agri benchmark

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Beef and Sheep Network

Mohamad Isam Almadani and Peter Weeks

Introducing the world's first global producer price indices for beef cattle and sheep by agri benchmark

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1 Introduction

agri benchmark Beef and Sheep Network is launching a set of annual (calendar year) global Producer Price Indices for finished cattle, weaner cattle, lambs and sheep meat. These global indices and associated country and regional indices can be used to monitor and explain developments in global, regional and country beef cattle, lambs and sheep prices over time.

The global Producer Price Indices are Laspeyres, production-weighted indices measuring changes in global farm gate prices as provided annually by the *agri benchmark* Beef and Sheep Network. The Indices use nominal prices (not inflation-adjusted) and based on average prices over the 2014 to 2016 period.

The *agri benchmark* Beef and Sheep Network is ideally placed to provide producer price indices, being global – composed of 48 institutional partners from 34 countries for beef and 30 institution partners from 16 countries for sheep representing different beef and sheep farming systems across the world. The Network was established in 2002, and requires accurate, consistent, standardized, detailed and transparent data.

With 34 countries included for cattle and 16 for sheep, covering the vast majority of global production, the *agri benchmark* Global and Country Producer Price Indices a) reflect the structure of beef and sheep prices in producing countries which are not within of the main exporters such as the US, Brazil, China or Oceania (sheep meat), b) represent what the medium and small producer countries actually produce, c) reflect country-specific drivers of prices such as policy interventions and supply / demand changes in major producing and consuming countries and d) allow easy comparison (benchmarking) of livestock prices between countries.

These global livestock price indices will also complement the FAO Export Meat Price Indices, which are measures of the internationally traded meat prices, using export prices for selected volume trades from major exporters, weighted with the average export shares, also using a base of 2014-2016.

The *agri benchmark* Indices can help to understand the key drivers of current and future trends and developments in global beef and sheep producer prices. A detailed analysis of past trends in global, regional and some major country producer price changes over the past 20 years for cattle and sheep, can be found in a journal paper entitled "*Introducing the World's First Global Producer Price Indices for Beef Cattle and Sheep*", published by Almadani, Weeks and Deblitz (2021).

2 Methodology

The *agri benchmark* Producer Price Indices are created mainly based on the "Country Page" datasets providing useful information for sector-level analysis. The *agri benchmark* country page delivers detailed timeseries of national inventories (cattle, lambs and sheep), meat production and

per capita consumption, export and import volume and value and meat and livestock prices for each of the network countries.

The Indices use national nominal prices for cattle, lambs and sheep in *agri benchmark* network's producing countries, expressed in United States dollars. Prices are on a calendar year basis (updates in February for the previous year) and weighted by production shares of the network countries in the base period. All indices are calculated on the basis of the Laspeyres approach, which has been modified by using production quantity weights[1]. The animal category that represents the bulk of each country's beef (sheep meat) output is used. The Indices of finished animals (finished cattle, lambs and lambs and sheep) are calculated on carcass weight prices, while the Weaner Cattle Price Index uses live weight prices.

The *agri benchmark* Price Indices start from calendar year 2000. Prices are combined using production weights calculated from average values over a chosen three-year base period. A three-year period is chosen to minimize the impact of variation in both internationally production prices and quantities. The base period 2014–2016 was chosen as an appropriate base period due the following aspects:
a) It is recent and yet data is unlikely to be subject to significant revisions.
b) The production weights of the main producing countries are relatively stable, so are structurally representative of recent years.
c) It matches with the FAO Food Price Index base period to allow easy comparison between the *agri benchmark* producer livestock price indices and the FAO export meat price indices.

In order to better understand global producer price developments over the observed period, sub-indices for regions and countries that contributed highly to the average global production over 2014–2016 were also calculated. Four sub-indices were identified for finished cattle: North America, South America, EU and China price indices. For weaner cattle there are three: North America, South America and EU price indices. For lambs there are three: Oceania, EU and UK price indices. For sheep meat there are China, Oceania, EU and UK price indices.

3 The *agri benchmark* Global Producer Price Indices

3.1 The Finished Cattle Producer Price Index

The global Finished Cattle Price Index (FPPI) includes weighted finished cattle prices from 33 countries, with all the major producing countries included except India – representing approximately 76% of global beef production. Three countries account for around 52% of the production weightings in the FPPI in the base period– the US (22%), Brazil (18%) and China (12%). The next largest production weightings are for Russia, Argentine and Australia, with a combined 16% production

