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Protected Farming in the Era of Climate-Smart Agriculture: A Photographic Overview

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IN THE LAST centuries, agriculture depended on the fertile soils beside the river, which helped the ancient humans to establish many civilizations like the Egyptian civilization. This agriculture mainly depended on the open field cultivation to produce the necessary food for human, but an urgent need was formed under the global overpopulation to produce more food using different farming systems such as soilless farming, protected cultivation, hydroponics, etc. Protected farming allows producing crops (food) under controlled conditions to modify any natural environment prevent/ restrict the plant growth and its productivity. This work focuses on the protected farming and its association with climate-smart-agriculture. Protected farming has several obstacles in the developing countries especially under using the low-tech protected farming technique. Climate-smart-agriculture is an agriculture, by which its productivity can be sustainably increased, its resilience to climate change can be enhanced, and greenhouse gases can be mitigated, as well as enhances achievement of national food security and development goals. The closed relationship between protected farming and climate-smart agriculture is needed to be investigated in more research. Therefore, this work reported on protected farming and its potential against changing climate. This is also a call by Environment, Biodiversity and Soil Security (EBSS) for receiving articles on protected agriculture under climate-smart agriculture approach, their challenges, their obstacles and the novel solutions in this concern.

Keywords: Climate change, Smart farming, Natural farming, Greenhouse gas emissions.

1. Introduction

There are various kinds of agriculture, which characterize certain properties such as subsistence farming, mixed farming, plantation farming or tree crop farming, pastoral or livestock farming (e.g., sheep farming, cattle farming), nomadic farming (Bedouin farming), fish farming, organic farming, smart farming, dairy farming, dry farming, irrigate farming, terrace farming, and poultry farming. Several challenges face the cultivation of crops, especially the adverse environmental condition. So, the protected farming was established to avoid these

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circumstances like the heavy snowing in winter, very high temperatures in summer, etc. Protected farming depends on the facilities and technologies. The low-tech protected cultivation is common in developing countries (Nordey et al. 2017). Several studies have recently been published on different kinds of farming like soilless cultivation (Nerlich and Dannehl 2021), potential of protected cultivation (Ramasamy et al. 2021), natural farming (Laishram et al. 2022), and drivers of farming systems (Materechera and Scholes 2022).

Climate change is defined as the variations that occur in different climatic elements for a long time (i.e., from decades to millions of years) or the distribution of weather over extended periods (El-Ramady et al. 2013). The main features of the climate changes may include increasing temperature, greenhouse gases (GHGs) like carbon dioxide (CO_2), nitrous oxides (N_2O), methane (CH_4), and increased seal levels (El-Marsafawy et al. 2019). These variations may occur in the average weather or simply in the distribution of weather events around an average on the level of regions, or countries on the whole globe (Maulu et al. 2021).

Human has been recognized as the major contributor to climate changes through the use of fossil fuels (coal, gas, and oil) for energy supplies (IPCC 2019; Palmer and Stevens 2019) as well as deforestation and forest degradation, which emit GHGs into the atmosphere (Elbasiouny et al. 2022). The increased accumulation of GHGs in the atmosphere over the years has been linked to these human activities, which have a global direct and/or indirect impacts on various sectors and services such as economic, environmental and agriculture (FAO 2020; Maulu et al. 2021). There is a crucial need for climate-smart agriculture (CSA). It is defined as an approach, by which helps guide actions to transform agri-food systems towards green and climate resilient practices (FAO 2022).

Therefore, the main issues addressed in this paper are: a), protected agriculture and its relationship to climate change, b) climate-smart-agriculture and its potential, and c) protected cultivation including its cons and pros. It is also a photographic call for submitting articles by EBSS on protected farming under changing climate to answer of the main question in this work: what is the main impact of protected cultivation on the global warming?

2. Agriculture and climate change

It is well known that, all growing stages of cultivated plants depend on the climatic elements including temperature, humidity, precipitation, etc. Agriculture is the main source of food production with global used land area 1.5 billion hectares, in addition to 3.5 billion hectares being grazed, and 4 billion hectares of forest are used by humans to different degrees and the total fisheries and aquaculture production is 214 million Mg (**Fig. 1;** FAO 2020). These sources definitely are influenced by climatic elements and their changes as reported in several studies (**Table 1**). It is assumed that agriculture sector may contribute to climate changes through its gas emissions resulted from anthropogenic activities including the three largest individual contributors to global warming the CO_2, CH_4, and N_2O (Lynch et al. 2021). The previous three gases are associated with agriculture and food production, whereas both CH_4 and N_2O are direct agricultural emissions (Mbow et al. 2020). Around 21–37% of annual emissions are resulted from the global food system, as commonly reported using the

100-year Global Warming Potential. Agricultural activities can generate around 1/2 of all anthropogenic methane (CH_4) emissions and around 3/4 of anthropogenic N_2O (Mbow et al. 2020). It is stated that, the limit warming to 1.5°C with limited or no overshoot reduces global agricultural emissions by 16–41% in 2050 relative to 2010, whereas baseline emission increase by 24–54% over the same period is the most ambitious scenario assessed by the IPCC (2018). This amounts to a reduction of direct global agricultural non-CO_2 emissions of 4.8 Gt CO_2-eq below baseline by 2050 (Huppmann et al. 2018; Frank et al. 2019; Leahy et al. 2020).

