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The Food and Land Use Coalition

2019 Report of the FABLE Consortium

Pathways to Sustainable Land-Use and Food Systems

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2019 Report of the FABLE Consortium

Pathways to Sustainable Land-Use and Food Systems in Argentina by 2050

Argentina

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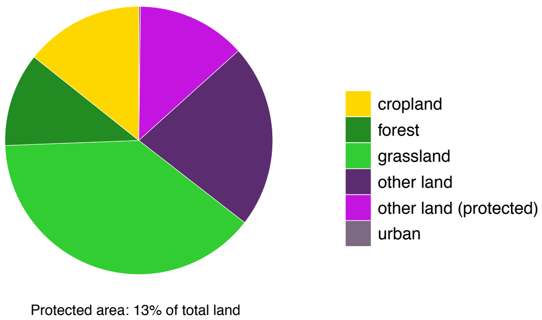
Land and food systems at a glance

A description of all units can be found at the end of this chapter

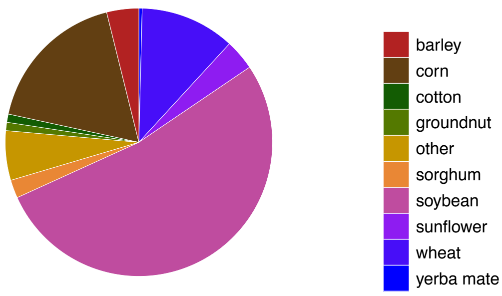
Land & Biodiversity

Fig. 1 | Area by land cover class in 2015



Source: FAO (2019), agroindustria.gob.ar (2019)

Fig. 2 | Share of harvested area by crop in 2015



Source: agroindustria.gob.ar (2019)

Annual deforestation in 2015:
159 kha (half of it illegally) =
0.6% of total forest area

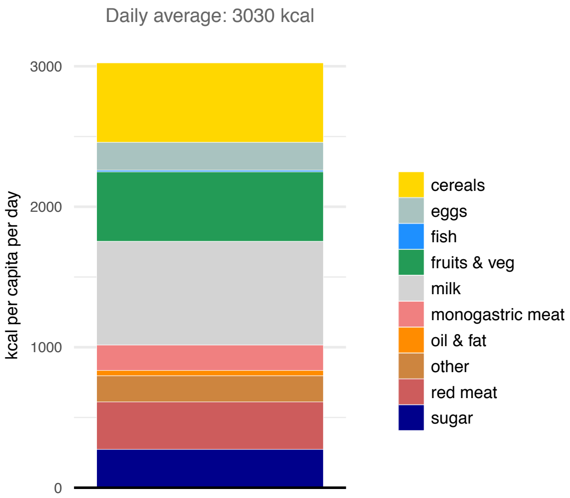
(Greenpeace, 2019; Presidencia de la Nación, 2017)

Endangered species:
564 (104 in danger, 149 threatened, and 311 vulnerable)

(AGN, 2019)

Food & Nutrition

Fig. 3 | Daily average intake per capita at the national level in 2010



Source: FAO (2019), INTA (2015)

Share of undernourished in 2015:
Children: 8.2%

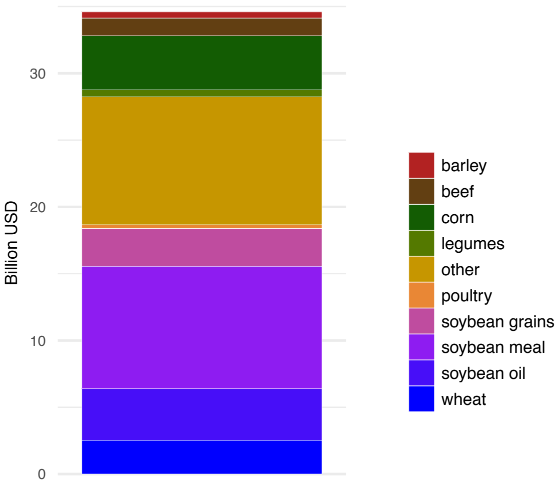
(FAOSTAT, 2019)

Share of obese in 2015:
Children: 10%
Adults: 28%

(FAOSTAT, 2019)

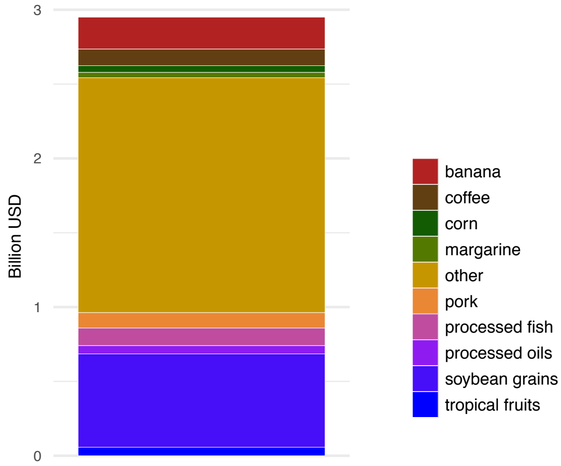
Trade

Fig. 4 | Main agricultural exports by value in 2017



Source: Observatory of Economic Complexity (2019)

