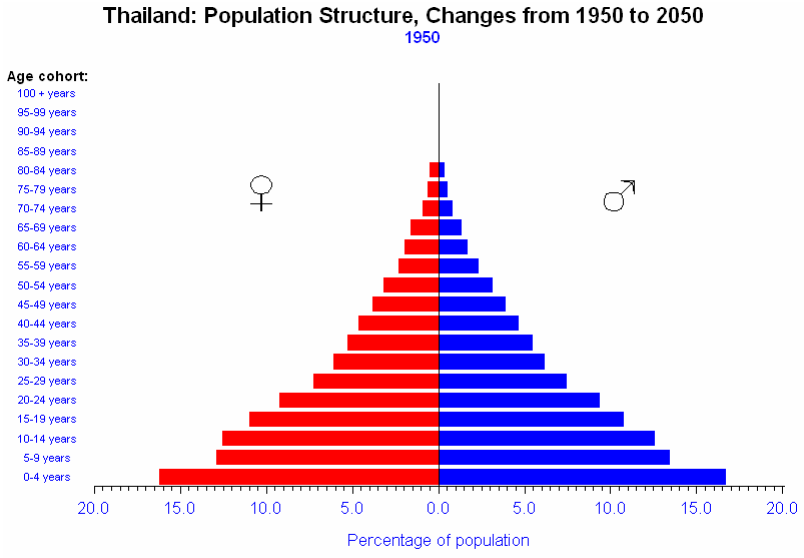
**Source: UN, World Population Assessment 2002**

Assumptions

# Ageing and population dividend of an Asian Tiger




**Based on: UN 2004 (http://www.un.org/esa/population/unpop.htm)**
**Josef Schmidhuber (2006)**

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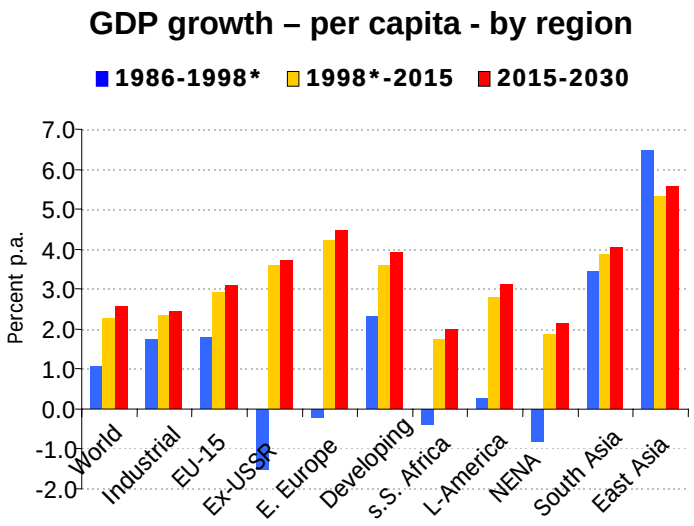
Assumptions

# 1. The main determinants

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**Source: World Bank, GEP 2003**

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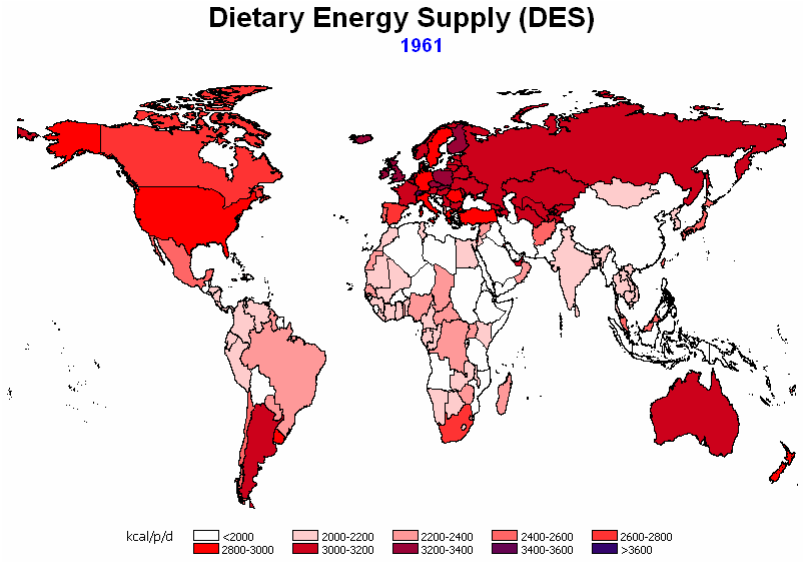
Food and nutrition