Table 1. List of some studies on agriculture and climate change.

The main findings of the study or main topic	Reference
Challenges and prospects for agricultural greenhouse gas mitigation pathways consistent with the Paris Agreement	Leahy et al. (2020)
The contribution of agriculture and its role in mitigation climate change and its distinct role compared to predominantly fossil CO_2-Emitting Sectors	Lynch et al. (2021)
Learning from a polycentric approach on climate governance and agriculture in Southeast Asia	Fasting et al. (2021)
Application of gene editing to generate DNA modifications at precise genomic locations for climate change in agriculture to improve crops and livestock	Karavolias et al. (2021)
Sustainability, implications, mitigation, and adaptations to climate change and their effects on aquaculture production	Maulu et al. (2021
Adapting to Climate Change Through Conservation Agriculture	Umar (2021)
Sustainable agriculture development in Northwest China under the impacts of global climate change	Liu et al. (2021)
Plant growth promoting rhizobacteria (PGPR) in agriculture: a sustainable approach to increasing climate change resilience	Shah et al. (2021)
Expansion of agriculture in Northern cold-climate regions: a cross-sectoral perspective on opportunities and challenges	Unc et al. (2021)
Advanced climate smart agriculture to secure nutrition and health to improve the livelihood of the poor/malnourished population	Babele et al. (2022)
Climate change impacts on socio-hydrological spaces of flow regime of the Brahmaputra River under climate warming scenarios, which impact on agriculture and food security	Borah et al. (2022)
Climate extreme and agriculture development using new insight from top agri-economics by causing a downturn effect on the agriculture export, and at the same time causing an upward shift in the agriculture import of selected economies	Lisha et al. (2022)
Evaluating the sensitivity of robust water resource interventions to climate change scenarios due to water resource system planning is complicated by uncertainty on the magnitude and direction of climate change	Geressu et al. (2022)
Climate resilient agriculture and enhancing food production: Field experience from Philippines	Varela et al. (2022)

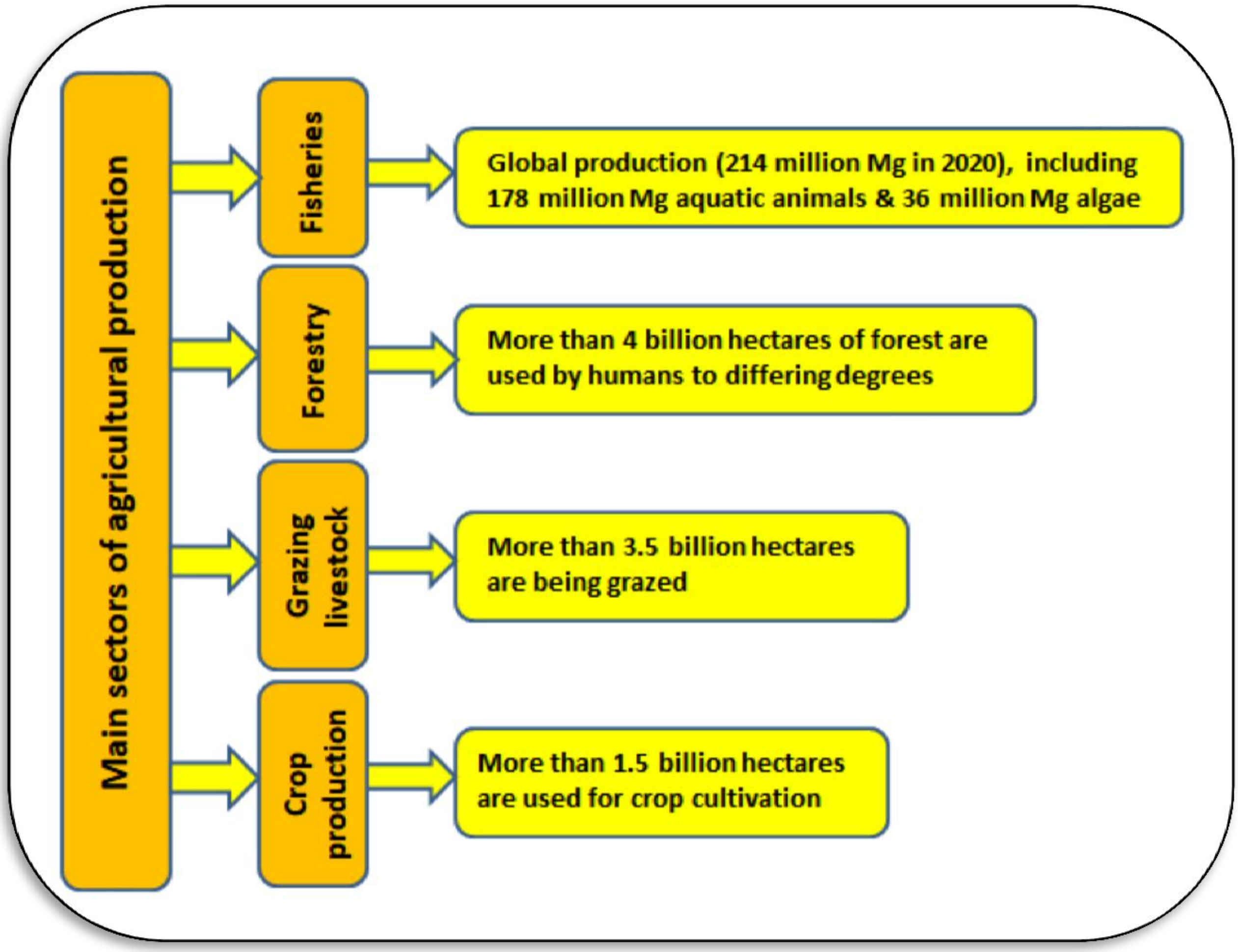


Fig. 1. Different production sectors in agriculture including crop production besides grazing, forestry, and fisheries (according to FAO 2020).