Fig. 5 | Main agricultural imports by value in 2017



Source: Observatory of Economic Complexity (2019)

Surplus in agricultural trade balance in 2015: USD 33.45 bln

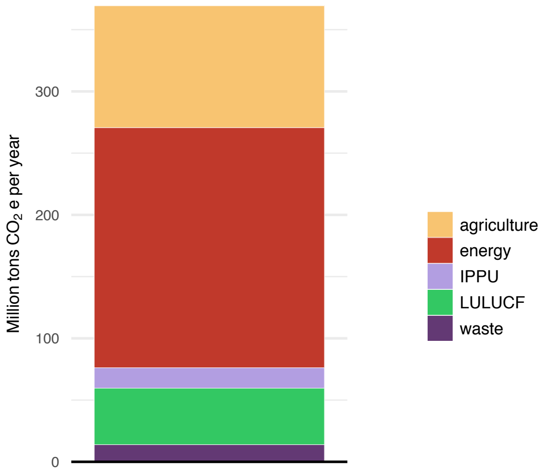
(OEC, 2019)

#1 exporter of soybean meal and oil. 5% of world grain and 15% of grain and byproducts

(Lopez-Dardaine, 2018)

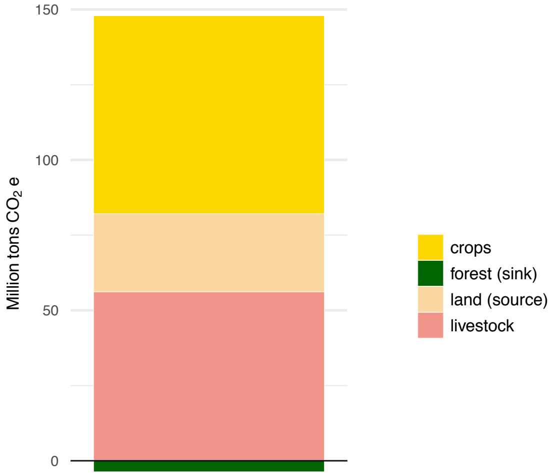
GHG Emissions

Fig. 6 | GHG emissions by sector in 2014



Source: Second BUR Argentina (2014)

Fig. 7 | GHG emissions from agriculture and land use change in 2014



Source: Second BUR Argentina (2014)

Main assumptions underlying the pathway towards sustainable land-use and food systems

For a detailed explanation of the underlying methodology of the FABLE Calculator, trade adjustment, and envelope analysis, please refer to sections 3.2: Data and tools for pathways towards sustainable land-use and food systems, and 3.3: Developing national pathways consistent with global objectives.

GDP GROWTH & POPULATION

	GDP per capita (large change)	Population (large change)
Scenario definition	GDP is expected to increase more than twofold, from USD 458 bnl in 2015 to USD 1 tln in 2050 (SSP3 scenario selected).	Population is expected to increase by 33% between 2015 and 2050 from 43 mln to 57 mln (SSP3 scenario selected).
Scenario justification	Based on the linear extrapolation of 1990-2017 potential GDP (Baumann Fonay et al., 2018).	Based on combined extrapolations from INDEC (2019) and Baumann Fonay et al., (2018).

TRADE

	Imports (no change)	Exports (large change)
Scenario definition	The share of total consumption which is imported decreases: - from 72% in 2010 to 36% in 2050 for bananas. The share of total consumption which is imported remains constant at 2010 level for the other products.	The exported quantity increases: - from 17 Mt in 2010 to 71 Mt in 2050 for corn, - from 13 Mt in 2010 to 54 Mt in 2050 for soybean, - from 5 Mt in 2010 to 20 Mt in 2050 for soy oil, - from 25 Mt in 2010 to 100 Mt in 2050 for soy cake, and, - from 2 Mt in 2010 to 8 Mt in 2050 for milk. The exported quantity remains constant at 2010 level for the other commodities.
Scenario justification	The selection of lower imports and higher exports is in line with the continuation of BAU tendencies on exports and imports.	The selection of lower imports and higher exports is in line with the continuation of BAU tendencies on exports and imports.

LAND

	Land conversion	Afforestation (large change)
Scenario definition	We assume that deforestation will be halted beyond 2030.	We assume total afforested/reforested area to reach 2 Mha by 2050 (based on the Bonn Challenge).
Scenario justification	We have made our choice based on the existence of a new law that establishes forest protection (Forest Law, 2017). As there are no other laws restricting land use changes, we have not selected another scenario.	Argentina's national commitment to the Bonn Challenge is to restore 1 Mha by 2020 (Bonn Challenge, 2014).