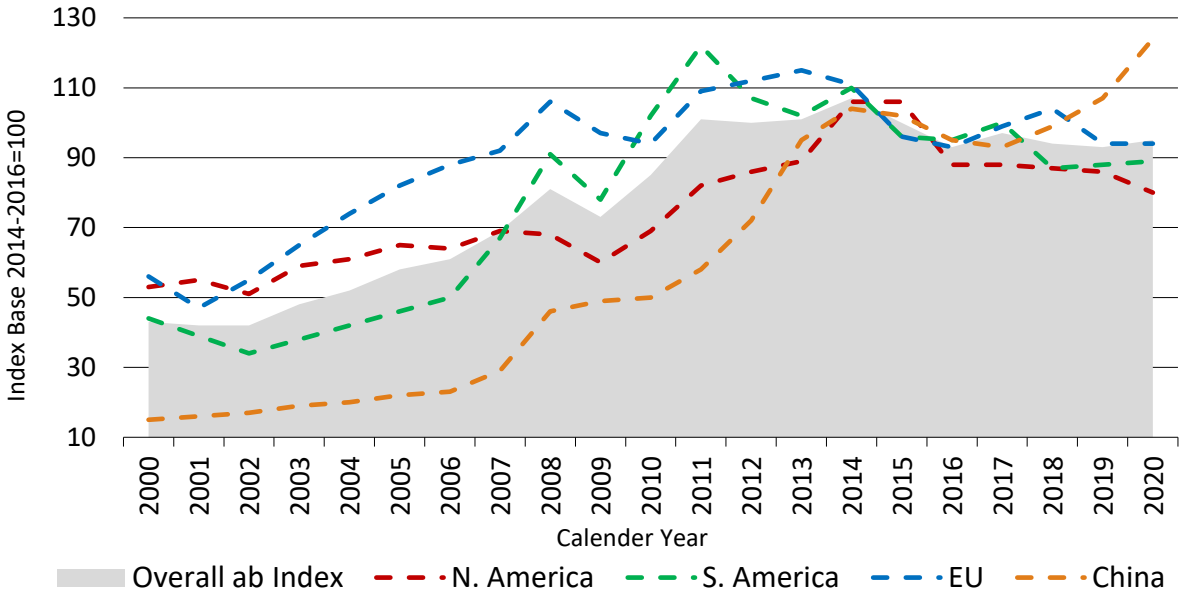
[1] For detailed information of how the Laspeyres approach has been used to calculate the indices, please see Almadani, et al. 2021 at: "*Introducing the World's First Global Producer Price Indices for Beef Cattle and Sheep*"

share in the base period 2014-16. The production shares of the US and Brazil have both risen over the past 20 years – giving a combined share of 43% in 2019 up from 38% in 2000.

As shown in Figure 1, The *agri benchmark* FPPI rose appreciably in all bar one year from 2003 to 2014, to peak 152% above the starting period of 2000-2002. This was driven mainly by price rises in China and Brazil commencing in 2007, and the US from 2010. Behind this was the influence of beef demand growth from expanding populations and incomes, especially in the US and developing Asian countries, plus a lowering of import barriers in North Asia and China. Also contributing was slowing supply growth over that period, mainly due to land, feed, water and environmental constraints.

The FPPI fell back in the two years following the peak in 2014 due to increasing production in North America and South America and a temporary fall in prices in China, but stabilised from 2017 to 2020 at a historically high level – still over double that of the start indexing period 2000-2002. Prices continue to be underpinned by ongoing expansion in Chinese beef demand and imports. The FPPI remained stable in 2019 and 2020, despite the pork shortfall following African Swine Fever in China and neighbouring countries (from late 2018) and COVID-19 impacts in 2020.

Figure 1: The overall *agri benchmark* and regional Finished Cattle Producer Price Indices



Source: *agri benchmark* database, 2021. Own illustration

3.2 The Weaner Cattle Producer Price Index

The *agri benchmark* global Weaner Cattle Producer Price Index (WPPI) measures weaner calf prices as the final output sold by cow-calf farms to pre-finishing operations (backgrounding or stocker) or directly to cattle finishing operations. It is mainly based on weaner calf prices weighted by weaner production share (live weight base) in the network countries.

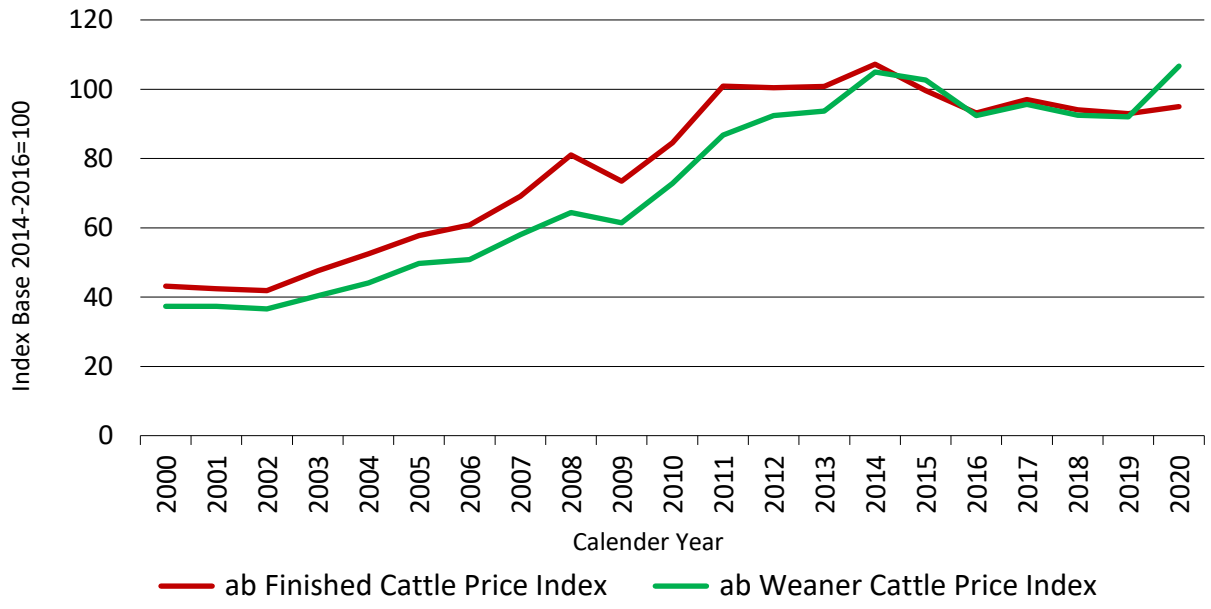
Since weaner prices and production are not available in all countries of the network, particularly for dairy specialised countries, 20 countries were included in the Index. Weaner production within each country was calculated based on the sucker cows' inventory (country page data) and the annual live weight sold per cow (typical farm data).

