



Agriculture

The Agriculture scenario

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The Agriculture scenario

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Briefly

This section models an Agriculture scenario that emulates the impact of an agricultural revolution on the continent. The scenario is built on eight interventions within the IFs forecasting platform to address the pressing issues of low productivity, high climate vulnerability, high agricultural losses, weak access to agricultural markets and high malnutrition rates. Each intervention initialises from individual country data, and the improvements are benchmarked to ambitious rates of progress in countries at similar levels of development. Addressing the challenges outlined in the previous section will boost farmers' income, helping to stimulate public demand for goods and services in rural areas, which will establish new enterprises and contribute to the broader process of structural economic transformation and diversification. Collectively the interventions promise improvements in food security and income growth for Africa and its large subsistence farming population.

The underlying logic to the interventions and their key outcomes and eventual impacts is summarised in Chart 6 below.

Chart 6: The Agriculture scenario

Logic	Intervention	Outcome	Impact
Revitalised agriculture sector: modern farming techniques and better inputs	Increased crop yields	More productive agricultural sector	Food security and sustainable economic growth
Decentralised irrigation and wider uptake	Increased land area equipped for irrigation	Climate resilient/sustainable agricultural sector	
Secure water access	Increase water withdrawal (ground)		
Ecosystem restoration	Increase forest protection	Reduce agricultural losses	
Improved food storage and supply chains	Reduce agriculture loss rate at point of production, and from production to consumer		
Connect rural communities to economic centres	Increase access to rural roads	Improve agriculture commercialisation	
Meet domestic food demand	Calories per capita multiplier	Increase domestic food access and consumption	

Increased crop yields

The first IFs intervention is on improving crop yields. Most African countries can improve yield outputs by improving inputs. This intervention assumes that governments prioritise agricultural productivity improvements through:

- Adopting modern farming techniques: Precision and mechanised farming equipment, satellite monitoring, early warning systems, sensors, access to information and crop rotation are all potent ways of improving productivity and efficiency.
- Improving the use of and access to improved seedlings: Farmers, particularly subsistence farmers, require access to drought-tolerant, disease-resistant, high-yielding seeds.
- Improving tenure security and transferability: Many African countries have recently started overhauling communal land rights, creating a middle ground between individual freehold and the customary colonial model. The result is progress on land administration at a reasonable cost. It is being pursued in countries as diverse as Ethiopia, Rwanda, Côte d'Ivoire, Ghana, Benin, Burkina Faso and Tanzania.
- Increasing fertiliser use: Fertilisers are critical to improving soil fertility, an essential component of boosting yields. While this has improved in many African countries, limited access to and sporadic use and low uptake of fertilisers are still noticeable in most.

In the Agriculture scenario, Africa's average crop yields improve to 7 tons per hectare by 2043, representing a 37% improvement compared to the Current Path forecast of 5.1 tons per hectare. The intervention brings yields per hectare closer to South Asia's 7.7 tons per hectare by 2043 but is still to be less than half that of South America's 16.7 tons. The improvements are particularly potent for Central and East Africa, where yields will increase by 41% above the Current Path forecast by 2043. Yields will improve by 40% and 35% compared to the Current Path forecast for Central and Southern Africa. Even with modest interventions in North Africa, yields can increase by 14% above the Current Path by 2043, indicating the importance of improving agricultural inputs.

Increase land area equipped for irrigation

Access to irrigation was one of the three key components that underpin Asia's green revolution. However, most African countries' stock of land currently under irrigation is meagre, with about 5% of cropland under irrigation, compared to the global average of 21%. Most of the cropland in sub-Saharan countries is rain-fed, dependent on predictable seasonal rainfall, which is increasingly becoming irregular due to climate change and desertification. This intervention is a critical adaptation response to climate change. Irrigation allows farmers to grow crops year-round, diversifying production and increasing crop yields, but is costly and not applied in countries with more predictable and consistent rainfall that experiences fewer meteorological droughts. These include the lower band countries of West Africa and western equator countries such as Nigeria, Benin, Ghana, Côte d'Ivoire, Liberia, Guinea, Sierra Leone, Equatorial Guinea, Gabon, Central African Republic and Congo, where ample water makes rain-fed agriculture still viable. However, this is a critical adaptation measure in Southern Africa, the Sahel and the Horn of Africa.