Scenario signs no change · small change · large change

BIODIVERSITY

	Protected areas (no change)
Scenario definition	The protected areas remain constant at 6.6 Mha between 2015 and 2050.
Scenario justification	The Administration of National Parks has issued a plan to double the current area in the near future, but not at the expense of highly productive areas. Therefore, we have not taken this into consideration to inform our pathway.

FOOD

	Diet (no change)	Food waste (no change)
Scenario definition	Between 2015 and 2050, the average daily calorie consumption per capita increases from 2,824 kcal to 2,855 kcal (SSP1 scenario was selected).	Between 2015 and 2050, the share of final household consumption which is wasted remains stable at 10%.
Scenario justification	We selected SSP1 scenario on diets, mainly because so far, we prioritized other variables. The impact of this assumption is yet to be determined.	Argentina wastes 16 Mt/year of food (Roulet, N, 2018, unpublished data). No projections on this issue were found.

PRODUCTIVITY

	Crop productivity (large change)	Livestock productivity (large change)	Pasture stocking rate (no change)
Scenario definition	Between 2015 and 2050, crop productivity increases: - from 8 t/ha to 21 t/ha for corn, - from 3 t/ha to 5.6 t/ha for soybean, and - from 3.7 t/ha to 10.4 t/ha for wheat.	Between 2015 and 2050, the productivity increases: - from 76 kg/TLU to 90 kg/TLU for beef, and - from 5.9 t/TLU to 6.9 t/TLU for cow milk.	The average livestock stocking density remains constant at 0.32 TLU/ha of pastureland between 2015 and 2050.
Scenario justification	The estimated yield gap in Argentina is 100% for corn, 140% for wheat, 130% for soybean (Global yield gap atlas, 2019).	The estimated yield gap in Argentina is 54% for cow-calf and 60% for finishing (Rearte, 2010).	This is a conservative assumption. Rearte (2010) estimates that it could increase by 15-20% with better management of forage resources only.

Scenario signs (=) no change (→) small change (↗) large change

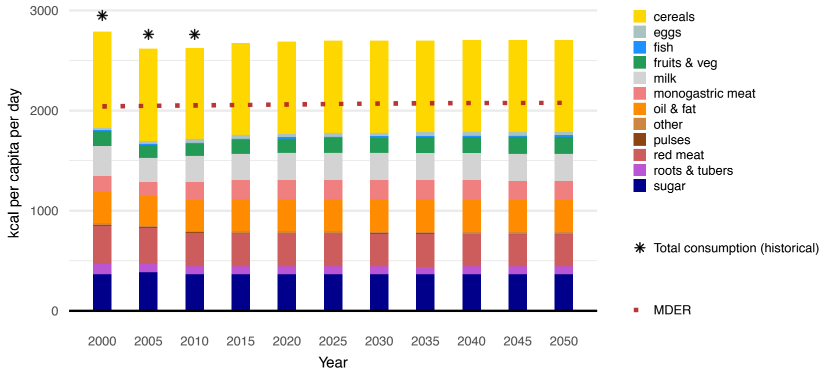
Results against the FABLE targets

The results for FABLE targets as well as "other results" are based on calculations before global trade harmonization.

Food security

Fig. 8 | Computed daily average intake per capita over 2000-2050

Note: The Minimum Daily Energy Requirement (MDER) is computed based on the projected age and sex structure of the population and the minimum energy requirements by age and sex for a moderate activity level. Animal fat, offal, honey, and alcohol are not taken into account in the computed intake.

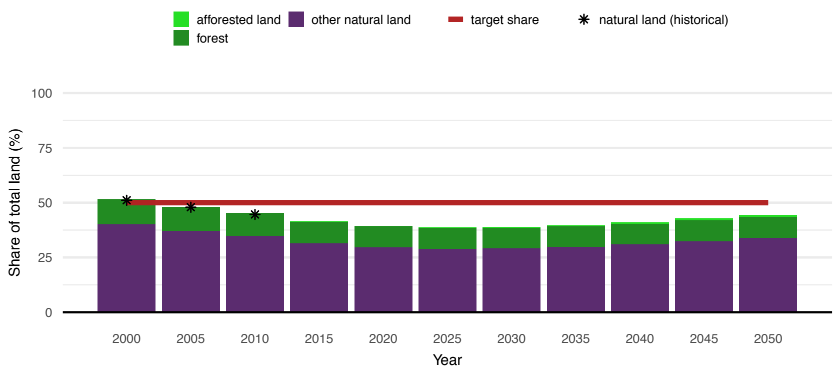


Our results show average daily energy intake per capita remains stable throughout the period, and near 20% higher than the MDER at the national level in 2050.