It is well stated that, growing the cultivated plants under protected conditions or in open field is totally controlled by climatic elements (**Fig. 2**). There are many expected impacts of the global climate change, including direct/indirect impacts on the agriculture sector and its output (Kumar et al. 2018; Kumari et al. 2020). For example, many studies discussed the relationship between climate changes and agriculture sector both in developed and developing economies (Sforna 2019; Chitakira and Ngcobo 2021). It is reported that increasing CO_2 is causing higher temperature along with altered precipitation patterns for agriculture productivity (Lisha et al. 2022). There is a need for modellings of climate change under different conditions in the upcoming decades to expect the effect of such changing climate in the livestock production system. Additionally, the projection for the crops and livestock production system has revealed the fact that the effect from of the climate changes over the next 25 years will be mixed. The reason is that the agriculture sector significantly depends on the range of economic system processes which supports the productivity including soil quality maintenance and water regulation as well (Lisha et al. 2022). It is predicted that extreme climate changes have an increasing impact on the value of total productivity of agriculture sector all over the world (Dar et al. 2020; Dar et al. 2021).

It could be noticed that climate changes have many risks on the sector of agriculture and food system as illustrated in **Fig. 3** (von Braun 2020; Shah et al.

2021). One of the most important approaches for studying the climate changes is the modelling research, which can synthesize hazard frequencies for critical time periods relevant to crop production (Shah et al. 2021). This climate modelling focuses on long-term changes in mean different climate variables and their suggested impacts like temperature extremes, seasonal droughts and increased stress due to excess water over land areas at the global and regional scale (Shah et al. 2021). It is important also to identify the most sensitive time windows over the crop growth cycle wherein variability in climate factors explains maximum variability in crop yields. The spatial assessment of heat stress in wheat, maize, rice and soybean at the global level found a high risk of yield losses at the reproductive stage for many parts of Asia and central North America (Shah et al. 2021), whereas for winter crops in Australia as the most sensitive to climate hazards, were up to 88% of yield variability (Shen et al. 2018). Therefore, in response to the need for information by the research-practice-policy communities on disasters and extreme events, there has been a surge in the development of risk management and climate adaptation methods, frameworks, and implementations (IPCC 2022).

Fig. 2. Several common horticultural crops are cultivated in the greenhouse like strawberry, pepper, tomato, cucumber, etc. (photos by El-Ramady).