The Index is of importance to both cow-calf farmers (output prices) and beef producers (input prices). Thus, it serves to monitor and explain changes in value added and net income movements for finished cattle farms over time. This is of major importance to feedlot and pasture production systems in which weaner purchase costs constitute the largest proportion of total finished cattle production costs.

As expected, the WPPI and FPPI follow each other closely (Figure 2). However, the strong rise in beef demand and cattle prices from 2010 to a peak in 2014 saw the weaner price rise further, which is normal during a herd rebuilding phase. The FPPI increased by 37% between 2009 and 2014, whereas the WPPI increased by 48% over the period.

On the one hand, this can be a critical indicator of profit margins for finished cattle producers particularly in pasture and grain-fed production systems where animal purchase costs count about two third of the total production costs. However, the rising trend of the WPPI in last decade could also reflect lower feed costs globally.

Figure 2: The *agri benchmark* Weaner Cattle and Finished Cattle Producer Price Indices



Source: *agri benchmark* database, 2021. Own illustration

3.3 The Lambs Producer Price Index

The *agri benchmark* Lambs Producer Price Index (LPPI) includes weighted prices of lambs from 11 countries, with Australia, New Zealand, the UK and Iran representing 83% of the production

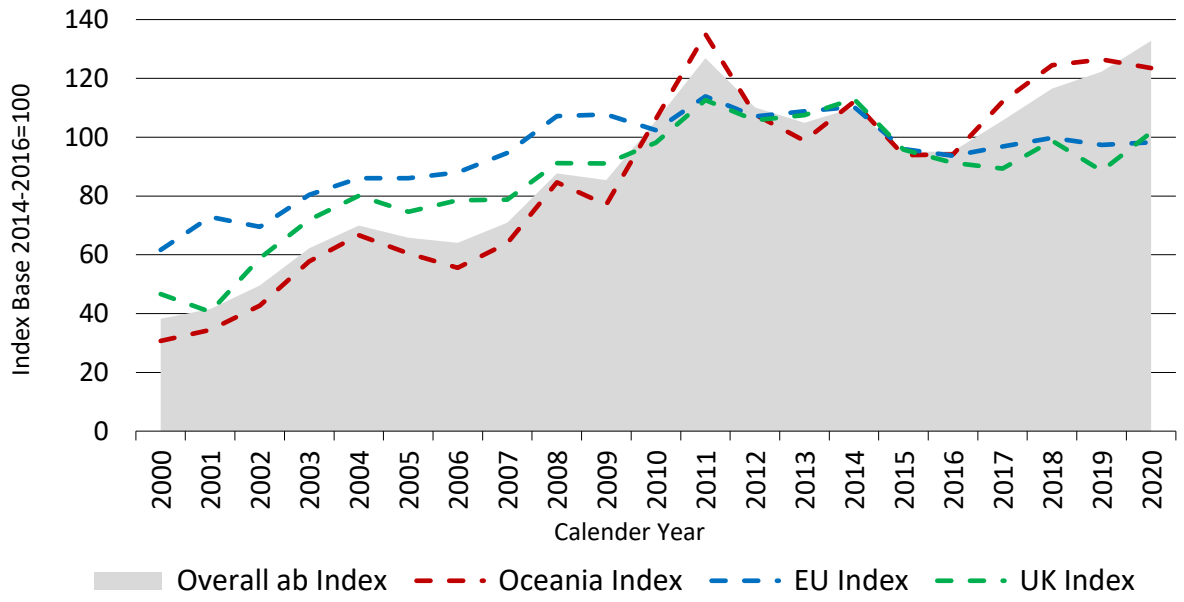
weighting in the base period 2014-16. This share has been largely unchanged since 2002, though within this Australia's share has risen from 23% to 32% over the period while New Zealand's share has fallen from 29% to 23%.

The price of lambs in Australia and New Zealand has the main influence on the LPPI, reflecting both their combined 56% production weighting and greater price volatility. Figure 3 shows both the similarity in movements in the Index and prices in Oceania, but also the more volatile and higher prices in Oceania, especially since China emerged as a major lamb importer in 2010. The other countries within the Index are primarily in the EU and have much more stable, and significantly lower, prices for lambs.

The LPPI has risen by 230% since 2000, first reaching this peak in 2011 – driven by a strong rise in demand and more constrained supplies. In the case of sheep meat, demand has benefited most from Chinese income growth and its opening to imports, plus population growth elsewhere, particularly in Muslim and Hispanic communities in the Middle East, Asia and North America.

The LPPI fell back from 2011 to 2015, following supply growth and a temporary easing in Chinese demand growth. The Index recovered again in the four years to 2020, to surpass the 2011 record. This reflected price rises in Australia, New Zealand and Germany, more than offsetting price falls elsewhere in Europe. The rise in Oceania was assisted by faster China demand and import growth and lower supplies in Australia (due to drought).