In 2019, Africa had roughly 14.2 million hectares of land under irrigation. In the Current Path forecast, the amount of irrigated land decreases such that by 2043 only 13.8 million hectares are under irrigation. In the Agriculture scenario, irrigated land will increase by 3.6 million hectares to 17.4 million hectares by 2043—a 26% increase above the Current Path. The intervention has the following impact on Africa's various regions:

- Central Africa sees an increase of 159% compared to the Current Path forecast by 2043, but equivalent to only 145 000 hectares. Central Africa remains the region with the lowest irrigation use due to rain-fed agriculture remaining a viable

option given higher annual rainfall levels and a tropical climate.

- East Africa sees a 34% increase compared to the Current Path forecast, pushing irrigated land to 5 million hectares by 2043.
- In Southern Africa, irrigated land is pushed up to 3.6 million hectares by 2043—a 71% increase from the Current Path forecast in the same year.
- West Africa sees a 49% increase compared to the Current Path forecast in 2043, but this comes off a low base and the intervention only adds 471 000 hectares of irrigated land, pushing irrigated land to 1.4 million hectares in 2043. The majority will be in the northern belt of West Africa, where the semi-arid climate and frequent droughts necessitate irrigation.
- North Africa is already well developed in terms of irrigated land. Currently, it boasts around 7.1 million hectares of irrigated land and the scenario sees an increase of only 3.3% for this region.

Increased water withdrawal

Increasing agriculture production inevitably increases the water demand, particularly for irrigation but expanding irrigation in many countries is made difficult by limited access to water resources. Excluding South Africa, Africa also has the world's lowest water storage capacity: 43 m³ per person compared to 6 150 m³ per person in North America. (South Africa's storage capacity is 750 m³ per person.) As a result, much of the continent has little ability to control water flow and conserve it during periods of abundance for use during periods of scarcity. Dryland conditions, variable rainfall and non-perennial rivers necessitate access to sustainable water resources such as groundwater. High rainfall bands (in lower West Africa and western equator countries) with fewer meteorological droughts can utilise either rainwater harvests or surface water sources. The intervention increases the total water supply in Africa by 14% compared to the Current Path forecast in 2043 (309 instead of 267 cubic kilometers). Higher interventions are applied in countries with dryland conditions (in steppe and desert climates) and savanna areas faced with repeated and severe rainfall variability and meteorological droughts. Groundwater extraction should, however, be carefully managed to ensure the sustainability of resources, but it remains an underutilised water resource across much of sub-Saharan Africa.

