# CGIAR SYSTEM
# ANNUAL PERFORMANCE REPORT ON 2017

## CGIAR Contribution Towards System-Level Outcome Targets

# ANNEX TABLE A – CGIAR CONTRIBUTION TO SYSTEM LEVEL OUTCOME TARGETS

**Notes:**

- The left-hand column records the 'aspirational targets' for 2022 from CGIAR's SRF.[1]
- The second column shows links to relevant SDG targets.[2]
- The third column records available information on global progress against each target. This helps identify areas which are most off track globally and may need additional investment (in actions/research to tackle each area and/or in gathering more evidence on impact of existing actions). Global data is incomplete in many areas, and CGIAR is one of the main contributors to improved data.
- The right-hand column lists recent evidence on the CGIAR contribution to global progress against each target.[3] Mostly this relates to new evidence published in 2017 of adoption and ex-post impact of earlier CGIAR work.[4] There are also some cases of monitoring of current (2017) scaling-up programs. Ex ante projections are not reported. A database of collected adoption and impact evidence is under construction.

[1] CGIAR, "CGIAR Strategy and Results Framework 2016-2030: Redefining How CGIAR Does Business until 2030" (Montpellier, France: CGIAR, 2015), http://hdl.handle.net/10947/3865.

[2] CGIAR has recently mapped all its 'sub-IDOs' (sub-Intermediate Development Outcomes, part of the SRF) to SDG targets, and is incorporating this mapping into Management Information Systems. This will facilitate reporting more closely against specific SDG targets in future years.

[3] These figures cannot be summed or accumulated over years, for a variety of reasons including methodology, disadoption or other changes over time, and the possibility of double-counting some people who may have adopted or benefited from more than one CGIAR innovation.

[4] Because the timeline between initiating agricultural research and ultimate impact at scale is typically 5-25 years, much of the evidence presented relates to earlier CGIAR research. However, the majority of current CGIAR programs build on earlier work and are expected to have the same order of impact.

| SRF ASPIRATIONAL TARGET | LINKS TO SDGS | LATEST DATA AVAILABLE ON GLOBAL PROGRESS | RECENT EVIDENCE ON CGIAR CONTRIBUTION TO GLOBAL PROGRESS |
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| 1.1 100 million more farm households to have adopted improved varieties, breeds or trees, and/ or improved management practices |  | **Insufficient global data**<br>  <br>Efforts to track adoption of improved varieties and management practices on a global scale vary widely by methodology, definition, and region. Data quality is better for varietal adoption than for adoption of management practices. Data from smallholder households are expensive and cumbersome to collect, and data based on expert opinion can be unreliable. Current adoption estimates rely on a wide variety of regional case studies and do not necessarily reflect global trends.<br><br>Estimates of crop variety adoption rates in sub-Saharan Africa specifically show that cropped area of improved varieties increased by 10-15% between 1998 and 2010. Genetic improvements to food crops, including major cereal grains as well as legumes, roots, and tubers, were estimated to have raised aggregate food crop output in sub-Saharan Africa by 15%.[5]<br><br>SDG data on agriculture has many gaps. Entities such as the Global Strategy to Improve Agricultural and Rural Statistics (GSARS), hosted by the statistics division of the FAO, have been developed in response to this need for robust agricultural data. At CGIAR, approaches using DNA fingerprinting, remote sensing, adjustments to large-scale household surveys, and openly accessible global data will in future enable more rigorous tracking of agricultural technology adoption rates globally.[6] | New evidence on adoption: An estimated 3.1 million farm households in Nigeria (66%, varying across regions) have adopted improved cassava varieties.[7] (Reported by RTB/IITA).<br><br>Monitoring data for 2017: 271,000 rural households (1.6 million individuals) in Ethiopia were provided with emergency seed of improved varieties, which they grew on 100,000 ha.[8] (Reported by WHEAT)<br><br>Monitoring data for 2017: In Bangladesh and Nepal, 81,100 farmers (11% women) adopted improved rice varieties and/or management practices on 26,800 ha in 2017.[9] (Reported by RICE)<br><br>New evidence on adoption: At least 69,540 households in Kenya had adopted CGIAR-informed agroforestry innovations.[10] (Reported by FTA)<br><br>New evidence on adoption: The GIFT strain of improved tilapia (farmed fish), which continues to be genetically improved over time, has now been disseminated in 16 countries and there are high rates of adoption, with 53% of production in fish hatcheries in Bangladesh and 40% in the Philippines found to use GIFT or GIFT-derived tilapia strains.[11] (Reported by FISH)<br><br>New evidence on adoption: 60% of the potato area in Peru (approximately 192,000 ha) is planted with improved varieties, and half of this |