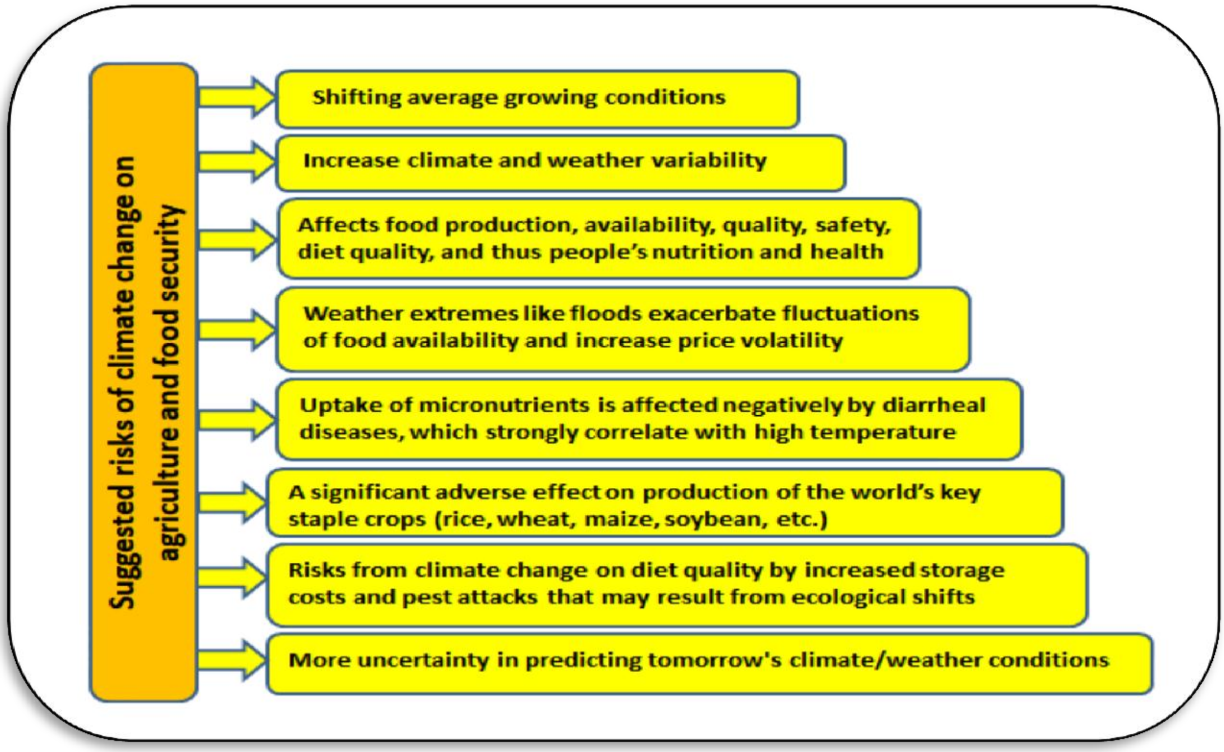


Fig. 3. List of some suggested risks from climate changes on agriculture and food system as reported by von Braun (2020), and Shah et al. (2021).

3. Climate-Smart Agriculture: an overview

Climate-smart agriculture (CSA) or climate resilient agriculture (CRA) is an approach, by which helps guide actions to transform agri-food systems towards green and climate resilient practices (FAO 2022). CSA could be also defined as "*an integrated approach to managing landscapes to help adapt agricultural methods, livestock and crops to the effects of climate change and, where possible, counteract it by reducing greenhouse gas emissions from agriculture, at the same time taking into account the growing world population to ensure food security*". The system of CSA emphasizes on carbon farming, sustainable agriculture, and increasing agricultural productivity. This CSA supports sustainable food and agriculture to make these sources including agriculture, forestry and fisheries more productive and more sustainable. The main pillars of CSA may include (1) increase agricultural productivity and its incomes, (2) adapt and build resilience to climate changes, (3) and reduce or removing greenhouse gas emissions from agriculture (Fawzy and Shedeed 2020; FAO 2022).

According to FAO (2022), there are some tools, used to assess, monitor, and evaluate the CSA such as (1) modelling system for agricultural impacts of climate change, (2) global livestock environmental assessment model, (3) sustainability assessment of food and agriculture system, (4) economics and policy innovations for climate-smart agriculture, (5) ex-ante carbon-balance tool, (6) climate risk management, (7) gender mainstreaming, (8) and monitoring and assessment of greenhouse gas emissions and mitigation potential in agriculture (**Fig. 4**). Several studies reported on climate-smart agriculture including different topics about this crucial issue as presented in **Table 2.**, whereas Table 3 includes the main climate-smart agricultural practices according to the German Agency for International Cooperation or GIZ (2022).

Table 2. List of some published articles on the climate-smart agriculture.

The amin findings of the study or the topic	Country	References
Climate-smart agriculture adoption in flood prone areas as an essential pathway to ensure food security and reduce rural poverty in a changing climate	Bangladesh	Akter et al. (2022)
Study the impacts of climate smart agriculture on food security using the social and ecological pressures (climate change & environmental factors) on the adoption of physical water and soil practices as well as crop rotation techniques in rural Ethiopia	Italy/ Ethiopia	Bazzana et al. (2022)
Determinants of awareness levels of climate smart agricultural technologies and practices including 10 major variables related to socio-economic & environmental properties of farming households	Nigeria	Mashi et al. (2022)
Climate change and maize productivity by simulating the impacts and alleviation with climate smart agriculture practices, mainly mulching and permanent planting basins as most effective for improved maize yield and water use efficiency	Uganda	Zizinga et al. (2022)
Climatization of agricultural issues in the international agenda through climate-smart agriculture, agroecology, and nature-based solutions	Global/France	Hrabanski et al. (2022)
Role of Institutional extensions services in climate- smart technology adoption in agriculture by enhancing adoption of CSA practices (e.g., re-scheduling planting, crop rotation, crop diversification, micro-irrigation, and drought-resistant seeds)	India	Tanti et al. (2022)
Designing scenarios for upscaling climate-smart agriculture on a small tropical island by combining agroecology and bioeconomy, which need many agro-socio-economic levers	France/ Guadeloupe	Selbonne et al. (2022)
Determinants of adoption of climate smart agricultural technologies among potato farmers through entrepreneurial orientation, which reflects the farmers' proactiveness, innovativeness, and risk-taking	Kenya	Andati et al. (2022)
Study the climate-smart agriculture in mitigation the Urmia Lake tragedy using the method of benefits, risks, opportunities, and costs by developing water-smart agriculture for problems of water scarcity, poor water governance and low water use efficiency	Iran	Maleki et al. (2022)
The role of weather and climate information services in driving the adoption of climate-smart agriculture practices like management of the erosion control, pest-resistant crops, and integrated pest	Ghana	Djido et al. (2021)

Table 3. Main climate-smart agricultural practices according to GIZ (2022) .

