

# Chapter 1

## Climate Change and Land Suitability for Potato Cultivation in India

**Ravindra Kashinath Naitam**  
*National Bureau of Soil Survey and  
Land Use Planning, India*

**Indal K. Ramteke**  
*Maharashtra Remote Sensing  
Applications Centre, India*

**Preeti Deshmukt**  
*Vasandada Sugar Institute, India*

**R. S. Singh**  
*National Bureau of Soil Survey and  
Land Use Planning, India*

**P. C. Moharana**  
*National Bureau of Soil Survey and  
Land Use Planning, India*

**S. K. Singh**  
*National Bureau of Soil Survey and  
Land Use Planning, India*

### ABSTRACT

*Potato is one of the most important vegetable crops in India accounting for 20-25% of area under cultivation of vegetables and grown in a wide range of climatic conditions. It is grown in almost all states under diversified agro-climatic conditions. Nearly 80% of the crop is grown in Indo- Gangetic plains comprising Uttar Pradesh, West Bengal, Punjab, Haryana, Bihar and other parts of India like Gujarat and Karnataka. Moreover, within the country, there is a lot of heterogeneity in potato productivity depending upon mostly on management and climatic conditions. The viability of commercial potato production is influenced by spatial and temporal variability in soils, agro climate, and the availability of water resources. The inter and intra-regional variations in productivity within the country are attributed to the variations in bio-physical factors vis-a-vis specific soil-climatic requirements of the crop. The present chapter discusses the impact of climate change on the land resources requirement for potato crop with reference to Indian context.*

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## INTRODUCTION

Potato (*Solanum tuberosum* L.) plays an important role in global food and nutritional security especially for the poor (Thiele et al., 2010). It is commonly known as ‘The king of vegetables and it has emerged as fourth most important food crop in India after rice, wheat and maize. Indian vegetable basket is incomplete without Potato. It is an annual, herbaceous, dicotyledonous and vegetatively propagated plant. The dry matter, edible energy and edible protein content of potato make it nutritionally superior vegetable as well as staple food. Potato is a highly nutritious, easily digestible, wholesome food containing carbohydrates, proteins, minerals, vitamins and high quality dietary fiber. Fresh potato contains about 80 per cent water and 20 per cent dry matter of which 60- 80 per cent is starch. It has low fat content and high vitamin C. A single potato of 150 g can meet 100 mg of vitamin C requirement. Potato is also a good source of iron, vitamins B1, B3 and B6 and important minerals. It also contains dietary fibers, which benefit human health. (Jha, 2015). It produces more quantity of dry matter, edible energy and edible protein in lesser duration of time than cereals like rice and wheat. The crop has also shown better economic viability during the current trend of diversification from cereals to horticultural/vegetable crops. However impending global climate changes are set to alter the potato production systems in the country and hence it is imperative to examine its consequences.

Global warming also termed as greenhouse effect is the result of accelerated emission of greenhouse gases (GHGs) viz. carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) in to the atmosphere due to anthropogenic activities. Global warming also termed as greenhouse effect is the result of accelerated emission of greenhouse gases (GHGs) viz. carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) in to the atmosphere due to anthropogenic activities. Atmospheric CH<sub>4</sub> and N<sub>2</sub>O are attributed to crop cultivation forestry and other land uses. Whereas rise in concentration of CO<sub>2</sub> is attributed to fossil fuel combustion. Agriculture has a minor role in contribution of CO<sub>2</sub> to the atmosphere. It is now established that the global atmospheric concentrations of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O have increased markedly as a result of human activities since 1750. The increase in GHGs has resulted in warming of the climate system by 0.74°C between 1906 and 2005. The rate of warming has been much higher in recent decades (Dua et al., 2013).

Although increase in atmospheric CO<sub>2</sub> has a fertilization effect on crops with C<sub>3</sub> photosynthetic pathway and thus promotes their growth and productivity, on the other hand, it can reduce crop duration. Report of Working Group II of Intergovernmental Panel on Climate Change (IPCC) and a few other global studies (Aggarwal, 2008) indicated a probability of 10–40% loss in crop production in India

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