[5] T.S. Walker and J. Alwang, Crop Improvement, Adoption and Impact of Improved Varieties in Food Crops in Sub-Saharan Africa (CABI, 2015).
[6] J.R. Stevenson, K. Macours, and D. Gollin, "The Rigor Revolution in Impact Assessment: Implications for the CGIAR," (Rome: CGIAR Independent Science and Partnership Council (ISPC), 2018).
[7] T. Wossen et al., "The Cassava Monitoring Survey in Nigeria Final Report" (Ibadan, Nigeria: International Institute of Tropical Agriculture (IITA), 2017); Standing Panel on Impact Assessment (SPIA), "What Is the True Impact of Improved Cassava Varieties in Nigeria?" Brief (Rome, Italy: Independent Science and Partnership Council, 2018).
[8] CIMMYT, "Emergency Seed Support for Drought Affected Maize and Wheat Growing Areas of Ethiopia: 01 January 2016 - 30 June 2017: End of Project Report" (Addis Ababa, Ethiopia: International Maize and Wheat Improvement Center (CIMMYT), 2018).
[9] CSISA, "Cereal Systems Initiative for South Asia Phase III Annual Report 2017," 2017, http://csisa.org/annual-reports/.
[10] K. Hughes et al., "Assessing the Downstream Socioeconomic and Land Health Impacts of Agroforestry in Kenya: Impact Assessment Report" (Independent Science and Partnership Council, 2017).
[11] R.W. Herdt, "Documenting the Impact of Widely-Adopted CGIAR Research Innovations," SPIA Technical Note (Rome, Italy: CGIAR Independent Science & Partnership Council (ISPC) Secretariat, 2018).; Kumar, Ganesh, and Carole R. Engle. "Technological Advances That Led to Growth of Shrimp, Salmon, and Tilapia Farming." Reviews in Fisheries Science & Aquaculture 24, no. 2 (April 2, 2016): 136–52. https://doi.org/10.1080/23308249.2015.1112357.

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| | | | (approximately 30% of the total potato area) is planted with varieties that were released by CGIAR with national partners. The new varieties showed an increase in yields in farmers' fields of about 1 ton/ha, equivalent to an additional average annual profit of US$ 585 per farmer.[12] (Reported by RTB)<br><br>Updated adoption data: 79 CGIAR-derived winter wheat varieties, including those released between 2000 and 2017 by the Kazakhstan-Siberian Network on Wheat Improvement were grown on 130,000 ha.[13] (Reported by WHEAT.)<br><br>Updated adoption data: The total area sown with CGIAR Brachiaria hybrids (forage grasses) increased by 103,000 ha in 23 countries in 2017 (monitoring data).[14] Global acreage has nearly doubled since 2013 and is now estimated to be 829,000 ha in 30 countries. In a separate study of five Latin American countries,[15] the total area planted with improved CGIAR Brachiaria varieties (including hybrids) was estimated to be about 3.9 million ha. (Reported by LIVESTOCK)<br><br>New evidence on increased species conservation: On-farm crop diversity and fruit consumption and/or marketing increased for 160,000 households across Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan.[16] (Reported by FTA)<br><br>(Note: adoption studies which also contain evidence of impacts such as poverty reduction and nutrition are reported under those targets, below) |

[12] W. Pradel et al., "Adopcion e impacto de variedades mejoradas de papa en el Peru: Resultado de una encuesta a nivel nacional (2013)." (Lima, Peru: International Potato Center, 2017), https://doi.org/10.4160/9789290602118.
[13] Annual Reports of the Kazakhstan-Siberia Network on Spring Wheat Improvement (KASIB), 2001-2017, based on unpublished Ministry of Agriculture statistics and Craig T. Beil et al., "Population Structure and Genetic Diversity Analysis of Germplasm from the Winter Wheat Eastern European Regional Yield Trial (WWEERYT)," Crop Science 57, no. 2 (04/01 2017): 812–20, https://doi.org/10.2135/cropsci2016.08.0639.
[14] Estimate based on seed sales data and a conservative sowing rate of 7kg/ha.
[15] R. Labarta et al., "Assessing the Adoption and Economic and Environmental Impacts of Brachiaria Grass Forage Cultivars in Latin America Focusing on the Experience of Colombia," SPIA Technical Report (Rome: Standing Panel for Impact Assessment (SPIA), 2017).
[16] E. Gotor et al., "Livelihood Implications of in Situ-on Farm Conservation Strategies of Fruit Species in Uzbekistan," Agroforestry Systems, January 31, 2017, https://doi.org/10.1007/s10457-017-0069-6.

