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GIS BASED MULTI-CRITERIA ANALYSIS FOR IDENTIFICATION OF SUITABLE AREAS FOR GREEN GRAM PRODUCTION. A CASE STUDY OF KITUI COUNTY, KENYA [View project](#)

Determination of the Best Planting Season for Green Gram in Kitui County - Kenya, Using Analytic Hierarchy Process

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1. Overview

The purpose was to analyze the spatial variation of rainfall and temperature and to identify the most suitable land for green gram production based on climate.

Experts identified rainfall and temperature as the key climatic factors affecting Green gram production and their key requirements were grouped into four classes based on FAO (1976) guidelines. The Analytical Hierarchy Process (AHP) was used to determine the perceived weights that rainfall and temperature have on green gram production using information from literature and expert opinions. The seasonal rainfall totals and seasonal mean temperature for the 'long rains' (March – May; MAM) and 'short rains' (October – December; OND), were calculated from Worldclim data. The seasonal rainfall total and seasonal mean temperature maps were reclassified into the four classes and suitability maps generated using GIS weighted overlay tool.

The weighed overlay of rainfall and temperature shows that the OND season has the highest potential for green gram production therefore the government should adequately prepare to ensure they maximize on the good environmental conditions.

2. Introduction

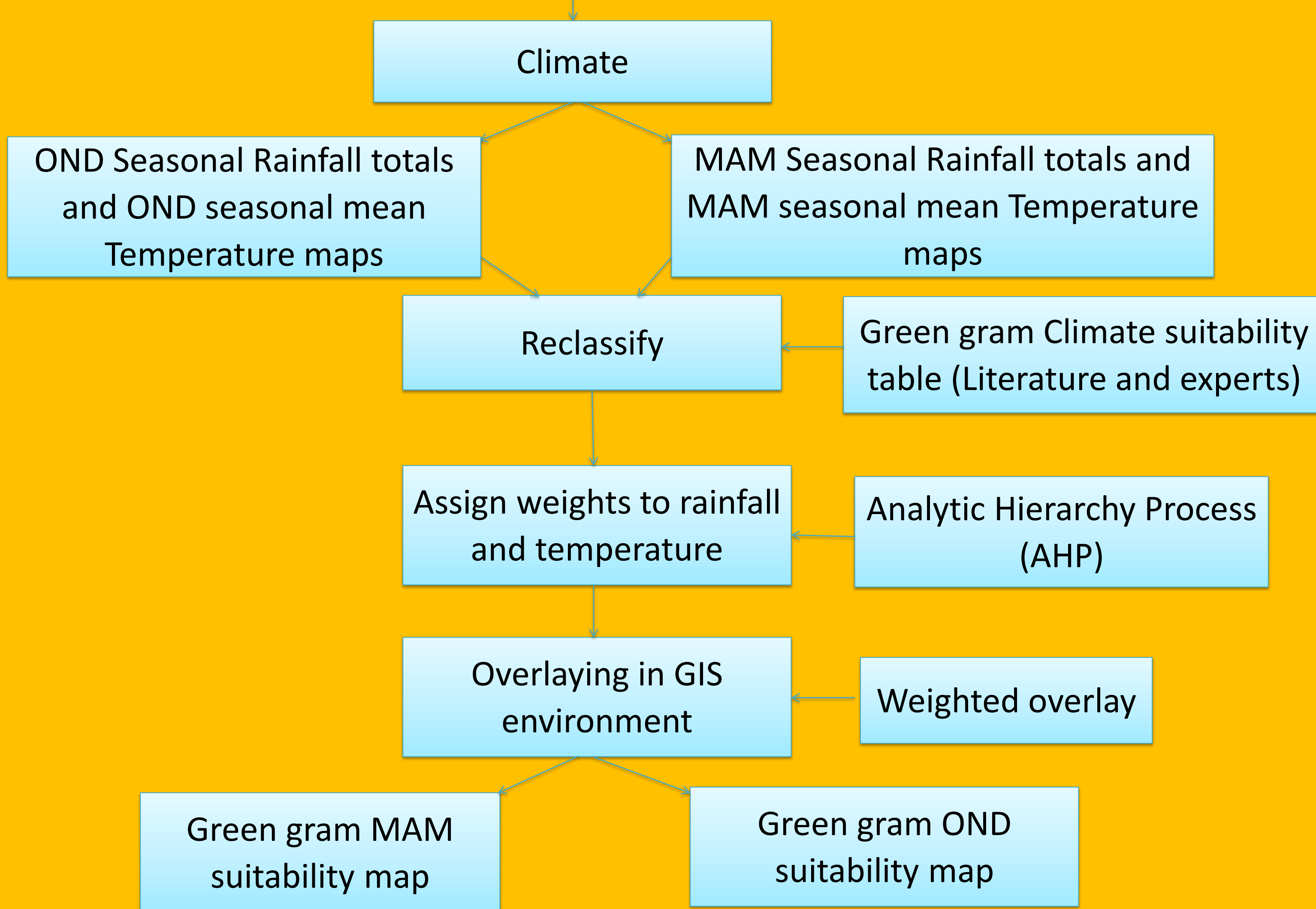
The County government of Kitui has shown a lot of interest in green gram (*Vigna radiata L.*) and has been promoting it to farmers as one of the most suitable and profitable legumes for the County.

