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Fostering Agri-Food System Transformation for Sustainable and Inclusive Growth: Challenges and Policy Imperatives

P. Srinivasa Rao

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Abstract: Accelerating agri-food systems transformation is critical for global food security, nutritional diversity, equitable access to healthy diets, fostering sustainable livelihoods and diversified income opportunities. It directly contributes to attain SDG 2 targets and underpins progress on other SDGs. This transformation is vital for developing countries, including LDCs, where heavy reliance on agriculture combines with structural backwardness compounded by the low labour and land productivity with rising climate risks, conflicts, and economic disruptions. These constraints perpetuate poverty, hunger, and all forms of malnutrition, undermining the growth potential of agri-food systems and overall development. Inadequate coverage of social protection schemes with absence of food safety nets is further exacerbated hunger and child malnutrition.

In this context, fostering the global agri-food systems transformation particularly in developing countries will helps in improving food security and nutritional situation. The evidence based and data driven assessment will shape the landscape of the agri-food systems through the informed decisions and targeted interventions. Addressing the systemic challenges faced by the agri-food systems is essential to enhance the global food security and nutritional situation and thereby helps in achieving SDG 2 targets

Keywords: Disparities, LDCs, SDG 2, Food Security, Nutrition, Agri-Food systems, G20

1. Background

Agri-food system transformation is crucial to improve global food and nutrition security especially the face of climate change, which otherwise intensify hunger and food insecurity situation. Besides persistent

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poverty and volatility in food, prices undermine access to healthy diets, exacerbating malnutrition, especially in developing countries. According to FAO (2023, 2024) conflict, climate variability, economic contraction and growing inequality have become the "new normal" for food insecurity and malnutrition in developing countries. Increase in prices of energy and inputs contribute to increased production costs and may constrain productivity and output growth (OECD and FAO, 2022, p.18) especially when farming communities lack access to finance and technologies.

As a result, global hunger has risen sharply since 2019 and remains persistently high, from 564.9 million in 2018 to 697.5 million in 2021 and 673.2 million in 2024. Nearly one in eleven people worldwide faced hunger in 2023, while about 2.3 billion experienced moderate to severe food insecurity in 2024 (FAOSTAT and UNSDGs Report, 2025). Developing countries, including LDCs are adversely impacted with higher-levels of hunger and its rising trends. Increased global food prices faster than core inflation is also threatening further and it outpacing then the income growth of many vulnerable populations (FAO, 2025, pp.v). Food-price inflation therefore disproportionately affects low-income countries and communities, even modest price rises can put food out of reach for poorer households, and the high prevalence of unaffordable healthy diets has driven hunger, food insecurity, and malnutrition. Rising agri-food system costs are also reducing incomes for small producers and family farmers, hindering recovery from the COVID-19 pandemic. With less than five years remaining to achieve the 2030 Agenda, progress on Goal 2 to end hunger and malnutrition is under serious threat. As FAO stated that poor dietary patterns also impose hidden costs equal to roughly 27 percent of GDP in low-income countries largely due to poverty and undernourishment. This will drives disease burden and reduced labour productivity further (FAO, 2023, pp.xx to xxi). All these multifaceted challenges act as obstacles in achieving 2030 agenda and its several SDG particularly SDG 2 progress on ending hunger and all formation malnutrition is stagnated to regressing at globally and across the regions further.

In 2024, approximately 2.60 billion people did not have access to nutritious, safe and sufficient food (FAO, 2025, pp.xii). The high cost of a healthy diet (CoHD) in the presence of inadequate access to nutritious foods leads to malnutrition (FAO, 2023 and 2025). This necessitates a rapid transformation of agri-food systems particularly in developing countries including LDCs is essential to tackle with these shocks efficiently. Global bodies (FAO 2024; UNEP 2022; UN SDG Report 2024) agree that agri-food systems must be rapidly transformed—becoming resilient, sustainable, equitable, and low-carbon—to ensure affordable healthy diets, protect ecosystems, boost productivity, and halve chronic child under nutrition. Achieving SDG 2 also demands tackling climate change, conflict, economic crises, and persistently high food prices. The United Nations (UN) has already indicated that most SDG goals are progressing too slowly or have regressed below their 2015 baselines (UN Summit Report, 2024, p.3). The SDG assessment of 2025 indicates (of 169 targets, 139 are measurable) 18 per cent are on track, 17 per cent show moderate progress and 48 per cent exhibit insufficient progress (31 per cent marginal gains and 17 per cent no gains), and 18 percent have regressed below the 2015 levels (UN SDG Report 2025, p.4). Other study shows that globally, none of the 17 goals is expected to be achieved by 2030, and only 17 percent of targets are projected to be met (Sachs, et al., 2025, p.viii). Conflicts, structural vulnerabilities, and limited fiscal space continue to impede progress, underscoring the urgent need for intensified efforts.

In this framework, the study examines the challenges confronting global agri-food systems transformation particularly in developing countries and identify the corresponding interventions which offering a roadmap for targeted policy measures and enhanced stakeholder collaboration—including through global forums like the G20. Ultimately, ensuring global food security and ending hunger and malnutrition, enabling inclusive growth with revitalizing rural economies and reduction of rural poverty and thus enlarging the economies of scale with fostering the transition of the sector is essential. This will improve the welfare of the

vulnerable groups of small and marginal farmers, women and indigenous communities' and thus further creates a substantial positive impact on the rural economic and transition of the sector including sustainable production, livelihoods, and enhanced farm and farmers' incomes further.

Considering these factors, the following key priority areas and underlying determinants can accelerate agri-food systems transformation globally, with particular relevance for developing countries.

- Prioritizing to Achieve SDG 2 targets on ending Hunger and All-Forms of Malnutrition
- Mitigating the Global Food Price Volatility and Improving Access to Healthy Diets
- Sustainable Livelihoods and Diversified Income Opportunities
- Averting Food Loss and Waste provides an Opportunity
- Financing for Agri-Food Systems and Accelerating Public Expenditure
- Addressing Digital- Divides to promote Inclusive and Sustainable Agri-Food Systems
- Tacking with Climate Change for Sustainable Agri-Food Systems
- Facilitating Agri-Food Trade to Ensure Food Security and Nutrition
- Transition of Global Agri-Food Systems: Importance and Role of G20

In view of this, there is a need to examine these issues particularly in the context of developing countries includes LDCs perspective. This will enable a better policy intervention and helps in taking informed decisions and initiatives. These aspects helps in shaping the landscape of global agri-food systems, and improve the developing countries conditions besides enhancing global food security and nutrition for all.

2. Global Disparities and Its Impact on SDGs Progress

The socioeconomic disparities within the country and across the countries are clearly visible. This divergence tendency in low-income countries including Least Developed Countries (LDCs) are impacted adversely

with hindering their developmental progress. The World Development Report 2024 indicates that global disparity in per capita income is evident. Both high-income countries (HICs) and upper-middle-income countries (UMICs) comprising 137 nations drives about 91.1 percent of global GDP and about to 50.8 percent of the world's population (Table 1). Both of these country-income groups are significant global emitters, together accounting for approximately 84.0 percent of global CO_2 emissions—48.6 percent from upper-middle-income countries and 35.2 percent from high-income countries. Per-capita emissions are also substantially higher in these highly developed country-income groups.

Table 1: World Bank Country Classification and Selected Global Indicators, 2022

	Countries	No. of Countries	GNI Per capita (in USD)	Global Share (%) of				
				Population	GDP	Extreme Poverty (%)	Carbon Dioxide (CO_2) Emissions (%)	Total greenhouse gas emissions per capita (excluding LULUCF(t CO_2e/ capita)*
1.	Low-income	26	1,135 or less	8.9	0.6	36.5	0.5	1.4
2.	Lower-middle-income	54	1,136 and 4,465	40.3	8.3	55.4	15.7	2.5
3.	Upper-middle-income	54	4,466 and 13,845	35.1	30.3	7.1	48.6	8.5
4.	High-income	83	13,846 or more	15.7	60.8	1.0	35.2	13.0

Source: World Bank. (2024). World Development Report 2024: The Middle-Income Trap. p.4.

Notes: "*", World Development Indicators, World Bank (Retrieved on 22.04.25)

In contrast, low-income (LICs) and lower-middle-income countries (LMICs), a group of 80 nations, contribute just 8.9 percent to global GDP while representing 49.2 percent of the population. They face extreme

poverty levels of 91.9 percent yet account for significantly lower global CO2 emissions, at only 0.5 percent and 15.7 percent respectively—much lower than the emissions of HICs and UMICs. The combination of low per capita incomes with high-poverty levels hampers the socioeconomic development in LICs and LMICs and thus hindering progress toward Sustainable Development Goals (SDGs), particularly hindering the SDG 2 progress globally particularly developing countries are impacted significantly with persistence of hunger and malnutrition further.

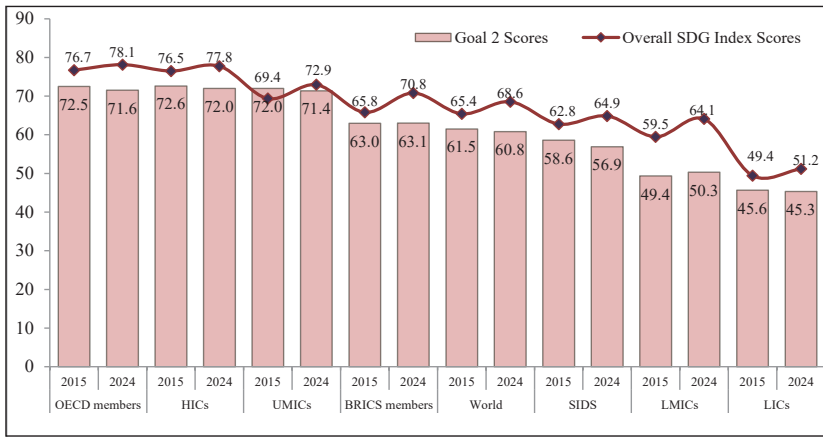
As a result, developing countries, including LDCs, bear the greatest burden from existential challenges along with increased climate crisis and extreme weathers events, besides widening global disparities. They suffer most from the consequences of the climate crisis despite least contribution to global emissions. Therefore, it is essential to estimate the loss and damage of these countries incurring from climate crisis and extreme climate events and the developed countries need to provide an appropriate compensation. At the sectoral-levels, agri-food systems is more vulnerabilities to these changing climate and its intensity due to inadequate adaptation and mitigation activities is incurring severe loss of agriculture produce, livelihoods and incomes further. Therefore, it's critical to closing the adaptation finance gap faced by the developing countries and ensuring better access to innovations and climate-smart technologies are most important to reduce climate vulnerabilities in developing countries.

2.1. Status and Attainment of SDG 2 on 'Zero-Hunger'

Global disparities are clearly visible, and thus developing countries including least developed countries (LDCs) are significantly lagging behind in key development indicators. The structural backwardness with persistent of socioeconomic inequalities are further hampering the SDGs attainments, particularly in low-income and lower-middle-income countries. The overall SDGs index scores, which measure the total progress towards achieving all 17 SDGs shows as a percentage of SDGs attainment have improved marginally from 65.4 in 2015 to 68.6 in 2024 (Figure 1). The highly industrialised economies of OECD

and high-income countries (HICs) followed by upper-middle-income countries (UMICs) have consistently scores above this global average and made modest gains since 2015. Among BRICS nations, the index climbed from 65.8 percent to 70.8 percent, while India advanced its scores from 60.5 to 67.0 respectively.

Figure 1: SDG Index and Goal-2 Scores Across Country Income Levels, 2015 and 2024



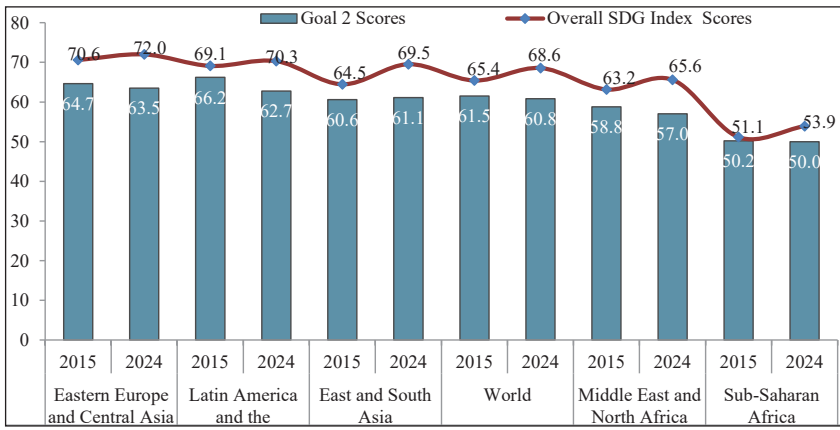
***Source*:** Based on Sustainable Development Report 2025 (https://dashboards.sdgindex.org/rankings)

Note: SDG Index, the overall score measures the total progress towards achieving all 17 SDGs. The score can be interpreted as a percentage of SDG achievement. A score of 100 indicates that all SDGs have been achieved.

In contrast, the low-income countries and lower-middle-income countries-including Small Island Developing States (SIDS)-remain below the global average. Therefore, SDGs progress have marginally improved from its baseline levels of 2015, while the gap between high-income and developing countries has widened. Particularly, LICs, LMICs, and SIDS are lagging considerably and they are below the global average of 68.6 percent, while LICs failing to meet over half of their SDGs targets. Therefore, global progress towards the 2030 Agenda and its several SDGs are in peril. Developing countries, in particular, are significantly off-tracked across the goals and thereby impeding the overall SDGs

advancement. The SDG 2 progress has stagnated to regressing across all the country-income groups. Particularly LICs and LMICs, are hardest hit with more than 55 and 50 percent of SDG 2 targets remain unmet, and hunger and malnutrition persist at high rates.

Figure 2: SDG Index and Goal-2 Scores across SDG Regions, 2015 and 2024



***Source*:** Based on Sustainable Development Report 2025 (https://dashboards.sdgindex.org/rankings)

***Note*:** as given in Figure 1.

Further, the SDG 2 progress across the SDG regions had also regressing in 2024 as compared to 2015 levels (Figure 2). This progress in East and South Asia is above the global average while, its progress is very negligible, and the Latin America and the Caribbean had declined significantly at (-) 3.5 percent from 66.2 to 62.7 in 2024 over 2015 levels. Sub-Saharan Africa and the Middle East and North Africa remains below the global average of 60.8 percent and have seen further declines, with nearly half of their SDG 2 targets are unmet. Although Eastern Europe and Central Asia, Latin America and the Caribbean, and East and South Asia all exceed the global average, only East and South Asia show some positive momentum. These patterns underscore the widespread of underperformance on Zero Hunger across the country-income groups and SDGs regions further.

2.2. The State of Global Agriculture and Productivity

Global disparities in agriculture across the country-income levels is also evident. Both LICs and LMICs are highly reliant on agriculture for incomes and livelihoods with higher size of rural population (Table 2). Agriculture value added as a percent of GDP (is at 26.7 and 15.4 percent in LICs and LMICs) employment in agriculture (is at 56.6 and 39.2 percent in LICs LMICs) particularly female employment in agriculture (at 63.6 and 47.0 percent in LICs and LMICs) is considerably high in LICs and LMICs. There are far above the developed countries of HICs and UMICs as well as global average respectively. It also indicates the lack of progress in non-agricultural economic activities with existence of low-productivity in labour and yields as compared to other country groups. For instance, the agricultural value added per worker in LICs and LMICs was alarmingly low at $713 and $2,299 respectively in 2023. These figures stand in sharp contrast to the values recorded in high-income countries ($33,970), upper-middle-income countries ($7,088), and the global average ($4,326). This divergence is reflected in several indicators including cereal yield (kg per hectare), which remains considerably low in LICs (1,443 kg) and LMICs (3,308 kg) respectively. Developing countries, therefore, are lagging behind in several key indicators indicates the inefficiency of a sector.

The structural backwardness, COVID-19 pandemic, economic downturn, high debts and its costs, conflicts, trade disruption and climate crisis etc., impeding the developmental progress in developing countries. These challenges coupled with the sluggish growth of non-agriculture sector serve as underlying bottlenecks, contributing to weak demand for manufactured goods due to the poor purchasing power of farm households besides rising the systemic challenges etc., hindering the overall progress of the economy further. These challenges may widen the global disparities further with persistence of poverty, unsustainable livelihoods, and incomes are more evident in developing countries including LDCs.

Table 2: Global Agriculture: High Productivity Gap

	Countries/Indicators	Low-income		Lower-middle-income		Upper-middle-income		High-income		World	
		2015	2023	2015	2023	2015	2023	2015	2023	2015	2023
1.	Agriculture and Allied Activities (percent of GDP)	24.5	26.7	16.1	15.4	7.5	6.9	1.4	1.3	4.2	4.1
2.	Employment in agriculture (percent)	58.3	56.6	42.2	39.2	24.9	20.4	3.9	3.2	28.4	26.1
3.	Female Employment in agriculture (percent)	66.5	63.6	48.4	47.0	21.7	17.2	2.9	2.2	27.4	25.9
4.	Agriculture, forestry, and fishing, value added per worker (constant 2015 US$)	972.6	713.0	1,931	2,299	4,627	7,088	27,155	33,970	3,492	4,326
5.	Cereal yield (kg per hectare)*	1,373	1,443	2,929	3,308	4,641	4,860	4,953	5,296	3,928	4,182
6.	Agricultural land*	41.5	42.3	42.8	43.3	43.1	42.7	28	28.2	36.7	36.9
7.	Rural population	65.9	62.4	62.9	59.0	37.8	31.4	20.4	18.3	46.3	42.7

***Source*:** World Development Indicators, World Bank (Accessed September 2025).

***Notes*:** "*" Refers to 2022 data.

3. Fostering Agri-Food Systems Transformation

Transforming agri-food systems especially in developing counties is essential to facilitate the socioeconomic development, reducing global disparities, achieving the 2030 Agenda and its SDGs. Particularly, the SDG 2 attainment is determine by the improved access to healthier and more diverse diets, and supporting diversified livelihoods and remunerative farm incomes. Therefore, agriculture serves as the foundation of national security and plays a crucial role in overall national development and long-term stability. The studies show the agricultural productivity would be a significant factor in the process of structural change (the shift into manufacturing employment). Whereas, the low agricultural productivity is likely to make such structural change difficult and, it is not only threatening the domestic food supply but also jeopardizes the sustainable growth of the agricultural sector (Grabowski and Self, 2023 and Zhang, et al., 2025).

