JNU, NEW DELHI uploaded the journal in UGC CARE PORTAL.
Page 32, http://www.epitomejournals.com Vol. 7, Issue 11, Nov. 2021, ISSN: 2395-6968

Epitome : International Journal of Multidisciplinary Research
ISSN : 2395-6968

A STUDY OF IMPACTS OF CLIMATIC CHANGE ON SUSTAINABLE AGRICULTURE

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ABSTRACT

Agriculture is a human activity that is intimately associated with climate. It is well known that the broad patterns of agricultural growth over long time scales can be explained by a combination of climatic, ecological and economics factors. Sustainable agriculture can be broken into three components: economic, environmental, and social. A major concern in the understanding of the impacts of climate change is the extent to which agriculture will be affected. Global climate change has become an important area of investigation in natural sciences and engineering, and irrigation has often been cited as an area in which climate change may be particularly important for decision-making. Climate change has many effects on the hydrological cycle and thus, on water resources systems. The planning and design process needs to be sufficiently flexible to incorporate consideration of and responses to many possible climate impacts. The main factors that will influence the worth of incorporating climate change into the process are the level of planning, the reliability of the forecasting.

KEY WORDS

Warming, Climate change, Sustainable agriculture, Forecasting

RESEARCH PAPER

Introduction:

Climate change has become an important area of investigation in natural sciences and geographer, and irrigation has often been cited as an area in which climate change may be particularly important for decision- making. According to the Intergovernmental Panel on Climate Change, IPCC (1996), climate change would affect precipitation patterns, evapotranspiration rates, soil moisture and infiltration rates, the timing and magnitude of runoff and the frequency and intensity of storms. Subsequently, changes in evapotranspiration rates can substantially, alter rainfall-runoff processes, adding uncertainty to the understanding of important links between the hydrological cycle and ecosystems behavior. The level of atmospheric carbon dioxide (CO2) may, also, affect both water availability and demand, through its influence on vegetation.

Although climate change is expected to have a significant impact on water availability and irrigation requirements, the extend and effect on the water resources planning and management process remains largely unknown. Though a major effort has been devoted to analyzing the potential impacts of contrast relatively little has been done to review the adequacy of existing water planning and evaluation criteria in the light of these potential changes. The challenge today is to identify short-term uncertainty. The question is not what the best irrigation development over the next four is or five decades, but rather, what is the best development for the next few years? Knowing that a prudent hedging strategy will allow time to learn and change course. Global climate change on water resource systems, by

All these problems will become more pronounced in the years to come, as society enters an era of increasingly complex paths towards the global economy. In this context, European and global environments are closely linked by global processes such as climate patterns, hydrological conditions and socio-economic factors transcending regional boundaries. Consequently, achieving sustainable irrigation development in Europe will depend on the above factors and on the basic policies adopted by our society in the decades to come.

What is meant by sustainable agriculture?

The classic definition of sustainability gleaned from the Brundtland report rests on the principle that we must meet the needs of the present without compromising the ability of future generations to meet their own needs. In relation to environmental considerations the basic issue is whether agricultural activities can produce food efficiently and at low cost and profitably (benefiting farmers) without degrading natural resources. Advances in product invitee, linked to pesticide use, mechanization, livestock intensification etc., have invariably been associated with environmental damage as noted above. In Northern Ireland for example the use of animal wastes and artificial fertilizers have contributed to the eutrophication of many rivers and lakes while fish kills are regularly reported due to release of farm effluent into freshwaters. However, the concept of sustainable agriculture is a complex one that incorporates a number of other, arguably, equally important factors.

Legg points out that while the basic premise of sustainable agriculture, outlined above, is easily understood there are important characteristics of sustainable development applicable to agriculture that should be noted:

"First, it is a dynamic process, which focuses on the ability of the economy to meet demand in cost-efficient ways through developing, combining and substituting resources in the production process — provided that there are appropriate signals to producers and consumers on which they can make their decisions.

Second, it is a global concept, which recognizes that allowing flows of resources between Sectors and economies through international trade can maximize production while reducing pressure on fragile resources.

Third, it is a multidimensional phenomenon, encompassing economic, environmental, and social dimensions. The concept of sustainable development goes beyond the economic growth that is conventionally measured in Gross Domestic Product, and takes into account the state of resources and environmental performance of the economy, as well as current and future social and Distributional aspects.