Crop management	Livestock Management	Soil and water management	Agroforestry	Integrated food energy system
Intercropping to maximize space by pest control and cash crop	Improve feeding strategies like cut and carry system	Conservation agriculture like minimum tillage, etc.	Boundary trees, and wind breaks	Biogas
Crop rotation system should include legumes	Rotational grazing	Use mounds to plant on slopes	Nitrogen-fixing trees on farms (e.g., legumes)	Solar power
New crop varieties as tolerant to stresses drought, heat, salinity, flooding,	Grow suitable crops under proper management to feed animals	Grass barriers (e.g., Kush grass)	Multipurpose trees (e.g., fruit trees used as windbreaker)	Ram pumps for irrigation
Improved storage and processing techniques	Manure treatment to be decomposed and well-decay	Use bench/eyebrow terraces to plant on slopes	Fruit orchards	Gravity-fed irrigation system
Greater crop diversity	Improved livestock health	Improved irrigation (e.g., drips)		Improved stoves
Underground crops (e.g., yams, dasheen)	Animal husbandry improvements	Water storage (e.g., rainwater harvesting)		
Stake plants to reduce wind damage		Encase beds (pallets, bamboo)		
Composting and organic fertilizer		Stone barriers		
Mulching crops		Check dams		
Shade house		Contour planting		

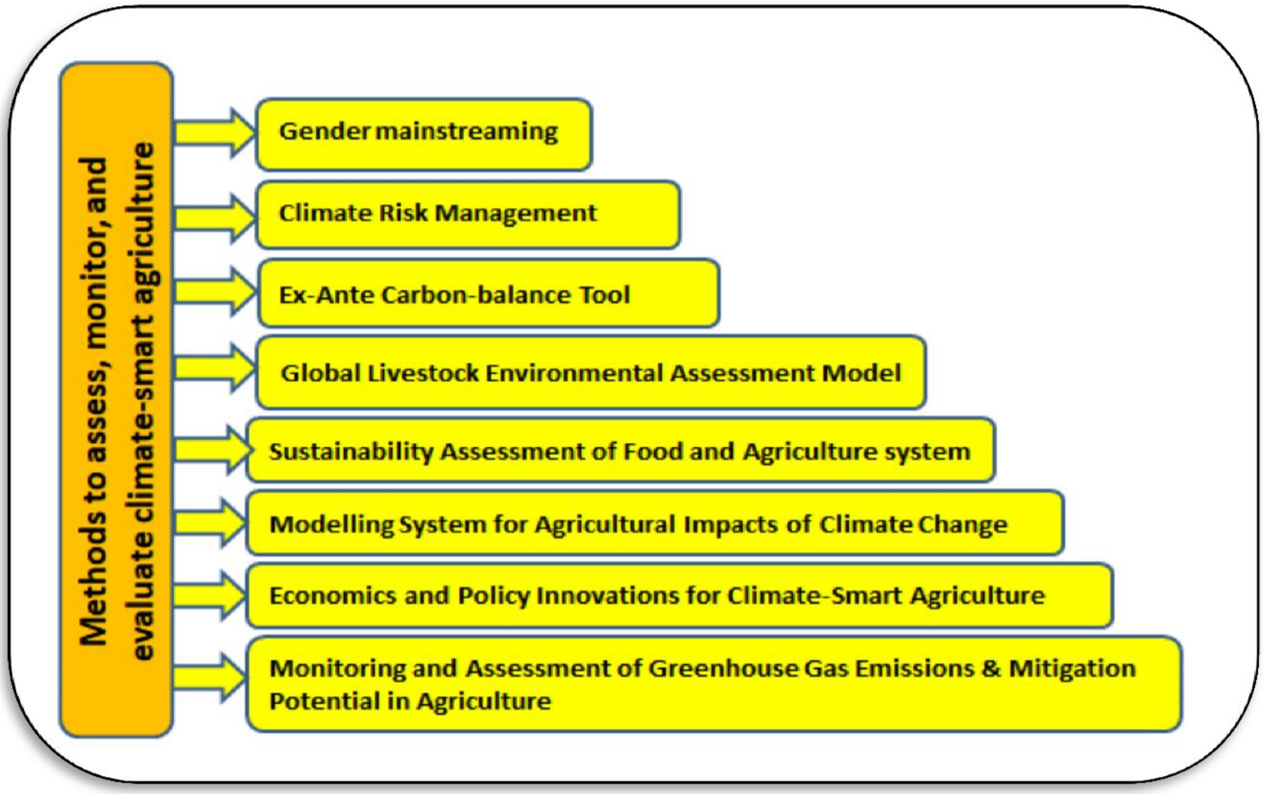


Fig. 4. Main methods for assessment, monitoring and evaluation of integral parts of CSA planning and implementation according to FAO (2022).

As mentioned in **Table 2**, there are several practices that support the adaption of climate-smart agriculture in different countries. There are also suggested three possible actions, which proposed by FAO concerning “Why climate-smart agriculture can help to achieve food security” (**Fig. 5**). CSA is an approach for developing agricultural strategies to secure sustainable food security under climate change. CSA can provide the means to help stakeholders from local to national and international levels identify agricultural strategies suitable to their local conditions. CSA is one of the 11 Corporate Areas for Resource Mobilization under the FAO’s Strategic Objectives. Widespread changes in rainfall and temperature patterns threaten agricultural production and increase the vulnerability of people dependent on agriculture for their livelihoods, which includes most of the world’s poor. Climate change disrupts food markets, posing population-wide risks to the food supply. Threats can be reduced by increasing the adaptive capacity of farmers as well as increasing resilience and resource use efficiency in agricultural production systems. CSA promotes coordinated actions by farmers, researchers, private sector, civil society and policymakers towards climate-resilient pathways through four main action areas: (A) building evidence; (B) increasing local institutional effectiveness; (C) fostering coherence between climate and agricultural policies; and (D) linking climate and agricultural financing. Climate Smart Agriculture differs from ‘business-as-usual’ approaches by emphasizing the capacity to implement flexible, context-specific solutions, supported by innovative policy and financing sources.