Figure 3: The overall *agri benchmark* and regional Lambs Producer Price Indices



Source: *agri benchmark* database, 2021. Own illustration

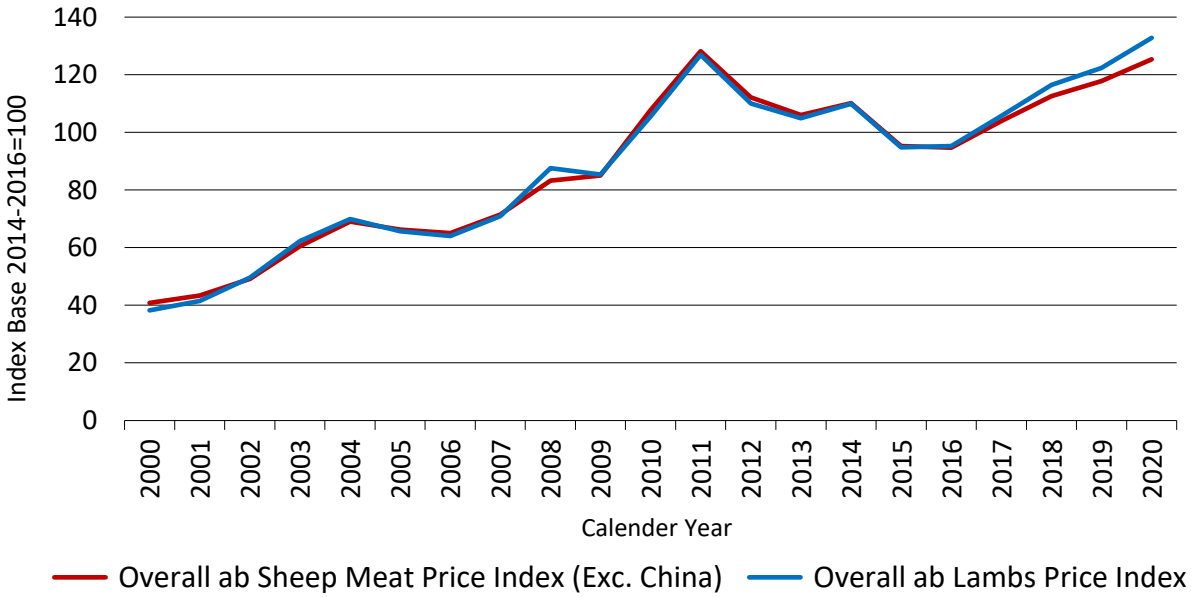
3.4 The Sheep Meat Producer Price Index

In many countries, there is no data distinguishing lambs from sheep, just a combined total. Hence, whereas the *agri benchmark* LPPI has 11 contributing countries, the Lambs and Sheep Price Index includes weighted prices from 20 countries. Since China contributes 60% of the sheep production share in the globe, it dominates the weighting. Thus, to build up a more complete and realistic picture of how the global sheep meat prices are developing, we introduce the Sheep Meat Producer Price Index (SPPI) including and excluding China.

Australia and New Zealand have a combined 40% of the production weighting in the *agri benchmark* SPPI (excluding China), largely unchanged in the past 20 years in total but with a rise in Australia's share from 24% to 27% and similar fall in that of New Zealand from 20% to 16%. Other significant countries in the index are Algeria, Iran and the UK, each with an 9-10% share in the base period 2014-16.

The *agri benchmark* SPPI (excluding China) displayed broadly the same movements as the Lambs Price Index (Figure 4), rising to a peak in 2011 before falling back to 2015 and recovering over the last four years. However, following the 2011 peak, the SPPI (excluding China) showed an identical change to that of the LPPI until 2016. The reason for this is probably the influence of the rapid rise in China's import demand, which would have lifted the value of sheep more than it did for lambs.

Figure 4: Comparison of the *agri benchmark* Sheep Meat Producer Price Index (excluding China) and Lambs Producer Price Index

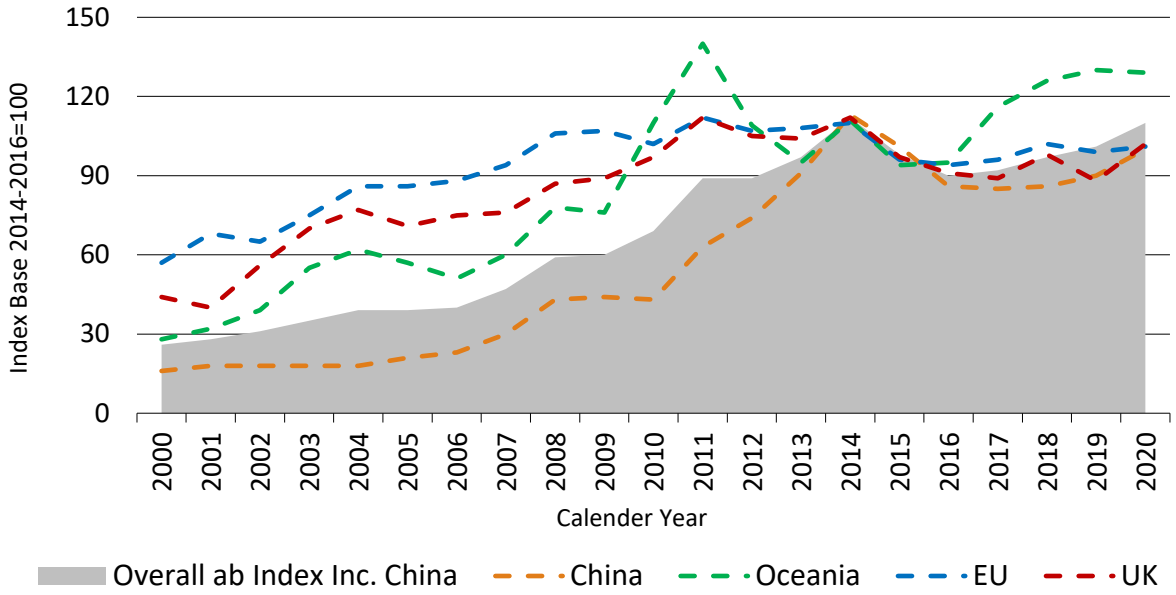


Source: *agri benchmark* database, 2021. Own illustration

The explanations for the movements in the SPPI (excluding China) are essentially the same as outlined above for the LPPI:

- The influence of the volatile prices from Australia and New Zealand on the Index (Figure 5) reflecting both their combined 40% production weighting and added volatility being export-focused.
- The impact of Chinese and Middle East import growth and constrained supplies on prices over the past 10 years.
- The impact of the EU country prices in bringing greater stability to the Index.
- The gradual slide in prices in almost all countries bar Australia, New Zealand and Iran since the peak in 2011, as represented by UK prices in Figure 5.

