# Finding Suitable Land Areas for Chickpea Cultivation in Kermanshah Province Using Climate and Environmental Data

**Hasan Zolfaghari**[*]

Associate Professor of Geography Department of Geography, Razi University, Kermanshah, Iran

**Amanollah Fathnia**

Assistant Professor of Geography, Department of Geography, Razi University, Kermanshah, Iran

**Mozhgan Shahriyari**

MA Student in Climatology, Department of Geography, Razi University, Kermanshah, Iran

## Extanded Abstract

### Introduction

More and better production of food is one of the necessities of today's world. Since production of agricultural products of one region depends on the air and climatic factors, it is important to examine the role of climate in agriculture (Mohammadi et al., 2004: 123). In relation to agroclimatology, numerous studies by different scientists and agricultural climatologists have been carried out in Iran and the world. Tobaybsir (2004) in a research says that in most regions of the Iran, especially in Lorestan Province like the other arid regions in Asia and North Africa, chickpea is usually planted in the spring and, thus, inadequate soil and water is the main limitation for this crop production. Chalakyan (2011) using data of annual precipitation, growing season precipitation, temperature, growing season relative humidity, elevation, slope, aspect, soil depth and wind speed made a zonation of the agroclimatic cultivated chickpea via AHP method for Ardabil Province. The results of the study indicated that the temperature and height of Ardabil Province are the main effective factors in cultivation of chickpea. Up to 120,000 to 150,000 hectares of land in Kermanshah Province is allocated to planting chickpea and the average yield is 450 kg per hectare (Haghparast, 2012: 13). A summary review of the literature shows that all the studies are conducted on this specific product and exclusively in agricultural areas. This research was employed spatial analysis functions of GIS, AHP and TOPSIS model to identify the areas suitable for cultivation of chickpea in Kermanshah province to put at the center of their attention.

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## Materials and Methods

The data used for this research are annual precipitation, growing season precipitation, minimum temperature, growing season, the mean temperature for germination, flowering and ripening temperature, maximum and minimum mean monthly relative humidity of the growing season, and mean monthly sunshine during the growing season, all in a 20-year period (2010-1991) from 17 synoptic stations. Environmental data, elevation, slope and soil type were also included in the study. Delphi technique was used to obtain the weights of parameters by pairwise comparison in AHP (Qodsypour, 2010: 7). Pairwise comparison matrix of random variables was completed by 40 rain fed cultivation experts, and the final criteria were extracted by Expert choice software. To convert the point data to the surface data, with interpolation methods it was found that the best method for the precipitation were Co-Kriging and IDW methods for other elements. In addition, the DEM was used for elevation and slope parameters. Digital Soil Map was achieved from the Department of Natural Resources of Kermanshah Province at 1:250000 scales. Then, according to Login different layers, with the aim of homogenizing values, layers were standardized. In this case, each layer in direct or inverse effect determines the potentials, while standardization (poor to excellent value from 0 to 1) is considered. The weights obtained from AHP were multiplied by the corresponding layers. Then, the positive and negative ideal values for each layer were extracted and entered into the TOPSIS model.

## Results and Discussion

The results of this research indicate that annual rainfall with 0.45% has the most influence and wind up with 0.03% the lowest effects on chickpea cultivation. Rainfall has a positive effect and the precipitation less than 250 mm in the areas of not more inhospitable region is not observed in this variable. Western areas have the highest power and the southwest, east and northeast areas have the lowest potential for germination. Western parts of the province such as Qasr-e Shirin and Srplzhab due to the higher temperature, more than 27°C, are inappropriate for chickpea cultivation and southwestern regions; north-east and east provinces will receive the highest score. City of Qasr-e Shirin is considered inappropriate to determine the temperature of the chickpea. Minimum temperature varies from 15-5 degrees; the minimum temperature will increase the growing season to provide suitable environments for the germination and growth of the peas. Thus, the western parts of the province have the greatest potential. The lowest average relative humidity is about 28 percent in the city of Qasr-e Shirin and the maximum of 52% in the southwest and northeast of the province. As the value of this variable increases, the more points it will receive. Due to low relative humidity, southwest and northeast regions points are close to 1 and the western parts of the province will receive a score close to zero. In most parts of the study area, the maximum relative humidity is 60 percent and the resulting exposure of Kermanshah Province, Songhor, Eslamabad-e-gharb rating is good. The highest amount of sunshine hours per day in growing season is 9.9 hours in southern and central provinces and the lowest value of 4.8 time is observed in the north-west part of the province. The mean wind speed during the growing season, which varies from 3 to 7 meters per second, is the highest in the region, Kermanshah, and falcon are between 7-5 meters per second and suitable in Kangavar and western regions including Qasr-e Shirin, Srplzhab, Gilangharb and Eslamabad-e-gharb. The central plains of the province with an elevation of 800 to 1,500 meters has better conditions in

terms of slope, mostly between the levels of 30-0 percent. In the soil situation, Kermanshah province is in moderate to good conditions.

## Conclusion

Integration of environmental and climatic GIS layers with TOPSIS model and combination of the layers of dry land farming, it was found that 4 factors can influence unfavorable conditions for chickpea cultivation. In other regions of Kermanshah provinces, the areas of the categories are as following: high level is 0.073%, good 26.43% and average is 73.48 %. The lands with very good features are located in Nosoud and Ravansar cities. The areas with average ability are located in Harsin, Kangavar and parts of the southern province and areas with good potential are located in some parts of the Eslamabad-e-gharb, Kermanshah and East of Sarpolzahab.