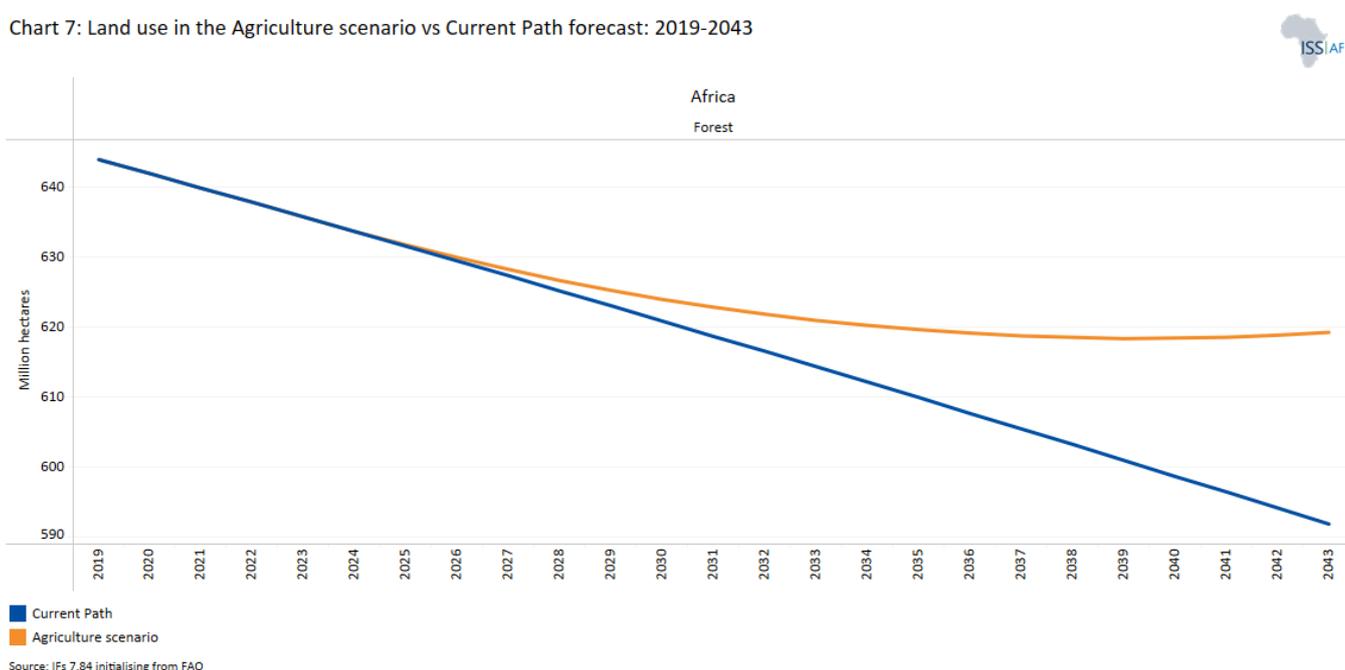
Increased forest protection

Many subsistence farming practices in rural areas across Africa significantly strain land resources, and increased land degradation and deforestation threaten agricultural productivity and sustainability. Historically, increased agriculture production in Africa came from expanding land use. Estimates suggest that Africa has 480 to 840 million hectares of untapped agricultural land. However, much of this land is heavily forested or currently unreachable, implying the need to balance land use with afforestation. The IFs Current Path forecast already includes an expansion of crop land from 279.7 million hectares in 2023 to 298.8 million hectares in 2043. The intervention emulates a reduction in the deforestation rate through environmental conservation and protection, reflecting the protection of forests in critical areas. Reforestation is applied in a select few countries to restore ecosystem services. The result reduces the rapid deforestation rate currently observed on the continent and slows it down such that by 2036 deforestation is stopped and forest land is slowly reintroduced, restoring forest land by 2043 to levels observed in 2029. This scenario therefore assumes an ecosystem-based approach that focuses on sustainable land management practices and ecosystem restoration and protection by increasing forest protection to protect rural communities against floods, soil erosion and other negative impacts of climate change.

In the Agriculture scenario (Chart 7):

- Forest land is forecast to decrease from 644 million hectares in 2019 to 592 million hectares by 2043 in the Current Path forecast. The Agriculture scenario limits this decline to 622 million hectares by 2043, saving 30 million hectares of forest land. While much more aggressive interventions are needed on the continent, it would come at the cost of agricultural land expansion and food security.
- The protection of forests reduces the availability of cropland. In the Current Path forecast, cropland expands from 279 million hectares in 2019 to 312 million in 2043. However, in the Agriculture scenario, cropland only expands to 300 million hectares in 2043—a difference of 12 million hectares.
- The same holds for grazing land: in the Agriculture scenario, it equates to 903 million hectares in 2043, whereas in the Current Path forecast, it will be 920 million hectares by 2043.
- The intervention has the biggest impact in Central Africa, adding 2.3 million hectares of forest to this critical ecosystem between 2019 and 2043.