It is evident that the lack of crop-diversification and value addition, low-penetration of mechanisation and digitalization of farming system, weak skilled workforce with limited access to extension services besides increased vulnerabilities to extreme climates, conflicts, miserable farm incomes and investments etc., contributes to the backwardness of the sector with hindering the land and labour productivity further. These challenges in developing countries holding back the structural shifts. Hence, developing countries includes LDCs and Sub-Saharan Africa, South-Asia and the Middle East and North Africa regions are lagging behind to global average in SDGs have bear this brunt of persistent hunger and malnutrition. In this context, a holistic systemic approach is essential to address the intertwined challenges of food insecurity and malnutrition by linking food production, sustainability, livelihoods and building resilience against climate shocks, conflict, and price volatility are matter of policy concern.

In this context, addressing these challenges and prioritizing the transformation of various aspects of agri-food systems—particularly in developing countries—is critical. Adoption of the holistic and systemic

approach, or exploring multidimensional strategies, can enhance productivity while strengthening the resilience and sustainability of the sector. This transformation is essential for achieving key development goals and narrowing the gap between developing and developed countries. Strengthening collaboration and cooperation with multilateral organizations—and leveraging their expertise and initiatives is vital to advancing the agri-food sector and reducing the global divergence between the Global South and the highly industrialized Global North. In particular, several G20 initiatives led by recent Global South presidencies—including India, Brazil, and the current South Africa presidency—have launched monumental efforts to transform global agri-food systems. Effective implementation of these initiatives, through enhanced collaborative interventions, remains a critical concern for Global South countries. Such efforts are instrumental in addressing systemic challenges and accelerating progress toward achieving SDG 2 targets, especially those focused on ending hunger and all forms of malnutrition.

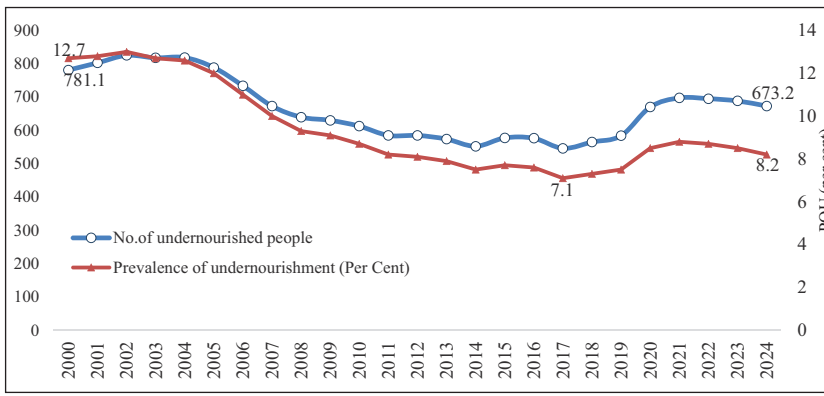
3.1. Prioritising the Achievement of SDG 2-Ending Hunger and Malnutrition

The slogan of "no one left behind" cannot be met without ensuring food and nutritional security for all, especially in developing countries and least developed countries—is essential to achieve the 2030 Agenda and its SDG 2 targets on 'Zero-Hunger'. The attainment of SDG 2.1.1 (prevalence of undernourishment) and 2.1.2 (prevalence of moderate or severe food insecurity) are critical to reduce the global hunger and food insecurity. Thus, prevalence of undernourishment measures the share of people whose habitual food intake is insufficient to meet the dietary energy requirements needed for a normal, active, healthy life (commonly benchmarked at about 2,100 kcal per day), values below that threshold signal rising hunger and elevated risk of undernutrition.

Globally the prevalence of undernourishment fell from the high of 12.7 percent in 2000 to 8.2 percent in 2024, the drop 4.5 percentage points, equivalent to 107.9 million fewer undernourished people, from 781.1 million in 2000 to 673.2 million in 2024 (Figure 3). Across the

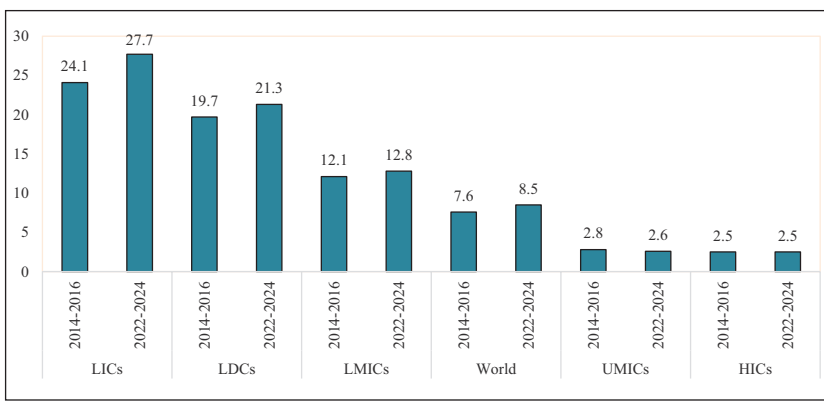
years, on average, it was high at 12.1 percent during 2000 to 2007 and decline to 8.7 percent and 7.5 percent during 2008 to 2012 and 2013 to 2019, and then it started rising to 8.5 percent, from 2020 to 2024, respectively. COVID-19, persistent of global food and energy prices, and conflicts caused spikes these rates to 8.5 percent in 2020 and 8.8 percent in 2021, after which the rate has gradually decreased.

Figure 3: Global Trends in Undernourishment, 2000 to 2024



Source: FAOSTAT (Accessed September, 2025).

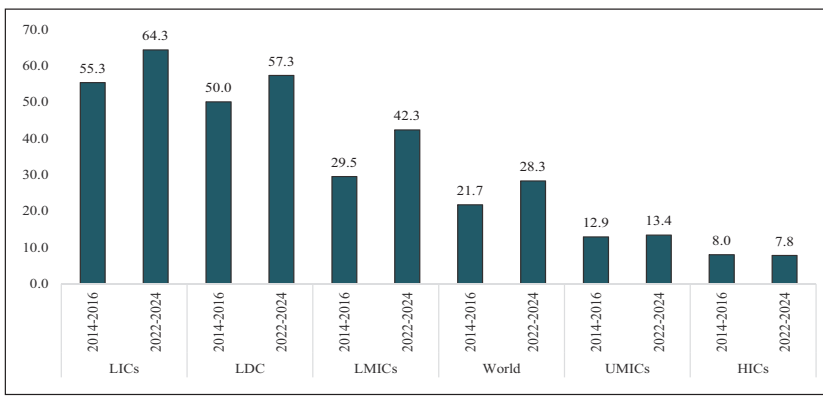
Figure 4: Undernourishment across Income Groups (3-year average, percent)



Source: FAOSTAT (Accessed September, 2025).

This burden of undernourishment is an acute issue in poorer country groups. In 2022–2024, prevalence was highest in low-income countries (LICs) and least developed countries (LDCs), at 27.7 percent and 21.3 percent respectively, up from 24.1 percent and 19.7 percent in 2014–2016. (Figure 4). These rates remains well above the world average of 8.5 percent and have risen relatively to previous years and other regions. In contrast, prevalence in high-income countries and upper-middle-income is much lower, around 2.5–2.6 percent, indicating minimal chronic hunger in wealthier economies. The high food insecurity across the developing countries is also visible scenario that led to rising hunger and malnutrition. These levels in food insecurity in LICs followed by LDCs and LMICs is considerably high at 64.3, 57.3 and 42.3 percent in 2022-2024 as compared to the global average of 21.7 percent (Figure 5). The high incidence of food insecurity in developing countries is at rising trend as compared to the 2014-2016 levels. These are far above the global average as well as HIC includes UMICs levels.

Figure 5: Food Insecurity across Income Groups (3-year average, per cent)



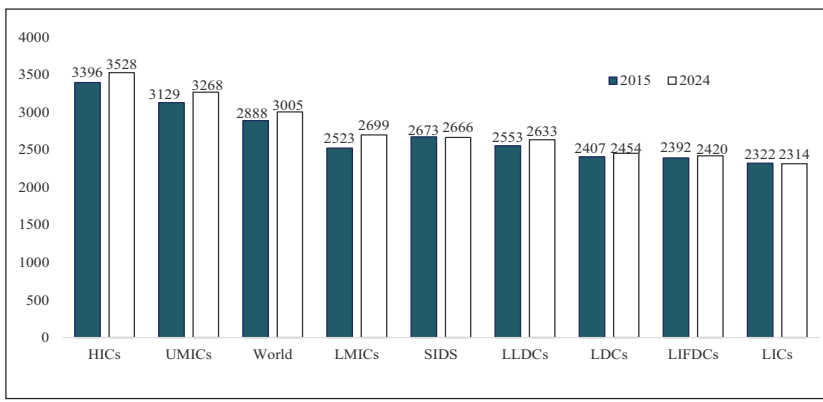
***Source*:** FAOSTAT (Accessed September, 2025).

Deterioration of food security situation with inadequate access and absence of social safety nets and limited resources have driven higher

levels of hunger in developing countries including LDCs, signaling a regression in progress against hunger in developing countries. For instance, the per capita dietary energy supply shows a clear divergence across global regions. In particular, low-income countries, including Least Developed Countries (LDCs) are lagging behind with significantly lower caloric intake of food. These levels are below the global average and other parts of the world (Figure 6). In contrast, both HICs and UMICs are well above the global average with higher-levels of caloric intake of food.

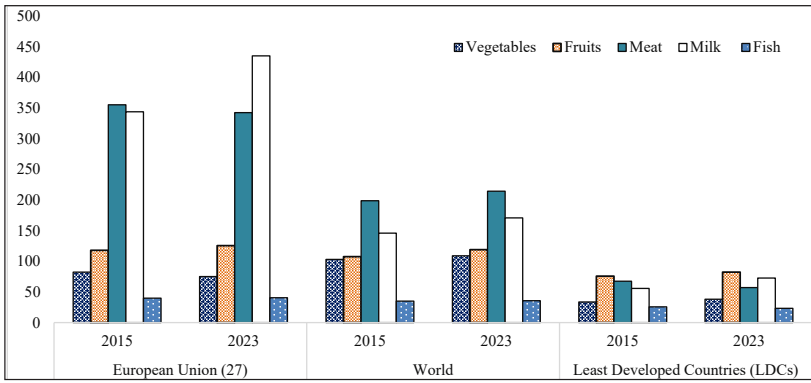
Besides, inadequate access to nutritious food items—such as vegetables, fruits, meat, milk, and fish—has resulted in low per-capita intake in LDCs. This is evident when comparing their consumption levels with global averages and those of the EU (Figure 7). Hence, The high prevalence of undernourishment with deprived dietary energy supply have adversely impacts on labour productivity with increased morbidity and mortality due to lack of sufficient food and not getting enough dietary energy levels.

Figure 6: Dietary Energy Supply (kcal/cap/day), 2015 and 2024



***Source*:** FAOSTAT (Accessed November, 2025).

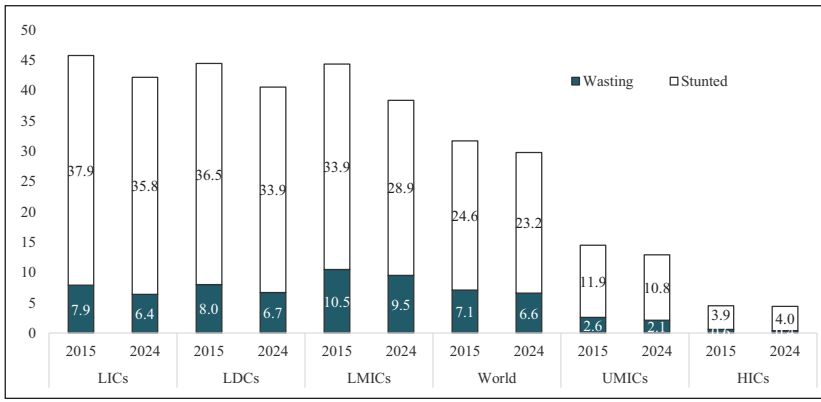
Figure 7: Food Supply (kcal/capita/day, 2015 and 2023



Source: FAOSTAT (Accessed November, 2025).

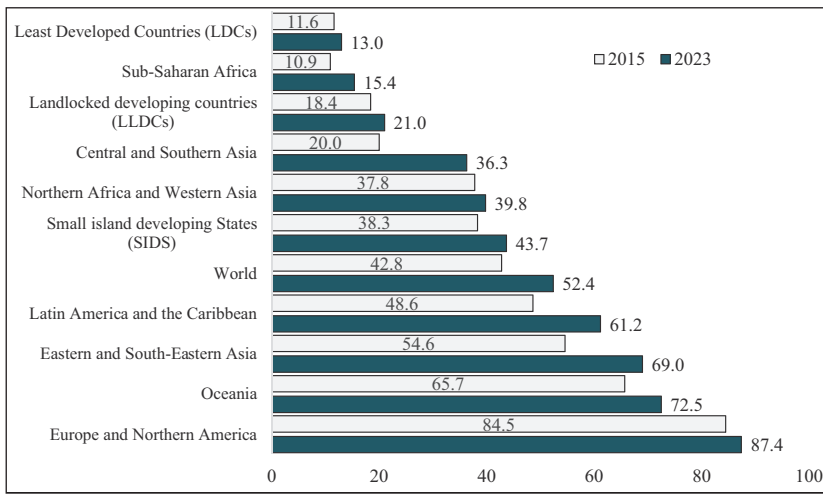
Owing to the high incidence of hunger and food insecurity adversely effects on nutritional outcomes with high prevalence of all forms of malnutrition. The level of child malnutrition such as stunted and wasted children under age 5 years across the developing countries including LDCs is considerably high and affected with higher percentage of children in these countries (Figure 8). The overall trend globally across almost all country groups in both wasting and stunting levels are declined between 2015 and 2024 showing measurable progress in reducing acute and chronic undernutrition. However, the greatest burden remains in poorer countries such as LICs (at 35.8 percent) and LDCs (at 33.9 percent) continue to have the highest stunting prevalence, and LMICs with 9.5 percent have the highest wasting prevalence so the heaviest burdens remain concentrated in lower-income settings. Both HICs and UMICs in contrast are below the global average and show a very low wasting and essentially stable stunting underscoring that residual stunting in HICs is small but persistent.

Figure 8: Wasting and Stunted Children Under Age 5 Years (Per cent)



***Source*:** FAOSTAT (Accessed September, 2025).

Figure 9: Population Covered by at Least One Social Protection Benefit, 2015 and 2023 (Per cent)



Source: UNSTATS (Accessed November, 2025).

As a result, global inequities in child nutritional outcomes remain substantial and the deprived nutritional outcomes is clearly visible in developing countries including LDCs. Absence of social security

protection including inadequate food safety nets is further exacerbating this situation with high prevalence of food insecurity and all forms of malnutrition and it is clearly reflecting in Figure 9. Therefore, the proportion of population covered by at least one social protection, benefits in developing countries across the SDGs is significantly low and far below the global average and other parts of the world. As stated by FAO that the unhealthy dietary patterns increase the non-communicable diseases and account for 70 percent of all quantified hidden costs of agrifood systems and it reduces the labour productivity (FAO, 2024a).

Addressing the worsening food security situation and alleviation of all child malnutrition should be a core agenda. It includes adequate access to food safety net includes social security schemes, adequate access and affordability of healthy diets and promotes the relevant and targeted interventions to tackle with these challenges are essential. The improved policy mechanisms aimed at the transformation of agri-food systems through enhanced adaptation and mitigate strategies can helps to reduce negative impacts on food systems and accelerate the progress in combating hunger in developing countries. This may positively impacts on labour productivity while improving the quality human resources in general particularly in developing countries.

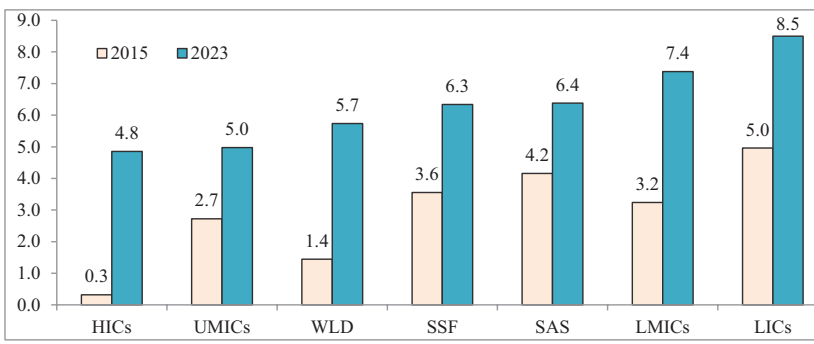
3.2. Mitigating the Global Food Price Volatility and Accessing Healthy Diets

Persistent of food price volatility as measured by the consumer price index (CPI), reflecting the cost to acquiring a basket of goods and services adversely affects food accessibility and affordability, leading to increased hunger and food insecurity. This will deprived human capital and economic growth of the country. For instance, food price volatility has hurt millions of people, undermining their nutritional status and food security. It affects household incomes and purchasing power leading to poverty, undernourishment and impacted consumers' welfare. Hence, it weakens the prospects of developing countries for economic growth and poverty reduction (HLPE, 2011). Increased food price have led to increases in social unrest (Bellemare, 2015). The soaring food prices increases the cost of living for households and thus reduce their real

incomes. The low income and developing countries are more acutely hurting due to their higher budgetary allocation on food (Amaglobeli et al. 2023 and FAO, 2024, p.3). Therefore, the high food prices lead to lower dietary quality and reduced total energy intake with negative impact on child growth and cognitive development (Meerman and Aphane, 2012 and Sadikeen et al., 2024). Persistent of food inflation not only exacerbates income inequities but also widens the regional disparities further.

