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Climate change and Agriculture

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Global climate change is a change in the long term weather patterns that characterize the regions of the world. It is about non normal variations of the climate and the effects of these variations on other parts of the earth. These changes may take tens, hundreds or perhaps millions of year but increased in anthropogenic relativities such as industrialization, urbanisation, deforestation, agriculture change in rural use pattern etc. leads to emission of green house gases due to which the rate of climate change is much faster. Climate change scenarios include higher temperature. Changes in precipitation and higher atmospheric CO₂ concentrations. There are three ways in which the green house effect may be important for agriculture. First, increased atmospheric CO₂ concentration can have a direct effect on the growth rate of crop plants and weeds. Secondary CO₂ include changes of climate may after levels of temperature, rainfall & sunshine that can influence plant and animal productivity finally rises in sea level may lead to loss of farmland by inundation and increasing salinity of groundwater in coastal areas.¹

The green house effect is natural process that plays a major part in shaping the earth's climate. It produces the relatively warm hospitable environment near the earth's surface where humans and other life forms have been able to develop and prosper. However the increased level of greenhouse gases CO₂, H₂O, Methane, Nitrous Oxide, H₂O, Hydrocarbons, per fluorocarbons and sulphur hexafluoride (SF₆) due to anthropogenic activities has contributed to an overall increase of the earth's temperature, leading to a global warming the average global surface temperature have increased by 0.74 °C since the late 19th century and is expected to increase by 1.4 °C-5.8°C by 2100 AD with significant regional variations.

The atmospheric CO₂ constantly increased from 715 ppb to 1882 ppb and H₂O concentration from 227 ppb to 323 ppb from the year 1980 to 2012. The global warming potential of the gases are 1.28 & 310 respectively.² (RPPC 2007) projected scenario of global warming potential indicated that global average surface temperature could rise by 1.4 to 5.8 °C by 2100. The projected rate of warming is unpredicted during last 10000 years.³

Agriculture and climate:-

Plant system and hence crop yields are influenced by many environmental factors and these factors such as moisture and temperature may act either synergistically or antagonistically with other factors in determining yields.⁴

Controlled field experiments can generate information on how the yield of specific crop variety responds to a given stimulus. Such as water or fertilizer however by their nature, such controlled experiments consider only a limited range as environmental factors.

An alternative approach to estimate crop yield is the use of crop biophysical simulation models that embed parameter drawn from crop experiments. Because climate changes likely to cut across a host of environmental factors most quantitative estimates of climate change effects on crop yields are desired from such crop simulation models.⁵ While the use of crop simulation models makes tractable the assessment of climate effects across a range of crops. Such models also have limitation including isolation from that effect procedure in the field.⁶

Climate change scenarios include higher temperatures change in precipitation and higher atmospheric CO₂ concentration. Although temperature increases can have both positive & negative effect on crop yield in general temperature increases have been formed to reduce yields and quality of many crops. Most importantly cereal and feed grains. Increases in precipitation many benefit semi arid and other water short areas

by increasing soil moisture but could aggravate problems in regions with excess water, while a reduction in rainfall could have the opposite effect. An atmosphere with higher CO₂ concentration would result in higher net photosynthesis rates.⁷ higher concentration may also reduce transpiration as plants reduce their stomata apertures. the small opening in the leaves through which CO₂ and water vapour are exchanged with the atmosphere.⁸

The next change in crop yields is determined by the balance between the negative and positive direct effects on plant growth that can effect production. These indirect effects have been largely ignored in the assessments of climate change effects. Indirect effects may arise from changes in the incidence and distribution of pests and pathogens. increased rates of soil erosion and degraded and increased troposphere ozone levels due to rising temperatures additional indirect effect may arise from changes in runoff and ground water recharge rates, which affects water supplies and changes in capital or technological requirement such as surface water storage and irrigation methods. In general these indirect effects are not captured in existing assessment⁹.

Uncertainties:

Despite the substantial advance in understanding of climate change and its agricultural impacts. many uncertainties remain of particular concerns are some of the limitation of the general circulating model used to simulate climate changes and the way those limitation may affect the predicted impacts of climatic changes on agriculture. some of these limitation suggest that the generally optimistic prediction outlined above for temperature region of the world may be too sanguine.

As the supply side a critical limitation of GCM is their ability to predict changes in climate with the spatial resolution needed to model impacts on agriculture productivity as discussed in the companion article in this issue by Adams and Pack. changes in water availability are especially difficult to predict. Particularly the site specific basis needed to quantify agricultural yield impact. at related uncertainty concerns impure on pests which are also highly sensitive to site specific environmental conditions.¹⁰ Another key uncertainty that affects impacts on all biological processes including agriculture is the rate of climate change the higher rate of climate change the higher will be the rates of obsolescence of all types of capital both produced and natural and thus the greater will be the cost of adoption for farmers, the private sectors providing technology and inputs to farmers and for government institutions responsible for infrastructure and policy. a related critical supply side uncertainty is how technology will evolve so as to reduce impacts and facilitate adoption in the past it has taken about 15 years to develop a new crop variety. a key occasion is weather biotechnology will speed adaptation and reduce vulnerability to drought extreme temperature and pests.

Another uncertainty on the supply side is the environmental consequences of adopting to climate change. on the demand side impact of change in consumer incomes and in markets infrastructure will be critical but highly uncertainty factors. given the predicted modest impacts of climate change. In global food supply the rate of economic growth is likely to be a key determinant of people vulnerability to climate changes. if there is higher rate of economic growth in many developing regions continues vulnerability to the impact of climate change will be modest.

National action to adopt to climate change

The existing stock of green house gases in the atmosphere means that the world is now committed to several decades of climate change. although changes in the climate are now inevitable the effects they will have on people and ecosystem will depend on the action taken in response to those changes.

Adaptation encompasses a multitude of behavioural structural and technology adjustment as a result there are many possible typologies of adaptation strategies and instruments. these include structural and technology instruments institutional and administrative measures. Market based instrument and on site operations.¹²

National climate policy frameworks are emerging .some of which establish legally binding economy wide emission cosmists and long term emersion goals these aim to implement reinforce or in some cases beyond the country's international obligations.

- 1- A reduction of green house gases emission by at level 20 % compared to 1990 by 2020 with a commitment to increase it to 30% if a satisfactory international agreement is reached.
- 2- A target of 20 % of energy coming from renewable sources by 2020 supplemental by 10 % of renewable transport fuel.
- 3- A commitment to reduce the European union's energy consumption by 20% commuted to the baseline in 2020.

Conclusion:

Climate change the outcomes of the global warming has how stunted is the primary its impure world wide .climate is the primary determinant of agriculture productivity which directly impact on ford production across the globe agriculture sector is the most sensitive sector to the climate changes because the climate of region/country determines the nature and characteristic of vegetation and crops incurs in the means seasonal temperature can reduce the duration of many crops and hence reduce final yields food production system are extremely sensitive to climate change like changes in the temperature and perception which may lead to out breaks of rests and discuses there by reducing harvest ultimately offering the food security of the country the next impact of food security will depend on the expose to global environment change and the capacity to cape with and recover from global environment change.

Coping with the impact of climate change on agriculture will require careful management resources like soil, water and biodiversity to cope with the impact of climate change on agriculture and food productive India .will need to net at the global regional, national & local levels.

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