## From widespread hunger towards a double burden of malnutrition in developing countries




Source: FAOSTAT and World agriculture: towards 2015/30
Josef Schmidhuber (2006)

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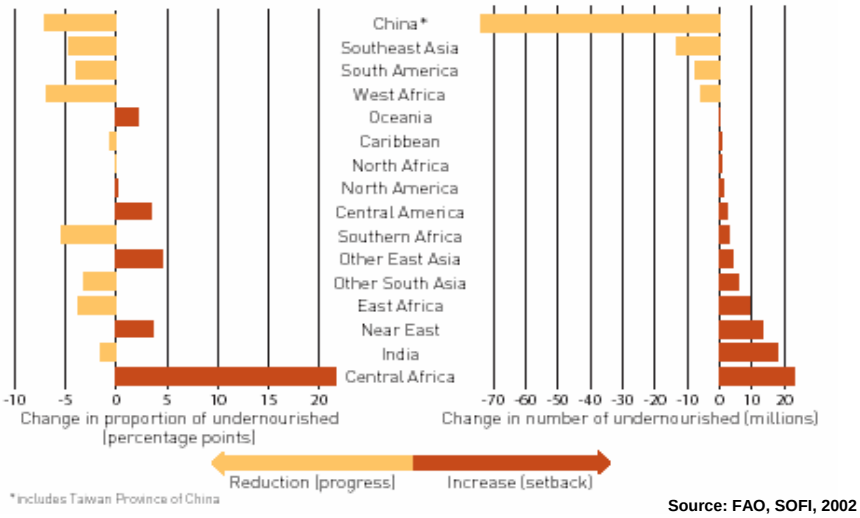
Food and nutrition

## Success and failure in fighting hunger

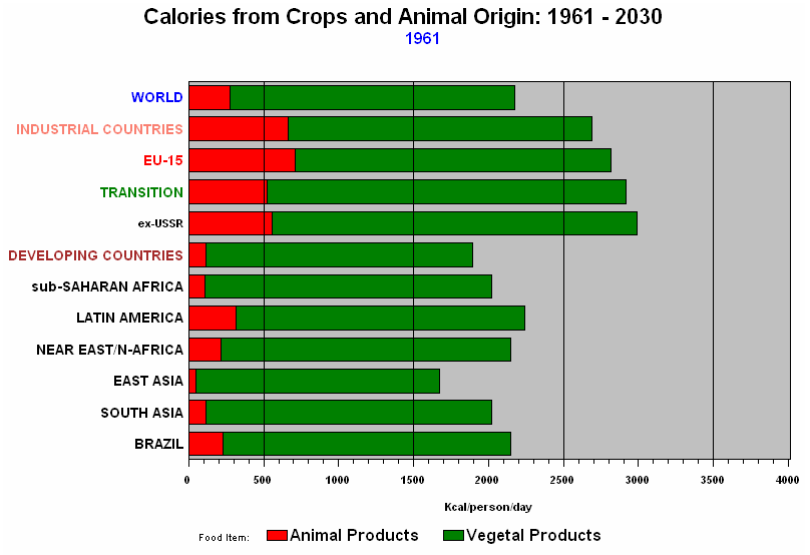



*includes Taiwan Province of China

Source: FAO, SOFI, 2002

Food and nutrition

## … and rising consumption of livestock products




Source: FAO, Global Perspectives Studies Group[1]
Josef Schmidhuber(2006)