| SRF ASPIRATIONAL TARGET | LINKS TO SDGS | LATEST DATA AVAILABLE ON GLOBAL PROGRESS | RECENT EVIDENCE ON CGIAR CONTRIBUTION TO GLOBAL PROGRESS |
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| 1.2 30 million people, of which 50% are women, assisted to exit poverty |  | **Globally on track**<br>  <br>World Bank data show that the poverty headcount (including those living on less than US$ 1.90 a day) has dropped significantly from 1.73 billion people in 1999 to 783 million in 2013. The average international poverty gap has also dropped from 9.6% in 1999 to 3.3% in 2013.[17] Although gender-disaggregated data are not yet available via the SDGs, are reported to represent about half (50.3%) of the world's extreme poor.[18] Recent statistics show that 80% of the extreme poor live in rural settings.[19] | New evidence on adoption and impact: Around 9.6 million households adopted improved rice varieties (including NERICA) in Africa between 2000 and 2014. The rate of adoption of these varieties increased over these years and was more significant after the 2008 food crisis. Average income from rice more than doubled for NERICA adopters, from US$ 25 per capita to US$ 58 per capita. An estimated 8 million people were lifted out of poverty.[20] (Reported by RICE)<br><br>New evidence on adoption and impact: In Nigeria, about a quarter (24%) of sampled farmers had adopted drought tolerant maize varieties. Adoption on average reduced the level of downside risk of crop failure by 80% (this is critical for food insecure smallholders) and maize yields were also 13% higher compared to non-adoption. An estimated 2.1 million individuals were lifted out of poverty. A smaller study in southeast Zimbabwe estimated that 30% of farmers had adopted drought tolerant maize and that this provided extra income of US$ 240/ha or more than nine months of food at no additional seed cost.[21] (Reported by MAIZE)<br><br>New evidence on impact: Gains in cassava productivity in Nigeria are associated with reduced poverty. At a poverty line of US$ 1.25 per person per day and using national adoption estimates from DNA fingerprinting, cassava productivity gains were associated with a reduction in poverty by an estimated 4.7 percentage points, implying that 8.4% of Nigeria's rural poor cassava producers (1.8 million people) escaped poverty in 2015/16.[22] (Reported by RTB/IITA) |

[17] World Bank, "PovcalNet," accessed August 31, 2018, http://iresearch.worldbank.org/PovcalNet/povDuplicateWB.aspx.
[18] UN Women Headquarters, "Spotlight on Goal 1: Gender Differences in Poverty and Household Composition through the Life Cycle. World Bank" (World Bank, Washington, DC, 2018), http://www.unwomen.org/en/digital-library/publications/2018/4/gender-differences-in-poverty-and-household-composition-through-the-life-cycle.
[19] UN Women Headquarters, "Turning Promises into Action: Gender Equality in the 2030 Agenda for Sustainable Development" (United Nations Women, 2018), http://www.unwomen.org/en/digital-library/sdg-report.
[20] A. Arouna et al., "Contribution of Improved Rice Varieties to Poverty Reduction and Food Security in Sub-Saharan Africa," Global Food Security, Food Security Governance in Latin America, 14 (September 1, 2017): 54–60, https://doi.org/10.1016/j.gfs.2017.03.001.
[21] T. Wossen et al., "Measuring the Impacts of Adaptation Strategies to Drought Stress: The Case of Drought Tolerant Maize Varieties," Journal of Environmental Management 203 (December 1, 2017): 106–13, https://doi.org/10.1016/j.jenvman.2017.06.058; R.W. Lunduka et al., "Impact of Adoption of Drought-Tolerant Maize Varieties on Total Maize Production in South Eastern Zimbabwe," Climate and Development (September 7, 2017): 1–12, https://doi.org/10.1080/17565529.2017.1372269.
[22] Wossen et al., "The Cassava Monitoring Survey in Nigeria Final Report"; Standing Panel on Impact Assessment (SPIA), "What Is the True Impact of Improved Cassava Varieties in Nigeria?"

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| | | | New evidence on adoption and impact: In Sulawesi, Indonesia, an independent review concluded that approximately 637,000 people (52% women) had improved their income as a result of adopting tree domestication technologies under the Ag-For project.[23] (Reported by FTA)<br><br>New evidence on adoption and impact: In Yunnan province, China, the estimated present value of economic benefits from planting the Cooperation-88 (C88) potato variety, developed cooperatively by CIP and Chinese researchers and released in 1996, ranged from a low of US$ 2.84 billion to a high of US$ 3.73 billion over a 19-year period.[24] (Reported by SPIA for CIP/RTB) |
| 2.1 Improve the rate of yield increase for major food staples from current <1% to 1.2-1.5%/year<br><br>(This target range refers to maize, rice and wheat global annual average yield gains, which are based |  | **Global trends are unclear at this time**<br>  <br>Global data on rice, maize, and wheat show that yield increases will be smaller than hoped. Yields are expected to grow between 2017 and 2026, but not to 1.2-1.5% per year targets. Figures show global yields will rise 0.88% for wheat, 1.01% for maize, and 1.11% for rice.[25]<br><br>Wheat yield gains in developing countries specifically are more encouraging. Statistics from FAO and USDA indicate that wheat production is increasing in line with 1.5% goals.[26]<br><br>No data is available on whether gains are achieved through "sustainable intensification". | *Studies of yield increases at scale that also contain evidence of impacts such as poverty reduction and nutrition are reported instead under those targets – see other rows in this table.*<br><br>New evidence on yields: A major review of the adoption of NERICA and other improved rice varieties in Africa[27] (see above) reported positive and significant impacts of improved rice varieties on on-farm yields, with estimated impact ranging from 0.16 to 0.71 tons/ha. In many cases, yields and total factor productivity (TFP) gains were significantly higher for women rice farmers than for men (e.g. average TFP of rice farming increased by 38% for women and 25% for men in a study in Benin. However, there appeared to be a decreasing trend in the impact on yield observed over the years, estimated at 0.03 tons per ha per year. This is probably due to farmers saving their own poor-quality seed and not buying new certified seed. (Reported by RICE) |