In relation to the recommended diet, our results show highest consumption of cereals, meat, sugar and oil and fat. Our results suggest that meeting national food security objectives will be easily attainable. However, the challenge will be linked to the distribution, ensuring that it reaches every person.

Biodiversity

Fig. 9 | Computed share of the total land which could support biodiversity over 2000-2050

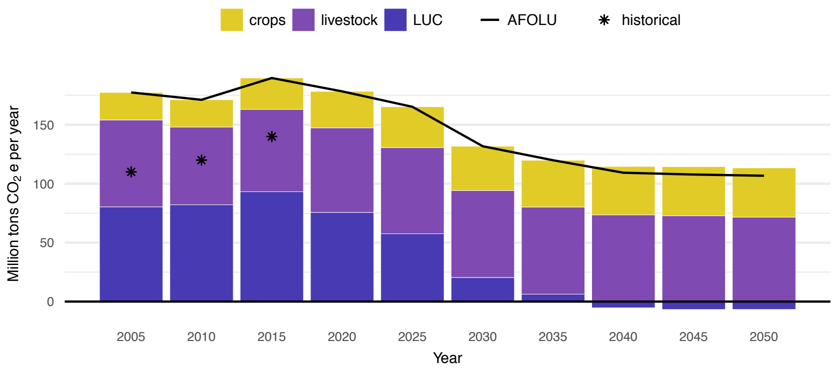


Our results show that the Share of the Land which could support Biodiversity conservation (SLB) decreases between 2000-2015 from 52% to 48%. To our knowledge, there are no statistics on past land use change to compare this estimate.

Compared to the global target of having at least 50% SLB by 2050, our results are below the target. However, we think that it does not reflect the reality since two-thirds of Argentina's territory are covered by native grasslands currently accounted for in the Calculator as pastures, while in reality they could also support for biodiversity conservation. Rewilding actions will be needed to restore native flora and fauna.

GHG emissions

Fig. 10 | Computed GHG emissions from land and agriculture



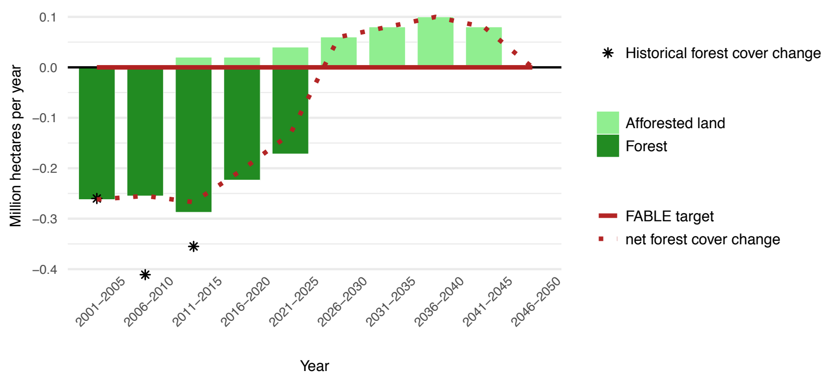
Historical data source: Second BUR Argentina (2014)

Our results show annual GHG emissions between 90 and 200 Mt CO_2e/year over 2000-2015 which decrease over time. The calculated values are lower than those expected by FAO's estimations. Peak GHG emissions from AFOLU are computed for 2015 at 145 Mt CO_2e/year. This is mostly driven by GHG emissions from land-use change (LUC). Argentina's Biennial Update Report (BUR) (Ministerio de Medio Ambiente y Desarrollo Sustentable, 2017) indicates 144 Mt CO_2e/year: 56 Mt from livestock, 45 Mt from land use, and 42 Mt from direct and indirect N_2O emissions. This is very close to our estimates even if carbon sequestration in forests and grasslands is only considered in the BUR. In our results, positive net emissions from AFOLU by 2050 are explained by livestock and crops while emissions from LUC become negative.

Compared to the global target, our GHG emissions from agriculture do not reduce over time but we do reach negative GHG emissions from LUC by 2050.

Forests

Fig. 11 | Computed forest cover change over 2000-2050



Source historical data: globalforestwatch.org (2019), Greenpeace (2019)

For the period 2001-2017, forest loss was estimated at 5.6 Mha (GFW, 2019), while the Calculator estimates 4.9 Mha for the period 2000-2020. Deforestation peak is computed for 2011-2015 at 1.5 Mha. This is in line with official statistics which report 1.7 Mha for that period (GFW, 2019). However, unofficial reports (e.g. Greenpeace) state that actual deforestation is much higher (twice the reported number). Deforestation is mostly driven by soybean, either directly (by increasing the area necessary for increasing its production) or indirectly, by pushing cattle production to areas which used to be forest previously. Our results show that annual deforestation stops in 2030. Deforestation values are expected to decrease as more provinces comply with the new Forest Code (Forest Law, 2017).