Figure 5: The overall *agri benchmark* and regional Sheep Meat Producer Price Indices



Source: *agri benchmark* database, 2021. Own illustration

As mentioned above, when China is included in the SPPI it dominates the weighting, with a production share of 60% in the base period, followed by Australia (10%) and New Zealand (6%). China's production share has risen from 48% in 2000, with commensurate falls in the shares of all other major producers. In the past 15 years, China's sheep meat demand growth has accelerated but local production growth has slowed, causing a rapid rise in China's lambs and sheep prices – to be one of the highest in the world. Hence, if China is included (Figure 6), the Index keeps rising beyond 2011 to peak in 2014 and has risen much more than the SPPI excluding China since 2020 (hard to see from Figure 6 as the peak in China prices in 2014 lies within the SPPI base period of 2014-16).

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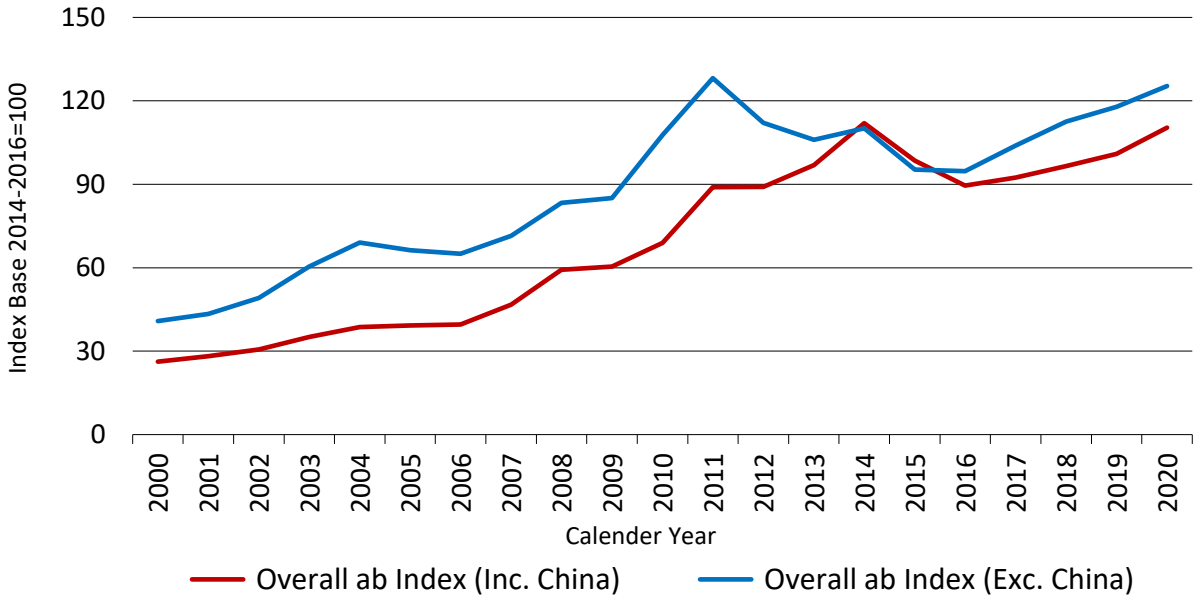
Figure 6: The *agri benchmark* Sheep Meat Producer Price Index (including and excluding China)



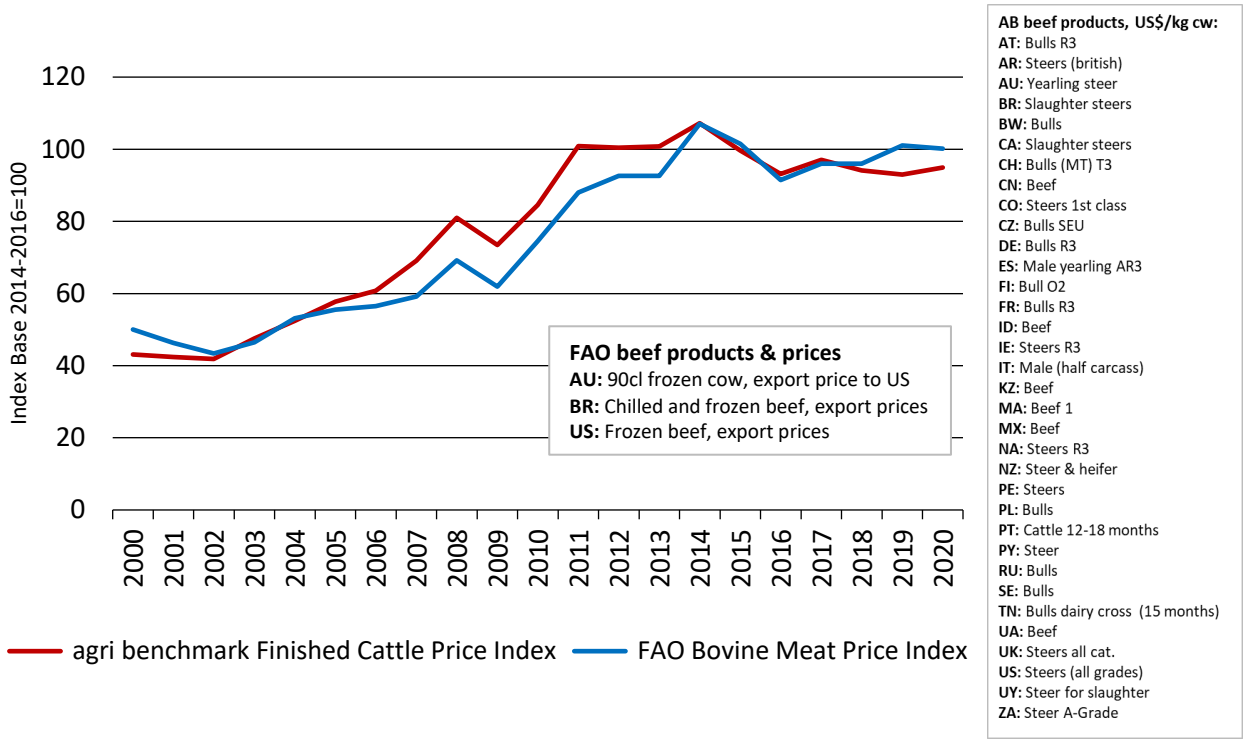
Source: *agri benchmark* database, 2021. Own illustration