[23] N. Khususiyah et al., "Dampak Pendampingan Terhadap Penghidupan Petani Agroforestri Di Sulawesi Tenggara," Brief (Bogor, Indonesia: World Agroforestry Centre (ICRAF) Southeast Asia Regional Program), accessed September 8, 2018, http://www.worldagroforestry.org/region/sea/publications/detail?pubID=4043;
J.M. Roshetko et al., "Agroforestry and Forestry in Sulawesi: Linking Knowledge with Action (AgFor) Project. End of Project Report" (Bogor, Indonesia: World Agroforestry Centre (ICRAF) Southeast Asia Regional Program; Center for International Forestry Research; Bau Bau, Indonesia: Operation Wallacea Trust; Makassar, Indonesia: Faculty of Forestry, Hasanuddin University, 2017), http://www.worldagroforestry.org/region/sea/publications/detail?pubID=4042.

[24] Robert W. Herdt, "Documenting the Impact of Widely-Adopted CGIAR Research Innovations," SPIA Technical Note (Rome, Italy: CGIAR Independent Science & Partnership Council (ISPC) Secretariat, 2018); ISPC, "Adoption and Impact of Cooperation-88 Potato in China," Brief (Rome: CGIAR Independent Science & Partnership Council (ISPC), 2018), https://ispc.cgiar.org/publications/adoption-and-impact-cooperation-88-potato-china.

[25] OECD and Food and Agriculture Organization of the United Nations, "OECD-FAO Agricultural Outlook (Edition 2018)," https://doi.org/10.1787/d4bae583-en, 2018, https://www.oecd-ilibrary.org/content/data/d4bae583-en.

[26] FAO, "FAOStat," Crop Production, accessed August 31, 2018, http://www.fao.org/faostat/en/#data.

[27] Arouna et al., "Contribution of Improved Rice Varieties to Poverty Reduction and Food Security in Sub-Saharan Africa."

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| on national averages of actual on-farm yield gains, achieved through germplasm improvement and sustainable intensification | | | New evidence on adoption and yields: A survey in western Bangladesh, checked with DNA fingerprinting, indicates that improved lentil varieties, developed by CGIAR and the Bangladesh Agricultural Research Institute, may have increased lentil production in Bangladesh by an estimated 52,600 tons per year (about 27%).[28] Improved lentil varieties have almost completely replaced landraces: approximately 99% of the 150,000 ha of lentil area in the rice-lentil system are planted with varieties released after 1995, and 69% of the area with varieties released after 2005. Modeling showed that adoption of newer (post-2005) varieties was associated with average on-farm yield increases of 382 kg/ha (29%). (Reported by SPIA, for GLDC)<br><br>New evidence on yields: Using DNA-fingerprinted adoption data suggests that improved varieties are associated with an 82% increase in cassava yields in Nigerian farmers' fields.[29] (Reported by RTB/IITA.) |
| 2.2 30 million more people, of which 50% are women, meeting minimum dietary energy requirements |  | **Global trends are unclear at this time**<br>  <br>The number of undernourished people dropped by 211 million people between the 2000-2002 three-year average and the 2014-2016 three-year average.[30]<br><br>However, the most recent statistics from 2016 show an increase in the total number of undernourished people by 38 million, reversing years of progress.[31]<br><br>Global data on undernourishment by sex is not yet available, however data from the 2014–2015 FAO Food Insecurity Experience Scale (FIES) survey indicates that from a national representative sample of adults, women were more likely to report food insecurity in almost two-thirds of the 141 surveyed countries.[32] | New evidence on food security: According to a major review published in 2017[33], adoption of improved rice varieties substantially enhanced food consumption in the households of rice producers in Africa. The impact varied seasonally. During the abundance period, (first 3–4 months after harvest), 33% of households that adopted NERICA varieties and 25% of those that adopted other improved rice varieties shifted from 'poor food consumption' to 'acceptable food consumption'. During the scarcity period (3–4 months before harvest, the proportion of households lifted out of food insecurity, due to the adoption of any improved rice variety, increased to 45%. These numbers correspond to about 300,000 households in sub-Saharan Africa lifted out of food insecurity in the abundance period and 900,000 households in the scarcity period. (Reported by RICE) |

