



## RESEARCH ARTICLE

## Energy Consumption and Sensitivity Analysis of Rainfed Chickpea Production in Vertisols of Semi-arid Karnataka

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**Abstract** In-situ rainwater conservation improves chickpea productivity in Vertisols. This hypothesis was tested by layout of compartmental bunds (CB) during rainy season and evaluating the performance of chickpea varieties during winter season. Grain yield of JG11 chickpea variety was 43.9 % higher in CB plots as compared to farmers' practice. Further, results revealed that smaller energy input through CB and cultivation of JG11 produced higher energy output of 40,183 MJ ha<sup>-1</sup> and net energy benefit of 30,553 MJ ha<sup>-1</sup>. Higher average energy use efficiency of 4.15, energy productivity of 0.126 and lesser specific energy of 8.22 were observed in CB plots cultivated with JG11. Econometric model estimation emphasized that human labour was significantly positive on yield. Thus sensitivity analysis also indicated marginal physical productivity of 3.29 for man labour. The impact of direct, renewable and non-renewable energies on yield was significant. Higher net returns of Rs. 23,722 per ha and B:C ratio of 1.83 was observed with cultivation of JG11 in CB plots. The authors concluded that adoption of CB and cultivation of JG11 variety ensured greater chickpea productivity even during drought years with higher energy efficiency and returns in Vertisols of Karnataka, India.

### Introduction

Rainfed area accounts for 82 % (1.22 billion ha) of the world's cropland (1.5 billion ha) and supports nearly 40 % of the human population [1]. Further, about 70 % of the world's staple food is being contributed from *rainfed* areas. The scope for further expansion of irrigation is limited due to growing competition for water from different sectors and high investment cost [2], hence upgrading rainfed agriculture through soil and rainwater conservation promises large social, economic and environmental paybacks, particularly in poverty reduction and economic development. India ranks first among the countries that practice rainfed agriculture both in terms of extent and value of production [1]. In India out of an estimated 140.3 Mha net cultivated area, 79.44 Mha (57 %) is rainfed, contributing 44 % of the total food grain production [3]. It is estimated that even after achieving the full irrigation potential; nearly 50 % of the net cultivated area will remain dependent on rainfall in India.

In India 91 % of coarse cereals, 91 % of pulses, 75 % of oilseeds and 65 % of cotton is being cultivated in rainfed regions [4, 5]. Among pulses, chickpea is one of the most