



Current scenario and future directions for sustainable development goal 2: a roadmap to zero hunger

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Sustainable development goals (SDGs) adopted as United Nations (UN) Agenda for 2030 consist of 17 goals and 169 targets setting a blueprint for a sustainable future for coming generations. Addressing the global challenges for sustainability, SDGs aim at minimizing global poverty, inequality and hunger, managing climate change and environmental degradation, and reducing risk management under extreme weather events. All the 17 goals are interconnected and any action taken towards one target affects the progress of others. To shed the light on current status of SDGs, the journal ‘Environmental Sustainability’ with this editorial is beginning a series, covering the goals that are directly related to sustainability and environment. Goal 2 targets ‘end hunger, achieve food security and improved nutrition as well as aims at promotion of sustainable agriculture’. The goal is a key for safeguarding the prospects of agro-ecosystems and is important for the success of SDGs.

SDG 2 is composed of eight targets where the first five targets (2.1–2.5) are directly linked to food security and sustainability of agriculture, whereas the last three targets (2A–2C) are based on market related measures focussing

on increasing agricultural investments and lowering market disruptions¹.

Target 2.1: to ensure universal access to safe and nutritious food for all round the year, especially to poor and those living in vulnerable areas by 2030 and Target 2.2: to end all kinds of malnutrition by 2030 are the foremost targets². The current estimates of a report by UN reveals that after a continuous decline over a decade, number of people suffering from hunger crisis (data estimated under prevalence of undernourishment) have gradually increased since 2015³. Data reveals that at present there are around 690 million people who are hungry which equates to 8.9% of the world population. The report further states that a majority of undernourished population have been found living in Asia (381 million) and more than 250 million live in Africa, where the numbers are increasing at a very fast rate than anywhere else in the world. On the other hand, there are an estimated 2 billion people who lack access to safe, nutritious and adequate food and are exposed to food insecurity. The report explains that if the present trend persists, the number of people affected by hunger and undernourishment will exceed 840 million i.e. 9.8% of total population. In case of malnutrition, the same report claims that in 2019, there were nearly 144 million children under the age of five who suffered stunting, of which three quarters were found living in Southern Asia and sub-Saharan Africa. Also, during the same year, 47 million i.e. 6.9% children under age of five were affected by wasting or acute under nutrition (see Footnote 3). As per the latest report of UN and remarks of the Secretary General António Guterres “Global hunger levels are at a new high.” The report shows that the number of hungry people has doubled in last two years largely due to the

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¹ <https://unstats.un.org/sdgs/report/2021/The-Sustainable-Development-Goals-Report-2021.pdf>.

² <https://www.globalgoals.org/goals/2-zero-hunger/>.

³ <https://www.un.org/sustainabledevelopment/hunger/>.

coronavirus disease pandemic (COVID-19)⁴. This clearly suggests that the world is neither advancing towards securing access to safe, nutritious and adequate food for all nor eliminating malnutrition. This also denotes that any danger to food security worsens diet quality and results in malnutrition, undernourishment, overweight and obesity, resulting in a more unhealthy population affecting world economy.

Target 2.3 aims at doubling the agricultural productivity and income of small scale food producers in particular women, indigenous people, family farmers, pastoralists and fishers by 2030. This evaluates the average income of the small scale food producers in order to eradicate hunger as well as to alleviate poverty. Sustainable Development Goals Report (2021) explains that small scale food producers account for majority (of food producers) as per survey done in 37 countries. Estimates from 11 countries show that productivity of small scale producers is three to four times lower in comparison to large scale producers⁵. The report also claims that men headed households get higher income than women headed households in almost all the surveyed countries. The key results of data given in a UN Food and Agriculture Organization (FAO) report reveal that in 2017, the average labour productivity of small-scale food producers was up to \$ 3 per day in countries including Burkina Faso, Nigeria, Tanzania and Uganda, to \$13.5 in Mali. Similarly, in developed countries, the productivity was measured from \$45 a day in Hungary to \$142 a day in Austria in 2016. Data states that average productivity of small-scale food producers is much lower than large scale ones. The largest difference in productivity of small and other producers was witnessed in India and Malawi⁶.