[28] ISPC, "Adoption and Impact of Improved Lentil Varieties in Bangladesh, 1996-2015," Brief (Rome: CGIAR Independent Science & Partnership Council (ISPC), 2018), https://ispc.cgiar.org/publications/adoption-and-impact-improved-lentil-varieties-bangladesh-1996-2015; Herdt, "Documenting the Impact of Widely-Adopted CGIAR Research Innovations."
[29] Wossen et al., "The Cassava Monitoring Survey in Nigeria Final Report"; Standing Panel on Impact Assessment (SPIA), "What Is the True Impact of Improved Cassava Varieties in Nigeria?"
[30] FAO, "FAOStat."
[31] FAO, "News Article: World Hunger on the Rise Again, Reversing Years of Progress," accessed August 31, 2018, http://www.fao.org/news/story/en/item/902489/icode/.
[32] J.C. Ruel-Bergeron et al., "Global Update and Trends of Hidden Hunger, 1995-2011: The Hidden Hunger Index," PLOS ONE 10, no. 12 (December 16, 2015): e0143497, https://doi.org/10.1371/journal.pone.0143497.
[33] Arouna et al., "Contribution of Improved Rice Varieties to Poverty Reduction and Food Security in Sub-Saharan Africa."

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| |  | | New evidence on child nutrition: Modeling based on a household survey in Ethiopia[34] found significantly positive effects of adoption of improved varieties on the height for age and weight for age of children under 5 (of the order of 0.5 Z-score), with increased consumption of homegrown maize being the major contributor to this result. Previous work has shown that maize is the most common crop on Ethiopian farms and 76% percent of maize produced is consumed at home; a survey in 2011 estimated[35] that 27% of households had adopted improved varieties. (Reported by MAIZE) |

[34] Di Zeng et al., "Agricultural Technology Adoption and Child Nutrition Enhancement: Improved Maize Varieties in Rural Ethiopia," Agricultural Economics 48, no. 5 (September 1, 2017): 573–86, https://doi.org/10.1111/agec.12358.

[35] M. Jaleta, M. Kassie, and P. Marenya, "Impact of Improved Maize Variety Adoption on Household Food Security in Ethiopia: An Endogenous Switching Regression Approach" (2015 Conference, August 9-14, 2015, Milan, Italy: International Association of Agricultural Economists, 2015), https://ideas.repec.org/p/ags/iaae15/211566.html.

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| 2.3 150 million more people, of which 50% are women, without deficiencies of one or more of the following essential micronutrients: iron, zinc, iodine, vitamin A, folate, and vitamin B12 |  | **Globally off track**<br>**Overall**<br>  <br>In low- and middle-income countries, where diets tend to be poor quality, people frequently have overlapping micronutrient deficiencies. The Hidden Hunger Index (HHI) documents the distribution and prevalence of three common micronutrient deficiencies (zinc, iron-deficiency anemia, and vitamin A) using a composite indicator. A comparison of changes in HHI scores from 1995 to 2011 showed a 6.7 net decrease in hidden hunger globally.[36] Countries that were most successful in improving their score were concentrated in Southeast Asia (e.g. Cambodia, Indonesia, Myanmar, and Vietnam), whereas the five worst performing countries in terms of the HHI were in sub-Saharan Africa. Those countries had also experienced times of significant conflict and/or food insecurity due to climate-related shocks (e.g. drought and floods) during that same period (1995 to 2011). The authors concluded that improvements observed were mostly due to reductions in zinc and vitamin A deficiencies, while anemia due to iron deficiency persisted and even increased.<br><br>As with other targets, there are significant data gaps for population-level estimates of micronutrient status. For example, the majority of vitamin A deficiency prevalence data comes from surveys conducted in the 1990s.[37] Expert opinion insists that to determine how to meet the SDGs or other targets, nationally representative data needs to be collected frequently from more countries and on more micronutrients than has been the pattern in the past. | Monitoring systems data from 2017:[42] 3.2 million farming households were 'reached' with biofortified planting material, bringing the total estimated number of farming households benefiting from biofortified crops globally to 6.7 million. For vitamin A crops this included 3.7 million households in 10 countries, for iron crops 1.7 million households in 8 countries, and for zinc crops 1.6 million households in 6 countries (note total > 6.7 million as some received multiple crops). (Reported by HarvestPlus/A4NH)<br><br>Monitoring systems data from 2017: There is emerging evidence that aflatoxin exposure is associated with micronutrient deficiency[43] in children. In sub-Saharan Africa, more than 100,000 ha were treated with Aflasafe© by 66,787 farmers during 2017, allowing production of maize and groundnut with safe aflatoxin levels. Large-scale use of Aflasafe© contributed to improved food safety (e.g. in Nigeria 91% of samples had less than 20 ppb) and increased the income of smallholder maize farmers (average 11.5% more than regular maize).[44] (Reported by A4NH) |

[36] Ruel-Bergeron et al., "Global Update and Trends of Hidden Hunger, 1995-2011."
[37] G.A. Stevens et al., "Trends and Mortality Effects of Vitamin A Deficiency in Children in 138 Low-Income and Middle-Income Countries between 1991 and 2013: A Pooled Analysis of Population-Based Surveys," The Lancet Global Health 3, no. 9 (September 1, 2015): e528–36, https://doi.org/10.1016/S2214-109X(15)00039-X.
[42] HarvestPlus, "Biofortification: The Evidence: A Summary of Research That Supports Scaling up of Biofortification to Improve Nutrition and Health Globally" (HarvestPlus, 2018).
[43] S. Watson et al., "Dietary Exposure to Aflatoxin and Micronutrient Status among Young Children from Guinea," Molecular Nutrition & Food Research 60, no. 3 (March 2016): 511–18, https://doi.org/10.1002/mnfr.201500382.
[44] AgResults Secretariat, "Nigeria Aflasafe Pilot" (AgResults), http://agresults.org/.