The aggregate impact of high-food prices also vary by regions. Net food-importing countries face higher import bills and reduce fiscal flexibility, while consumers in many African and Asian nations, who spend a large share of their income on food, feel the strain. Smallholder producers struggle with price volatility and rising input costs (World Bank, 2012). As result, the high-food prices hindered the SDG 2 progress on achieving 'zero hunger' and it affects the developing countries performance and prospects considerably. In this context, examine the inflation pressure and its trends across the countries and regions is essential leading to promote the better policy interventions and thus helps to achieving several SDG 2 targets on food security and ending all forms of malnutrition.

Figure 10: Inflation Trends (CPI percent) across Country Income Groups, 2015 and 2023

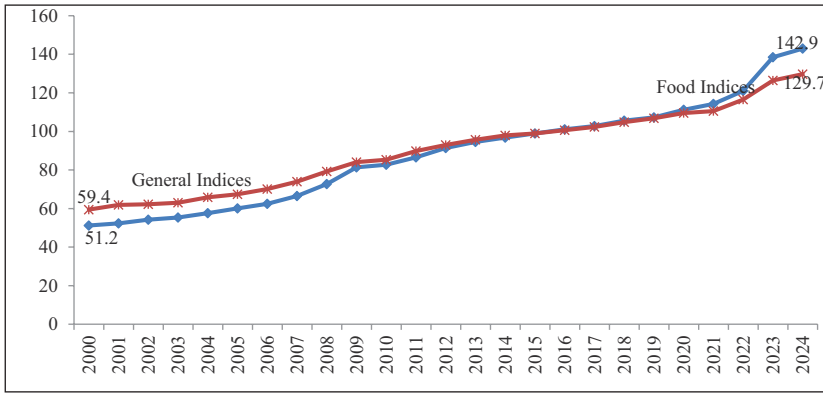


***Source*:** World Development Indicators (WDI), World Bank (retrieved on 12.05.25).

Figure 10 show global inflationary pressures increased across all income country groups. It disproportionately affects low-income (LICs) and Lower-Middle-Income Countries (LMICs), with an increased to 8.5 and 7.4 percent in 2023 from 5.0 and 3.2 percent in 2015 respectively. The South Asia (SAS) and Sub-Saharan Africa (SSF) regions had also faced the higher inflation pressure with increased to 6.4 and 6.3 percent in 2023 from 4.2 and 3.6 percent in 2015. These are above the global average of 5.7 and 1.4 percent in 2023 and 2015 respectively. Indicating greater vulnerability to inflation shocks, often struggle with currency depreciation, rising food and fuel prices, weak monetary and unstable fiscal policies, economic instability, higher costs of imports, supply chain disruptions etc., contributes to this rising inflation trends. In contrast, both High-Income Countries (HICs) and Upper-Middle-Income Countries (UMICs) had a very low inflation rate and are below the global average, however, these were also experienced a sharp rise to 4.8 and 5.0 percent in 2023 as compared to 0.3 and 2.7 percent in 2015 respectively. This suggested that inflation has become a widespread issue, even affecting advanced economies with strong financial systems.

It also found that the consumer price index in general and food categories has shown a consistent increase, following a linear trend. The median of food CPI grew at an even faster rate from 51.2 to 142.9, while, the general CPI rose from 59.4 to 129.7 during 2000 to 2024 (Figure 11). This growing trend of food indices as compared to general prices is more visible since the COVID-19 pandemic and thus prices for essential food items—including input costs such as fuel and fertilizers—are rising at a faster pace than core inflation. This trend of higher food prices often contributes the inadequate access and lack of affordability of basic food items and thereby worsening food insecurity situation further. Hence, the poorer countries and the low-income households are disproportionally affected with increased hunger and food insecurity. Figure 12 shows the price indices for key food items particularly sugar, cereals, and overall food categories, have become increasingly volatile, while, oils and dairy indices remain significantly high, contributing to the overall rise in the food price index further.

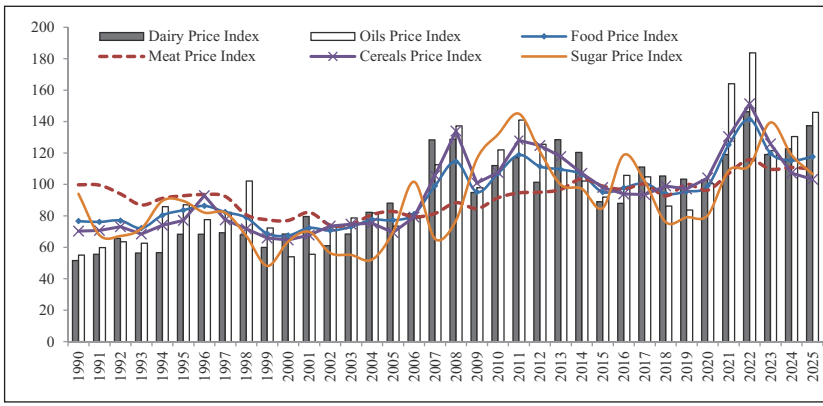
Figure 11: Consumer Prices, Food and General Indices, 2000 to 2024



***Source*:** FAOSTAT (retrieved on 20.05.25).

***Notes*:** Consumer Prices, Food Indices and General Indices (base year at 2015 = 100) and it represents monthly data only (median), January month of each year taken into consideration.

Figure 12: Food Price Index for Key Food Items, 1990-2025

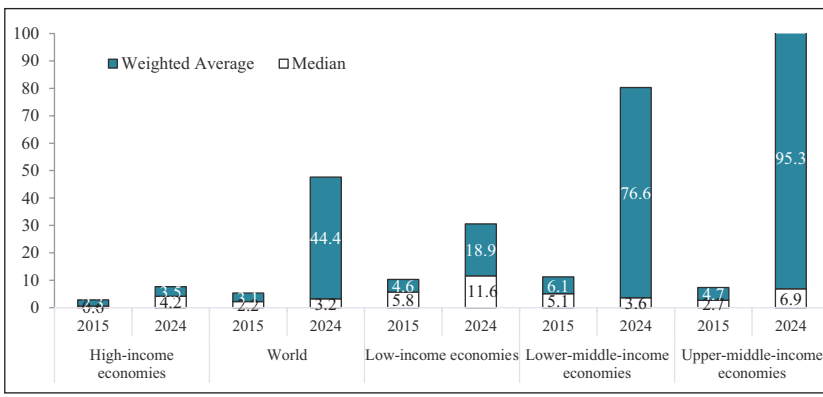


***Source*:** FAO (retrieved on 22.05.25).

Figure 13 show that both the median food price inflation (helps in identify underlying trends without being skewed by extreme price movements) and the weighted average food price inflation (especially useful when commonly purchased food items have a higher weight,

reflecting the overall impact of inflation on consumers) has seen an increasing trend globally. The weighted average rose sharply from 3.1 in 2015 to 44.4 in 2024 indicating a steep increase in prices of key food items that carry highly weight in household food consumption baskets. This price surge recorded the biggest rise in upper-middle-income economies, from 4.7 in 2015 to 95.3 in 2024 followed by lower-middle-income economies from 6.1 in 2015 to 76.6 in 2024. These are far above the global average. The average food prices in low-income economies is substantially high from 5.8 in 2015 to 11.6 in 2024. This will resulted to increased risks of accessing and affordability of food. In high-income economies, in contrast, in both dimensions are below the global average and are relatively resilient which shows a better infrastructure and government interventions to curb inflation.

Figure 13: Food price inflation, Median and Weighted Average, 2015 and 2024

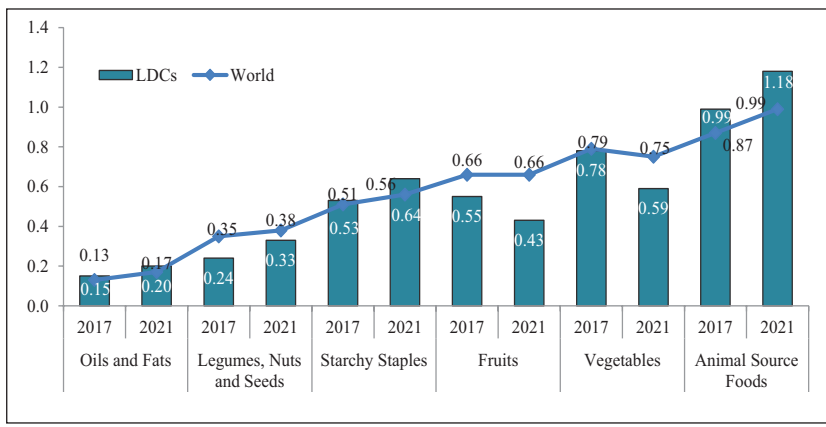


***Source*:** FAOSTAT.

High-food inflation has also reduced access to and affordability of healthy diets (CoHD) , while the poor diet quality increases the risk of different forms of malnutrition, including undernutrition and micronutrient deficiencies, as well as overweight and obesity. These interlinkages particularly evident in most of the developing countries. Furthermore, the FAO identifies six food groups that make up the Healthy Diet Basket (HDB) namely starchy staples, animal source foods, legumes,

nuts and seeds, vegetables, fruits, and oils and fats. Between 2017 and 2021, the cost of these food groups showed mixed trend (Figure 14). Animal source foods experienced the largest price increases followed by vegetables, fruits, and starchy staples while, oils and fats, legumes, nuts, and seeds rose modestly. A similar price trends have also observed in least developed countries (LDCs) where the cost of animal source foods continues to rise with higher costs price, followed by starchy staples. Prices for other commodity groups are also increasing, except for vegetables and fruits. The overall cost of accessing these commodity groups-excluding animal source foods and starchy staples—remains lower in LDCs as compared to the global average cost of a healthy diet.

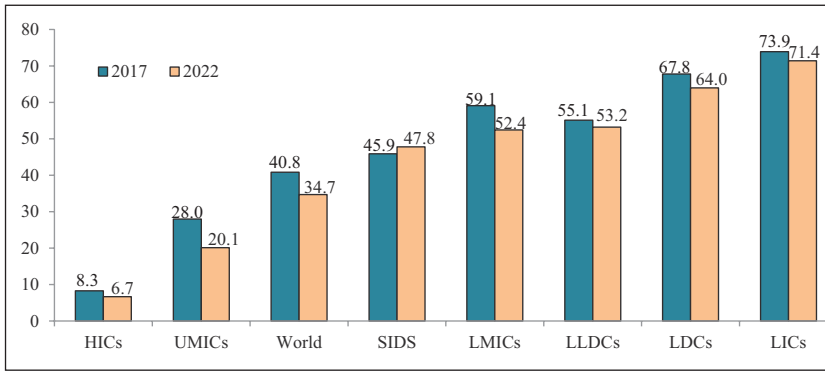
Figure 14: Cost of Food Items- Healthy Diet (PPP$ per person per day), 2017 and 2021



***Source*:** FAOSTAT (retrieved on 26.05.25).

On the contrary, the prevalence of unaffordability of healthy diets in LICs including LDCs, LLDCs LMICs and SIDS was very high with ranging from 71.4 percent to 47.8 percent in 2022. These numbers are far above the global average of 34.7 and 40.8 percent in 2022 and 2017 (Figure 15). By contrast, lower costs with adequate access to healthy diets in HICs and UMICs indicate a lower prevalence of unaffordable healthy diets, at 6.7 percent and 20.1 percent in 2022, respectively. These figures are well below the global average.

Figure 15: Prevalence of Unaffordability Healthy Diet, 2017 and 2022 (Percent)



***Source*:** FAOSTAT (retrieved on 23.05.25).

The persistent of high-food prices, therefore, affecting low-income countries disproportionately, while, the import dependent countries are also impacted adversely by raising their food import bill. The FAO Food Outlook for 2024 estimated that the global food imports bill (FIB) is consistently increasing from 1,789.2 billion in 2021 to exceed USD 2.0 trillion (2029.0 billion) in 2024, representing a 2.2 percent, or USD 43.3 billion, increase from 2023 (1,985.7 billion). The largest share of global cereal import bill represents by the least developing countries, net food-importing developing countries and sub-Saharan Africa. The global agricultural input import bill was estimated to increase by 48 percent in 2022 to USD 424 billion (FAO, 2024). As a result, the high food inflation affects global food systems as well as the high food import costs influenced by the local food systems and thereby meeting the food security, and nutritional targets are significant challenge to the developing countries including NFIDCs.

In conclusion, inflation is no longer an isolated issue but a global economic challenge, which affects every country irrespective of their income levels and it affects developing countries considerably through the higher cost of living and reduced purchasing power leading to higher levels of hunger and poverty. This price surge poses a serious risk to food security, and child nutrition includes the import-dependent

countries such as NFIDCs (Net Food-Importing Developing) and LIFDCs (Low-Income Food-Deficit Countries) whereas rising import bills and inadequate access to essential food items exacerbate this situation further. The growing emerging challenges particularly supply chain disruptions, conflicts, unilateral trade decision includes non-tariff barriers led to rising trade costs, climate changes etc., have intensified food insecurity and hunger situation further. These issues are matters of policy concern that require coordinated global action. Promoting the targeted intervention, strengthening multilateral partnerships, especially G20 efforts and to support vulnerable countries is essential to tackle the situation. It includes addressing the persistent of food inflation and ensuring better access to and affordability of healthy diets is vital to achieving SDG 2, especially for low-income countries (LICs) and lower-middle-income countries (LMICs), and to end hunger and all forms of malnutrition.

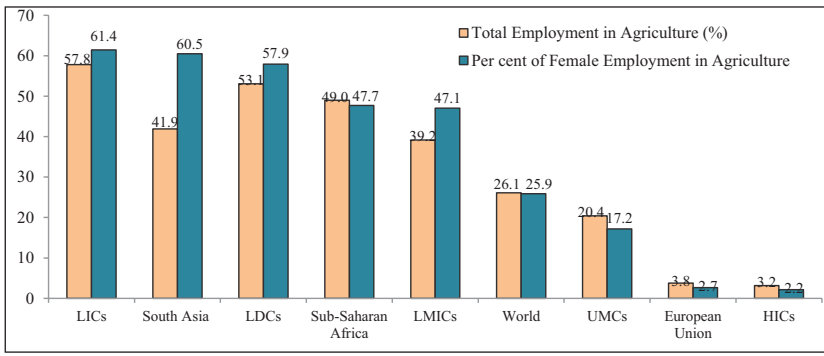
3.3 Sustainable Livelihoods and Diversified Income Opportunities

The sectoral-pattern of employment particularly the high reliance on agriculture sector and the relatively large share of women employed in that sector underlines the sluggish expansion of non-farm sector employment. The limited industrialization with lack of diversification have reinforced reliance on agriculture with unsustainable livelihoods and incomes besides sluggish land and labour productivity. Thereby deprived economies of scale include a slower demand for manufacturing goods etc. These features are more visible in low-income countries (LICs), least developed countries (LDCs) and Lower-Middle-Income Countries (LMCs). Their relative dependency on the agriculture sector is considerably high at 57.8, 53.1 and 39.2 percent and are above the global average of 26.1 percent, respectively (Figure 16). In particular, the female employment in agriculture is substantially high as compared to the total agriculture employment. It is higher in LICs, South Asia, LDCs, Sub-Saharan Africa and LMICs etc.

The relative share of agriculture employment in advanced economies of High-Income Countries (HICs) is just about 3.2 percent followed by Upper-Middle-Income Countries (UMCs) at 20.4 percent. The same trend has also observed for female employment in agriculture sector which

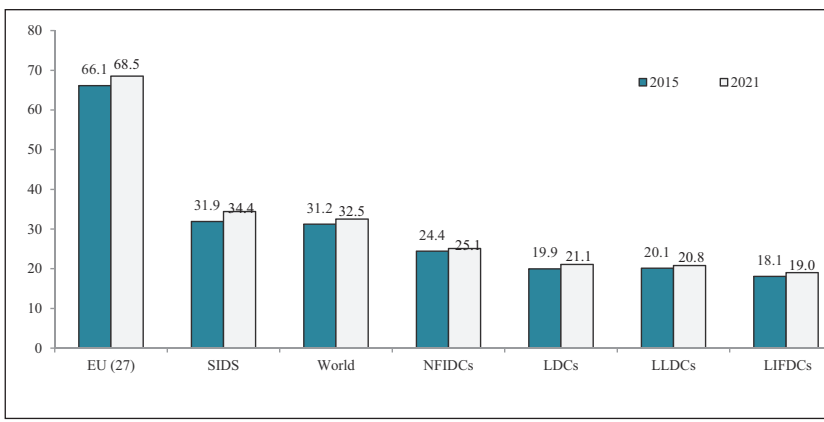
is considerably low in HICs, EU and UMICs with 2.2, 2.7 and 17.2 percent, respectively. It signifies a shift to dominance of non-agricultural employment particularly the services sector employment in HIC at 74.3 percent in 2023 is considerably high (as per World Development Indicators data by the World Bank) and are above the world's average of 50.2 percent.