Target 2.4 focuses on sustainable production of food and resilient agricultural practices by 2030. Generally food production has been looked up as one aspect but it is just a part of a bigger picture. Food systems have a major impact on environment as they are responsible for 70% of the water withdrawal from nature, cause 60% of biodiversity loss and produce up to a third of green-house gases (GHGs)⁷. The situation becomes even more alarming when the produced food for human consumption goes uneaten and ends up as waste. A recent report by World Bank- 'Addressing Food Loss and Waste: A Global Problem with Local Solutions' (2020) states that about one-third of global food produced i.e. approximately 1.3 billion tonnes is either lost along the

supply chain or wasted by consumers or retailers and that by 2030, the annual food loss and waste will reach 2.1 billion tons i.e. worth USD 1.5 trillion⁸. World Resource Institute (WRI) has reported that in creation of sustainable food for future and to feed 10 billion by 2050, we need to reduce the food losses by 25%. This will decrease the food caloric gap by 12%, gap in land use by 27% and GHGs mitigation gap by 15%⁹. The challenge is further intensified as agriculture system is vulnerable to climate changes that often occur in form of extreme weather events, temperature fluctuations, changing agro-ecosystem boundaries as well as pests and invasive species. FAO report suggests that occurrence of natural disasters have increased by three times in last 50 years or so and about 63% of consequences are felt on agricultural sector. Poor and developing countries are the hardest hit due to climate change and increase in natural disasters. The report claims that from 2008 to 2018, natural disasters have caused losses in tune of USD 108 billion due to damaged crops and impact on livestock production in the developing countries¹⁰. As agriculture is one of the main drivers of climate change, it is important that the farmers across the world, particularly small scale farmers in developing countries, get access to resilient and sustainable agricultural practices. This target also mentions about improvement of land and soil quality, both of which are vital to humans. Land degradation is happening at a rapid pace, which in turn is deteriorating soil quality causing loss of soil organic matter thus rendering it infertile. A report by Global Environment Facility (2022) estimates that about 25% of the total area of land has been degraded up till now¹¹. The report warns that 24 billion tons of fertile soil is lost per year mainly due to unsustainable agricultural practices and if the present trend continues, 95% of the total land area on earth will be degraded by 2050 due to anthropogenic activities. Soil salinization is another major cause of land degradation that is affecting agro-ecosystems around the world (particularly in arid and semi-arid regions) and is growing at a rate of 1–2% each year (Sunita et al. 2020). It is a global and dynamic problem which has exacerbated under impact of climate change. The declining soil fertility due to increasing soil salinization has raised serious concerns towards food security and needs to be mitigated to achieve the targets of SDG 2.

Target 2.5 aims at maintaining the genetic diversity in food production. While the other targets of SDG 2 are focussed for 2030, target 2.5 has a deadline for 2020. Biological diversity plays an important role in providing food, fibre, water, energy, medicine and is responsible for regulation of

⁴ <https://www.un.org/sg/en/content/sg/speeches/2022-05-18/secretary-generals-remarks-the-global-food-security-call-action-ministerial%2C%A0>.

⁵ <https://unstats.un.org/sdgs/report/2021/The-Sustainable-Development-Goals-Report-2021.pdf>.

⁶ <https://www.fao.org/sustainable-development-goals/indicators/231/en/>.

⁷ <https://www.unep.org/news-and-stories/story/food-systems-hold-key-ending-world-hunger>.

⁸ <https://openknowledge.worldbank.org/handle/10986/34521>.

⁹ <https://www.wri.org/insights/how-sustainably-feed-10-billion-people-2050-21-charts>.

¹⁰ <https://news.un.org/en/story/2021/03/1087702>.