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| | | Vitamin A: Regional trends in vitamin A deficiency (VAD) in children under 5 years of age suggest there have been significant declines in the prevalence of VAD between 1991 and 2013 in East Asia, Southeast Asia, and Oceania (42% to 6%) and in Latin America and the Caribbean (21% to 11%). Prevalence rates in Africa south of the Sahara and in South Asia remain persistently high (48% and 44% respectively).[38]<br><br>Zinc: Global data on zinc levels are difficult to find. Data from Wessells et al.[39] show little progress between 1990 and 2005, where similar numbers of countries are tagged as "high risk" (greater than 25% of the population with inadequate zinc intake).<br><br>Iron: In a comparison of changes in Hidden Hunger Index (HHI) scores from 1995 to 2011, in most countries, anemia due to iron deficiency persisted and even increased.[40]<br><br>Among the 186 countries with sufficient data, 137 showed no or worsening progress since 2012 in reducing the percentage of women of reproductive age with anemia.[41] | |

[38] Stevens et al., "Trends and Mortality Effects of Vitamin A Deficiency in Children in 138 Low-Income and Middle-Income Countries between 1991 and 2013: A Pooled Analysis of Population-Based Surveys."
[39] K.R. Wessells and K.H. Brown, "Estimating the Global Prevalence of Zinc Deficiency: Results Based on Zinc Availability in National Food Supplies and the Prevalence of Stunting," PLOS ONE 7, no. 11 (November 29, 2012): e50568, https://doi.org/10.1371/journal.pone.0050568.
[40] Ruel-Bergeron et al., "Global Update and Trends of Hidden Hunger, 1995-2011."
[41] Development Initiatives, "Global Nutrition Report 2017: Nourishing the SDGs." (Bristol, UK: Development Initiatives Poverty Research Ltd.), accessed August 31, 2018, http://globalnutritionreport.org/the-report/.

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| 2.4 10% reduction in women of reproductive age who are consuming less than the adequate number of food groups |   | **Globally off track**<br>  <br>With the introduction of the Minimum Dietary Diversity for Women (MDD-W) indicator, there are a number of new and ongoing initiatives, many of them linked to CGIAR researchers, to collect and catalog food consumption data so that the minimum dietary diversity data for women of reproductive age could be calculated.[45]<br><br>This data may show improvements in the consumption of adequate food groups; however, current statistics on rising undernourishment[46], and growing rates of anemia among women of reproductive age[47] are not encouraging.<br><br>Statistics show increasing per capita vegetable availability between 2000 and 2013 (from 29.98 kg per person per year to 41.52 kg per person per year among Least Developed Countries).[48] Unfortunately, these figures represent national averages of availability and do not account for access to or utilization of food groups among women in particular. | No new evidence in 2017. This is due mainly to the fact that very few impact studies measure this indicator. |
| 3.1 5% increase in water and nutrient (inorganic, biological) use efficiency in agro-ecosystems, including through recycling and reuse |   | **Globally off track**<br>  <br>There is no measurement of either water or nutrient efficiency at a significant scale. There are reported statistics of water use in agriculture and mineral fertilizer use which are reported which provide partial information on these indicators.<br><br>Global initiatives to promote water use efficiency are encouraging. For example, 50% of countries have implemented water resource management plans in conjunction with the SDGs.[49] However, no improvements in water and nutrient use efficiency have been made | No new evidence in 2017. Further impact work required. |

[45] "Data4Diets - INDDEX Project," accessed August 31, 2018, https://inddex.nutrition.tufts.edu/data4diets.
[46] FAO, "News Article: World Hunger on the Rise Again, Reversing Years of Progress."
[47] FAO, "FAOStat."
[48] FAO, "FAOStat," Food Balance Sheets, accessed August 31, 2018, http://www.fao.org/faostat/en/#data/FBS.
[49] United Nations Economic and Social Council, "Progress towards the Sustainable Development Goals: Report of the Secretary-General" (United Nations Economic and Social Council, 2017), https://unstats.un.org/sdgs/files/report/2017/secretary-general-sdg-report-2017--EN.pdf.