Figure 16: Relative Share of Female Employment in Agriculture (percent), 2023



***Source*:** FAOSTAT.

Figure 17: Non-agricultural AFS employment in total AFS employment (percent), 2015 and 2021



***Source*:** FAOSTAT.

Moreover, the global average in the non-agricultural agri-food systems (AFS) employment related to processing, logistics, and retails is at 32 percent in total AFS and the share in total employment is at 12.9 percent in 2021 (Figure 17). With 68.5 per cent in EU is remarkably high and 34.4 percent in SIDS. While, LIFDCs (at 19.0 percent), LLDCs (at 20.8 percent), LDCs (21.1 percent) and NFIDCs (at 25.1 percent) are below the global average. It emphasises constraints in diversification and agri-food processing due to lack of infrastructure, technologies, MSMEs, industrialization etc. This will create more imbalances in agriculture sector growth, while, the high reliance of agriculture sector with inadequate non-agricultural AFS employment is more visible in developing countries.

Advancing AFS activities and diversifying employment opportunities are essential. Facilitating investments in R&D and innovation, improving access to and adoption of emerging technologies, and capacity building and skill development will promote rural agripreneurship, create sustainable agribusinesses, and enhancing value addition across the food and farm supply chain. These interventions help generate remunerative jobs, secure sustainable livelihoods, incomes and fostering the structural transformation of agri-food systems while revitalising of rural economy and reducing hunger, poverty and inequalities etc. Developing countries, therefore, need to reshape their policies towards achieving these objectives are essential. This will enhance labour and yield productivity and to reduce the high concentration of the workforce in the agricultural sector etc. The better interventions and strategies with a special focus to create the remunerative employment for women is uttermost important to promote the diversified employment and income opportunities.

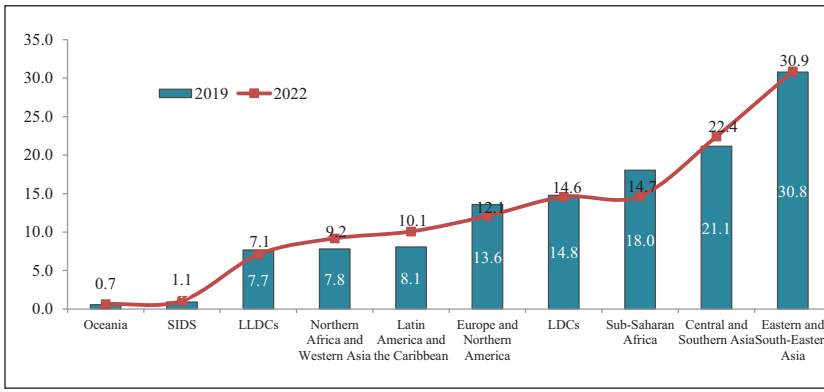
3.4. Averting Food Loss and Waste (FLW): Challenges and Opportunity

Food Loss and Waste (FLW) is a global challenge and thus reduces the availability of food, besides depleting critical resources used in production and distribution systems. As per UNEP, in 2022 around 1.05 billion tonnes of food (i.e. 132 kg per capita per year) being wasted globally, combined in the retail, food service and household sectors.

This amount to 19 percent of food (one fifth) of all food available to consumers was wasted. Households were responsible for 631 million tonnes of food waste—60 percent of the total (about 79 kg per capita), while the food service and retail sectors wasted 290 million tonnes and 131 million tonnes (UNEP, FWIR, 2024) . This is in addition to the estimated 13 percent of the world's food that is lost in the supply chain from post-harvest up to and excluding retail. FLW also generated 8 to 10 percent of global greenhouse gas emissions besides, the significant amounts of land (it take up nearly 30 per cent of the world's agricultural land), water and other resources are also wasted. The costs of food waste is more than USD 1 trillion and these costs are considerably high in the developing countries.

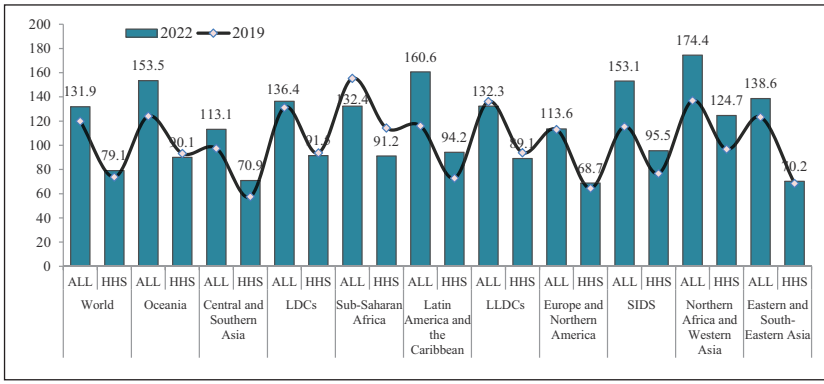
The relative share of food waste across the SDGs regions shows both Eastern and South-Eastern Asia, and Central and Southern Asia contributes more than 50 percent in total global food waste for 2022. Whereas, Oceania and SIDS are below one percent, LLDCs, Northern Africa, and Western Asia are below 10 percent in total global food waste (Figure 18). Food waste at per capita terms, on the contrary, are varying across the regions, both Central and Southern Asia and Europe and Northern America are below the global average of 132 kg in food waste per capita from all sectors (Figure 19). Whereas, Northern Africa and Western Asia (174.4 kg) followed by the Latin America and the Caribbean (160.6 kg), Oceania (153.5 kg) and SIDS (153.1 kg) are considerably high as compared to global average with an increasing trend in 2022 against to 2019 level. It includes Eastern and South-Eastern Asia, and Central and Southern Asia are at increased trend in 2022 as compared to 2019 while, both Sub-Saharan Africa and LLDCs are close to the global average with a declining trend. These numbers are increased due to increased household food waste ranging in between 71 to 58 percent in the total food waste among these regions.

Figure 18: Share of Global Food Waste (percent) across SDG Regions, 2019 and 2022



Source: Based on UNSTATS (Accessed July 2025).

Figure 19: Food waste per capita (KG) All Sectors and at Households levels, 2022 and 2019



***Source*:** UNSTATS (Accessed July 2025).

***Note*:** All and HHS refers to all food waste sectors and Households sector's waste, respectively.

In addition, food losses of all the crop and livestock for human-edible commodity quantities that directly or indirectly completely exits that occurs after harvest on farm, storage, transportation, wholesales,

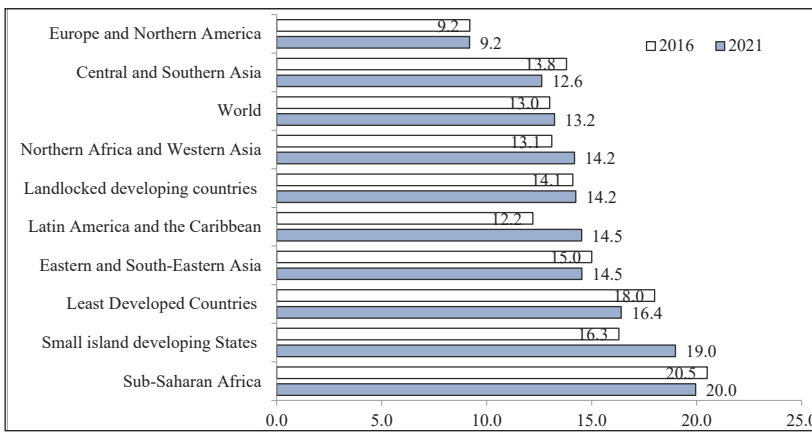
and processing. Food losses at globally remained relatively stable between 13.0 and 13.2 percent from 2016 to 2021 showing no sign of decline (Figure 20). These levels in Sub-Saharan Africa is notably high at 20.5 percent, followed by SIDS at 19.0 percent (it increased from 16.3 percent in 2016) and LDCs at 16 percent of food loss. Whereas, Eastern and South-Eastern Asia, Latin America and the Caribbean, LLDCs and Northern Africa and Western Asia, reports levels higher than the global average, ranging between 14.5 percent to 14.2 percent levels. Along SIDS with Latin America and the Caribbean and Northern Africa, the percentage of food loss was increased in 2021 as compared to 2016 levels, attributable to structural inadequacies. While, Least Developed Countries, and Central and Southern Asia regions food loss noticeable declines. Higher-income countries usually experience lesser food losses, with the lowest losses recorded in Europe at 7.25 percent in 2021.

Owing to higher relative share of food losses in developing countries, along with increasing trends, adversely affects their food security by reducing total food availability. This highlights structural backwardness such as inadequate infrastructure, logistics, storage, and market linkages compounded by traditional farming practices with inadequate technologies, processing with lack of R&D investments and innovations are aggravated the food losses further. Thereby incurring the additional costs for producing this food which is lost never been eaten. On the other hand, the high prevalence of hunger and undernutrition is significantly high in these developing countries. For instance, one in five in Africa and nearly 1 in 11 people worldwide faced hunger in 2023 while more than 2 billion people experienced moderate to severe food insecurity. Millions of children and women are affected by malnutrition (UN, SDG Report 2025, p.10).

In this context, the reduction of food loss along food value chain right from production across supply chain including the reduction of food waste at the retail, food services and at households levels in both absolute and per capita terms reduction in FLW is critical. It is an

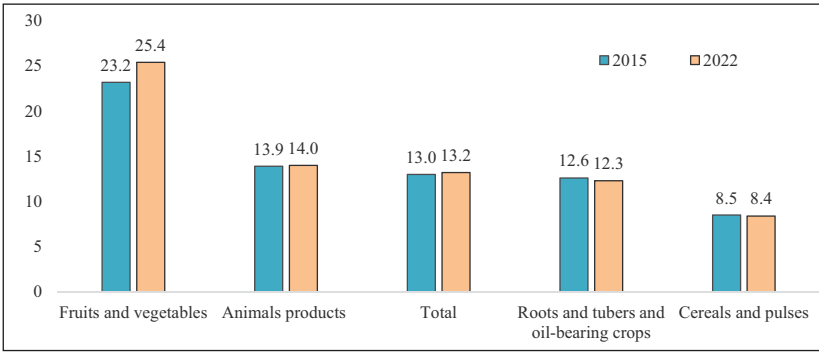
important strategy to ensure global food security and nutrition besides facilitating the efficient use of natural resources and thus reduction of FLW is recognised as a 'zero-cost' productivity. The effective actions and collaborations, with better participation of multilateral organisations and commitment by the global forums is essential to tackle with the persistent issue of FLW globally, particularly for developing counties. Prioritising domestic policies towards reduction of post-harvest losses along production to supply chains and reducing consumer food waste more efficiently requires necessary actions with enhanced participation of all the stakeholders including civil society. Improved storage, cold-chain and logistics infrastructure helps to better post-harvest management. Promoting the targeted interventions by the products wise is also required a policy intervention. Horticulture crops particularly fruits and vegetables along with animals products losses are notably high at 25.4 and 14.0 percent and are high than the overall post-harvest losses globally (at 13.2 percent in 2022) and losses in roots, tubers, oil-bearing crops, cereals, and pulses should also reduce (Figure 21).

Figure 20: Food loss Across the SDGs Regions (per cent), 2016 and 2021



***Source*:** UNSTATS (Accessed July 2025).

Figure 21: Relative Share of Food Loss by Product globally, 2015 and 2022 (percent)



***Source*:** UNSTATS (Accessed November 2025).

Promoting R&D investments and technologies, improved start-ups eco-system, better market linkages from farm to fork, etc., are essential, accompanied by facilitating the suitable policy actions includes capacity building activities, enlarging extension services and early warning systems etc., helps in tackling FLW issue. Such interventions is necessary in general, particularly for developing countries to improve their food security and nutritional situation and thus enhance the agri-food systems transformation further. The improved participation by small farm holders, women and youth farmers' and enhancing their skills with better access to and adoption of emerging technologies and innovation is critical to tackle FLW situation in global south developing countries. This will help in achieving SDG 12.3 targets of halve per capita global food waste at the retail and consumer levels besides in achieving SDG 2 targets on food security and nutrition by 2030. This will promote the efficient use of natural resources and thereby escape from the triple planetary crises of climate change (SDG 13'Climate Action'), biodiversity loss and pollution situation besides increase in productivity and economic growth (SDG 8) further.

3.5. Financing for Agri-Food Systems and Accelerating Public Expenditure

Facilitating investments and fostering the public expenditure in agri-food systems is a key enabler to achieve the sustainable productivity, livelihoods and transition of the sector. The existing literature also show the direct agricultural credit disbursed to farmers and doubling of agricultural credit increases productivity and the better credit accessibility of smallholder has resulted to increased agriculture production per hectare and employment in developing countries (Manoharan and Varkey, 2022; Assouto and Houngbeme, 2023; Shivaswamy et al., 2020 and Seven and Tumen, 2020). Therefore, the direct agriculture credit has a positive and statistically significant impact on agriculture output and its effect is immediate, while, the intensity of agricultural credit on total factor productivity in agriculture has relatively stronger impact with respect to direct agricultural credit. (Das et al., 2009 and Misra et al., 2016). Both agricultural credit guarantee scheme fund (ACGSF) and banks' loans to agriculture (BLOAN) both has long-run and short-run positive impact on agricultural productivity (Fagbemi et al., 2025 and Chandio, et al., 2020).

It also found that both formal credit and informal credit increases farm household agricultural productivity (Akudugu, 2016). A nationally representative household survey in India found credit raised farm productivity by 24 percent and reduced downside risk a 16 percent, boosting resilience to climatic shocks (Birthal et al., 2025). Other studies argues that credit has positive impact on rice productivity and increases wheat production, in kind credit improves maize productivity, and the cash credit on cereal productivity is positive for sorghum (Wicaksono, 2014; Chandio et al., 2023; Agbodji and Johnson, 2019). Agricultural credit therefore, found to positively affect agricultural GDP in both the short-run and long-run (Anh et al., 2020). Agriculture credit positively affects value- added in agriculture in the long- run (Ozdemir, 2024). Hence, widening to access credit market for farmers is key to enhancing food productivity and incomes leading to increase in agriculture value-added, besides, to ensuring food sustainability further.

Agriculture credit refers to the amount of loans provided by the private and or commercial banking sector to producers in agriculture, forestry and fisheries, cooperatives, and agro-businesses. An adequate flow of investments and financing for agri-food systems helps in shaping agri-food system by enhancing productivity, livelihoods, incomes and to ensuring food security and better nutritional outcomes. The efficient functioning of financial sector such as banks and other lending institutions with better policy interventions will help in promoting agriculture credit. Enhanced agricultural finance should ensure seamless and affordable credit access for farmers across the value chain, promoting financial inclusion for all stakeholders is essential.

In this framework, this section examine credit flows in agriculture relative to total credit, along with trends in government expenditure, development finance, and foreign direct investment in the sector. It also essential to study disparities in access to institutional credit, the share of agriculture credit compared to other industries and variations in public investment across income groups. This analysis helps in identifying the key challenges faced by developing countries and outlines pathways for strengthening agricultural finance and value chains further.

Globally, credit for all sectors including agriculture is increased to USD 52.8 trillion in 2023 from USD 38.9 trillion in 2015 and it grew by 35.9 percent (Table 3). The credit for agriculture is increased to USD 1,215 billion in 2023 from USD 1,001 and grew by 21.4 per cent. It relative share in total credit is just 2.3 percent with a declining trend from 2.6 in total credit. The regional disparities are also clearly visible, in particular, combined credit and for agriculture credit in European Union (EU) sector is substantially high. However, the relative share of agriculture credit in EU is at declining trend from 242.6 to 214.3 billion and it declined from 4.4 percent to 3.5 percent during 2015 to 2023 respectively. Nevertheless, the combined total credit and agricultural sector credit in all developing countries is significantly lower compared to the overall credit provided by the EU.

Table 3: Total Credit and Share of Agriculture Credit (US$ at 2015 prices), 2015 and 2023

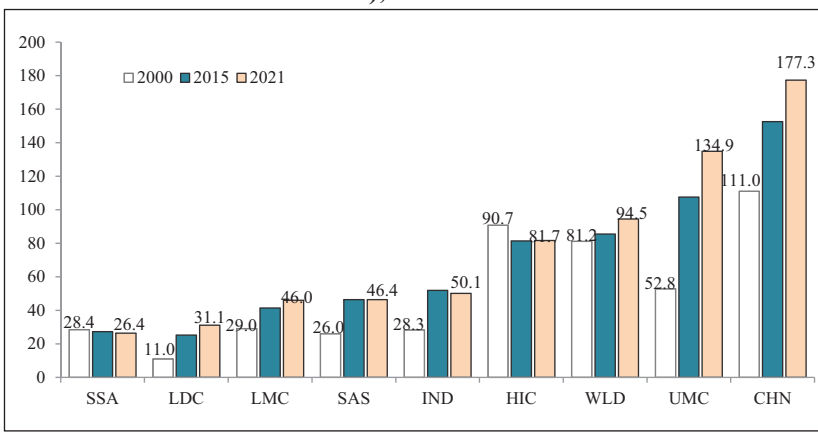
Sl. No.	Region	Total Credit (trillion US$)		Credit to Agriculture, Forestry and Fishing (billion US$)		Credit to Agriculture, Forestry and Fishing Relative Share in Total Credit (%)	
		2015	2023	2015	2023	2015	2023
	World	**38.9**	**52.8**	**1,001**	**1,215**	**2.6**	**2.3**
1.	European Union (27)	5.5	6.1	242.6	214.3	4.4	3.5
2.	Net Food Importing Developing Countries	0.6	0.9	30.7	40.1	4.8	4.4
3.	Least Developed Countries	0.2	0.4	13.7	20.3	6.5	5.8
4.	Land Locked Developing Countries	0.1	0.2	9.0	11.6	6.1	5.9
5.	Small Island Developing States	0.5	0.5	5.3	2.5	1.1	0.5
6.	Low Income Food Deficit Countries	0.1	0.2	9.7	12.3	7.1	5.6

***Source*:** FAOSTAT, FAO (Accessed on June 2025).

Developing nations, particularly NFIDCs and LDCs, have notably high overall credit and agricultural credit, alongside relatively low spending on agriculture. The relative share of agricultural credit in both LLDCs and LDCs, followed by LIFDCs, is notably high despite low levels of spending. The Small Island Developing States (SIDS) faced

the most dramatic reduction, with agricultural credit plunging by over 50 percent and its share nearly halving from 1.1 to 0.5 percent. Hence, the declining trend in agricultural credit, in both absolute and relative terms, suggests other sectors are outpacing it in credit growth. This could raise questions about agricultural investment priorities, especially in the face of food security and climate resilience needs. This includes inadequate access to banking and financial services, leading to low domestic credit by the private sector.