¹¹ <https://www.thegef.org/what-we-do/topics/land-degradation>.

ecosystem services including climatic patterns. Biodiversity at genetic, species and ecosystem levels provide resilience against climate variability and changing environmental conditions by making production system and livelihoods more flexible. Using diversity of local breeds, species and varieties, integrating indigenous crops, livestock, forest and aquatic biodiversity and by promoting habitat diversity, local population can support their livelihoods and lead to food security, simultaneously helping in improving their socio-economic conditions. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) reported that due to unprecedented anthropogenic activities, one million plant and animal species have been threatened with extinction, many within decades, which is highest than ever in human history. The report describes that mean abundance of native species in land based habitats has reduced by 20%, mostly since 1900. In addition, more than 40% of amphibian species, around 33% corals, and greater than a third of total marine mammals are threatened and in danger of getting extinct¹². Loss of genetic diversity, including local varieties and breeds of domesticated plants and animals, poses risk of food insecurity and undermine the targets of SDGs. A report by FAO on ‘The State of World’s Biodiversity for Food and Agriculture’ (2019) based on information from 91 countries assessed that there are 3980 wild food species (majority includes plants followed by fish and mammals), of which 24% are decreasing while for remaining 61%, the trend is neither reported nor known¹³. The report states that biodiversity for food and agriculture is being negatively affected by several drivers including climate change, overexploitation, overharvesting, pollution, faulty irrigation practices and invasive alien species. Some other drivers such as demographic change, urbanization, market and trades also impact biodiversity, indigenous varieties and earth system as a whole (Steffen et al. 2015). However, these causes also open opportunities for sustainable agricultural practices like adoption of climate smart agriculture, use of organic farming and bio-based agriculture.

Target 2.A is to invest in rural infrastructure, agricultural research, technology and gene banks by 2030. According to United Nations Department of Economic and Social Affairs (UNDESA) World Social Report (2021), rural population is about 67% and 60% of the total population in low-income and lower-middle-income countries, respectively. In high income countries, people living in rural areas make up one fifth of the population. The report explains that development in rural zones is failing to address socioeconomic or environmental goals and there is an urgent need for reconsideration of rural development in order to achieve 2030

¹² https://ipbes.net/sites/default/files/inline/files/ipbes_global_assessment_report_summary_for_policymakers.pdf.

¹³ <https://www.fao.org/state-of-biodiversity-for-food-agriculture/en/>.

Agenda for Sustainable Development. Moreover, as a result of this, rural people are experiencing decrease in natural resources (largely due to over exploitation), heightened impacts of climate change, as well as impact of epidemics and pandemics¹⁴. A more balanced development, targeting rural areas (especially in developing and poor countries) is required. This will not only help in improved and sustainable productivity but will also reduce exodus of people from villages towards urban centres. A report by McKinsey Center for Advanced Connectivity and McKinsey Global Institute (MGI) reveals that by the improvement of connectivity coupled with advanced technologies, the agriculture industry could contribute to an additional USD 500 billion to global gross domestic product (GDP) (an improvement of about 7–9%) by the end of this decade¹⁵.

The last two targets of SDG 2 are Target 2B: to prevent agricultural trade restrictions, market distortions and export subsidies by 2030; Target 2C: to ensure stable food commodity markets and timely access to information by 2030. According to a report, a remarkable change has been witnessed overtime in total food trade. Value of exports in basic food commodities has doubled since 2000 in comparison to 2019. It has reached almost USD 1.3 trillion in 2019 from USD 610 billion in 2000. This is largely driven by increase in merchandise trade which included 5.4% of basic food in 2000 that has grown up to 6.8% in 2019. This is also accompanied by gradual decrease in export concentration index for basic food from 0.154 in 2000 to 0.125 in 2019. This shows that those parties that were small exporters of food are now participating in global trade of these products (United Nations Conference on Trade and Development (UNCTAD 2021)¹⁶.