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| |  | globally, as limited advances in some countries are outstripped by lack of advances in most countries in development.[50] Recent CGIAR data show that water reuse is more prominent than previously thought, given that about 30 million ha are indirectly receiving wastewater, while flagging the need for risk reduction, as this water is commonly untreated.[51]<br><br>Fertilizer use efficiency is not currently monitored globally but modelled similarly to yield improvements. Inorganic/chemical fertilizer use in kilograms per hectare of arable land is increasing globally. The estimates generally do not include organic fertilizer, such as animal and plant/green manures (CGIAR programs usually encourage the combined use of organic and inorganic fertilizers, which improve farm-level and plant-level use-efficiencies). The significance of increased use in terms of efficiency depends upon baseline levels of use in different parts of the world. For example, baseline use in Africa is different from baseline use in North America, thus progress toward 'efficient' use differs among regions. In addition, low baseline levels can cause as much environmental damage as too high fertilizer rates, e.g. from accelerated soil erosion due to poor soil cover, and leaching of mineralized nitrogem to insufficient uptake demand. Globally, fertilizer use has increased from 106.4 kg per hectare of arable land in 2002 to 137.6 kg in 2015.[52] A summary from FAO World Fertilizer Trends and Outlook to 2020[53] projects the demand for nitrogen, phosphate and potassium to grow annually on average by 1.5%, 2.2%, and 2.4% respectively, from 2015 to 2020. Though global data on fertilizer use efficiency is not available, increases in use per hectare of arable land do not imply progress with regard to efficiency. | |



[50] F. Jaramillo and G. Destouni, "Local Flow Regulation and Irrigation Raise Global Human Water Consumption and Footprint," Science 350, no. 6265 (December 4, 2015): 1248–51, https://doi.org/10.1126/science.aad1010; M. Rodell et al., "Emerging Trends in Global Freshwater Availability," Nature 557, no. 7707 (May 2018): 651–59, https://doi.org/10.1038/s41586-018-0123-1.

[51] A.L. Thebo et al., "A Global, Spatially-Explicit Assessment of Irrigated Croplands Influenced by Urban Wastewater Flows," Environmental Research Letters 12, no. 7 (2017): 074008, https://doi.org/10.1088/1748-9326/aa75d1.

[52] World Bank, "World Bank Data," Fertilizer consumption (kilograms per hectare of arable land), accessed August 31, 2018, https://data.worldbank.org/indicator/AG.CON.FERT.ZS.

[53] FAO, "World Fertilizer Trends and Outlook to 2020: A Summary" (Rome: Food and Agriculture Organization of the United Nations (FAO), 2017), http://www.fao.org/3/a-i6895e.pdf.

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| 3.2 Reduction in agricultural-related greenhouse gas emissions by 0.2 Gigatonnes (Gt) $CO_2e$ per year (5%) compared with business-as-usual scenario in 2022 |  | **Globally off track**<br>  <br>Global greenhouse gas emissions by the agricultural sector are rising globally (i.e. not including carbon sinks like trees). Gross agriculture-based greenhouse gas emissions, measured in carbon-dioxide equivalents ($CO_2e$) have risen from 4.66 Gt in 2000, to 4.88 Gt in 2006, to 5.04 Gt in 2010.[54]<br><br>Under a business-as-usual scenario, emissions are projected to rise to 5.76 Gt in 2030 and 6.31 Gt in 2050.[55]<br><br>Data from Climate Action Tracker shows different projections in greenhouse gas emissions based on a number of scenarios. These projections offer hope that evidence-informed policies can lead to reduced emissions. For example, emissions with no climate policies in place, under current climate policies, and with more aggressive national pledges beyond those reached within the Paris Agreement.[56] Recent research on agriculture specifically suggests that more technical and scaling work is needed, as using current technology will only achieve 21-40% of the mitigation required to meet targets.[57] | New evidence and modeling: An expected return-on-investment study of the FTA contribution to fire prevention regulations in Indonesia's Riau province estimates that if the new regulation achieves a 50% reduction in fires in the province annually, given FTA's contribution to the policy development process, there is an attributable contribution to avoided emissions through this reform process of up to 1.26 million tons annually. This is a 3% reduction based on World Bank estimates for 40.8 million tons emitted in 2015. (Reported by FTA)<br><br>New evidence and modeling: An ex-post impact study of a co-management forestry project by CGIAR and partners in Guinea LAMIL, undertaken eight years after the end of the project, found that net rates of forest decline were 4% lower in areas which had been involved with the project.[58] This resulted in moderate amounts of retained natural forest and sequestered carbon—the area of natural forest retained due to LAMIL was about 11 square kilometers ($km^2$) in 2010, 24 $km^2$ in 2014, and about 14 $km^2$ in 2016. The associated social value of carbon ranges from US$ 6.9 million to US$ 13.8 million (at US$ 20 and US$ 40 per ton of carbon, respectively). (Reported by FTA) |

[54] FAO, "FAOStat," Agriculture Total, accessed August 31, 2018, http://www.fao.org/faostat/en/#data/GT/visualize.
[55] FAO, "FAOStat."
[56] Global Partnership on Forest Landscape Restoration (GPFLR), "Atlas of Forest Landscape Restoration Opportunities," 2016, http://www.wri.org/applications/maps/flr-atlas/#&init=y.
[57] E. Wollenberg et al., "Reducing Emissions from Agriculture to Meet the 2 °C Target," Global Change Biology 22, no. 12 (December 1, 2016): 3859–64, https://doi.org/10.1111/gcb.13340.
[58] Mills, Nelson, and Achdiawan, "Into the Forest with or Without a Trace? A Multi-Level Impact Analysis of Forest Co-Management in Guinea. Unpublished Report Submitted to the Standing Panel on Impact Assessment (SPIA) of the ISPC."; Standing Panel on Impact Assessment (SPIA), "Impacts of Co-Management Activities on Forests and Households in Guinea."