Compared to the global target of having zero or positive net forest change after 2030, our results are slightly above the FABLE target with net afforestation after 2030. However, our results do not meet our national commitment of having 1 Mha restored by 2020.

Other relevant results for national objectives

Table 1 | Other Results

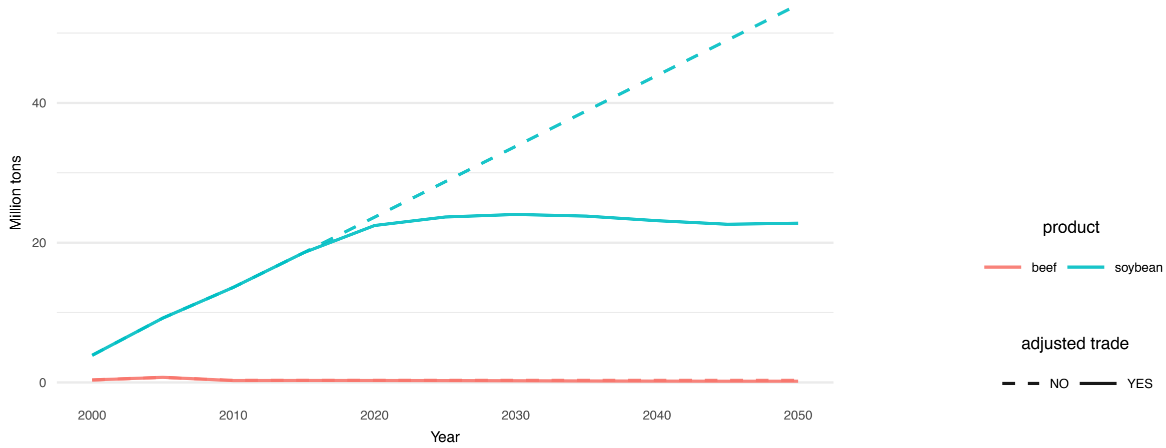
Variable	Unit	2000	2005	2010	2015	2020	2030	2040	2050
Virtual water use									
Green Water (historical)	10^9 m^3/year	241.0	250.0	256.0					
Green Water (calculated)	10^9 m^3/year	190.9	241.4	285.4	345.4	416.7	558.9	700.7	842.4
Blue Water (calculated)	10^9 m^3/year	4.7	5.1	5.5	6.0	6.6	7.6	8.6	9.6
Grey Water (calculated)	10^9 m^3/year	5.1	5.2	6.4	6.9	7.9	9.9	11.9	13.9
Share of virtual water used for exports									
Green Water (calculated)	%	46.0%	50.0%	45.7%	49.6%	50.9%	52.5%	53.5%	54.1%
Blue Water (calculated)	%	0.5%	0.6%	0.5%	0.5%	0.4%	0.4%	0.4%	0.4%
Grey Water (calculated)	%	1.4%	1.2%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%

Source of historical data: Frank (2014)

The results on virtual water use in the historical period are compatible with a local estimation available in Frank (2014). The evolution of water footprint is in line with the changes expected in land use and production of agricultural commodities. As a rainfed-agriculture producing country, it is expected that Argentina has a very large green water footprint, and very low blue and grey. The fact that more than 90% of the water footprint is green is a very good news, since rainfall rarely competes with other possible uses for fresh water (use it or lose it). Moreover, most of the recurrent flooding in the central part of the country are related to lower water use (water transpiration from soybean is lesser than that of maize and legumes). Our results show that half of the water used to produce food is exported.

Changes to Results arising from Trade Adjustments

Fig. 12 | Impact of global trade harmonization on main exported/imported commodities over 2000-2050