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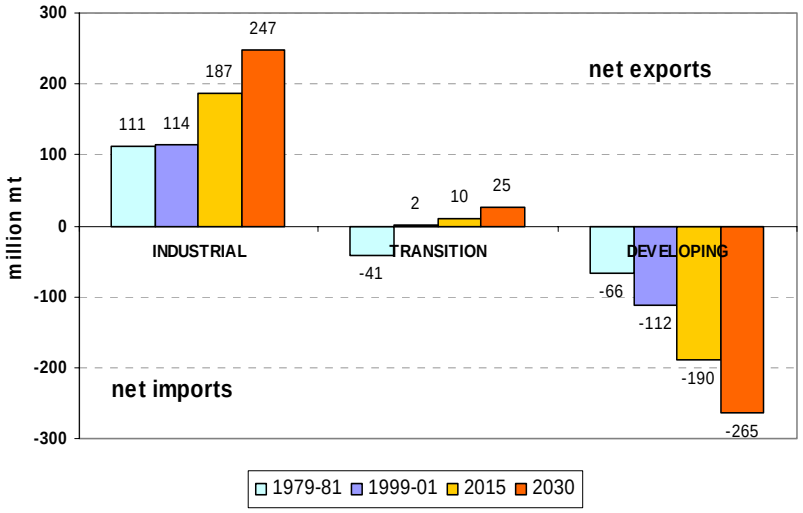
The world markets for agricultural produce

# World markets and export opportunities

## Main import and export regions in world cereal markets

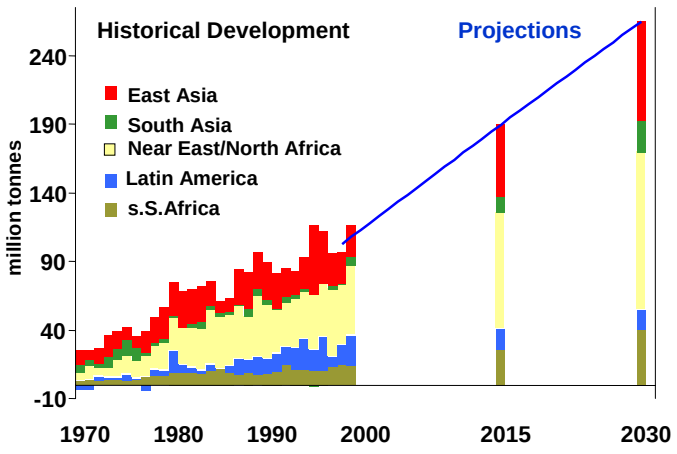



The world markets for agricultural produce

# World markets and export opportunities

## Cereal imports of developing countries

1970-2030

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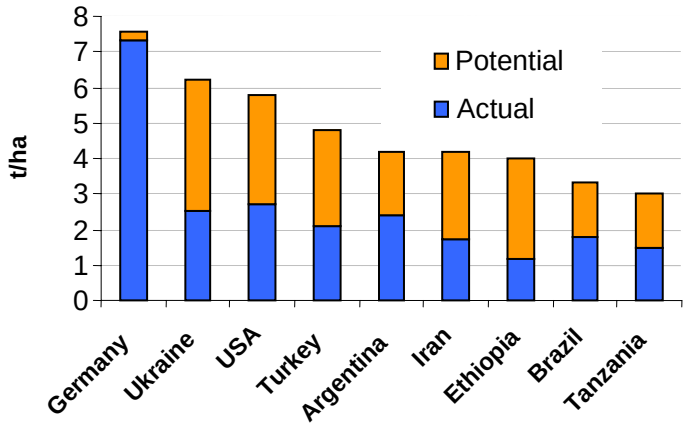
The resource base

## Wheat: actual versus potential yields

(high input, suitable land, rain-fed)