The aim of the study was to determine how rainfall and temperature vary during March-May (MAM) and October-December (OND) seasons, regarding their suitability for growing green gram. The two seasons; MAM and OND are known as 'long' and 'short' rain seasons respectively. The output of this work will be of great use to farmers in zoning and timing of green grams for increased productivity.

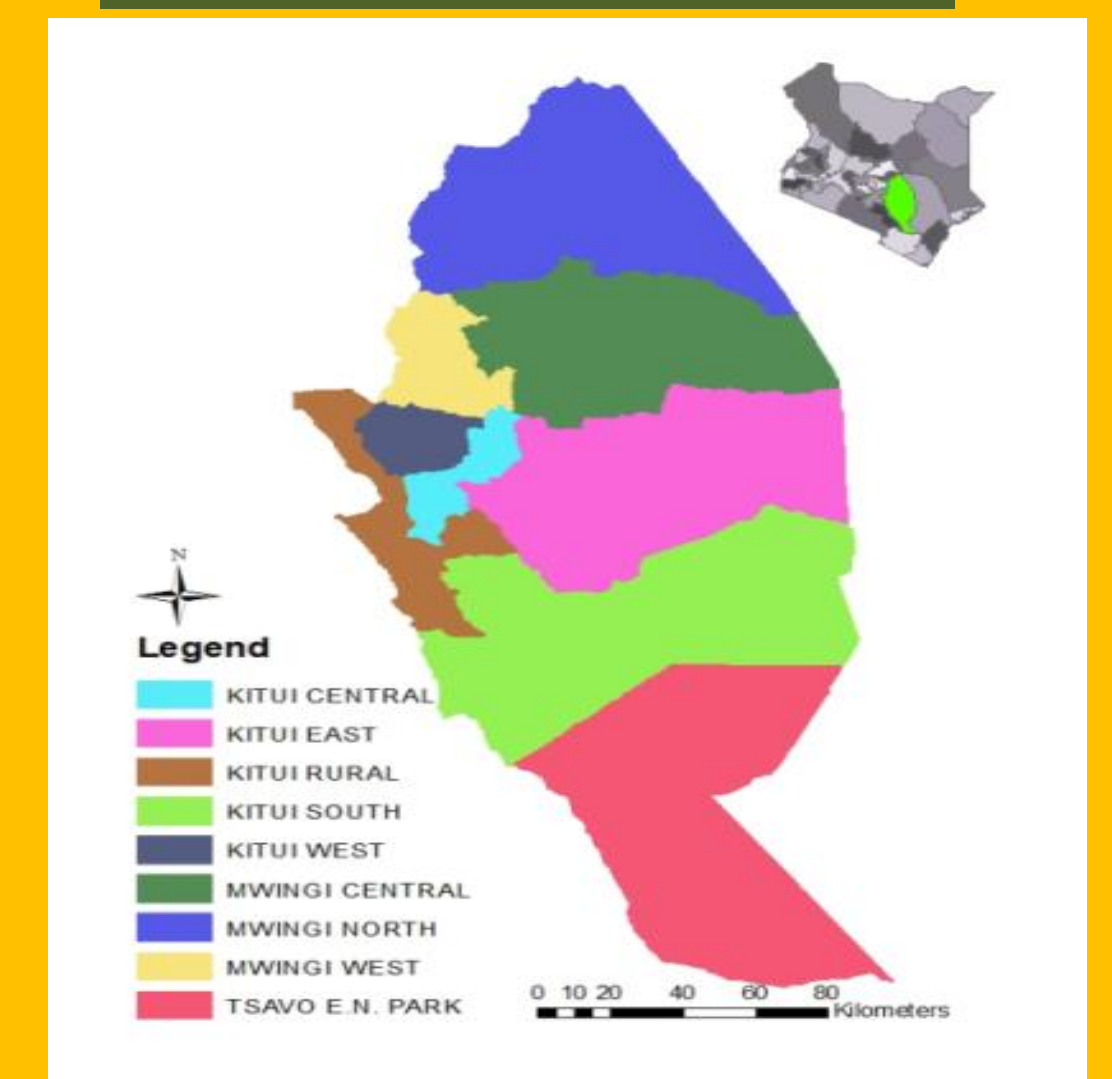
Kitui County (see map) which is located in lower eastern Kenya is highly vulnerable to effects of drought. The periods June to September and January to February are usually dry. The rainfall pattern is bimodal with a mean annual of 750 mm that varies from 500 to 1050 mm with 40% reliability. The annual mean minimum temperature range from 22 to 28 °C, while the annual mean maximum temperature ranges between 28 and 32°C.