Figure 22: Domestic credit to private sector by banks (per cent of GDP), 2000-2021



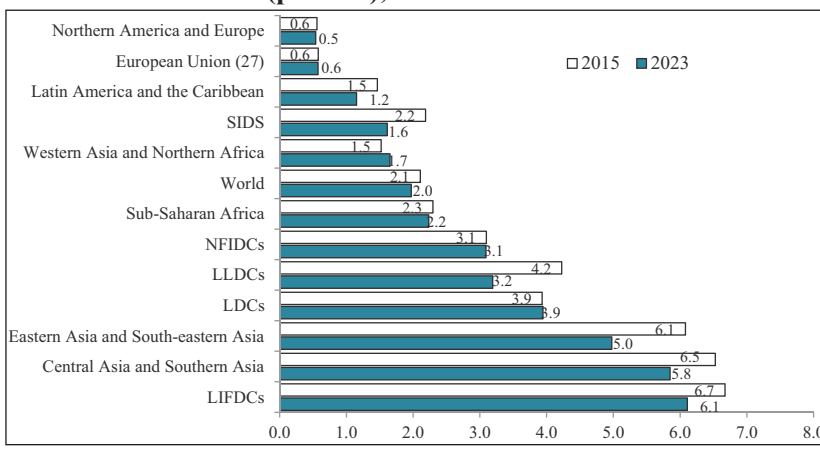
***Source*:** Data from World Development Indicators, World Bank (Accessed June 2025).

Notes*:* SSA (Sub-Saharan Africa), LDC (Least developed countries), LMC (Lower middle income), SAS (South Asia), IND (India), HIC (High income), WLD (World), UMC (Upper middle income) and CHN (China).

The domestic credit to private sector by banks as a percent of GDP reflecting financial resources allocated to businesses and households (Figure 22). Between 2000 and 2021, the world average rose from 81.2 percent to 94.5 percent. In upper-middle-income economies, it increased to 134.9 percent in 2021 from 52.8 percent in 2000, largely driven by China, where bank lending climbed from 111 percent to 177 percent of GDP, signaling deeper financial inclusion and credit penetration through aggressive bank lending and state-driven credit expansion. In contrast,

Sub-Saharan Africa, least-developed countries (LDCs), lower middle-income countries, and South Asia including India are considerably lagging behind to the global average. Weak monetary frameworks and underdeveloped banking systems have limited private-sector borrowing, slowing credit growth and perpetuating socioeconomic challenges. These gaps also undermine efforts to channelization of institutional finance into agri-food system and its transformation across developing regions. In this framework, promoting institutional credit to agri-food systems transformation by the developing countries became challenge for them due to inadequate banking and financial infrastructure and thereby inadequate credit flows to the sector.

Figure 23: Share of Government Expenditure in Agriculture (percent), 2015 and 2023

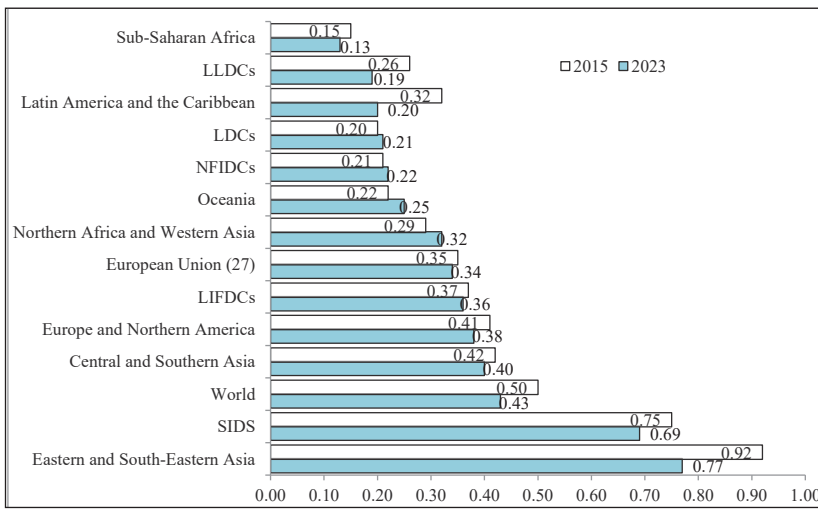


***Source*:** FAOSTAT, FAO (Accessed on June 2025.

In this context, the government budgetary allocation to agriculture sector particularly in developing nations plays a critical role to finance the sector. For instance, the proportion of total government spending in global credit for all sectors is more than 62 percent and above 53 percent for global credit for agriculture sector in 2023. Public expenditure in agriculture as a percent of total government spending is between 2.0 to 2.1 percent in 2015 to 2023 and absolute terms it rose from USD 558.2 billion

to USD 650 billion (Table 4). Over the same period, total government spending across all sectors expanded significantly from USD 26.5 trillion to USD 33.0 trillion. Across the SDGs regions, Eastern Asia and South-eastern Asia are the largest allocators towards agriculture (around 418.3 billion) with the declining share, from 6.1 to 5.0 percent in total government spending on agriculture (Figure 23). The Central Asia and Southern Asia are emerging the biggest agriculture allocators between 5.8–6.1 percent in the total government spending. The Low Income Food Deficit Countries (LIFDCs) is also higher spending on farming.

Figure 24: Agriculture orientation index for government expenditures (percent), 2015 and 2023



***Source*:** UNSTATS and FAOSTATS (Accessed June 2025).

Conversely, highly developed regions (North America, Europe including EU-27) allocate only 0.5 percent to 0.6 percent of their budgets to farming, a figure that has continued to decline. It indicates that the non-agricultural spending by these governments is considerably high and it grew by 19.0 trillion from 16.0 trillion, with the highest share (about 58) in total global government expenditure for all the sectors. Further, Latin

America and the Caribbean actually cut farm spending, while, Western Asia and Northern Africa and Small Island Developing States (SIDS) are below the global average in government spending on agriculture sector.

Table 4: Govt. Expenditure in Agriculture, (US$, 2015 prices), 2015 and 2023

Sl. No.	Regions	Total Expenditure (trillion US$)		Agri-culture, forestry, fishing (Billion US$)		Relative Share of Agri in Total Exp (per cent)	
		2015	2023	2015	2023	2015	2023
	World	**26.5**	**33.0**	**558.2**	**650.0**	**2.1**	**2.0**
1.	Eastern Asia and South-eastern Asia	6.0	8.4	366.5	418.3	6.1	5.0
2.	Northern America and Europe	16.0	19.0	89.2	102.9	0.6	0.5
3.	Central Asia and Southern Asia	0.7	1.2	48.5	70.1	6.5	5.8
4.	Western Asia and Northern Africa	1.3	1.5	19.5	24.7	1.5	1.7
5.	Sub-Saharan Africa	0.3	0.4	7.6	9.1	2.3	2.2
6.	Latin America and the Caribbean	1.6	1.8	23.5	20.7	1.5	1.2
7.	Low Income Food Deficit Countries	0.6	1.1	43.2	68.1	6.7	6.1
8.	European Union (27)	6.5	7.6	37.6	43.9	0.6	0.6
9.	Net Food Importing Developing Countries	0.6	0.7	18.9	23.1	3.1	3.1
10.	Least Developed Countries	0.2	0.2	7.0	9.1	3.9	3.9
11.	Land Locked Developing Countries	0.2	0.2	7.7	7.7	4.2	3.2
12.	Small Island Developing States	0.2	0.2	4.1	3.9	2.2	1.6

Source: FAOSTAT, FAO (Accessed on June 2025).

Note: Government Expenditure refers to highest government level only.

Table 5: Global Development Flows to Agriculture, 2015 and 2022 (US$ Million at 2022 prices)

Sl. No	Regions	Development Flows to Agriculture		Share of total Development Flows to Agriculture		Relative Share of Donors					
						Bilateral		Multilateral		Private	
		2015	2022	2015	2022	2015	2022	2015	2022	2015	2022
	World	11,024	17,253	4.1	4.4	52.6	33.1	42.3	62.1	5.0	4.8
1.	LDCs	3,468	4,187	6.3	5.8	63.8	38.2	31.0	57.0	5.3	4.8
2.	LLDCs	2,414	2,884	6.6	6.2	61.7	38.4	34.0	56.4	4.2	5.2
3.	SIDS	230	367	3.2	4.4	58.3	40.3	41.6	59.7	0.1	0.0
4.	LIFDCs	3,382	4,300	5.7	5.6	61.7	37.5	32.8	56.8	5.6	5.8
5.	NFIDCs	4,983	7,999	5.3	6.6	59.0	26.3	36.8	70.4	4.2	3.3

***Source*:** FAOSTAT, FAO (Accessed June 2025).

***Notes*:** Global flows are not matching with regional levels flow due to several reasons including undisbursement.

Moreover, Agriculture Orientation Index (AOI) shows the government spending on agriculture sector relative to the agriculture sector's contribution to economic value-added. The lower ratio of AOI indicates that the agriculture sector receives a credit share lower than its contribution to the economy, whereas, the higher ratio of AOI showed the government prioritized agriculture spending. Figure 24 shows agriculture orientation index have reduced globally from 0.50 in 2015 to 0.43 in 2023. The same trends have also observed at regional-levels also. This signals a shift of public expenditure away from agriculture to other sectors, likely reflecting broader economic diversification and changing policy priorities. Both Eastern and South-Eastern Asia followed by SIDS remains the most agriculture-focused regions and are above the global average in AOI, yet a notable drop had observed in 2023 as compared to 2015 levels (i.e. from 0.92 to 0.77 and from 0.75 down to 0.69). While, Central and Southern Asia is very close to the global average, while, Sub-Saharan Africa had persistent gaps and it remains at the bottom (at 0.15 and 0.13) underscoring chronic underinvestment despite acute food-security needs.

The low-income (LDCs) and land-locked developing countries (LLDCs), Latin America and the Caribbean and NFIDCs are considerably lagging behind to the global average in AOI with ranging between 0.13 to 22 percent. These levels also either held steady or saw slight declines, with LLDCs falling sharply from 0.26 to 0.19. As a result, these regions are more than 50 percent are underinvested and underfinanced to the agriculture sector by the government budgetary allocations also. Others regions like, Europe and Northern America, LIFDCs, European Union (27) Northern Africa and Western Asia and Oceania are deprioritisation of agriculture sector visible indicates a lower-government spending towards agriculture.

The global development flows by the multilateral, bilateral and private donors to agriculture development is increased to 17.25 billion in 2015 from 11.02 billion in 2022 (Table 5). Its relative share in total development flows also marginally improved from 4.1 percent in 2015 to 4.4 percent in 2022. Multilateral bodies (such as World Bank, IFAD,

FAO, AfDB, ADB, UNDP etc.) have taken on a much larger role, displacing traditional bilateral donors and their relative contribution in total international development flows to agriculture sector is increasing considerably, from 42.3 percent to 62.1 percent, becoming the dominant source of development support to agriculture. In contrast, the bilateral flows are sharply falling from 52.6 percent in 2015 to 33.1 percent in 2022, while private donors remain lower with ranging between 4.8 to 5.0 percent.

Net Food Importing Developing Countries (NFIDCs) alone receiving more than 46 per cent (driven by multilateral institutions contribution), followed by Low Income Food Deficit Countries (LIFDCs), Least Developed Countries (LDCs) and Land Locked Developing Countries (LLDCs). Although, the relative share of agriculture in total development flows in NFIDCs and SIDS is increasing with rising trend due to may be providing assistance to meet food security needs. In addition, LLDCs, LDCs and LIFDCs are above the global average with the declining trend in agriculture flows as a per cent of total development flows, suggesting donor priorities maybe shifting other than agriculture activities.

In conclusion, despite a 21.4 percent rise in agricultural credit, the agriculture's share in total credit remains marginal at 2.3 percent (down from 2.6 percent). Public spending on agriculture has stayed flat at 2.0–2.1 percent of government budgets, even as absolute agricultural outlays rose in 2015 to 2023. The highly industrialized regions such as North America, Europe including EU-27 now allocate just 0.5–0.6 percent of budgets to farming. Global development assistance to agriculture edged only from 4.1 percent to 4.4 percent in 2015 to 2022 even as multilateral donors increased their share from 42.3 percent to 62.1 percent, bilateral support fell from 52.6 percent to 33.1 percent, and private giving remained low at about 4.8–5.0 percent. The modest nominal gains have not prevented a sustained decline in agriculture's relative priority, leaving the sector underfunded and requiring immediate policy reorientation and targeted investment to reverse the trend.

Developing countries face weak monetary systems, underdeveloped banking, and limited private-sector borrowing, which slows credit

growth and perpetuate socioeconomic challenges. These deficiencies restrict institutional finance for agri-food systems, leaving agriculture with inadequate credit flows. As a result, small and marginal farmers—especially women, youth, and indigenous communities—depend heavily on non-institutional sources such as moneylenders and microfinance institutions, leading to rise in rural indebtedness and high interest burdens. Low public expenditure on agriculture further undermines productivity, livelihoods, and food security, intensifying hunger, undernutrition, and poverty. This situation jeopardizes progress toward SDG 2 (Zero Hunger) and stalls broader SDG achievements.

In this context, enhancing the flow of institutional credit and higher relative public spending are critical to transition of agri-food systems and thereby strengthening rural economy. Therefore, developing countries need to realize it and strategically boost agricultural spending. Including encourages allocation towards agricultural R&D, extension services, and climate-smart practices. These interventions includes implementing accountable and digital systems with a holistic approach that integrates Agricultural Value Chains (AVCs) with global markets shifts, the focus from merely addressing supply shortages to meeting market demands, supporting the transition from a production-centric to a demand-driven model. The underfunded countries and regions essentially requires a budgetary allocations, international aid and technical partnerships including multilateral institutions and MDB support is necessary to enhance agriculture credit. Beyond absolute spending levels, the relative share on agriculture expenditure helps in food security, rural livelihoods, and environmental sustainability.

3.6. Addressing Digital- Divides to Promote Inclusive and Sustainable Agri-Food Systems

Digitalisation of agri-food systems, including the adoption of modern digital technologies and ICT solution, enables the transition of the sector to data-driven, efficient, resilient, and sustainable. Better integration of these technologies along supply chain reduces vulnerabilities while ensuring inclusivity for small and medium-sized farmers, women, youth, and indigenous communities, facilitates agri-food systems transformation

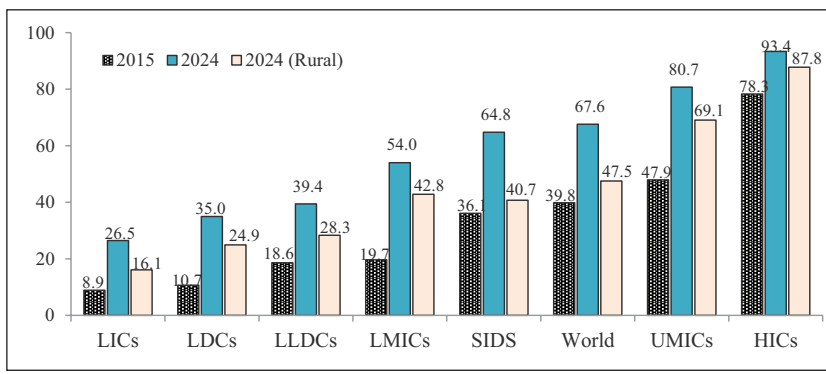
with sustainable productivity and livelihoods, besides, reducing hunger and malnutrition. 'Digital technology recognised as a solution to the long-standing problem of food shortage' (Lajoie et al., 2020), which shows promise in addressing the key challenges facing the agri-food sector (ITU and FAO, 2021). The World Bank (2019) indicates 'digital technology' tools that collect, store, analyze, and share information digitally including mobile phones and the internet have significant potential to improve efficiency, equity, and environmental sustainability in the food system.

The application of digital agriculture (DA) provides accurate and real-time observations which influences plant health, soil quality, besides, weather conditions, and pest and disease pressure and thus helps in increasing yields, improve efficiency, reduce costs, and manage resources (Abiri, et al., 2023). Digital innovation facilitates sustainable and resilient agricultural systems and can enable increased productivity, reduced environmental footprints and higher resilience of farms (Finger, 2023). Better adoption of digital agriculture led to high-value agricultural production and per unit of adoption increases economic benefits. It significantly improves smallholder farmers' welfare by enhancing extension services, pest management, market information access, and financial services (Geng et al., 2024, Bahn et al., 2021 and Kitole, et al, 2024).