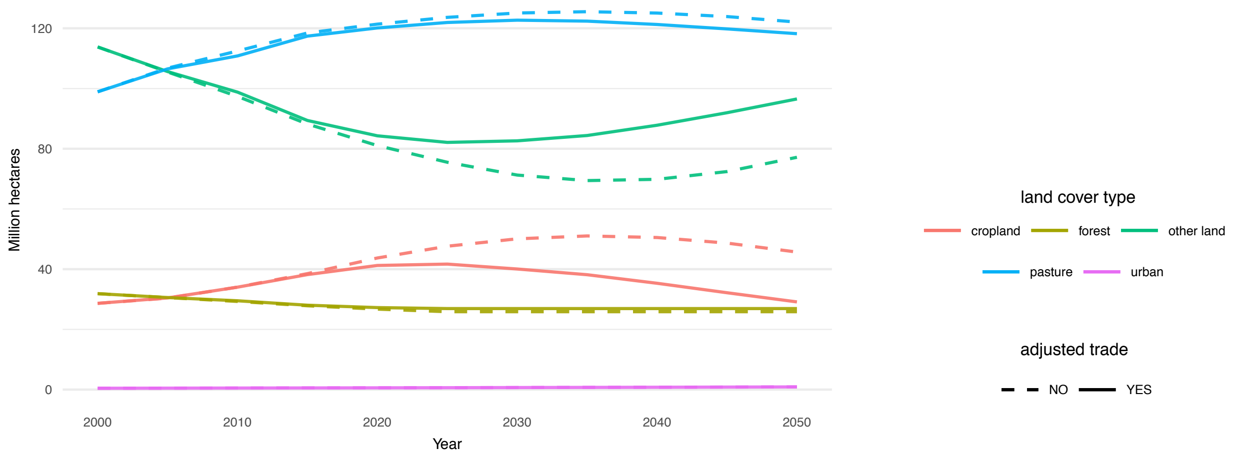


We observe a strong impact of the trade adjustment on soybean. We initially assumed a strong growth of soybean exports up to 50 Mt in 2050 but after the trade adjustment, exports peak at around 20 Mt in 2020 and then they slightly decrease until 2050 (historical value for 2017 is around 12 Mt).

The impact of the trade adjustment on beef exports is lower. We initially assumed stable beef exports over 2015-2050 at approximately 300 kt. After the trade adjustment, exports peak at 274 kt in 2015 and then reduce until 184 kt in 2050 (historical value for 2018 is around 500 kt).

Trade adjustment makes absolutely no change in imports. This is not surprising since Argentina's contribution to global trade is always on the supply side.

Fig. 13 | Impact of global trade harmonization on land use over 2000-2050



Land use by types of land cover area is the basis for analyzing the rest of the variables, and the easiest way to check if projections make any sense.

Cropland is the land cover class which is the most impacted by the trade adjustment. It is reduced by 35% in 2050 compared to pre-trade adjustment levels (dashed lines). This is mainly due to lower soybean exports: the land used for soybean productions represents more than half of the country's cropland area. Even though beef exports are also limited, this does not affect pasture area (less than 5% change). Since crops expansion occurs on other land, the impact of trade adjustment increases this class.

During the computed period, cropland area increases, but then decreases, ending in 2050 at a similar level as in 2000. Pasture area increases and then stabilizes. There are no strange or abrupt changes in tendencies, overall, it looks like there is almost no land use change.

Discussion and next steps

A central objective of the FABLE Consortium is to support the preparation of integrated national pathways towards sustainable land-use and food systems that are consistent in their trade assumptions (i.e. all trade flows have to balance out) and consistent with countries' sustainable development objectives (including the Paris Climate Agreement and the SDGs). The use of the FABLE Calculator has allowed for a sound representation of such a sustainable pathway for Argentina.

The pathway presented in this chapter can be summarized as a compromise between development and environmental objectives. Land use changes necessary to attain this pathway by 2050 are moderate. There is an increase in cropland area in the first years, but then this tendency changes, resulting in approximately the same cropland area in 2050 as in 2000. Pasture area increases by 20%, but this includes both native grasslands and sowed pastures. Forest area decreases during the period, but at less than 20%, and at a slower rate than the previous deforestation. These small changes, plus the technological improvements that will reduce yield gaps, lead to reaching the food production objectives of the country. Moreover, they allow for an increase of more than twofold in exports of food products and avoid the need for imports. It is safe to say that the target of zero hunger could be easily achieved.

The environmental impacts of pursuing this pathway are not of great concern as it could be expected from a pathway that increases production. Greenhouse gas emissions increase at first, but end in values closer to those of 2000, with emissions from deforestation disappearing after 2030. The global target was set at 4 Gt of CO_2e from crops and livestock and negative or zero from land use changes by 2050. Argentina's CO_2e contribution from crops, livestock, and land use change represents only 2.5% of that figure. The target of zero net deforestation is met by 2030, which leads to also fulfilling the zero net emissions target from land use change.

Biodiversity is another issue. The target set at 50% of land supporting biodiversity is not achieved at any time during the period. The final value is around 45%, considering that the country exports a great amount of food, its negative contribution to this target is negligible. Protected areas cover nowadays around 12%, so the 17% target is not so far away and could be easily fulfilled. To achieve these targets there are at least three necessary actions: 1) strengthen the function of protected areas as sources of reproduction of native species, 2) minimize the deterioration of natural areas that are not yet legally protected, and 3) establish rewilding plans to recover biodiversity. The latter is the most expensive and inefficient, so we believe actions 1 and 2 should be prioritized.

Increase in water use is also important to mention, since this pathway leads to doubling the water consumption to produce food. However, unless irrigation increases dramatically in the future, more than 95% of this corresponds to green water, not actually competing with other uses, hence not compromising the target of less than 2,500 km^3 per year. Further developments of this newly added indicator of the FABLE Calculator is necessary to address, for example, changes in irrigation.