3. Methodology

3.1 Determine best season for Green gram production



Kitui County map

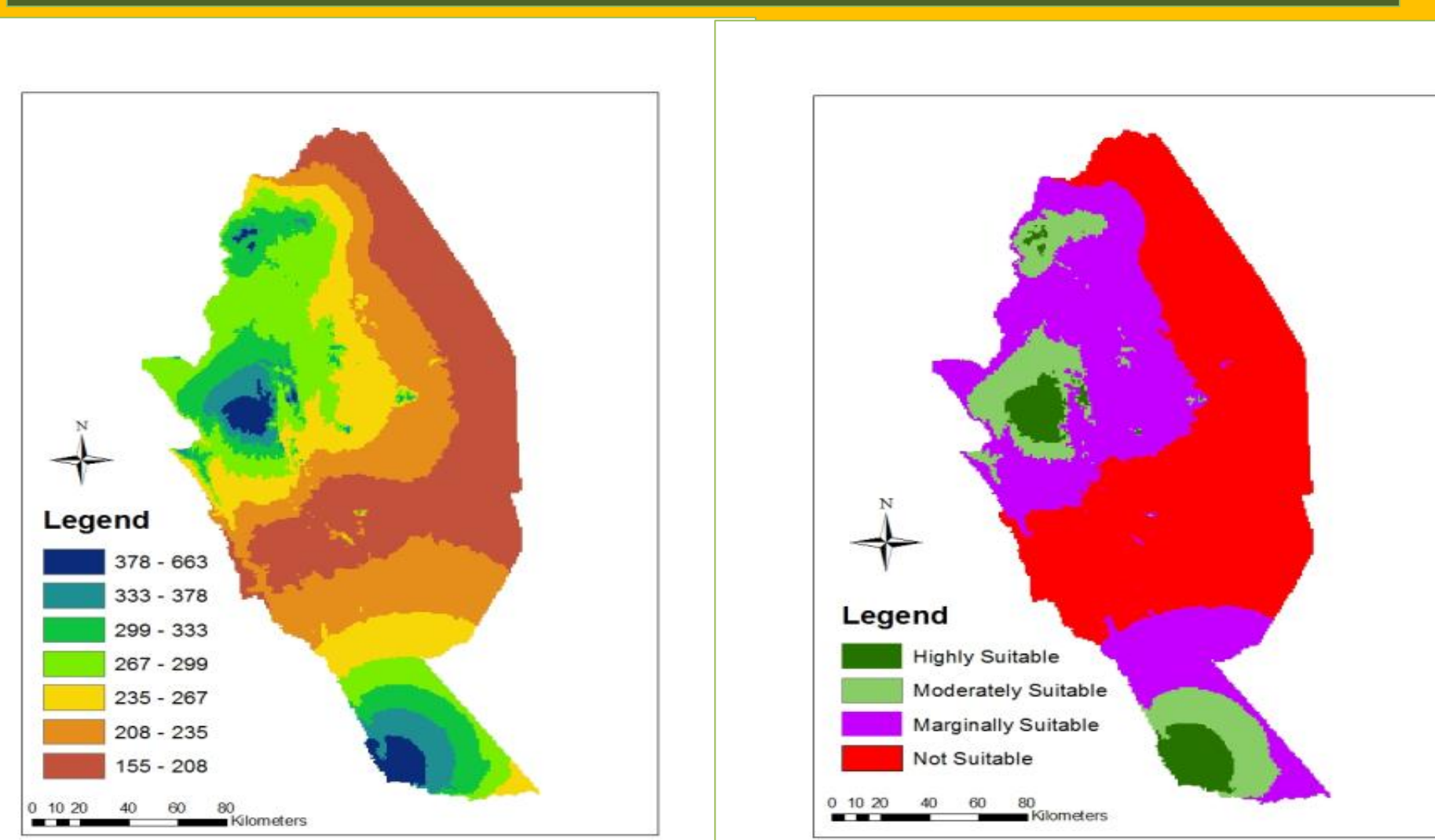


3.2 Green gram Suitability Table

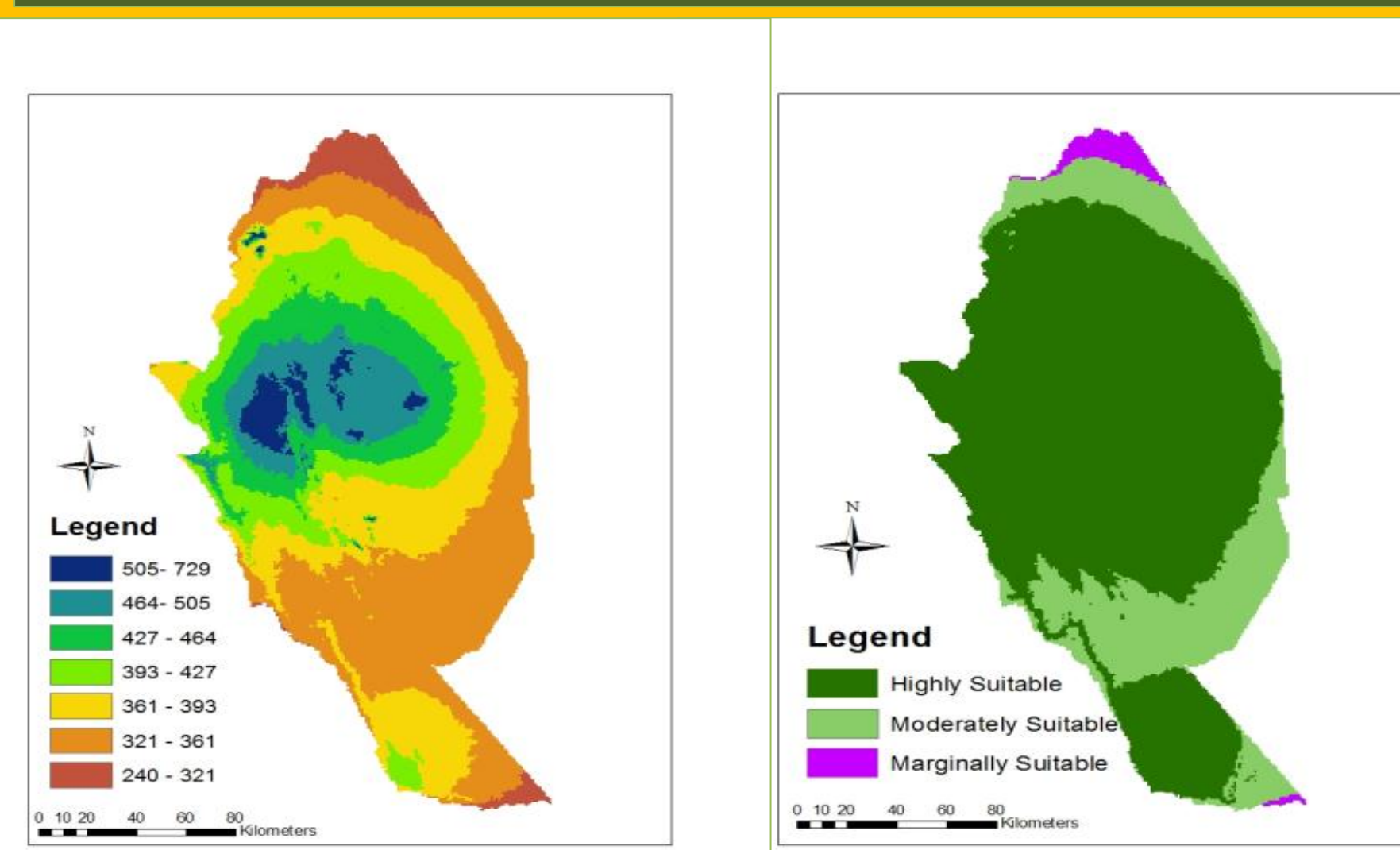
	S1	S2	S3	N	Weights from AHP
Rainfall	350-600 mm	600-1000 mm or 300-350 mm	>1000 mm or 230-300 mm	<230 mm	67
Temperature	30-24 °C	24-20 °C	20-15°C	<15 °C or >30 °C	33