4 Relativity of the *agri benchmark* Livestock Price Indices to the FAO Export Meat Price Indices

These *agri benchmark* Global Price Indices are unique in representing prices of livestock as sold by farmers. However, FAO produces a well-known set of Global Food Price Indices, including ones for bovine meat (beef) and ovine meat (sheep meat). The FAO Meat Price Indices are measures of the international (traded) meat prices weighted with the average export shares for 2014-2016. Thus, they are exporter reference prices rather than the price being received by producers, but have often been used to approximate movements in producer returns in the absence of global producer prices.

Producer livestock prices and internationally traded meat prices should move together and, hence, it can be instructive to compare movements in the two series. As Figure 7 shows, the *agri benchmark* Finished Cattle Producer Price Index (FPPI) and the FAO Bovine Meat Price Index (based on beef export prices from US, Brazil and Australia in USD) do follow each other closely, with a correlation of 95% on a calendar year basis since 2000. The *agri benchmark* Finished Cattle Producer Price Index was on a slightly higher level compared to the FAO Bovine Meat Price Index from 2007 to 2017, probably due to the inclusion of China – as Chinese cattle prices rose rapidly over that period (and China accounts for 12% share of the production weighting in the *agri benchmark* FPPI in the base period).

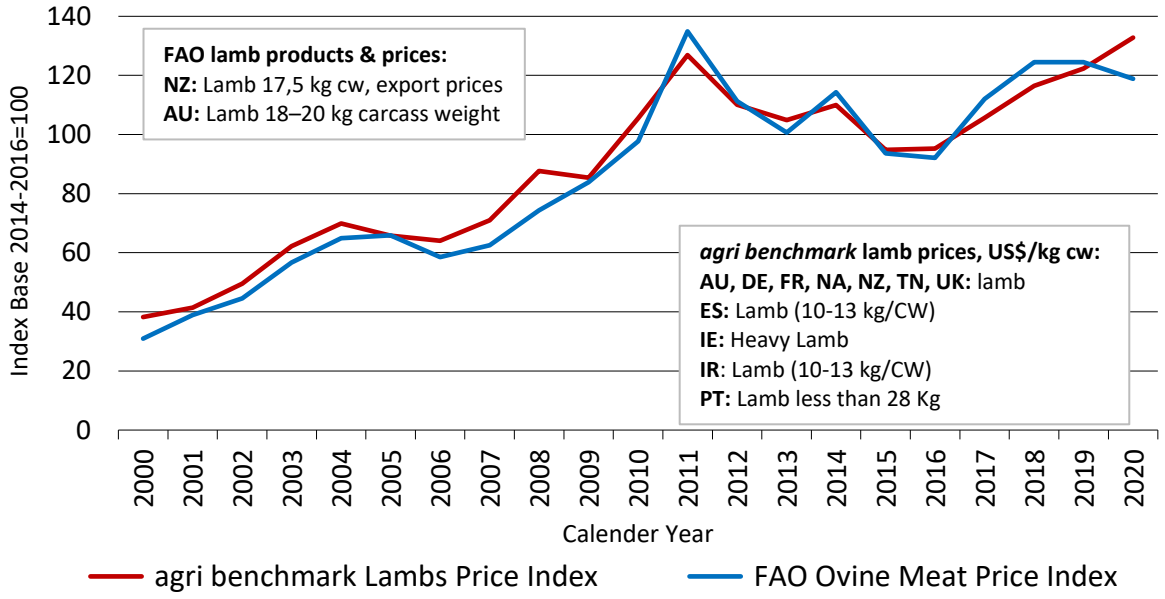
Figure 7: The *agri benchmark* global Finished Cattle Price Index and the FAO Bovine Meat Price Index



Source: *agri benchmark* database, 2021. Own illustration

As Figure 8 shows, the *agri benchmark* Lambs Producer Price Index (LPPI) and the FAO Ovine Meat Price Index also move in similar ways but the FAO series is more volatile, as expected given that it is based on the price of New Zealand export lambs of 17.5kg carcass weight whereas the *agri benchmark* LPPI is based on the weighted price of lambs in 11 countries. Export prices tend to be more volatile as the world market is relatively thin (only 9% of global sheep meat production is traded). The rapid growth in Chinese lamb imports, especially from New Zealand, probably explains why the FAO Index has risen more than the *agri benchmark* Index since 2011.