In order to contribute to achieving sustainable development goals under climate change, production systems need the agricultural sector aims to simultaneously address three intertwined challenges: increasing productivity and income in the sustainable farming; building resilience to the effects of climate change; and contribute to Mitigating climate change where possible. Climate-smart agriculture is developed as a framework to meet these three challenges. Climate-smart agriculture can facilitate the transition to more productive and sustainable agricultural and food systems and observance of the climate. This is achieved by promoting the adoption of proven climate-smart practices its effectiveness is based on solid evidence, and by providing an enabling environment that includes policies and institutions and favourable sources of financing. Climate-Smart Agriculture is not a technology, a new production system, or a combination of One-size-fits-all practices, but rather an action-based approach at three levels of. In order to identify the existing production systems that are most resilient to the effects of climate change. Farming approach helps Climate-Smart can identify appropriate production systems to adapt to and mitigate climate change wherever possible.

Climate-Smart Agriculture approaches tend to promote medium to long-term measures Long-term response to slow-onset climate change threats to development agricultural. Also, disaster risk prevention and preparation efforts provide and response, vital and sometimes life-saving support to the most vulnerable populations vulnerabilities by improving their ability to withstand and respond in case extreme phenomenon or catastrophe. The “Building Back Better” approach is based on in disaster response by directing interventions during the recovery and transition from in order to achieve risk-aware development that seeks to reduce those risks in the future. This approach covers the full range of responding to situations emergencies to climate change adaptation strategies. It is clear that this approach complements the CSA goal of building capacity for agriculture Resilience to and adaptation to climate change offers many Opportunities for integrated and mutually reinforcing interventions. To conclude, Climate Smart Agriculture is a productive agro-ecosystem which might be very resilient and adaptive to climate change sources.

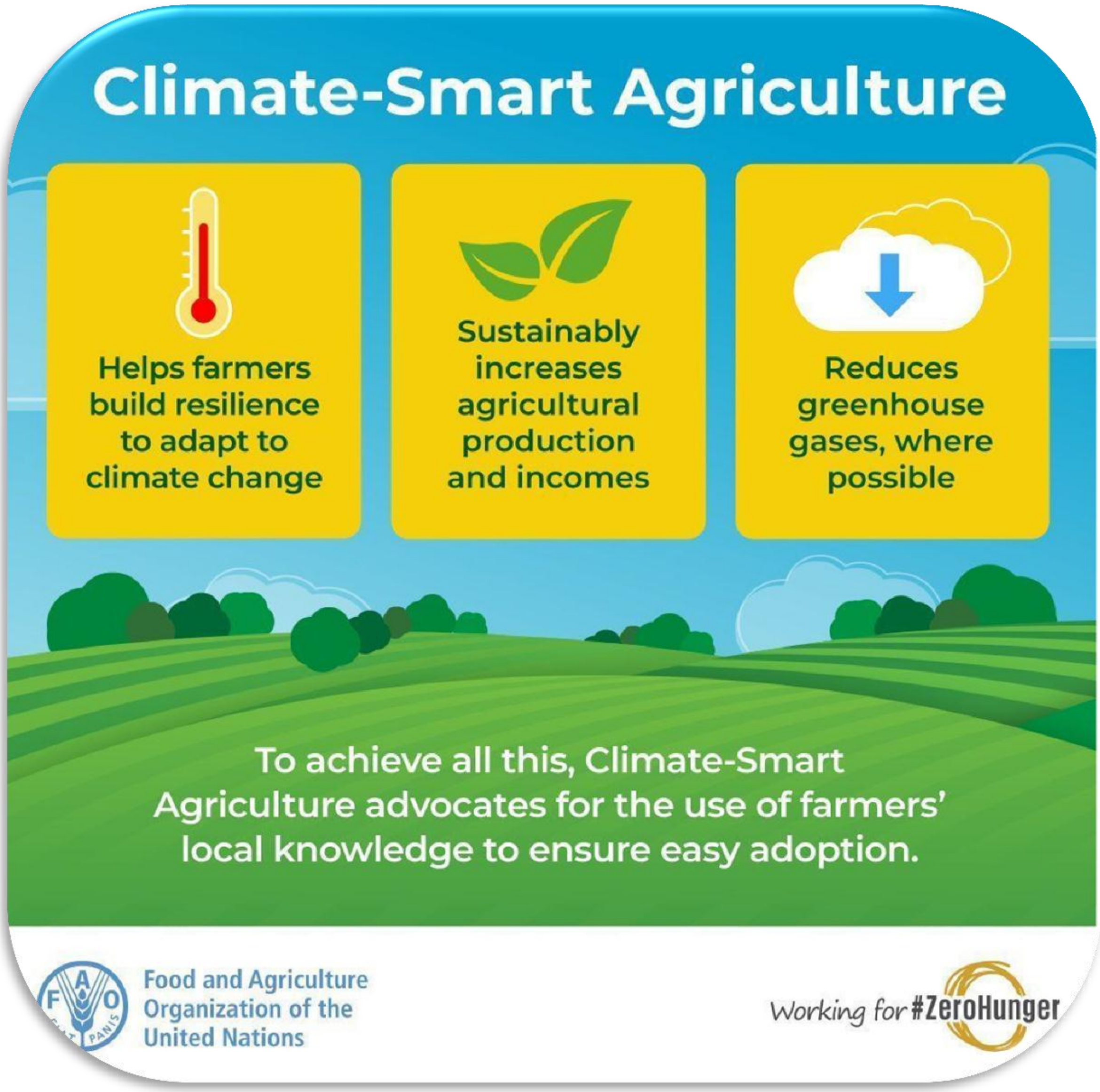
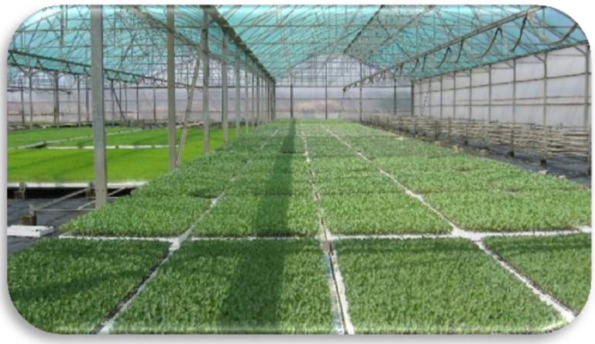


