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CLIMATE SMART AGRICULTURE: APPROACHES TOWARDS SUSTAINABILITY FOR GLOBAL FOOD SECURITY

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Climate smart agriculture (CSA) which can be defined as sustainably increasing agricultural productivity and incomes by the adapting and building resilience to climate change through the reducing of greenhouse gases emissions. It is also can define as an approach to help guide actions to transform and reorient agricultural systems as effectively and sustainably to support the development and food security under a changing climate. It can also be said as identifying which production systems and enabling institutions are best suited to respond to the challenges of climate change for specific locations for maintaining and enhance the capacity of agriculture that support food security in a sustainable way.

Why it so emerging topics in modern farming system

1) Agricultural production systems expected to produce food for a global population which will amount to 9.1 billion people in 2050, over 10 billion by end of the century (UNFPA 2011).
2) Climate change that can have effects on all human beings due to its alarming threats to the environment, and agricultural production system all over the world
3) The rate of climate change, along with the world population along with income growth issues threatens food security all over the globe.
4) In 2005, about 50% of the economically active population with 2.5 million natives in developing countries depended on agriculture production for their living whereas at present 75% of the world's poor lives in rural areas (World Bank, 2008).
5) The vital sources of greenhouse gases (GHG) emissions in the agricultural field are not only CO2 but also causing nitrous oxide N2O emission that has a share of about 58% in total GHG emissions through the application of fertilizers and soils whereas the CH4 that has a share of about 40 % in total GHG emissions does so through its

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release by livestock and rice cultivation are contributed by the agricultural practices and natural processes which create situations are difficult to effectively control and evaluate.

6) In the current circumstances, climate change problems have become a vital scenario that guarantees the sustainability of livelihood.

Approaches for climate-smart Agriculture

1) Efficient Resource Management
2) Integrated renewable energy technologies for farming systems
3) Availability of technical knowledge of farmers
4) Resource conserving technologies
5) Crops Genetic Modification
6) Land-use Management
7) Cropping Season variation
8) Crops Relocation
9) Efficient pest management
10) Forecasting
11) Crop modelling
12) GIS mapping

Efficient Resource Management

Resource management is a very significant feature of CSA with future climate. It is reported as the food loses are found through all stages of the food production till food utilization which are almost one-third part of food produced is wasted (Gustavsson *et al.*, 2011) and the energy consumed in annually world food losses are almost 38 % of the final energy utilized by the total food chain that include All the food chains, from agricultural, transport, conservation, processing, cooking and consumption are likely areas for improving energy use efficiency (FAO, 2011).

Integrated renewable energy technologies for farming systems

The suitable energy technologies, tools and different services in farming fields are important to create a stable change to energy-smart and proficient food systems. Whereas the number of new technologies which can be very important for energy-smart food systems

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includes are windmills, solar panels, photovoltaic lights, biogas extraction units, power generators, tools for bio-oil mining and purification, fermentation and distillation processes for ethanol extraction, bio energy-operated water pumps,

Availability of technical knowledge of farmers

In South Asia farmers mostly belong to poor families with limited to their recourses, therefor they are experimenting with climate variability for centuries but conventional environmental knowledge of people improved with developed in the test of time could give different ideas and feasible options for adaptation procedures to adopt new technology

Resource conserving technologies

The resource-conserving technologies (RCTs) consists of techniques which enhance efficiency in the management of resources and application of inputs that use of direct, identifiable and comprehensible economic advantages that decline in production costs; saving fuel, labour and water; the timely sowing of crops, resulting in improved yields. The RCT such as zero tillage systems (ZT) or no-tillage is a cultivation system which can be explained "as the system of cultivating crops into untilled soil by creating thin channels to have adequate depth and width to attain suitable seed coverage

Crops Genetic Modification

Environmental stress mostly affects the decay of organic matter in the soil, availability of nutrients and water to the plant, which recycling of water and nutrients. The nutrient concentration and period of environmental limits conclude the level of effect on crop growth cycle and biomass accumulation. It is reported that Crop yields in Asia are estimated to decrease by 2.5-10% from 2020 and by 5-30% after 2050, that is the most horrible decrease in South and Central Asia (Cruz *et al.*, 2007) there for the adjustment techniques that can play enhanced by the availability of new crop varieties which are tolerant to heat, drought and salinity and thus reduce the risks of climate situation and the genetic diversity of the seed structure and seed composition has been recognized as a very effective defence against plant disease and pest attack and risks of climate.