Regarding the strongest limitations of the use of the FABLE Calculator to design and represent a sustainable pathway for Argentina, the first worth mentioning is biodiversity. Needless to say, it is very difficult to represent such a complex issue in a non-spatially explicit way. The idea of "land supporting biodiversity" is a fair proxy, since it is universal, but it disregards completely the biodiversity present in agricultural areas (cropland and pastures). Besides, this approach does not take into account the actual conservation status of agricultural areas, ignoring both the different negative impacts of agricultural activities on biodiversity, and the conservation value of pastures and some of the crops.

Related to this, but also to livestock production, separating native grasslands from sowed pastures is crucial. These two land covers are very different in terms of biodiversity, soil carbon storage, productivity, and management, at the very least. Moreover, in Argentina great portions of forest areas are filled with cattle as well. At this point, pasture area is estimated from cattle stocks and stocking rates, but in reality, cattle forages on pastures, native grasslands, and forests.

Another limitation of the FABLE Calculator worth mentioning relates to food distribution. Despite overachieving the target, there is the fear of not providing everyone with sufficient and healthy food. According to these results, there is plenty of food (or the capacity to grow it) yet, if there is still hunger, it is because food is not distributed equally. This raises the need for an indicator that addresses this problem, for example, by "correcting" food supply by its unequal distribution.

The use of the FABLE Calculator is a continuous process. Each iteration on the Scenathon, exchanges during global FABLE Consortium meetings, or even remote participation in FABLE coordination calls bringing together the FABLE country teams represent opportunities for further improvement. Until now, country teams have updated their FABLE country Calculator almost 20 times, from minimal corrections to the inclusion of new indicators and scenarios. With this in mind, there are several improvements and further developments that should be addressed by the Consortium in the future:

- Biodiversity present in agricultural lands and impacts of agriculture on biodiversity,
- Scenarios on the evolution of protected areas,
- Separating native grasslands from pastures,
- Food distribution inside the countries,
- Scenarios on water use and irrigation, and
- Other indicators to assess other targets (e.g. nutrients).

One of the most important steps that the FABLE Argentinian country team is pursuing is the integration of the FABLE Calculator with other available tools. Advances have been made in using the results from the Calculator (primary production only) to feed into other models, such as the Long-range Energy Alternatives Planning system, to estimate GHG emissions throughout the supply chain of the food system. As an example, the case of soybean and all of its byproducts has been analyzed and presented in a report to the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) in 2019.

In parallel, another national ambition that can be explored in the framework of the FABLE analysis is the potential for Argentina to shift from being a producer of commodities to being a producer of high agricultural value products, which would also include an improvement of the internal market, and the promotion of environmentally friendly agricultural practices, such as agroecology. Besides considering the political, technological, and economic feasibility of such a shift, the Calculator should be modified to include these aspects. On the other hand, the technological intensification paradigm appears as one of the most hopeful alternatives to achieve sustainability, especially in the production of food. This would mean increasing productivity per hectare, production of new forms of food, new technologies in food transportation, and depending on the policies of future governments, the incentive or disincentive to develop technological packages aimed at adding value to primary production.

Beyond the analytical development of a sustainable pathway by the FABLE Argentinian country team that is in line with the FABLE global targets and is as realistic as possible, the implementation of such a pathway is challenging, mainly with regards to "selling it to decision makers". The main challenges for implementing this sustainable pathway in Argentina are the pressure exerted by agricultural lobbies (e.g. promoting soybean monoculture which rely on an important use of Glyphosate), corruption, weak law enforcement, lack of interest, etc. Besides, recurring changes of direction in decision making regarding land use, foreign trade policies, and commodity market are expected to continue. Being part of the FABLE Consortium for over a year, with our preliminary results in hand, Argentina's country team should explore how to address this issue right away. None of the technical limitations and flaws mentioned here should be an excuse to stop the continuous work of making use of the FABLE Calculator and its development, in parallel to exploring ways to effectively present and discuss its results with stakeholders.

Another issue of great importance to the country team are "spillover effects", understood here as the effects of the decisions taken in one country on other countries. For example, the positive (income) and negative (deforestation, herbicide pollution, GHG emissions, etc.) effects of China's soybean imports from Argentina (also estimated and discussed in the previously mentioned GIZ report). This phenomenon can be observed in richer countries, where they buy food for their internal consumption from abroad to enable the country to get closer to achieving the SDGs on its territory, thus creating spillover effects on the producing countries. We believe these effects should be discussed in greater detail within the Consortium.

Nowadays, Argentina is basically a soybean exporter, with a very linear and simple system (exporting mainly to China). This simplification makes Argentina very vulnerable to any change in global foreign trade networks. The pressure of Argentina's external debt, together with possible free trade agreements establishes a lock on the future, making it difficult to move towards a paradigm shift: a diversified system with high added value and job creation, prioritizing food security over the entire surface of the country and establishing foreign trade agreements with a multiplicity of countries, multiplying the redundancy, alternative channels and strengthening the country's position in the global system.