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Overview

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The potentials

# How big is the market for biofuels?

## Energy production and potential, biofuels and land use

| | | | Exajoule ($10^{18}$), EJ[9] | | | million ha |
|---|---|---|---|---|---|---|
| Energy source | | Year | World | OECD | non-OECD | World |
| All sources (TPES) | | 2002[2] | 428 | 224 | 205 | |
| | | 2030[2] | 670 | | | |
| | | 2050[2] | 850 | | | |
| Biomass | Actual use | 2002[2] | 47[11] | 14 | 33 | |
| | Theoretical potential | | >>2000 | Global photosynthesis: ~ 4000 EJ | | |
| | Technical potential | 1990[1] | 225 | | | |
| | | 2050[1] | 400 | | | |
| | Economic potential | 1990[1] | 89 | | | |
| | | 2050[1] | 158 | | | |
| Biofuels | Ethanol[7] | 2004[3] | 0.84 | 0.34 | 0.51 | 9.52[4] |
| | Biodiesel[7] | 2003[3] | 0.06 | 0.04 | 0.02 | 0.47[4] |
| | Potential[1] | 2050[1] | 53[10] | | | |
| | | | million ha | | | |
| Agricultural land[8] | Used | 1997-99 | 1506 | 658 | 848 | 850[4/5] |
| | Total suitable | | 4188 | 1406[6] | 2782[6] | (4730) |

1.) Potential based on Schrattenholzer and Fischer, IIASA, 2000
2.) Based on IEA: Key energy statistics, 2004
3.) Derived from http://www.earth-policy.org/Updates/2005/Update49.htm, Earth Policy Institute
4.) Assuming an average yield per hectare for ethanol of 4200 l (3000 l US maize, 5500 l Brazil cane, 6900 l France sugar beet) and of 3800 l/ha for biodiesel (average). Most recent yields are about 10% higher for cane and 20% higher for maize.
5.) 850 million ha would be required to meet today's transport fuels needs (77 EJ) at current yields (l biofuel/ha), technology, and crop composition.
6.) Area for developing and developed countries, not OECD and non OECD
7.) Assuming an energy content of 34 MJ/l for biodiesel and 21.1 MJ/l for ethanol
8.) Bruinsma (ed), World agriculture: towards 2015/2030, An FAO Perspective, 2003, total suitable land for rainfed agriculture
9.) 41.868 Mtoe = 1 EJ
10.) IEA (2003), "Biofuels for Transport", table 6.8.
11.) 15-60 EJ: most biomass fuels are not traded on world markets, estimates of consumption are highly uncertain.

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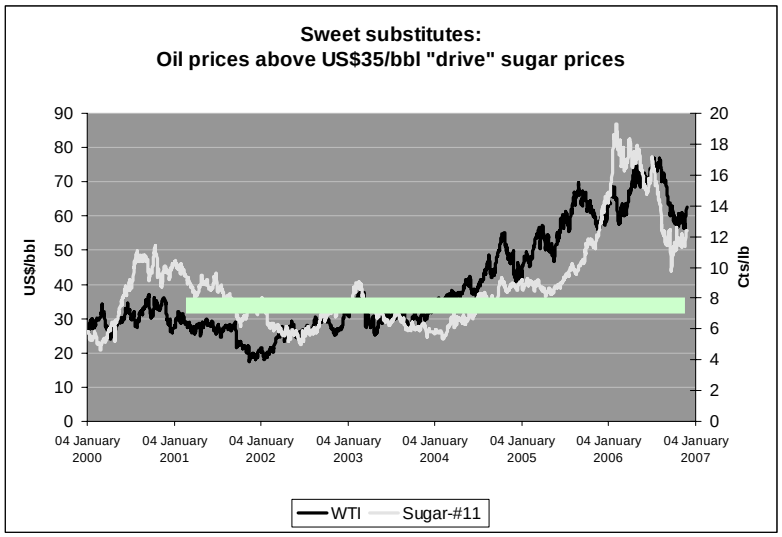
The impacts on prices and markets