Fig. 5. The suggested three possible actions, which proposed by FAO concerning "Why climate-smart agriculture can help to achieve food security".

4.Protected cultivation and climate-smart agriculture

Production of different horticultural crops (i.e., vegetables, flowers, and others high valued as well as perishable crops) under controlled conditions is called a protected cultivation. Protected farming is an emerging technology used in modern agriculture (**Fig. 6**). This protected farming mainly established for more production with higher productivity under a structure against the extreme environmental conditions. Compared to open field production, the quantity and quality of products under protected farming is much better (Pachiyappan et al.2022). This farming system is common from the Roman times, and then spread all over the world as protected structures were appeared in Netherlands and England in the 17th century (Nimbrayan et al. 2018). There are several different kinds of greenhouses, in which several horticultural crops could be produced beside performance scientific research and some examples from some countries (**Fig. 6**). The main components of a greenhouse are framed or inflated structure, transparent or translucent material to maintain optimum light levels, partially or completely controlled micro-climate, and enough space to permit a person to do intercultural operations. The main benefits of greenhouse may include (1) protect cultivated plants from abiotic stress (e.g., temperature, excess/deficit water, hot and cold waves), and biotic stress (2) high water use efficiency with minimum weed infestation, (3) high productivity per unit area, (4) minimize using of pesticides for crop production, (5) promoting the crop production and its quality, (6) production of healthy, uniform, and disease-free plant materials, (7) production of off-season vegetable, or flower or fruit crops, (8) and proper place for hardening/acclimatization of tissue cultured plantlets (Kulkarni et al. 2018).


A system of greenhouse, in which tomato was cultivated in organic farming in Bari (Italy)

Several greenhouses could be used to produce seedlings for organic farming in Bari (Italy)

A system for cultivation of vegetables in greenhouse in China

Cultivation of tomato in a system of greenhouse in Kafrelsheikh (Egypt)

Computerized greenhouse for research from inside (left photo), and outside (right photo) in Halle Saale (Martin Luther University Halle-Wittenberg), Germany

Fig. 6. Some photos for different kinds of greenhouse, in which several horticultural crops could be produced beside performance scientific research and some examples from some countries. Photos by Fawzy (photos from China) and the rest by El-Ramady.

There are many types of protected structures including hi-tech polyhouse protected cultivation, natural ventilated polyhouse (e.g., tubular, bamboo or wooden), shade net house, walk-in tunnel structure (e.g., plastic tunnel), and nursery raising in protected cultivation (Nimbrayan et al. 2018).

Protected farming is a hi- tech method of growing crops under controlled environments and protection from adverse climatic conditions using innovative structures such as net-houses, polyhouses, screen houses, and tunnels or protections like wind-breaks, irrigation, and mulches (Pachiyappan et al. 2022). Protected farming is more sustainable as the effect of climate is minimized as the environment is controlled and the inputs such as pesticides, fertilizers, and water are utilized more efficiently compared to the open methods of cultivation (Mehta et al. 2020), and improved productivity with better quality ensures higher returns for the produce (Pachiyappan et al. 2022). Protected cultivation can support farmers to produce crops off season and fetch higher prices, help to reduce greenhouse gas emissions and the overall environmental impacts of food production (Gruda et al. 2019). The major environmental concern under hi-tech greenhouses may include heating, artificial lighting, post-harvest transporting, and their packaging as well as fertilizer use efficiency (Pachiyappan et al. 2022). The productivity obtained under protected cultivation was 3-5 times higher than open methods of cultivation depending on the crops (**Figs. 7, and 8**).

Different growing media can be sued in cultivating the seedlings under greenhouse conditions (China)

Cultivation of grapes (left) in green house is not common, but cucumber (right) is opposite (China)

Different transplants could be produced in the nursery under greenhouse conditions (China)

Fig. 7. Some photos for producing a lot of cultivated crops under green house in China. Photos by Fawzy .