Chart 7: Land use in the Agriculture scenario vs Current Path forecast: 2019-2043



Improved food supply chains

Reduced post-harvest losses will increase food availability. Whereas the average loss and waste of **agricultural produce** in the rest of the world is roughly 14%, it is at 24% in Africa and up to 30% in West Africa. Unlike in Europe and North America, where most food reaches the consumer and is discarded or wasted, almost a third of the food loss in Africa happens in the production stage. Modern technology can play a big role here as, according to FAO, one-third of the world's food—approximately 1.3 billion tons and worth US\$1.2 trillion a year—is wasted. Technology can help track inventory and reduce food waste along the distribution chain. One African example is **InspiraFarms**, which produces affordable, energy-efficient cold storage and processing equipment for on- or off-grid use. Reduced post-production losses and increased yields can increase food availability for local consumption and export (or at least reduce import dependency).

In the Current Path forecast, agricultural loss and waste (as a share of production) will increase from 24.3% in 2019 to 26.3% by 2043, more than 8% above South Asia and double that of South America. In the Agriculture scenario, food loss and waste fall quickly to 19.4% by 2033, followed by a slight upward trend towards 2043.

Increased access to rural roads

Farmers need to sell their products to obtain an income, making access to markets essential. Given the large rural population in Africa, investing in rural access roads will promote positive economic impacts such as improved rural incomes, better [agricultural productivity](#) and increased economic participation. Improved rural mobility and connectivity will promote positive social impacts such as reducing poverty, addressing the exceptionally high maternal mortality rate and improving paediatric health through easier access to healthcare facilities.

Africa has less than half the kilometres of roads per capita compared to the world's average. Likewise, the percentage of the African rural population with access to an all-weather road was 56% in 2019, compared to a world average of 77%. The Agriculture scenario pushes the percentage of rural accessibility up to 69% compared to the Current Path forecast at 62%. The scenario's impact is largest in Central Africa, where accessibility increases from 47% in the Current Path forecast to 57% in 2043 (a 23% increase).

Calories per capita increase

Calories per capita is used in the Agriculture scenario as a proxy to ensure that the additional agriculture produce that flows from the various interventions in the scenario is not all exported but that some are domestically consumed, thus reducing the food import bill and improving food security. The vast majority of African countries have more than 2 000 calories per person per day, as recommended by the World Health Organisation. Africa has therefore made good progress, although the positive national numbers obscure very large sub-national and local differences in per capita calory access. In 2019 it was only low-income Somalia, Burundi, Madagascar, Central African Republic and the DR Congo that had less than 2 000 calories per person per day, although all are forecast to progress above the minimum within the next decade on the Current Path forecast.

To emulate an increase in domestic food security before prioritising exports, the intervention increases average calories per person per day by 4.4% in 2043 compared to the Current Path forecast. Africa climbs to 2936 calories per capita per day, compared to a world average (that excludes Africa) at 3272 in 2043. The intervention has the biggest impact in Central Africa, improving calories available by 9% compared to the Current Path forecast by 2043. North Africa continues to outperform the region throughout the forecast horizon, although the intervention only increases calorie availability by 2.2%.

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Scenarios and forecasting can help Africa identify and respond to opportunities and threats. The work of the African Futures & Innovation (AFI) program at the Institute for Security Studies aims to understand and address a widening gap between indices of wellbeing in Africa and elsewhere in the world. The AFI helps stakeholders understand likely future developments. Research findings and their policy implications are widely disseminated, often in collaboration with in-country partners. Forecasting tools inspire debate and provide insights into possible trajectories that inform planning, prioritisation and effective resource allocation. Africa's future depends on today's choices and actions by governments and their non-governmental and international partners. The AFI provides empirical data that informs short- and medium-term decisions with long-term implications. The AFI enhances Africa's capacity to prepare for and respond to future challenges. The program is headed by Dr Jakkie Cilliers.