In contrast, weak technological infrastructure, high costs of technology, low-levels of e-literacy and digital skills especially among women, youth and rural populations, beside weak regulatory framework and limited access to services, technological risks and high operator skill requirements, etc., act as barriers to digitalisation of agriculture (Trendov et al., 2019; Griffin, et al.,2022 and Hassoun et al., 2022). This will lead to increase the risk of digital divide across socioeconomic groups (e.g. income, gender and age), geographies (e.g. rural and urban populations) and countries also. Data ownership and management, privacy, and cybersecurity are some other challenges impeding adoption of digital technologies. In this context, examining trends in digital inclusion across country income groups is essential, particularly in the context of developing nations.

Globally, the internet penetration such as the percentage of individuals using the internet has increased from 39.8 percent in 2015 to 67.6 percent in 2024. Both HICs and UMICs are above the global average with 93.4 percent and 80.7 percent (Figure 25). In contrast, the low-income countries are considerably lagging with only 26.5 percent, followed by LDCs and LLDCs are much below than the global average, while, SIDS close to global average. This suggests divergence while progress is visible across all categories, low-income and geographically constrained nations (LICs, LDCs, and LLDCs,) remain at the lowest levels of internet inclusion, especially in rural areas.

Figure 25: Percentage of Individuals using the Internet, 2015 and 2024

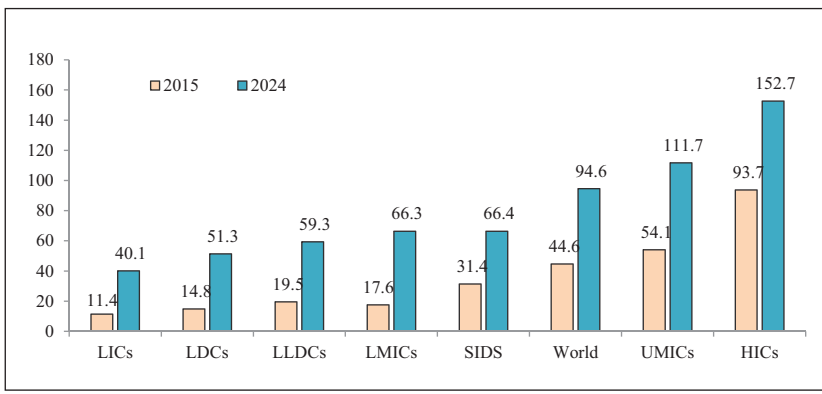


***Source*:** ITU World Telecommunication/ICT Indicators database.

The similar trends have also observed in mobile-broadband subscription per 100 people. Globally, it has been increased to 94.6 in 2024 from 44.6 in 2015, which shows a rapid digital transformation besides prevailing disparities across the country income groups. For instance, HICs far ahead with 152.7 subscriptions per 100 inhabitants in 2024, increased from 93.7 subscriptions in 2015. This reflects near-universal mobile connectivity and multi-device usage. The low-income nations are significantly lagging behind with 40.1 followed by landlocked countries (at 59.3) remains far below the global levels. Both LMICs and SIDS are above 66.0 subscriptions (Figure 26). This shows persistent gap between high- and low-income countries includes in mobile cellular

subscriptions per 100 people (Figure 27). With 62.8 in low-income nations (LICs) remain far behind and South Asia, and Sub-Saharan Africa subscription rates in mobile cellular per 100 people remain well below the world average (110.6 in 2023). This indicates lack of affordability, inadequate digital infrastructure and its access barriers including uneven network expansion. The UMICs approaching HIC levels with an increased to 126.5 from 105.5 in 2015 which suggests strong progress.

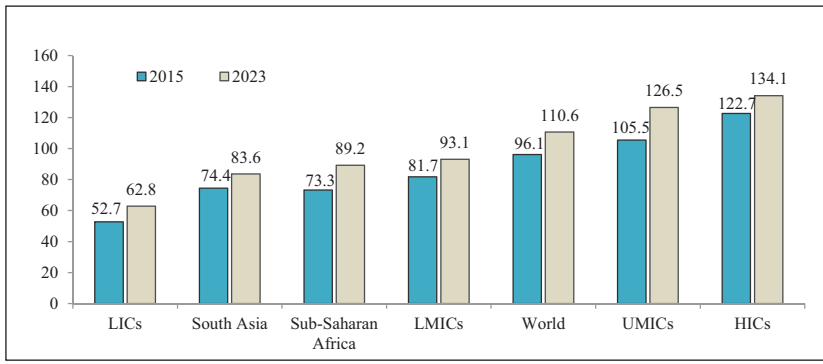
Figure 26: Active mobile-broadband subscriptions (per 100 people)



***Source*:** ITU World Telecommunication/ICT Indicators database.

A stark digital divide persists, with LICs, LDCs, and LLDCs trailing significantly behind wealthier nations due to inadequate digital infrastructure, limited affordability, and insufficient investment. Developing regions-particularly South Asia and Sub-Saharan Africa-remain far below the global average in digital inclusion, reflected in low mobile cellular adoption and internet penetration. Structural barriers such as weak digital public infrastructure (DPI), high service and handset costs, limited network expansion, and low levels of digital literacy exacerbate exclusion across regions and genders. These challenges hinder agricultural productivity and weaken agri-food systems, leaving developing countries increasingly vulnerable.

Figure 27: Mobile cellular subscriptions (per 100 people)



***Source*:** WDI, World Bank (Accessed May 2025).

Without targeted infrastructure investment and comprehensive policy interventions, the gap between high- and low-income countries will continue to widen, constraining digital inclusion and thus persistent of socioeconomic disparities. This necessitates a major structural transformation is required. It includes public-private partnerships, better access to Digital Public Infrastructure (DPI) and Digital Public Goods (DPGs), enhancing availability, accessibility and affordability of modern digital innovation and technologies while promoting digital-literacy and capacity building actives for across stakeholders particularly inclusion of rural population, smallholders, women and youth will reduce the digital-divides. This will result to ripe the fruits that offer modern digital innovations and the effective adoption along with relevant interventions that shape the agri-food systems globally. While, giving a technological push in developing countries is required to address the socio-economic disparities across the sectors and regions.

In particular, promoting digital adoption in developing nations should focus on digital literacy, strengthened extension services, subsidized technology access, and public-private partnerships for sustainable agriculture (Kitole et al., 2024). The key factors driving digital technology adoption among growers include knowledge, technology compatibility, government support, and competitive pressure, with male farmers and

those managing larger farms showing higher adoption rates (Geng et al., 2024). To accelerate adoption, technology should raise awareness, display tangible benefits, and provide agricultural services. Such interventions can improve capacities of the countries, especially of developing countries including Least Developed Countries (LDCs) to overcome the structural barriers.

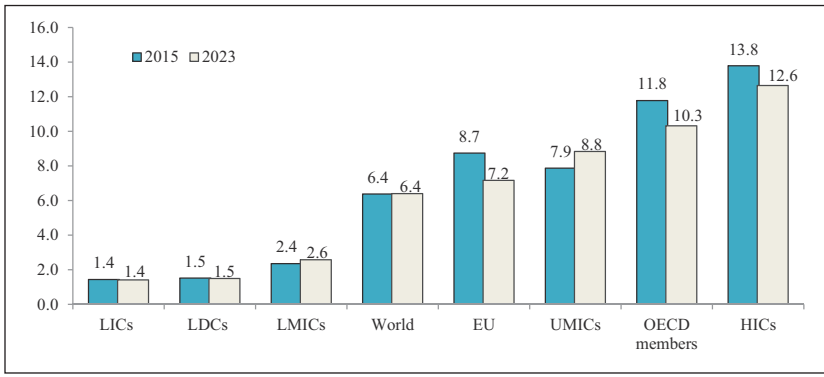
3.7. Tackling with Climate Change for Sustainable Agri-Food Systems

The sustainable and climate-resilient agri-food-systems are essential to ensure productivity, livelihoods, incomes and global food security and nutrition for all. However, change in climate and its variability with increased frequency of extreme weather events including droughts, floods, pests and diseases, supply chain disruption etc., are threatening agri-food systems sustainability. It includes the slowdown of agricultural, forestry and fishery production with reducing food availability and its nutritional quality accompanied by high food prices and thereby increased hunger, food insecurity, poverty, inequalities with loss of livelihoods around the world particularly in developing countries. IPCC underscores that climate change is already stressing food and forestry systems, with negative consequences for the livelihoods, food security and nutrition of hundreds of millions of people globally. With reduced food and water security led to hindering efforts to meet SDGs (IPCC, 2023 p.5-6 and 2022, p.48). Conflict and weather-related events continue to drive food insecurity in different countries (World Bank, 2025).

Global food commodity production remains vulnerable to weather conditions (FAO, 2025). The rising temperatures and increased surface ozone concentrations further diminish crop yields, reduce grassland quality, and destabilize harvest outcomes and disrupting food supply chain. The economic loss includes the adverse impacts on crop yields, water availability, and outdoor labor productivity due to heat stress (IPCC, 2022, p.48 and IFPRI, 2022). It is also estimated that climate change could also reduce global crop yields by 3–12 percent by mid-century and 11–25 percent by century's end, under a vigorous warming scenario (Wing et al., 2021). By 2050, climate change is expected to put millions of people at risk of hunger, malnutrition, and poverty (IFPRI,

2022, p.6). In addition, extreme weather events and climate change are disproportionately reducing the incomes of rural poor, especially women and older individuals in low- and middle-income countries. Both floods and heat stress particularly driving these losses, with female-headed and elderly households are impacted considerably with declining their total incomes FAO, 2024, xiii–xiv).

Figure 28: Total greenhouse gas emissions per capita (t CO2e/capita), 2015 and 2023



***Source*:** World Development Indicators, World Bank (Accessed August 2025).

***Note*:** GHG excluding LULUCF.

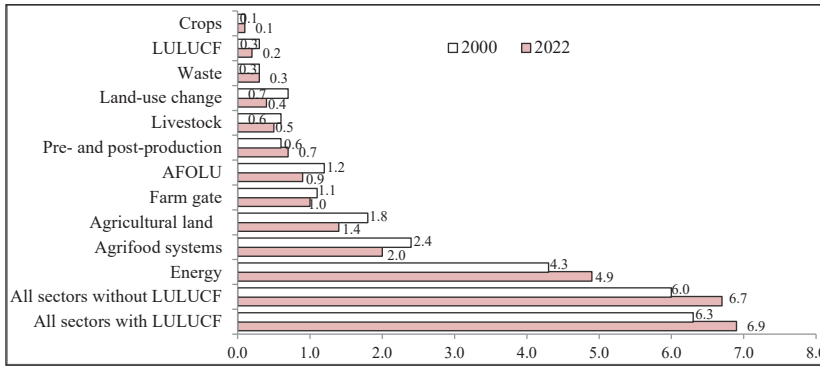
In this context, addressing these challenges globally and particularly in developing countries is critical for ensuring food security and nutrition given their significant contribution to global food production. For example, OECD/FAO (2022) estimated for the next decade, global agricultural production is projected to grow by 1.1 percent annually, with the additional output to be predominantly produced in middle- and low-income countries. However, rising vulnerabilities in agri-food systems—driven by climate change, conflict, and compounded by structural and historical disadvantages in developing countries such as inadequate investment, limited research and development, and inadequate access to inputs and technologies—are adversely affecting agriculture production and thereby global food security and nutrition. These challenges are further impeding progress toward achieving SDG 2 targets. This section,

therefore, focuses on some of these key aspects affecting developing countries adversely and aims to identify barriers to effective adaptation to a changing climate.

Raising all forms of emissions such as greenhouse gases (GHG) particularly in the developed countries is significantly high. This is an indicative that a strong correlation exists between higher the incomes size associated with higher-levels of environmental degradation along with over exploitation of natural resources besides growing emissions. All high-income countries (HICs), therefore, had a higher relative contribution to global emission (GHG) than the developing countries including LDCs. Figure 28 also indicates it and the per capita annual emissions of the GHG is very much high in HICs, OECD members, UMICs and EU. These were above the global average of greenhouse gas emissions per capita of 6.4 metric tonnes of carbon dioxide equivalent (t CO_2e/capita) in 2023. Globally, these levels remain unchanged since 2015, while it shows a slightly declining trend across high-income country-groups except UMICs. In contrast, LICs including LDCs and LMICs contribution to GHG is below the global average with considerably low per capita emission of GHG.

Globally, the annual emissions of greenhouse gases (GHG) and its composition from various economic activities driven by the energy, industry, waste, and agriculture sectors. According to the emissions gap report 2024, the power sector (i.e. electricity production) is highly emitted with 26 percent contribution to global GHG, while, agriculture including LULUCF (Land Use, Land-Use Change, and Forestry) is at 11 and 7 percent respectively, bring AFOLU (agriculture, forestry, and other land use) share is at 18 percent. Transportation, industry, fuel production and industrial process are at 15, 11, 10 and 9 percent respectively, waste and others sources contributing about 4 percent (UNEP, EGR 2024, p.xii). It also shows the share of agri-food systems emissions has continued to decrease over time. Farm-gate emissions continued to be the largest component of agri-food systems in 2022 followed by pre- and post-production activities, while, the contribution of land use change emissions diminished.

Figure 29: Global Agriculture Emissions Per capita (t/cap), 2000 and 2022



***Source*:** FAOSTATS (Accessed August 2025).

In addition, per capita emissions (tCO2eq/cap) from agri-food systems across various activities, in particular, emissions from agri-food systems, agricultural land, and AFOLU declined significantly in 2022 relative to 2000 (Figure 29). Notably, per capita emissions from crops, LULUCF, waste, land-use change, and livestock remain significantly lower than those from other activities in the agricultural sector. However, per capita emissions from all sectors without LULUCF-followed by all sectors with LULUCF and the energy sector-remain the highest-emitting activities, and their levels have continued to rise in recent years compared to previous periods. These trends underscore the urgent need for targeted interventions. This includes enhancing adaptation measures, with improved stakeholder participation being critical, to reduce emissions across all levels of the agri-food system—particularly those from energy, agri-food systems, agricultural land, and farm-gate activities.

At the regional-level, Oceania is the largest per capita emitter (6.5 tCO2eq/cap) followed by the Americas (4.1tCO2eq/cap) in 2022, respectively three and two times higher than the world average per capita emissions (Table 6). In contrast, Asia is the least per capita emitter with 1.5 metric tonnes of carbon dioxide equivalent (tCO2eq/cap) and below the global average, followed by the Africa (2.0 t CO2eq/cap). In addition, emission per hectare of agricultural land is increased to 1.6 in 2022 from

1.4 (tCO2eq/ha) in 2000, while, Oceania followed by the Africa are the least emitters in 2022 with rising momentum. Both Europe and Asia are above the global average and are highest per hectare of agricultural land.

As a result, the per capita emissions from agri-food systems and agricultural land are reducing significantly in 2022 as compared to 2000 levels. These were reducing globally and across the regions particularly. Farm-gate emission, on the contrary, per area of agricultural land (t/ha) is increasing globally and it increased in Africa followed by Americas and Asia respectively. This underscores the need for targeted interventions at both sectoral and regional levels to address the adverse impacts of emissions - not only those generated within the agri-food sector itself, but also those driven by other economic sectors.

Table 6: Emission at Per Capita and Per Value of Agriculture Production in 2000-2022

Sl. No.	Regions	Per capita (t/cap)			Emissions -Per Area of Agricultural Land (t/ha)		
		2000	2022	Change (%)	2000	2022	Change (%)
1.	Oceania	13.3	6.5	-51.1	0.6	0.6	-9.4
2.	Americas	5.7	4.1	-27.1	1.4	1.7	22.1
3.	Europe	2.9	2.7	-8.6	2.4	2.2	-8.3
4.	Africa	2.5	2.0	-19.4	0.8	1.0	36.0
	World	***2.4***	***2.0***	***-15.0***	***1.4***	***1.6***	***17.1***
5.	Asia	1.5	1.5	-0.7	1.8	2.1	20.9

Source**:** FAOSTAT (Accessed August 2025) and FAO. (2024).

In this context, promoting better adaptation measures and strategies with the improved stakeholder's participation is critical to enhance resilience in the agri-food systems and mitigate its adverse impact of climate change and extreme climate conditions. Promoting the targeted interventions such as:

- Effective adaptation options include cultivar improvements, agroforestry, community-based adaptation, farm and landscape diversification, and urban agriculture. Demand-side measures such as shifting to sustainable healthy diets, reducing food loss and waste,

deforestation and sustainable agricultural intensification can reduce ecosystem conversion and restoration. Further, minimizing trade-offs requires integrated approaches to meet multiple objectives including food security.

- Scaling up climate action and adaptation options offers multiple opportunities. It includes efficient livestock systems, improved cropland management, water use efficiency and water resource management, biodiversity management and ecosystem connectivity, agroforestry, sustainable aquaculture and fisheries, forest-based adaptation (includes conservation and restoration, reforestation), integrated coastal zone management, coastal defence and hardening (IPCC, 2023).

These were synergies with mitigation activities such as reduce conversion of natural ecosystems, carbon sequestration in agriculture, ecosystem restoration, afforestation, reforestation, shift to sustainable healthy diets, improved sustainable forest management, reduce methane and N2O in agriculture, reduce food loss and food waste etc.

Agri-food systems, nevertheless, face significant barriers to effective adaptation resulted to increased climate vulnerability particularly developing countries are impacted significantly.