Cultivation of strawberry (left) and pepper (right) in greenhouse in salt-affected soil (Egypt)

Different growing media can be used in cultivation of tomato under greenhouse conditions

Producing the seedlings of horticultural crops are common agro-practice under greenhouse conditions

Cultivating tomato using different growing media under greenhouse conditions

Fig. 8. Some photos for producing seedlings or cultivated crops in salt-affected soil or in growing media under greenhouse in Kafrelsheikh University, Egypt. Photos by El-Ramady.

As new technology, protected farming has many constraints especially in arid/semiarid regions, which high temperature is a main factor causing the salinization of used soils under greenhouses and use of drip irrigation **(Fig. 9**). Low technology systems suffer from soil salinization, several fungal diseases for cultivated plants due to high moisture in air and soil beside the decrease of soil biological activities. Many physiological and nutritional problems are subjected also to be problematic under protected farming. Greenhouse and different structural plans for various agro-climatic conditions of the region are not standardized. Lack of awareness among farmers relating to potential of protected vegetable production and lack of significant research program on protected vegetable farming are other limiting factors (Prakash et al. 2020).

The physiological problem due Ca- deficiency on tomato (left photos), and cracks of fruits

Accummulation of salts on the soil surface under salt-affected soils in greenhouses

Accummulation of salts on the soil surface under salt-affected soils in greenhouses

Cultivated plants face problems under greenhouse especially plant diseases/ or nutrients deficiencies

Drying and death of strawberry cultivated under greenhouse conditions

Poor drainage due to heavy clay soil or/and salt-affected soils in greenhouses

High soil moisture content, growing algae on the soil surface and plant diseases on pepper

After harvesting, an overview on the soil surface before and after tillage of salt-affected soils

Fig. 9. Many problems face cultivated plants under greenhouse especially plant diseases, nutrients deficiencies, high soil moisture and problems of drainage under heavy clay soil or/and salt-affected soils in arid/semi-arid regions.

Limitations of protected farming may include (1) high cost of initial infrastructure, (2) non-availability of skilled human power and their replacement locally, (3) lack of technical knowledge of growing crops under protected structures, (4) all the operations are very intensive and require constant effort, (5) closed supervision and monitoring is required, (6) many pests and soil-borne pathogens are needed to manage, (7) maintenance and repairing of the system are necessary, (8) assured marketing is required because the investment of resources like effort, time, and finances, is expected to be very high, and (9) under arid/semi-arid regions, several problems could be noticed especially under low-tech of protected farming systems (**Fig. 10;** Kulkarni et al. 2018).

After harvesting, during the summr and high temeratyutre, a flooding irrigation of greenhouse to leach the salts from soil, which follow by growing grasses

Irrigation, tillage, and then start cultiavtion the new crop


Different kinds of greenhouses


Different kinds of greenhouses

Fig. 10. Different kinds of greenhouses in arid/semi-arid regions at Kafrelsheikh University, Egypt. All photos by Bayoumi.

The question is now: what is the role of protected farming under climate-smart agriculture? First, under the increasing threat of climate changes to agriculture, it is important to determine how to achieve farm sustainability to support both researchers and policy makers. Is the protected farming a supporter or a possible adaptive solution at the farm level for farm sustainability? It is confirmed that, protected cultivation is proposed to be a possible adaptive solution to climate change at the farm level, through its mitigating to the adverse effects of climate change (Liao et al. 2020). Therefore, the protected cultivation can create an eco-friendly condition by controlling the micro-climate surrounding the cultivated plants during the period of growth. Furthermore, many types of protected farming facilities (e.g., net houses, greenhouses, tunnels, and so forth), are designed according to the plant species and climatic condition requirements (Ummyiah et al. 2017). This issue needs more studies and investigations. So, this is a call by the EBSS journal for more submission articles on this important global issue.

5. A call for photographical articles

Environment, Biodiversity and Soil Security (EBSS) journal already planned this year, for more calls including more new hot topics. EBSS already started publication through a call for smart farming for developing sustainable agriculture (Fawzy and El-Ramady 2022), smart irrigation (Fawzy et al. 2022c), smart fertilizer (Fawzy et al. 2022d), then move to a call on Soil-Water-Plant-Human Nexus (Brevik et al. 2022). At the same time, more calls for submission of photographic review or mini-review such as Global Soil Science Education (Koriem et al. 2022), Management of Salt-Affected Soils (El-Ramady et al. 2022a), Soil-Water-Plant-Human Nexus (Brevik et al. 2022), Grafting of Vegetable Crops (Bayoumi et al. 2022), Sustainable Applications of Mushrooms in Soil Science (Fawzy et al. 2022b), and on Nano-Farming of Vegetables (Fawzy et al. 2022a). This is a new call for more publications on climate-smart agriculture especially using the photographic reviews or mini-reviews. More submission of articles is most welcome. We have more different photographic call for the Egyptian Journal of Soil Science or EBSS like a call on Sustainable Applications of Mushrooms (Fawzy et al. 2022b), Lab of Soil Science and Plant Nutrition (El-Ramady et al. 2022c), and on Soil and Humans (El-Ramady et al. 2022b).

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Contribution of Authors: Conceptualization by El-Ramady. All authors shared in writing, editing and revising the MS and agree to publish it.

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