If the FABLE project can be used to prove that a more intricate system of food-trade relationships between Argentina and other countries could be achieved using economically and environmentally sustainable means, an important step towards Argentina's achievement of the SDGs will definitely be taken.

Units

% – percentage
bln – billion

cap – per capita

CO_2 – carbon dioxide

CO_2e – greenhouse gas expressed in carbon dioxide equivalent in terms of their global warming potentials

GHG – greenhouse gas

Gt – gigatons

ha – hectare

kcal – kilocalories

kg – kilogram

kha – thousand hectares

km^2 – square kilometer

kt – thousand tons

Mha – million hectares

mln – million

Mt – million tons

t – ton

TLU –Tropical Livestock Unit is a standard unit of measurement equivalent to 250 kg, the weight of a standard cow

t/ha – ton per hectare, measured as the production divided by the planted area by crop by year

t/TLU, kg/TLU, t/head, kg/head- ton per TLU, kilogram per TLU, ton per head, kilogram per head, measured as the production per year divided by the total herd number per animal type per year, including both productive and non-productive animals

tln – trillion

USD – United States Dollar

References

AGN. (2019). Fauna silvestre en peligro de extinción [Data set]. *Auditoría General de La Nación*. Retrieved from https://www.agn.gov.ar/

Baumann Fonay, Iván y Cohan, & Luciano. (2018). *Crecimiento económico, PTF y PBI potencial en Argentina*. Retrieved from Ministerio de Hacienda, Subsecretaría de Programación Macroeconómica website: https://www.argentina.gob.ar/sites/default/files/crecimiento-economico-ptf-y-pib-potencial-en-argentina_1.pdf

Bonn Challenge. (2014). Bonn Challenge Argentina. Retrieved July 10, 2019, from http://www.bonnchallenge.org/content/argentina

FAOSTAT. (2019). *FAOSTAT database*. [Data set]. Retrieved from http://www.fao.org/faostat/en/#data

Forest Law. (2017). *Ley 26.331 de Presupuestos Mínimos de Protección Ambiental de los Bosques Nativos*. Retrieved from Presidencia de la Nación website: http://servicios.infoleg.gob.ar/infolegInternet/anexos/135000-139999/136125/norma.htm

Frank, F. (2014). *Flujos de Agua y Energía en 40 años de agricultura en Argentina*. Universidad Nacional de Mar del Plata, Argentina.

GFW. (2019). *Global Forest Watch Website* [Data set]. Retrieved from https://www.globalforestwatch.org/notsupportedbrowser

Global yield gap atlas. (2019). *Food security analysis: from local to global* [Data set]. Retrieved from http://www.yieldgap.org/

Greenpeace. (2019). *Greenpeace Argentina Website*. Retrieved from https://blog.greenpeace.org.ar/

INDEC. (2019). *Instituto Nacional de Estadística y Censos de la República Argentina*. Retrieved from https://www.indec.gob.ar/

INTA. (2019). *Atlas de consumo de alimentos* [Data set]. Retrieved from https://inta.gob.ar/documentos/atlas-de-consumo-de-alimentos

Lopez-Dardaine, M. (2018). *How does Argentina stand in the world market of grain and their by-products?* Retrieved from UNCTAD website: https://unctad.org/meetings/en/Presentation/MYEM2018_Mauricio_Lopez_Dardaine_26042018.pdf

Ministerio de Medio Ambiente y Desarrollo Sustentable. (2017). *Segundo informe bienal de actualización de la República Argentina a la Convención Marco de las Naciones Unidas sobre el Cambio Climático.* Retrieved from Ministerio de Medio Ambiente y Desarrollo Sustentable website: https://www.argentina.gob.ar/

OEC. (2019). Argentina Exports, Imports and Commercial Partners [Data set]. *Observatory of Economic Complexity Website*. Retrieved from https://atlas.media.mit.edu/en/

Presidencia de la Nación. (2017). *Monitoreo de la superficie de bosque nativo de la República Argentina*. Retrieved from Presidencia de la Nación website: https://www.argentina.gob.ar/

Rearte, D. (2010). *Situación actual y prospectiva de la producción de carne vacuna*. Retrieved from Instituto Nacional de Tecnología Agropecuaria website: https://inta.gob.ar/documentos/situacion-actual-y-prospectiva-de-la-produccion-de-carne-vacuna

Secretaría de Agroindustria. (2019). *Datos Agroindustriales, Versión: 2.5.4*. Retrieved from https://datos.agroindustria.gob.ar/

Simoes, A., & Hidalgo, C. (2011). *The Economic Complexity Observatory: An Analytical Tool for Understanding the Dynamics of Economic Development*. Presented at the Workshops at the Twenty-Fifth AAAI Conference on Artificial Intelligence. Retrieved from https://atlas.media.mit.edu/en/