- It includes limited resources, lack of private sector and citizen engagement, insufficient mobilization of finance (including for research), low climate literacy, lack of political commitment, limited research and or slow and low uptake of adaptation science including low sense of urgency.
- Despite increased climate vulnerability to Agri-food systems and the second most emitted sector globally, agri-food systems remain significantly underfunded, it received just 3.8 per cent of total mitigation finance tracked across all sectors in 2021-22—a slight increase from 2 per cent in 2019-20 (CLIC,2025, p.2). Overall, it receiving only 4.3 percent of global climate finance flow in 2019-20 (FAO, 2025, p.1) and it reached to 7 percent in total climate finance, nearly USD 100 billion in 2021-22. However, the gap between the estimated costs of adaptation and the finance allocated to adaptation

is widening further. To support a global transition, twelve times more finance—USD 1.1 trillion annually—is required through 2030 to align agrifood systems with climate goals (CPI and FAO, 2024). Public finance is remained the dominant type of funding (about to 78 percent) with domestic sources increasing over five times and surpassing international sources in share and volume.

This is indicative that adaptation finance has come predominantly from public sources and a small proportion of global tracked climate finance was targeted to adaptation and an overwhelming majority to mitigation. The insufficient funds constrains to implementation of adaptation options, especially in developing countries.

- The inadequate access to climate smart technologies and innovations with lack of adoption and unaffordability of these technologies including inadequate extension and capacity-building programmes particularly vulnerability communities of indigenous, small-scale farmers, women and youth are more vulnerable to changing climate and its extremes. Limited finance, poverty, lack of knowledge and digital literature, inadequate technological advancement, innovation etc., hindering better adoption of low-emission technologies particularly developing countries includes LDCs are lagging behind.
- The individual and collective actions are also constrain by poverty, inequity and injustice, economic, institutional, social and capacity barriers, siloed responses, lack of finance, and barriers to finance and technology and tradeoffs with SDGS

These are some of the issues and/or challenges hinder to better adaptation of climate smart agriculture in the face of climate challenges and rising the frequency of extreme weather events etc. Particularly most of the developing countries affected adversely with rising climate vulnerabilities incurring losses, damages, and thereby impeding national economic growth with rising socio-economic poverty. In addition, agri-food systems is the second most emitted sector, while, it is most vulnerable to the climate change and rising heating stress driven by other sectors emission to GHG. OECD also underlines that weather shocks, supply

chain disruptions and geopolitical tensions are driving up real prices for agricultural commodities. These pressures exacerbate hunger and food insecurity and push farm households—especially smallholders—into unsustainable livelihoods as production costs rise and productivity falls. Developing countries are more vulnerable to climate change and it is visible across all the sectors, particularly growing vulnerabilities in agri-food systems is more visible with declined yields for the major cereals crops, reduced nutritional quality and affecting the supply chains substantially with the unsustainable livelihoods and incomes. Besides, rising poverty, hunger and all forms of malnutrition and these are more visible in the developing countries further.

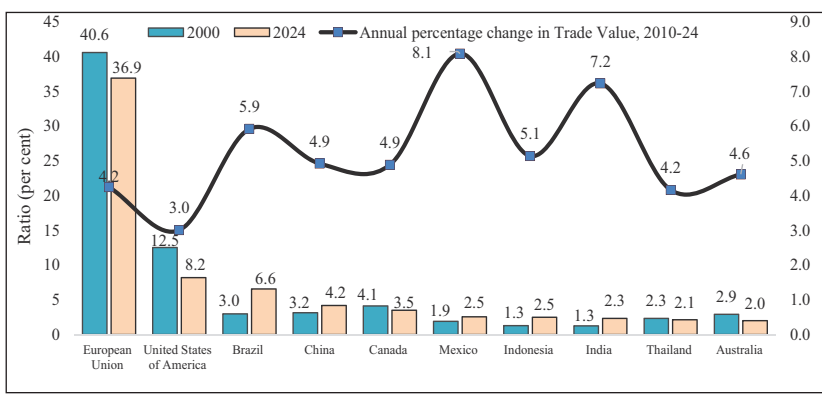
In conclusion, increased all forms of emissions across the countries particularly in the developed countries (HICs) is significantly high. Over exploitation of natural resources and environmental degradation besides growing emissions will accelerate climate crisis further includes intensifying extreme weather and thereby worsening food insecurity, economic losses and instability.

Addressing these challenges is critical to enhance agricultural efficiency, adoption of innovative technologies, and better access to inputs, knowledge, and markets, as well as locally tailored and effective business risk management practices helps in maintaining farm incomes and livelihoods. Building resilience in the agri-food systems particularly in developing countries is a matter of concern. Developed countries should provide necessary support to developing countries and sharing of technologies and innovation is critical to mitigate climate vulnerabilities in the agri-food systems. Ensuring adequate climate finance flows particularly adaptation finance to agri-food systems besides higher allocation of public spending and investments towards it with reduction of food loss and waste, shifts to sustainable healthy diets helps in necessary transformation of these systems. This includes assistance by the developed countries to developing economies should be scaled up to trillions from billions. The commitment by the developed country in COP 29 is (at least) at USD 300 billion per year by 2035 for climate action, which is far below the requirement of the developing countries.

3.8. Facilitating Agri-Food Trade to Ensure Food Security and Nutrition

Trade has played a significant role in reducing poverty, accelerating the structural transformation and contributing to income convergence especially in low- and middle-income economies (WTO, 2024, p.8-11). Facilitates trade in food and agriculture improves global food security and nutritional situation and accelerate the supply of sufficient, safe and diverse food, and generate income for farmers and contribute to efficient natural resources use through trade agreements (FAO, 2024, p.x). It also supports the net food import dependent countries like Sub-Saharan Africa (in which the growing food imports in the share of their total consumption is relative high and its projections shows an increase of about 55 percent by 2034 (OECD/FAO 2025, p.41). The Net Food Importing Developing Countries (NFIDCs) and Low Income Food Deficit Countries (LIFDCs) are also benefited significantly through trade in food and agriculture by access food and to diversify diets and improves their nutritional outcomes. The sustainable and resilient trade in food and agriculture helps to meet in global demand for food and accessing healthy diets and thereby nutritional diversity in several ways to the growing population (see Box 1). Trade facilitation in food helps in achieving several SDGs and it is underline determinant to attain 'Zero-Hunger' (SDG2) globally and across the regions as well.

Figure 30: Relative Share in world's Food Exports, 2000-2024



***Source*:** WTO. (2024). World Trade Statistical Review

Global trade in agri-food commodities experienced significant growth, rising from USD 400 billion in 2000 to USD 1.9 trillion in 2022 (Figure 30). Food trade made up around 85 percent of all trade in food and agriculture. The energy it carried more than doubled between 2000 and 2021, increased from 930 kcal per capita per day in 2000 to 1640 kcal per capita per day in 2021 (FAO, 2024, p.x). The proportion of production traded for commodities increased from 16 percent in 2000 to 23 percent in the base period of 2022-24, reflecting a trade sector growing at a faster rate than agricultural production (OECD/FAO 2025, p.41). Global trade in food and agriculture continues to be dominated by the developed countries particularly both European Union and United States of America are key global food exports. Together, they accounted for above 52 percent in total global food exports in 2000 and 45.1 percent in 2024.

The emerging developing countries particularly Brazil and India has doubled their relative share in global food exports in 2024 as compared to 2000. The OECD/FAO Report (2025) also indicated that the growing share of export in their domestic production e.g., Latin America (particularly, Brazil, Argentina, and Paraguay) have experienced substantial growth in exports over the past decade. It also projected to continue generating surpluses, solidifying the region's status as the world's leading agricultural exporter. The Caribbean, Europe and Central Asia are anticipated to increase their surplus volumes. In contrast, developing countries including LDCs exports is significantly low and lagging behind to the global average. According to WTO statistics, the global food exports as a percent of total merchandise exports is increased to 8.5 percent in 2023 from 6.7 percent in 2000. While, the LDCs' relative share in global agriculture and food exports are very negligible ranging from 0.6 percent in 2000 to 1.2 percent in 2023. Between 1995 and 2023, the shares of food and agricultural raw materials in total LDCs' merchandise exports dropped from 23 to 9 percent and from 11 to 2 percent, respectively (WTO, 2024, p.3).

Trade policies and trade costs shape global food and agricultural markets. Besides, tariff and non-tariffs measures (NTMs), some unjust standards, supply chain disruptions, conflicts, unsustainable food

production etc., led to inadequate access to essential food items and thus have an adverse impact on global food security and nutrition. The other costs (such as transport, administrative, transaction, and costs arising due to border delays etc.) lead to sub-optimal and or lack of access to global food markets and can offset the available comparative advantage. These costs can be significant due to the bulkiness and perishability of food, and the high costs of compliance with NTMs, such as sanitary and phytosanitary standards.

In addition, on an average, a food product faces eight different non-tariff measures and standards. Their compliance significantly increases the cost of trade, adding that in low-income countries, trade costs are estimated to be up to 400 percent in ad valorem equivalent (i.e. the proportional rise in the domestic price of the goods to which it is applied, relative to a counterfactual where it is not applied). Such high costs inhibit trade integration and affect the structural transformation of the economy. In this context, developing countries, including Least Developing Countries (LDCs), are considerably affected (FAO, 2022). WTO also indicated that developing economies and least-developed countries (LDCs) have high trade costs relative to high-income economies. Manufacturing and services trade is around 50 percent more difficult for LDCs than for high-income economies (World Trade Report 2024, p.31).

Addressing barriers to agri-food trade is critical and should be a global priority to promote food security and nutrition. High trading costs-

Box 1: Trade in Food and Nutrition Linkages

Nutrition transition

- Trade is an accelerator of the nutrition transition. Its effects on food availability, dietary patterns and resulting nutritional outcomes.
- It influences nutrition both directly—by affecting the availability, diversity, and prices of foods—and indirectly, through its broader impact on the economy

Diversity of food supply

- Overall diversity of foods increases all-year-round and nearly twofold increases with countries importing about three times as many processed and ultra-processed items as they produce.

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- Net-importing countries often achieve greater food-supply diversity than export-oriented countries.
- In 2020, countries produced an average of 120 distinct food items, while the array available for consumption averaged 225. China produced around 320 items, compared with Kiribati's 15 terrestrial food products.
- Improved trade policies and greater openness can advance nutritional objectives. Higher diversity in national food supplies is linked to lower rates of child stunting, wasting, and underweight. In 2012, Fiji cut tariffs on imported fruits and vegetables from 32 per cent to 5 per cent to explicitly promote healthier diets.

Bridging the Nutrient Gap

- Trade can be an important contributor to bridging nutrient supply gaps.
- Between 2010 and 2020 the expansion of trade helped increase the average supply per capita of micronutrients across countries. The per capita trade of the B-vitamins riboflavin and thiamine and the minerals calcium and zinc increased by around 40 percent.
- From 2000 and 2021, per capita trade in vitamin C and calcium increased by almost 90 percent.

Reducing Food Prices volatility

- Trade shapes diets and nutrition by influencing food prices, imports boost availability, lower domestic prices, and expand consumer access to a wider variety of foods.
- Openness to trade can affect the relative prices of different foods, which, in turn, can influence household food consumption and dietary patterns but this effect will depend on the intensity of trade
- It can help narrow the differences among prices of similar foods across countries. Its impact is most pronounced for staple food prices, modest for fruits and vegetables, and varies with a country's income level.
- Lower import tariffs, on average, are associated with lower food prices across all categories—including those in a healthy diet basket—thereby improving overall food affordability and access.

Source: FAO. (2024). The State of Agricultural Commodity Markets 2024 – Trade and nutrition: Policy coherence for healthy diets. Rome. https://doi.org/10.4060/cd2144en

including tariffs and non-tariff measures-limited access to global markets and the structural backwardness of many developing countries hinder food exports from least developed countries (LDCs). As a result, weak trade participation, poor integration with global markets, and limited diversification impede income convergence and structural transformation. This widens income inequalities, increases poverty, and undermines progress toward the Sustainable Development Goals, particularly SDG 2 on 'Zero Hunger.'

It is also essential to ensure sustainable and resilient value chains across food and agricultural systems, since these chains provide inputs, primary produce, and value-added products that support sustainable livelihoods. Promoting regional and inclusive agricultural value chains is key to confronting supply-chain disruptions caused by pandemics, extreme climate events, conflicts, and natural disasters.

3.9. Transition of Global Agri-Food Systems: Importance and Role of G20

The Group of 20 (G20) comprises 19 countries across five continents with the European Union and it represents about 85 percent of global GDP, 75 percent of world trade, and roughly two-thirds of the world's population. During India's Presidency in 2023, the African Union also admitted, leading to highly diversified group, which includes both highly developed and least-developed countries (LDCs), is a vital global forum influencing international economic cooperation. The G20 initially emphasized macroeconomic issues within its Finance Track in 1999, but it broadened its agenda after being elevated to a leaders' summit in 2008–2009. The Sherpa Track was added and includes socio economic topics such as agriculture, climate, the digital economy, education, energy, health, and trade. As of now, a total of 15 dedicated working groups under the Sherpa Track focus on fostering deliberation and enhancing collaboration on these pressing matters.

The G20 Agriculture Deputies Meeting (ADM) or Agriculture Working Group (AWG) was created under the French Presidency in 2011 to address global food price volatility and strengthen food security, has become a key forum for G20 cooperation on agriculture and food

system issues. Its priority areas include ensuring food security and nutrition; addressing price volatility; building resilient supply chains amid conflicts; promoting inclusive agri value chains for smallholders, women, and youth; reducing food loss and waste; and mobilizing investment, technology, digitalization, and finance to accelerate the transition of agri food systems, etc. The enhanced cooperation among member countries will help in achieve the 2030 Agenda, and progress toward SDG 2 (Zero Hunger) is significantly impacted by these interventions.

G20Agriculture Ministers' meetings have recognised these systemic issues and deliberated on promoting G20 cooperation and collaboration to improve global agri-food systems and support their growth. At the 2010 Toronto Summit, the G20 launched the Global Agriculture and Food Security Program (GAFSP) to implement the Global Partnership for Agriculture and Food Security and to explore innovative, results-based mechanisms for engaging the private sector in agricultural innovation. During the French presidency in 2011, the G20 committed to sustainably increase agricultural production and productivity and agreed to further invest in agriculture—especially in the poorest countries—recognizing the importance of smallholders and the need for responsible public and private investment. As a first step, the G20 launched the International Research Initiative for Wheat Improvement (Wheat Initiative) in Paris on 15 September 2011 (G20 Leader's Declaration 2011, pp.10).

Towards this, G20 has made its continuous efforts across summits since 2008 and undertaken several initiatives and actions towards enhancing the global food security and nutrition and it includes humanitarian assistance to needy countries. The latest global south countries presidencies starting from Indonesia in 2022 to South Africa presidency 2025 have undertaken the key initiatives to enhance agri-food systems sustainability and to address global hunger and food insecurity etc. In particular, the G20 India presidency in 2023 followed by the G20 Brasil Presidency have undertaken several prominent actions and initiatives towards strengthen food security situation, and enhance agri-food systems transformation. The key priority areas of the G20 Agricultural Working Group across the recent Global South presidencies have shown in Table 7.

Table 7: Global South Presidencies 2022-2025: Key Priority Areas of G20 AWG

Presidency	Slogan/Theme	G20 AWG: Key Priority Areas	Key Achievements/ New Initiatives
Indonesia (2022)	"Recover Together, Recover Stronger"	i. Resilient and Sustainable Agriculture and Food Systems ii. Open, Fair, Predictable, Transparent, and Non-Discriminatory Agricultural Trade to Ensure Food Availability and Affordability for All iii. Innovative Agri-preneurship through Digital Agriculture to Improve Farmers' Livelihood in Rural Areas	• A mapping exercise on the global responses to rising food insecurity (Leaders are requested to FAO, World Bank group). • Strengthening more resilient and sustainable agriculture and food systems in the Small Island Developing States (SIDS) of the Pacific.
India (2023)	"One Earth, One Family, One Future"	i. Food Security and Nutrition ii. Sustainable Agriculture with Climate Smart Approach iii. Inclusive agri value chains and food systems, iv. Digitalization for Agricultural Transformation	• Deccan High Level Principles on Food Security and Nutrition 2023 • International initiative for research on millets and other ancient grains

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Brazil (2024)	"Building a just world and a sustainable planet"	i. Sustainability of Agriculture And Food Systems in Their Multiple Paths ii. Enhancing International Trade's Contribution To Food Security And Nutrition iii. Elevating the Essential Role of Family Farmers, Smallholders, Indigenous Peoples and Local Communities in Sustainable, Resilient and Inclusive Agriculture and Food Systems. iv. Promote the Integration of Sustainable Fisheries and Aquaculture into Local and Global Value Chains.	• Global Alliance against Hunger and Poverty • G20 Global Initiative on Bioeconomy (GIB)"
South Africa (2025)	"Solidarity, Equality, Sustainability"	i. Promotion of policies and investments for inclusive market participation ii. Empowering Youth and Women in Agriculture and food Systems iii. Fostering Innovation and Technology in Agriculture and Agroprocessing iv. Building climate resilience for sustainable agricultural production.	• Established the G20 Food Security Task Force. • Ubuntu Approaches on Food Security and Nutrition,and Excessive Food Price Volatility

***Source*:** G20 Agriculture Ministers'Meeting (AMM) Outcome Document & Chair's Summary, various years.

The G20 India presidency in 2023 identified four priority areas: Food Security and Nutrition; Sustainable Agriculture with a Climate-Smart Approach; Inclusive Agri-value Chains and Food Systems; and Digitalization for Agricultural Transformation. The presidency launched two flagship initiatives: the Deccan High-Level Principles on Food Security and Nutrition 2023 and the International Initiative for Research on Millets and Other Ancient Grains. Better implementation of these initiatives will help shape the global agri-food systems landscape and further improve food security and nutrition. Momentum on these priorities has continued in the successive presidencies of Brazil and South Africa. Appendices 1-4 provides the G20 AWG's key Achievements and Initiatives across the global south presidencies.