Environmental Sustainability:

Environmental concerns are central to sustainable agriculture. Sustainable agriculture is frequently described as: ecologically sound practices that have little to no adverse effect on natural ecosystems. However, more than that, sustainable agriculture also seeks to have a

positive impact on natural resources and wildlife. This can often mean taking measures to reverse the damage that have already occurred through harmful agricultural practices. Renewable natural resources are protected, recycled, and even replaced in sustainable systems. While there are common goals that are critical to sustainable agriculture, there is no single approach that will guarantee sustainable success on every farm. The methods for accomplishing those goals must be tailored to the individual farm.

A key to successful sustainable production is healthy soil. Depending on the condition of the soil, it can take several years to build up organic matter and improve soil quality. Sustainable methods of enhancing soil fertility and improving soil structure can include: using nitrogen fixing legumes, green manure, and animal manure; minimizing or eliminating tillage; and maintaining year round soil cover. Fertilizer decisions are based upon soil test results. While synthetic fertilizers can be used to supplement natural inputs, they are applied on an as needed basis. Synthetic chemicals known to harm soil organisms and soil structure must be avoided in sustainable agriculture.

Using crop rotations that will disrupt the pest life cycle, improving soil quality, practicing good sanitation, using optimum planting densities, timing planting and transplanting operations to avoid high pest populations, employing biological control, and growing resistant varieties. Monitoring pests through frequent crop inspections and accurate identification are essential to keeping ahead of potential problems. Many Integrated Pest Management techniques can be incorporated into a sustainable program.

Agriculture and Environment:

A. Agriculture and land use

The term “land use” is more comprehensive than the term “soil use”. Land, commonly, stands for a section of the earth’s surface, with all the physical, chemical and biological features that influence the use of the resource. It refers to soil, spatial variability of landscape, climate, hydrology, vegetation and fauna, and also includes improvements in land management, such as drainage schemes, terraces and other agro biological and mechanical measures. The term “land

use" encompasses not only land use for agricultural and forestry purposes, but also land use for settlements, industrial sites, roads and so on

B. Land degradation and desertification:

Because of the current climate patterns and intensification of human activities Asian countries are already faced with a real threat of land degradation and desertification and there is no doubt that the present enhanced greenhouse effect will only exacerbate this threat in the short term. In the eighties and early nineties, global warming and the impact of the agricultural systems introduced in the sloping lands of the Indian or Asian environment in the previous decades were identified as the main culprits of soil erosion and land degradation. Accelerated runoff and erosion, previously unreported, began to be observed in cultivated sloping areas. The unprecedented pressure to increase crop productivity at lower costs, made possible by the technological revolution in agricultural management, had led to soil erosion in the agricultural ecosystem, due to hydrological impact, resulting in severe deterioration in soil fertility and degradation of the landscape.

C. Agricultural and water use:

In the Indian region nearly 70% of the available water resources are allocated to agriculture. In the arid and semi-arid region of the region agricultural water use accounts for as much as 80% of the water consumed, decreasing to 50% of the total available resources in the countries Impact of global warming on crop water requirements plays a role of paramount Importance in assessing irrigation needs. In the last decade, global vegetation models have been developed that include parameterization of physiological processes such as photosynthesis, respiration, transpiration and soil water intake. These tools have been coupled with GCMs and applied to explore future scenarios at both regional and worldwide levels. In the context of the Asian environment the models outcomes show that irrigation requirements are likely to increase in most irrigated areas in the north of the basin, while in the south the patter becomes complex.

Conclusion:

Agriculture is a human activity that is intimately associated with climate. It is well known That the broad patterns of agricultural growth over long time scales can be explained by a combination of climatic, ecological and economics factors. Modern agriculture has progressed

by weakling the downside risk of these factors through irrigation, the use of pesticides and fertilizers, the substitution 44 of human labor with energy intensive devise, and the manipulation of genetic resources. A major concern in the understanding of the impacts of climate change is the extent to which agriculture will be affected.

Climate change has many effects on the hydrological cycle and thus, on water resources systems. Global warming could result in changes in water availability and demand, as well as in the redistribution of water resources, in the structure and nature of water consumption, and exasperate conflicts among water users. Nevertheless, it is reasonable to assume that the largest changes in the hydrological cycle are expected for the snow dominated basins of the Alpine Europe, while annual stream flow is likely to decrease over the river basins in the southern part of the region. Impact of global warming on crop water requirements plays a role of paramount importance in assessing irrigation needs. In the last decade, global vegetation models have been Developed that include parameterization of physiological processes such as photosynthesis, respiration, transpiration and soil water intake.

The development of a comprehensive approach that integrates all these factors into irrigation project selection, requires further research on the processes governing climate changes, the impacts of increased atmospheric carbon dioxide on vegetation and runoff, the effect of climate variables on crop water requirements and the impacts of climate on infrastructure performance.

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