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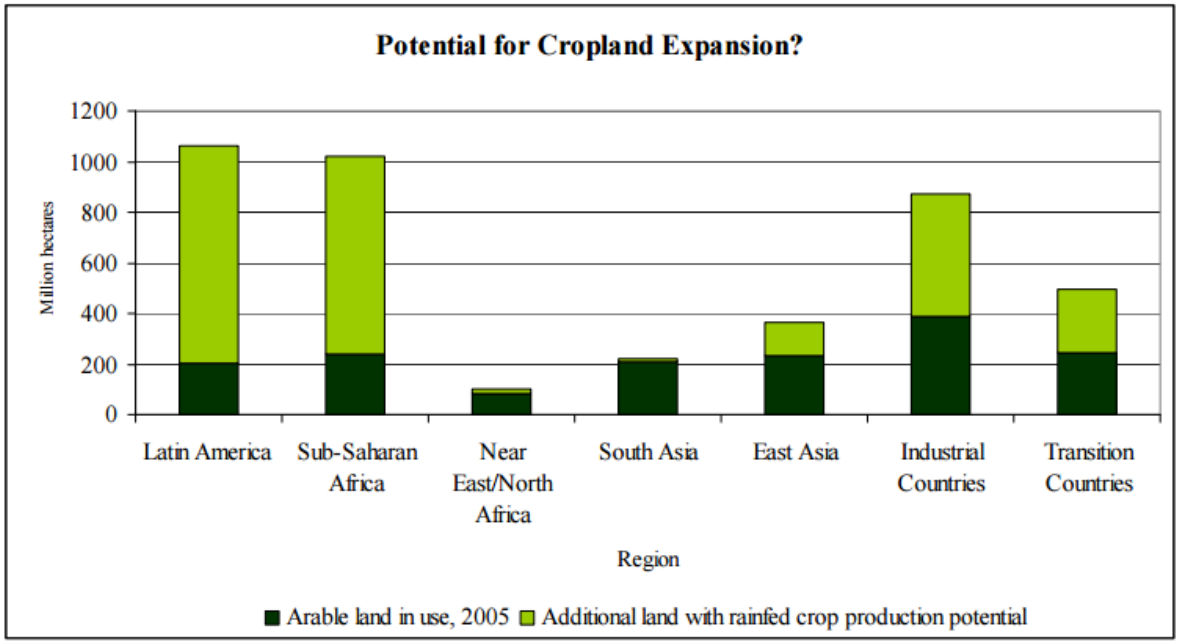
Land-use Management

The changing land-use practices like to be the location of crops and livestock production, rotation or shifting production between livestock and crops, shifting production out of marginal areas, changing the intensity of the application of fertilizers and pesticides, capital and labour that can help minimize the risks from climate change on production of agriculture. Whereas the adjustment of a sequence of the crop by altering the time of sowing, spraying, and harvesting the crop, in order to take benefits of the altering length of seasons of growth and levels that changing heat and humidity associated is one more option.



Land uses management and resources **(Source:** Burnisma, 2009**)**

Cropping Season variation

Planting dates can be set to reduce infertility induced by the increased temperature which may save the flowering period from coinciding with the hottest period whereas the changing of sowing or planting dates to take benefit of the wet period to avoid intense weather events in the growing season and cultivation systems include improving the better cultivars and enhancing the intensity of farming various crops there for farmers will have to manage the changes in different hydrological regimes by adopting changed crop rotations (Pathak *et al*., 2012).

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Crops Relocation

It is necessary to different regions and crops that are very much prone to climate change variability, so these should be repositioned to more appropriate areas would be more appropriate for these kinds of crops with respect to quality must be identified and evaluated for suitability.

Efficient pest management

1. To the development of cultivars resistant to diseases and pests;
2. Integrated pest management (IPM) adoption having more dependence on biological control with a change in cultural practices.
3. To the adoption of substitute crop production and techniques, as well as places that are resistant to pests and other hazards

Crop modeling

Crop modeling is a creative and newly developed tool for dealing risks in Agriculture where the computer-aided simulation models play an important role to approach the techniques which establish crop management responses and forecast crop yield. Whereas two crop management systems are APSIM (Agricultural Production System Simulator) and DSSAT (Decision Support System for Agro Technology Transfer) that are mostly used in the whole world (Ahmad et al., 2014)

GIS mapping

GIS (Geographical Information System) that is used in analysis and mapping which helped in the estimation and computation of the storm course and flooding associated with hot cyclones which create a risk and hazard maps at different possible scales to show the threat allocation across the different geographical region which can be site-specific include provincial or municipal administrative areas and other small national landscapes, like river basins, coastlines and lake.

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Risk Assessment and mapping **(Source:** IPCC, 2007**)**

Conclusion

It reported that (FAO) if the present production and consumption rates continue, agricultural production should increase 60% by 2050 to meet the needs of food of world's population for achieving food security and agricultural development goals with adaptation to climate change will be required to lower emission intensities per output by improving food protection through the moderate climate change, sustainably use the natural resource, use all products more competently, have less inconsistency with greater constancy in their outputs with more fruitful and more flexible agriculture requires a most important change in the way of the use of land, water, soil nutrients and genetic resources management by climate-smart agriculture techniques

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