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| 3.3 55 million hectares (ha) of ecosystem restored, including degraded land area and aquatic ecosystems |  | **Insufficient global data**<br>  <br>Over the years, a number of approaches have been taken with regard to assessing land degradation. For this reason, it is difficult to find a harmonized global dataset. Even in FAO's soil database, only three years have been tracked globally, with each year monitoring a different variable. Approaches introduced in the guidelines for reporting on SDG 15.3.1, as well as digital soil mapping techniques, will hopefully allow for more harmonized land degradation data across regions and time periods.<br><br>While increases in land use in and out of agriculture are tracked (FAOStat), these do not cover changes in land quality within agriculture. Thus, it will be important to track land degradation in future.<br><br>The Atlas of Forest Landscape Restoration Opportunities highlights that 2 billion hectares of the world's deforested and degraded forest lands contain opportunities for restoration—including mosaic restoration, where trees can be integrated into mixed-use landscapes such as smallholder agricultural lands and settlements.[59]<br><br>In September 2011, a number of countries and institutions set a global target to restore 150 million hectares of degraded and deforested lands by 2020. To date, the Bonn Challenge has received 47 national and institutional commitments targeting the restoration of 160.2 million hectares. Political commitment to restore degraded lands is thus encouraging, as well as efforts to produce harmonized data and tracking as part of SDG 15.3.1. | New survey evidence: From impact studies in Kenya and Malawi, it was estimated that improved agroforestry innovations are being practiced on at least 66,167 ha of partially degraded land.[60] (Reported by FTA)<br><br>New evidence of contribution to this outcome: 186,050 ha of water area is under improved management in Bangladesh, through co-management in Bangladesh and (as yet unquantified) progress made in Solomon Islands, Cambodia, and Myanmar.[61] (Reported by FISH) |

[59] Global Partnership on Forest Landscape Restoration (GPFLR), "Atlas of Forest Landscape Restoration Opportunities."
[60] Hughes et al., "Assessing the Downstream Socioeconomic and Land Health Impacts of Agroforestry in Kenya: Impact Assessment Report"
[61] I.M. Dutton, M.S. Hossain, and H. Kabir, "Midterm Performance Evaluation Report of USAID/Bangladesh Enhanced Coastal Fisheries (ECOFISH) Project," Accelerating Capacity for Monitoring and Evaluation (ACME) (United States Agency for International Development (USAID), 2018).

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| 3.4 2.5 million ha of forest saved from deforestation |  | **Global trends are unclear at this time**<br>  <br>The global rate of forest loss has decreased by 25% since the 2000-2005 period. FAO has also indicated "positive change" for three of the five SDG 15.2.1 sub-indicators.[62]<br><br>Despite these positive trends, deforestation and forest degradation are still a concern, particularly in the tropics. According to the World Bank, the world lost 564,686 square kilometers of forest between 2000 and 2015.[63] Data on SDG 15.1.1 reveals that forest area (as a percentage of total land area) decreased from 31.15% in 2000 to 30.71% in 2015. Most of the losses occurred in sub-Saharan Africa, Southeast Asia, and Latin America, and are largely attributed to the expansion of agriculture.[64]<br><br>Hansen et al.[65] used Earth observation satellite data to map global forest loss (2.3 million square kilometers) and gain (0.8 million square kilometers) from 2000 to 2012. Tropical areas showed both the greatest losses and the greatest gains (due to regrowth and/or planting). Brazil notably reduced deforestation, but forest loss increased in Indonesia, Malaysia, Paraguay, Bolivia, Zambia, and Angola. | No examples provided for 2017, apart from the LAMIL example reported under Target 3.2. |

[62] FAO, "15.2.1 Sustainable Forest Management, Sustainable Development Goals, Food and Agriculture Organization of the United Nations," accessed August 31, 2018, http://www.fao.org/sustainable-development-goals/indicators/1521/en/.
[63] World Bank, "World Bank Data," Forest area (sq. km), accessed August 31, 2018, https://data.worldbank.org/indicator/AG.LND.FRST.K2.
[64] FAO, "15.1.1 Forest Area, Sustainable Development Goals, Food and Agriculture Organization of the United Nations," accessed August 31, 2018, http://www.fao.org/sustainable-development-goals/indicators/1511/en/.
[65] M.C. Hansen et al., "High-Resolution Global Maps of 21st-Century Forest Cover Change," Science 342, no. 6160 (November 15, 2013): 850–53, https://doi.org/10.1126/science.1244693.