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Food security is a vital aspect of the Sustainable Development Goals (SDGs), and agriculture is the primary source of food production. However, agriculture faces challenges due to the unpredictable effects of climate change and land degradation. The Intergovernmental Panel on Climate Change (IPCC) has extensively analyzed these issues in a report. The report is extensive, requiring collective efforts to comprehend fully. In this brief overview, we will touch upon some key highlights from chapter 5 Food security.

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"How to Adapt: A Treatise on the Impacts of Climate Change and the Food System" delves into the critical connection between climate change and the global food system.

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With over 1.1 billion people depending on agriculture for their livelihoods and sustenance, this sector stands as the largest contributor to GDP in many developing countries, comprising approximately 1.6 percent of all national GDP. Forecasts from the Food and Agriculture Organization (FAO) reveal a daunting 50% surge in food demand by 2050.

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Against this backdrop, the chapter meticulously examines various approaches and synthesis strategies within the food chain, seeking to navigate climate variability and enhance food security. By illuminating different adaptation measures and the inevitable trade-offs that accompany them, this treatise aspires to pave the way towards a resilient and sustainable future for global food systems in the face of climate uncertainty.

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The interaction between food insecurity and climate change creates a vulnerable food system. Food security ensures sufficient safe and nutritious food for all, but climate change affects food availability. Food insecurity results from unsafe or inadequate nutrition. Surprisingly, only 9-14% of global greenhouse gas emissions are from crop and livestock production. Understanding this interplay is vital for building a resilient and sustainable food system to tackle climate challenges.

The global greenhouse gas (GHG) emissions are typically measured in gigatons of carbon dioxide equivalent (GtCO2eq) emitted per year. GHG emissions come from various sources, and here are approximate values for the emissions from different sectors:

Energy Sector: 33-35 GtCO2eq per year

Agriculture: 5-6 GtCO2eq per year

Emissions in this sector primarily come from enteric fermentation in livestock, rice cultivation, and the use of synthetic fertilizers.

Land Use and Forestry: -5 to -10 GtCO2eq per year

This sector includes emissions from deforestation and forest degradation (which release carbon dioxide) and carbon sequestration through afforestation and reforestation (which absorb carbon dioxide from the atmosphere).

Industrial Processes: 5-6 GtCO2eq per year

Waste: Approximately 1.5-2 GtCO2eq per year

This sector includes emissions from solid waste decomposition in landfills and waste treatment processes.

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Food security rests on four fundamental pillars, each playing a vital role in ensuring a stable and sustainable food system. The first pillar is the availability of food, ensuring an adequate supply of food to meet the demands of the population. The second pillar is access to food, ensuring that individuals have the means and resources to obtain the food they need. The third pillar focuses on the effective utilization of food to achieve nutritional security, ensuring that the food consumed is nutritious and meets the dietary requirements of individuals. Finally, stability in all four pillars is crucial, as the combined impacts of availability, access, and utilization work harmoniously to create a robust and resilient food security framework. Recognizing the significance of each pillar and their synergistic interactions is essential for addressing the complexities of food security and promoting a sustainable and equitable food system for all.

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Availability is hindered primarily by reduced yields and a decline in both the quantity and quality of food. Sections 5.2.2.1 and 5.2.2.2 delve into the detailed impact of these challenges, while mitigation strategies are outlined in Section 5.3 onwards.

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Sections 5.2.2.1 and 5.2.2.2 explore the changes in farmer livelihoods and the limitations they face in purchasing food. Additionally, Sections 5.1.3, 5.2.3.1, 5.2.5.1, and Box 5.1 shed light on the effects of price rises and spikes. Mitigation strategies are discussed from Section 5.6.4 onwards.

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Section 5.2.4.1 delves into utilization, discussing the impacts of increased prevalence of microorganisms and toxins on food safety, as well as the decline in nutritional quality. The section also addresses mitigation strategies to tackle these challenges.

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The discussion in sections 5.2.5, 5.8.1, and 5.8.2 highlighted how the stability of continuous food availability and access can be compromised by the instability of food supply. Widespread crop failures were identified as a significant contributing factor to the shortage of food supply, thereby impacting the overall stability of food accessibility.

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The interactions among all four pillars resulted in systemic impacts, prompting recommendations for mitigating the rise of undernourishment, obesity, environmental degradation, and food insecurity.

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Section 5.1 elucidates that undernourishment is a highly perilous condition arising from a compromised food system, and its prevalence continues to escalate, regardless of the level of development, as indicated in the graph.

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Here we observe the global prevalence of different malnourishment statuses gathered from various organizations. Alarmingly, the total number of undernourished individuals has surpassed 820 million people worldwide.

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The strategies include enhancing food system productivity and efficiency, promoting sustainable consumption of energy-intensive products, reducing greenhouse gas emissions, and implementing governance and institutional measures to ensure equity and fairness.

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The impact of climate change on food security is a critical concern. The theme of "access" is particularly significant for low-income regions, where vulnerability to food insecurity is heightened. The status of the global food system and trends in food insecurity and malnourishment are crucial aspects to examine. Additionally, understanding the role of food in human health and well-being is essential. Analyzing the five-century period from 1961 to 2013 reveals interesting trends in food supply and demand, with most food production occurring on land with a "food surplus."