3.10. Conclusions and Policy Recommendations

Global disparities is evident and the level of underperformance in key economic indicators including SDGs attainment is unfavorable to the developing countries including LDCs. These countries are more reliant on agriculture with lack of advancement led to the deprived productivity of land and labour. The low productivity undermines domestic food supply, hampers structural change, jeopardises sustainable agricultural growth which hinder the progress of farm incomes and investments, insecure livelihoods with persistent of food insecurity and all types of malnutrition. Increased climate crisis, conflicts, disruption and economic downturn with uneven progress of post-pandemic are affecting developing countries adversely. This was compounded by the limited innovation with lack of digitalisation and technological adoption, inadequate access to quality inputs, markets, resources and finance particularly formal credit are some of the key barriers to agri-food systems transformation in developing countries.

These challenges disproportionately affects vulnerable countries as well as groups such as small and marginal farmers, women, youth, and indigenous communities, while exacerbating food insecurity and undernutrition simultaneously. In addition, the persistent of indebtedness with rising debt servicing costs along with the high SDG investment gap

(stands at $4 trillion per year) is further holding back the developing countries progress that threatens the SDGs progress. In this context, agri-food systems transformation especially in developing countries is essential to improve resilience and productivity and should be a global priority. **Targeted Policy Recommendation and the issue-based intervention outlined below** across specific thematic areas can further enable and accelerate the transformation of global food systems, particularly benefiting developing countries.

- Prioritising the structural transformation in agri-food systems particularly in developing countries should be a policy agenda towards enhancing efficiency and sustainable productivity, crop-diversification, value addition, diversified livelihood opportunities and improved farm incomes. Access to and adoption of advanced technologies, mechanisation of farming systems and building the skilled workforce and to delivering emerging innovation, extension services, etc., helps in enhancing land and labour productivity. This will facilitates the overall development of the economy, which includes generating an additional demand for manufacturing goods, and thus a multiplier impacts is more visible across many domains of the socioeconomic sectors of the economy.
- Addressing the worsening food security situation and alleviation of all forms malnutrition should be a core agenda. It includes better access to food safety nets and social security schemes, adequate access and affordability of healthy diets and promotes the relevant and targeted interventions to tackle with these challenges are essential. As per UN-SDGs Report 2025, globally 3.8 billion people remained unprotected by at least one social safety nets and the coverage in low-income countries is considerably low at 9.7 percent, followed by the LMICs. The effective coverage of women (50.1 percent) lagging behind that of men (54.6 per cent). To address these challenges, required a global attention and collaborations towards ensuring global food security and child malnutrition particularly in developing countries.

- Food commodity prices have shown sharp volatility during global disruptions such as the global financial crisis and the COVID-19 pandemic, and future disruptions are likely to pose similar risks, thereby threatening food security and worsening malnutrition. Policy action must prioritize enhancing global cooperation and collaborative efforts to reduce international prices of key commodities—particularly oils, sugar, and cereals. This includes lowering input costs such as fuel and fertilizers, which is essential to stabilize markets and further protect vulnerable populations. It also visible that food inflation disproportionately affects low-income households and countries and the price surge poses a serious risk to food security, child nutrition includes the import-dependent countries such as LIFDCs, and NFIDCs whereas rising import bills and inadequate access to essential food items exacerbate this situation further. This necessitates the policy intervention and global cooperation and bilateral relations to better tackle this situation.
- Advancing agri-food systems (AFS) and to facilitating investments in R&D and innovation, improving access to and adoption of emerging technologies, and capacity building and skill development will promote rural agripreneurship, create sustainable agribusinesses, and enhance value addition across the food and farm supply chain. These interventions help generate remunerative jobs, secure sustainable livelihoods, incomes and fostering the structural transformation of agri-food systems while revitalising of rural economy and reducing hunger, poverty and inequalities etc. Developing countries, therefore, need to reshape their policies towards achieving these objectives are essential. This will enhance labour and yield productivity and reduce the high concentration of the workforce in the agricultural sector etc. Targeted interventions and strategies that prioritize women's access to these roles are essential to expand diversified livelihoods. This approach improves rural socioeconomic conditions and helps reduce hunger, poverty, and inequality.
- Reducing food loss and waste (FLW) is recognized as a 'zero-cost' productivity measure, requiring improved storage, cold-chain and

logistics infrastructure for better post-harvest management, alongside targeted product-wise interventions. Losses in horticulture crops, particularly fruits and vegetables (25.4 percent) and animal products (14.0 percent), exceed global post-harvest losses (13.2 percent in 2022), while reductions are also needed in roots, tubers, oil-bearing crops, cereals, and pulses. Addressing FLW demands R&D investments, technological innovation, stronger start-up ecosystems, and better farm-to-fork market linkages, supported by policy actions such as capacity building, expanded extension services, and early warning systems. These interventions are especially critical for developing countries to strengthen food security and nutrition, advance agri-food systems transformation, and enhance participation of smallholders, women, and youth through skills development and access to emerging technologies. Such measures contribute to achieving SDG 12.3 on halving global food waste, SDG 2 on food security and nutrition, SDG 13 on climate action, and SDG 8 on productivity and economic growth, while promoting efficient resource use and mitigating the triple planetary crises of climate change, biodiversity loss, and pollution.

- Enhancing budgetary allocations and strengthening the intuitional finance and investments in agri-food systems. The flow of institutional credit and increasing relative public spending are critical to the transition of agri-food systems and the strengthening of rural economies. The vulnerable farming communities such as small and marginal farmers, women and youth and indigenous communities should access these resources efficiently. Developing countries need to recognize this and strategically boost agricultural spending, including allocations toward agricultural R&D, extension services, and climate-smart practices. These interventions include implementing accountable and digital systems with a holistic approach that integrates Agricultural Value Chains (AVCs) with global markets, shifting the focus from merely addressing supply shortages to meeting market demands and supporting the transition from a production-centric to a demand-driven model. Underfunded

countries and regions essentially require budgetary allocations, international aid, and technical partnerships, including support from multilateral institutions and MDBs, to enhance agricultural credit. Beyond absolute spending levels, the relative share of agricultural expenditure is vital for food security, rural livelihoods, and environmental sustainability.

- Targeted infrastructure investment and coordinated policy interventions includes prioritise public-private partnerships and expanded access to interoperable Digital Public Infrastructure (DPI) and open Digital Public Goods (DPGs) helps to improve availability, affordability, and integration of agricultural technologies in general particularly in developing countries. It coupled with targeted subsidies, device-and-connectivity vouchers, and community access points to reach rural populations, smallholders, women, and youth. These measures will reduce digital divides and enable effective adoption of modern innovations, simultaneous investment in digital-literacy and capacity-building within agricultural extension (blended delivery in local languages) and clear data-governance, privacy, and interoperability standards will ensure trusted, scalable services that help close socio-economic gaps across regions and sectors.
- Better accessing emerging technologies and innovations and to address digital-divides within the sector across all the stakeholders should be minimised as compared with other sectors of the economy led to enhanced access to various IT solutions. Promoting extension services and enhancing the capacity building activities for all the stakeholders is also necessary. Mechanisation of farming activities and the adoption of precision farming activities includes access digitally enabled solution and provides an opportunity to tackle with several challenges need to be promote. Facilitate access to emerging technologies and innovations, and strengthen mechanisation and skills to boost land and labour productivity and reduce vulnerabilities.
- The improved policy mechanisms aimed at the transformation of agri-food systems through enhanced adaptation and mitigate strategies can help to reduce negative impacts climate changes and its extremes

on food systems and accelerate the progress in combating hunger in developing countries. It enhances resilience and efficiency in agri-food systems agricultural by accelerate adoption of climate smart and innovative technologies. Developed countries should enhance their support towards developing countries by providing technology and innovation sharing, scaled-up assistance, and adequate climate finance flows—particularly adaptation finance. The current assistance must be scaled up from billions to trillions, since commitments such as the COP29 pledge of at least USD 300 billion per year by 2035 remain far below developing countries' needs and must be substantially increased. Developing nations should increase public spending and investments in agri-food systems, reduce food loss and waste, and promote shifts to sustainable healthy diets.

- Enhancing agri-food trade is critical by addressing barriers to agri-food trade and should be a global priority to promote global food security and nutritional diversity and to achieve the SDGs particularly SDG 2 on 'Zero Hunger. Developing countries includes LDCs participation to be enhanced in global trade in food and agriculture. The high trading costs such as tariffs, non tariff measures, limited diversification, structural backwardness and lack of access to global markets and to less integrated etc. are blocking their participation. It is also essential to ensure sustainable and resilient value chains and promote regional and inclusive agricultural value chains, a key to confront supply-chain disruptions caused by pandemics, extreme climate events, conflicts, and natural disasters. Addressing this challenge, helps in improving income convergence and reducing inequalities poverty, and improves SDGs progress.
- Resolving the systemic challenges within and across sectors is essential and requires coordinated policy action, comprehensive interventions, and stronger stakeholder engagement. Multilateral institutions and global forums, including the G20, must support developing countries through knowledge exchange, technology transfer, innovation, and the sharing of best practices.

The effective implementation and the action oriented policy interventions helps in accelerating the transition of agri-food systems by raising productivity, removing bottlenecks, and mitigating sectoral risks. Adoption of holistic approaches drives the structural transformation which includes diversifying agricultural activities involving value addition and the non-agriculture activities with the sector, besides pushing the demand for manufacturing products.

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Appendix 1

G20 Indonesia Presidency 2022: G20 AWG-Key Achievements and Initiatives

1. **A. Mapping Exercise on the Global Responses to Rising Food Insecurity**

   - In response to the G20 Leaders request through their G20 Bali Declaration of November 2022, FAO, World Bank group (WBG) and WTO undertaken a mapping exercise on the global responses to rising food insecurity, with the objective to identify any major gaps in these responses.

   This Report was delivered to the G20 Troika in April 2023, during the India Presidency.

   Key Recommendations of this Report

   1. Emergency humanitarian assistance
   2. Social safety net programmes
   3. Increasing resilience
   4. Fertilizer
   5. Finance
   6. Markets and trade
   7. Agrifood systems transformation

2. **G20's concrete deliverables in strengthening more resilient and sustainable agriculture and food systems in the Small Island Developing States (SIDS) of the Pacific.**

This initiative will be carried out through the Project of Development of Regional Agriculture Training Center and Demfarm in Fiji Under South-South and Triangular Cooperation (SSTC) Framework.

Appendix 2

G20 India Presidency 2023: Key Achievements and Initiatives of G20 AWG

1. Deccan High-Level Principles on Food Security and Nutrition 2023

Principle 1: Facilitate Humanitarian Assistance to Countries and Populations in Vulnerable Situations;

Principle 2: Enhance Availability and Access to Nutritious Food and Strengthen Food Safety Nets;

Principle 3: Strengthen Policies and Collaborative Actions for Climate Resilient and Sustainable Agriculture and Food Systems;

Principle 4: Strengthen Resilience and Inclusivity in Agriculture and Food Value Chains; Principle 5: Promote the One Health Approach;

Principle 6: Accelerate Innovation and the Use of Digital Technology;

Principle 7: Scale-Up Responsible Public and Private Investments in Agriculture

Leaders committed to enhance global food security and nutrition for all in line with the G20 Deccan High-Level Principles on Food Security and Nutrition 2023.

2. Millets And OtHer Ancient GRains International ReSearcH Initiative (MAHARISH)

- To facilitate research collaboration and encourage efforts to strengthen research cooperation on climate resilient and nutritious grains including Millets and other underutilized grains such as quinoa, sorghum and other traditional crops including rice, wheat and maize.
- In this context, G20 Agriculture Ministers' welcomed the launch of the 12th G20 Meeting of Agriculture Chief Scientists (MACS) international initiative for research on millets and other ancient grains. This will supplement the efforts undertaken under the International Year of Millets 2023 (IYoM 2023) program initiated by the United Nations General Assembly (UNGA).
- It also endorsed and committed by G20 New Delhi Leaders' Declaration (held on 9-10 September 2023) in para no. 26 on food security and Agriculture, as it follows:

As per the Implementation, the MAHARISHI secretariat will be based in the Indian Institute of Millets Research (IIMR), Hyderabad with technical support from International Crops Research Institute for Semi-Arid Tropics (ICRISAT), One CGIAR, International organisations (IOs) and research institutions.

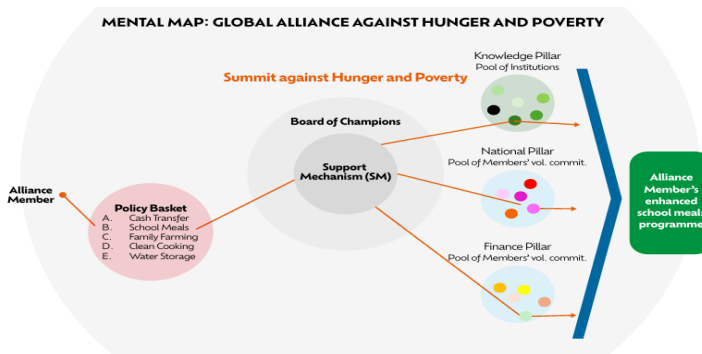
Appendix 3

G20 Brazil Presidency 2024: Key Achievements and Initiatives of G20 AWG

1. Global Alliance against Hunger and Poverty, 2024

- Global Alliance against Hunger and Poverty launched at the G20 Leaders' Summit in November 2024 to support and accelerate efforts to eradicate hunger and poverty (SDGs 1 and 2) while reducing inequalities (SDG 10) by scaling up the implementation of public policies through global partnerships for sustainable development (SDG 17).
- Its innovative approach to mobilizing finance and knowledge sharing to support the implementation of country-led, country-owned, large-scale and evidence-based programs aiming at reducing hunger and poverty and to revitalizing global partnerships for sustainable development.
- The Alliance champions proven strategies such as cash transfers, development of homegrown school feeding programs, improving access to microfinance and the formal financial system and social protection, among other strategies that can be adapted to each country's national circumstances.

2. G20 Global Initiative on Bioeconomy (GIB)



Premises

1. Members seeking support choose solutions or policy reinforcements from the policy basket.
2. Resources within the GA's Pillars are unknown or inaccessible to members seeking support, or potential partners are unaware of an existing demand.
3. SM and BoC connect interested Members with needed resources and partners, and make efforts to unlock partnerships.
4. Alliance Member's new, scaled-up or enhanced policy will boost SDG 1 and 2 achievements.

- G20 Leaders' officially launched the G20 Initiative on Bioeconomy (GIB) in November 2024. Recognizing the remarkable potential of bioeconomy to contribute to building a sustainable future and fostering economic growth for all. In this regards,
- Ten voluntary, non-binding High-Level Principles on Bioeconomy (1.Sustainable Development; 2.Inclusive and Equitable; 3.Mitigation and Adaptation Efforts against Global Climate Change; 4.Biodiversity; 5.Advance Sustainable Consumption and Production; 6. Science, Technology, Innovation and Traditional Knowledge; 7.Robust and Coherent Policy Frameworks; 8.Criteria and Methodologies; 9.International Collaboration and Cooperation and 10.Country-Specific), which aim to outline how this innovative complementary productive paradigm can and should be economically, socially, and environmentally sustainable.
- Recognize the potential for further cooperation and welcome the decision of South Africa to continue the work of the GIB in the next G20 Presidency of the group.

Appendix 4

G20 South Africa 2025: Key Achievements and Initiatives of G20 AWG

2. Established the G20 Food Security Task Force

- Build on and complement other initiatives which aligns with other existing frameworks on food security.
- Looks at food security and systems at the regional and global levels (While, Brazil's Global Alliance focuses at the ntional and programme level), with a specific focus on the macroeconomic dimensions of food security and food prices.
- It will build off, and assess the effectiveness of previous G20 work undertaken since 2011 on food and agricultural commodities' price volatility.
- This will also complement South Africa's current leadership of the Committee on World Food Security (CFS).

3. Ubuntu Approaches on Food Security and Nutrition,and Excessive Food Price Volatility

- Address the negative impacts of excessive food price volatility, particularly for lowincome households
- Access to adequate, safe, affordable and nutritious foodall people.
- G20 Leaders endorse and commit to implementing theUbuntu Approaches and to review progress on implementation.

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BEF aims to serve as a dedicated platform for fostering dialogue on promoting the concept in the Indian Ocean and other regions. The forum focuses on conducting studies on the potential, prospects and challenges of blue economy; providing regular inputs to practitioners in the government and the private sectors; and promoting advocacy for its smooth adoption in national economic policies.

FIDC, has been engaged in exploring nuances of India's development cooperation programme, keeping in view the wider perspective of South-South Cooperation in the backdrop of international development cooperation scenario. It is a tripartite initiative of the Development Partnership Administration (DPA) of the Ministry of External Affairs, Government of India, academia and civil society organisations.

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FISD aims to harness the full potential and synergy between science and technology, diplomacy, foreign policy and development cooperation in order to meet India's development and security needs. It is also engaged in strengthening India's engagement with the international system and on key global issues involving science and technology.

As part of its work programme, RIS has been deeply involved in strengthening economic integration in the South Asia region. In this context, the role of the South Asia Centre for Policy Studies (SACEPS) is very important. SACEPS is a network organisation engaged in addressing regional issues of common concerns in South Asia.

Knowledge generated endogenously among the Southern partners can help in consolidation of stronger common issues at different global policy fora. The purpose of NeST is to provide a global platform for Southern Think-Tanks for collaboratively generating, systematising, consolidating and sharing knowledge on SSC approaches for international development.

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