# The price links

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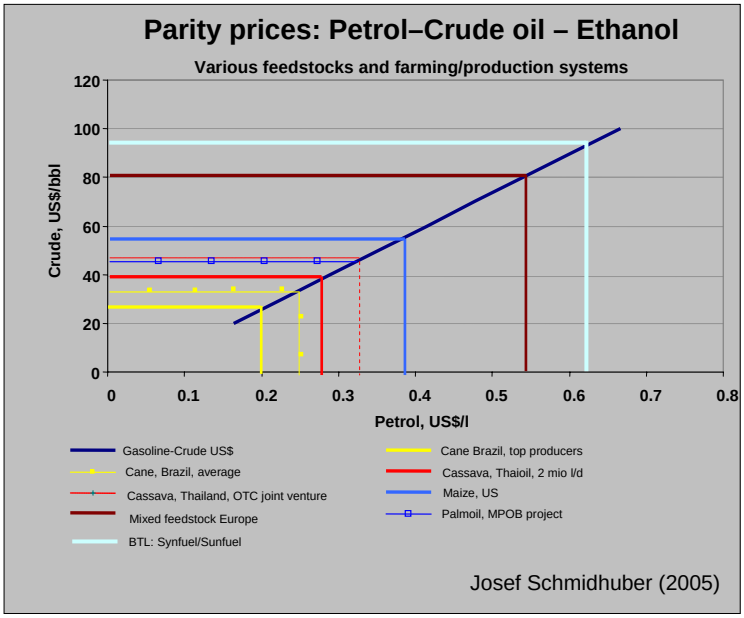
Data: Nymex and EIA, J. Schmidhuber (2007)

The competitiveness

# Competitiveness by feedstock




Josef Schmidhuber (2005)

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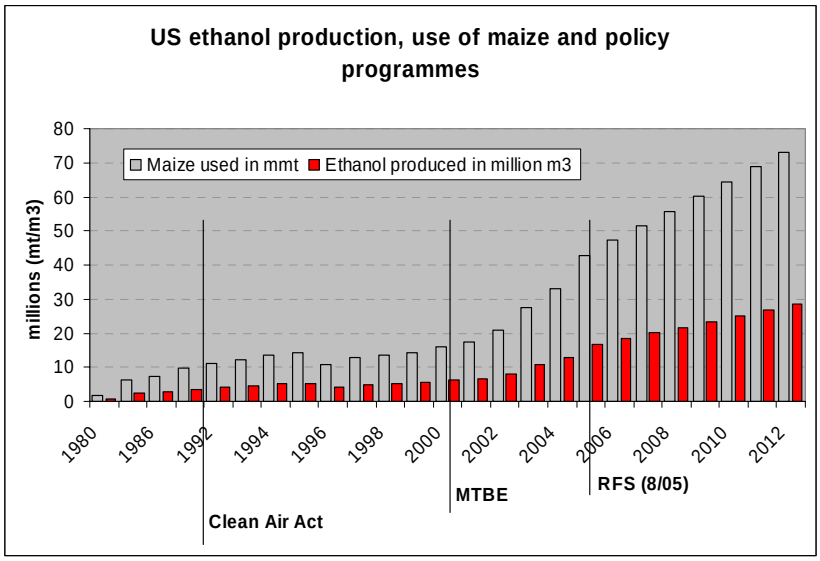
The impacts on prices and markets

# US ethanol-some market impacts



The impacts on prices and markets

## Cross links: Impacts on international commodity prices

| | An additional 10 million tonnes of … | | | | |
|---|---|---|---|---|---|
| | Sugar | Maize | Sugar and Maize | Soybeans and Maize | Sugar, Maize and Soybeans |
| Corresponding energy [biofuels] | 0.195 EJ | 0.087 EJ | 0.282 EJ | 0.167 EJ | 0.349 EJ |
| Commodity | … used for biofuels would change international prices (percent) in the long-run by : | | | | |
| Sugar | +9.8 | +1.1 | +11.3 | +2.3 | +13.8 |
| Maize | +0.4 | +2.8 | +3.4 | +4.0 | +4.2 |
| Vegetable oils | +0.3 | +0.2 | +0.2 | +7.6 | +7.8 |
| Protein | +0.4 | -1.2 | -1.2 | -8.1 | -7.6 |
| Wheat | +0.4 | +0.6 | +0.9 | +1.8 | +2.0 |
| Rice | +0.5 | +1.0 | +1.2 | +1.1 | +1.4 |
| Beef | +0.0 | +0.2 | +0.2 | +0.4 | +0.4 |
| Poultry | +0.0 | -0.4 | -0.4 | -2.1 | -2.0 |



Source: @2030 simulation results