Food prices have spiked since last two decades, which is an indicator for recent changes in supply and demand as well as denotes the risks towards future food markets. Food price hike can also be attributed to the recent COVID-19 pandemic. Such instability does not allow consumers and producers to speculate their budget plans and hence is disturbing livelihood at both ends. The recent Ukraine-Russia conflict has affected the food supplies and prices across the world, jeopardizing global food security. Both Ukraine and Russia being major exporters of several leading cereal crops (such as wheat and barley) and vegetable oil (such as sunflower oil) will have far reaching consequences on those countries that are net importers of such commodities¹⁷ and

¹⁴ <https://www.un.org/development/desa/dspd/world-social-report/2021-2.html>.

¹⁵ <https://www.mckinsey.com/industries/agriculture/our-insights/agricultures-connected-future-how-technology-can-yield-new-growth>.

¹⁶ <https://unctad.org/webflyer/world-investment-report-2021>.

¹⁷ <https://ourworldindata.org/ukraine-russia-food>.

in coming time may plunge the world, particularly the poor countries, towards food insecurity, hunger and malnutrition. Apart from this, the current heat wave situation in South Asia including India and Pakistan has also affected the agriculture production jeopardizing the food security not only in this region but around the globe. The anomalies in food pricing when combined with agricultural income losses, occurrence of extreme weather events, decreased access to food and shifts in quantity, quality and diversity of consumed food are warnings for the coming times.

The present estimates establish the fact that the targets of SDG 2 are far from reach. SDG 2 reflects that a collective consensus from public, governments, policymakers is needed that directs towards environmental, public health, and social equity crises confronting present food systems. A conceptual framework is needed that estimates the contribution of each dimension of sustainability. Transforming the world's food and land use patterns has crucial role to play when it comes to tackling climate change, biodiversity, public health and a thriving livelihood. Also, improved landscape approaches by forest governing bodies, sustainable peri-urbanization, innovations in agricultural management are also critical for achieving targets of SDG 2 (Garrett et al. 2021). It is important to adopt sustainable agricultural practices such as organic farming, and use of green alternatives e.g. bioinoculants replacing agri-chemicals. It has been estimated that market share of biofertilizers will reach up to USD 3.3 billion by 2025¹⁸ and biopesticides market will reach up to USD 9.6 billion by 2028¹⁹. Climate smart agriculture (CSA) is another approach that can ease the challenges of climate change and food insecurity. It will improve productivity, reduce GHG emissions, boost income of small hold farmers as well as enhance resilience against climatic vulnerabilities and pathogen attack. World Bank Group is promoting CSA that will contribute to SDGs including Goal 2, and has also tied up with research programs like Consortium of International Agricultural Research Centres (CGIAR) that looks after climate-smart technologies and management methods²⁰. Additionally, it is also important to phase out subsidies and freebies that hamper sustainability of environment and must be redirected towards protecting climate and nature. According to a recent study, the world is expending around \$1.8 trillion every year on subsidies that are causing destruction of wildlife and responsible for rise in global warming²¹.

Subsidies resulting in exploitation of natural resources must go but there should be support system for vulnerable population, particularly in economically poor regions, to ensure food supply and availability. Change in eating habits is another important aspect to feed the expected future population of 10 billion people. This can be achieved by eating sustainably, improving food production plus minimizing food waste (Soergel et al. 2021). According to a study by Eat- Lancet Commission, diets that are rich in diverse plant based products and low in animal foods, saturated and un-saturated fats, refined grains, processed foods and added sugars, could avert 19–24% of total adult deaths²². It is important to establish such a food system that is efficient, climate smart, full of nutrition, health and sustainability driven. Policies must be implemented on high carbon footprint products so that people become aware of such goods. GDP should be linked to Gross Carbon Footprint (GCF) and taxes must be levied based on proportion of carbon footprint of the product (Arora and Mishra 2019). Strict laws must be formulated to prevent genetic erosion of species and to conserve natural resources and biodiversity.