Figure 8: The *agri benchmark* Global Lambs Producer Price Index and the FAO Ovine Meat Price Index

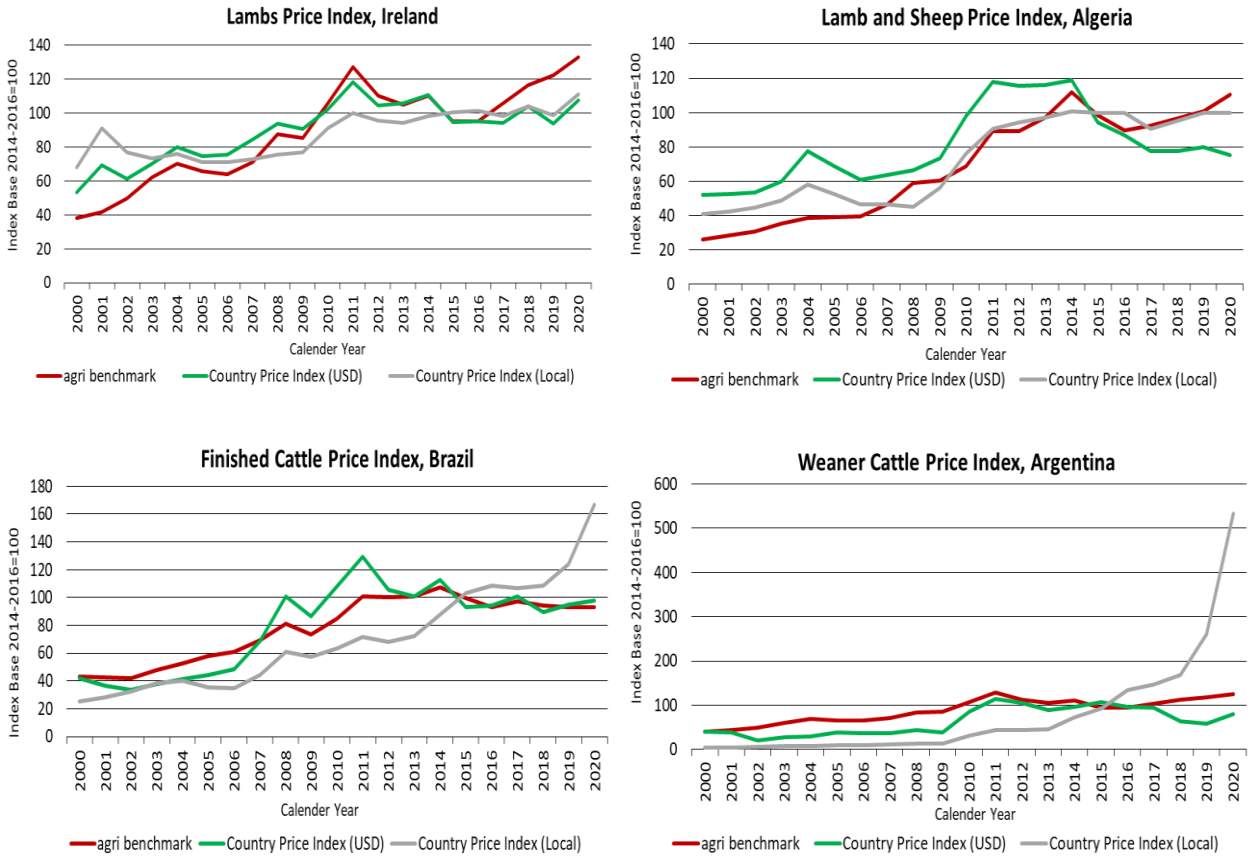


Source: *agri benchmark* database, 2021. Own illustration

5 The *agri benchmark* Price Index Tool for partners and interested parties

The *agri benchmark* Network created a tool to produce and update all the indices described above – the global, regional and country indices. For deeper insight at the national level, another tool was created to point out the national price index movement (in USD and local currency) compared to the relevant global *agri benchmark* index. Figure 9 highlights some of the tool outputs for different global, regional and country indices.

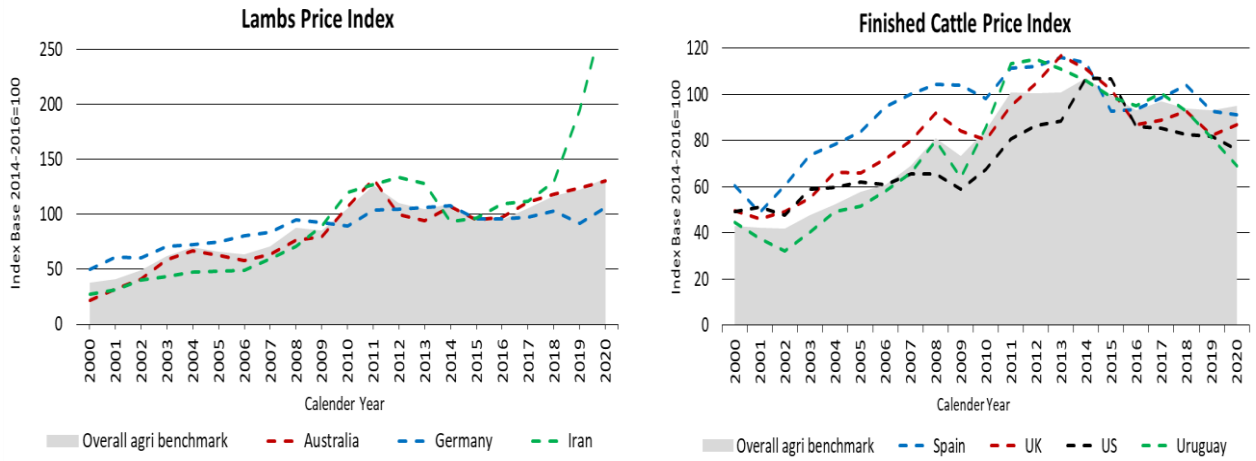
Figure 9: Comparison of national index (USD and Local) with the relevant *agri benchmark* Index (selected countries)



Source: *agri benchmark* database, 2021. Own illustration

Since the network partners are often wanting to compare their indices with the other key producers/exporters in the world, a comparison button was added to easily graphically compare the indices between the network countries (Figure 10).