It is also important to make trade more open and inclusive as it is a key factor in strengthening food systems. Better trade policies could encourage market access, opportunities for value addition and generate incomes for small scale producers. Knowledge tools and partnership platforms must be developed to maintain the flow of trades. Decreasing high import tariffs and removing tariff rate quotas are also necessary so that secure and equal access to food and agriculture markets can be made available²³. BioTrade initiative that comprises products which are biological in origin such as vegetables, animals living on land and water has been promoting conservation of biodiversity as well as improving socio-economic welfare²⁴. BioTrade has contributed in progress of SDGs and is being implemented in over 80 countries in sectors like personal care, textiles, food, fashion, handicrafts and sustainable tourism²⁵. It is also important to check the reliability of the facts and figures of the available data as there may be chances of diversity at national or local levels over a longer period of time. Research methodologies that are well suited at all levels, be it food systems, agricultural, environment, health, trade or market, keeping sustainability at centre, are crucial.

¹⁸ <https://www.globenewswire.com/news-release/2020/01/24/1974768/0/en/Global-Biofertilizers-Industry.html>.

¹⁹ <https://www.globenewswire.com/news-release/2021/09/27/2303450/0/en/Biopesticides-Market-Worth-9-6-Billion-by-2028-Exclusive-Report-by-Meticulous-Research.html>.

²⁰ <https://www.worldbank.org/en/topic/climate-smart-agriculture>.

²¹ <https://www.theguardian.com/environment/2022/feb/17/world-spends-18tn-a-year-on-subsidies-that-harm-environment-study-finds-aoe>.

²² <https://eatforum.org/eat-lancet-commission/#:~:text=It%20emp%20hasizes%20a%20plant%20Dfor%20ward,%20C%20vegetables%20C%20nuts%20and%20legumes>.

²³ <https://ieep.eu/uploads/articles/attachments/b94ce9c4-9476-4543-8d25-6d7ee674d954/Achieving%20Sustainable%20Development%20Goal%202.pdf?v=63771019594>.

²⁴ <https://unctad.org/topic/trade-and-environment/biotrade>.

²⁵ <https://sdgpulse.unctad.org/trade-agriculture-biotrade/>.

SDG 2 has intricate linkages with other SDGs and influence targets covered under other goals. Although there is enough food available at present to feed the world population but the threats created by the ongoing COVID-19 pandemic, increasing impact of climate change, conflicts that affect the sustenance of supply chain and trade, future energy demands and looming economic crisis have to be tackled in unison. The only way-out to achieve sustainability and food security for all is by cutting across the boundaries of inequality. As per UN Secretary General “Ending hunger is within our reach. But unless we solve this problem today, we face the spectre of global food shortages in the coming months ... Our only chance of lifting millions of people out of hunger is to act together, urgently and with solidarity.”

References

- Arora NK, Mishra I (2019) United Nations Sustainable Development Goals 2030 and environmental sustainability: race against time. *Environ Sustain* 2:339–342
- Garrett RD, Cammelli F, Ferreira J, Levy SA, Valentim J, Vieira I (2021) Forests and sustainable development in the Brazilian Amazon: history, trends, and future prospects. *Ann Rev Environ Res* 46(1):625–652
- Soergel B, Kriegler E, Weindl I, Sebastian R, Alois D, Constantin R et al (2021) A sustainable development pathway for climate action within the UN 2030 Agenda. *Nat Clim Chang* 11:656–664
- Steffen W, Richardson K, Rockström J, Cornell SE, Fetzer I, Benette EM et al (2015) Planetary boundaries: guiding human development on a changing planet. *Science* 347:1259855
- Sunita K, Mishra I, Mishra J, Prakash J, Arora NK (2020) Secondary metabolites from halotolerant plant growth promoting rhizobacteria for ameliorating salinity stress in plants. *Front Microbiol* 11:567768

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