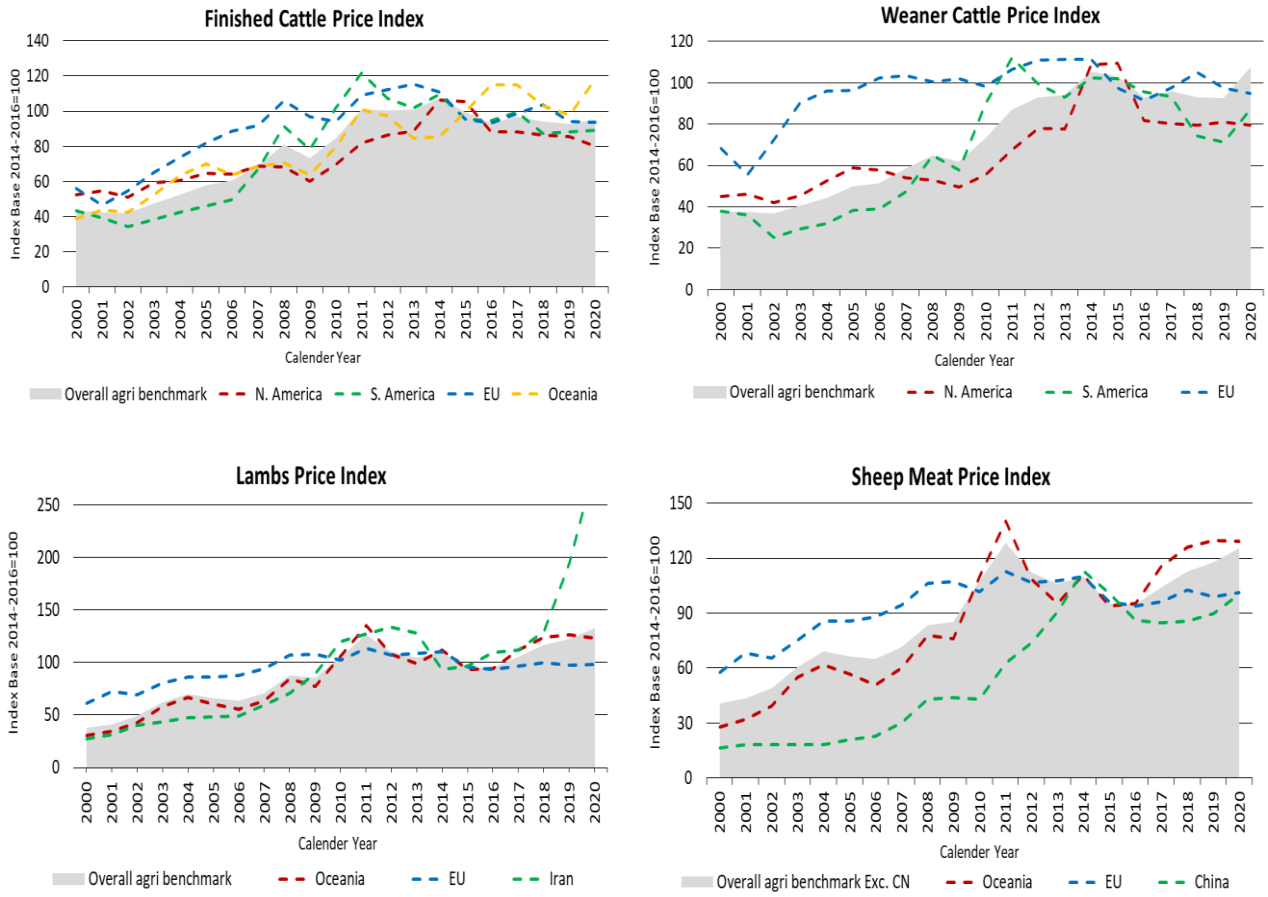
Figure 10: The *agri benchmark* Price Indices in comparison with selected countries



Source: *agri benchmark* database, 2021. Own illustration

The *agri benchmark* Producer Price Index tool provides regional indices presenting a group of countries under a sub-index. Global meat production and prices vary between countries due to their differences in resource base, input prices, environmental conditions, industry structure, exchange rate against the USD, global export and import access, and government supports. Nevertheless, presenting a group of countries under a sub-index is warranted given the positive and significant correlation of price changes between countries within each identified region. Regional indices help to understand developments of each of the four global indices over the observed period. Figure 11 highlights the regional indices which are identified within each global index.

Figure 11: The *agri benchmark* Regional Producer Price Indices



Source: *agri benchmark* database, 2021. Own illustration

6. Conclusions

The close cooperation between the *agri benchmark* Beef and Sheep Network partners ensures the reliability of data sets for defining the per unit prices received by cattle, lambs, and sheep meat producers as farm gate prices. This needs an interactive networking to define the most prevailing product types for cattle and sheep and the key production regions in the network countries.

The global, regional, and national producer price indices provide researchers and interested parties with a detailed breakdown of price developments that allows them to better understand recent market developments and challenges and the competitive situation. Benchmarking a country and region's price developments against other countries or regions and the global indices is essential to judge trends in local prices being received by producers—as an indicator of profitability and as a precursor to possible supply shifts. Thus, the indices reflect whether producers globally are receiving more, or less, for the commodity (cattle, lambs, sheep) and might increase or reduce production and investment accordingly.

This would be of more use if there were producer price indices for those enterprises that compete with cattle and sheep for land, especially dairy and cropping, and those that compete for the consumer dollar, such as pigs, poultry, and fish.