4. Results

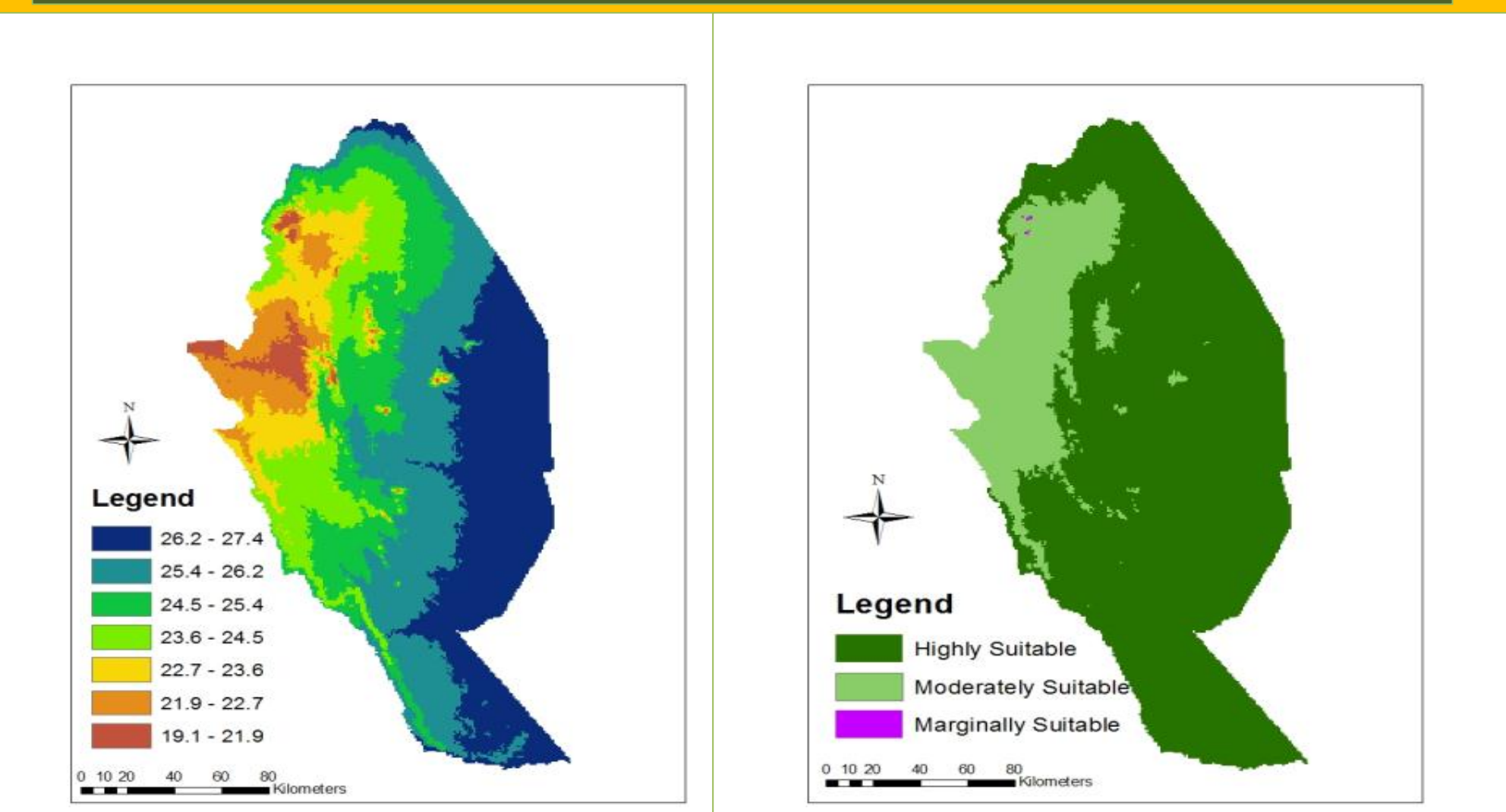
4.1 Unclassified and Classified MAM rainfall



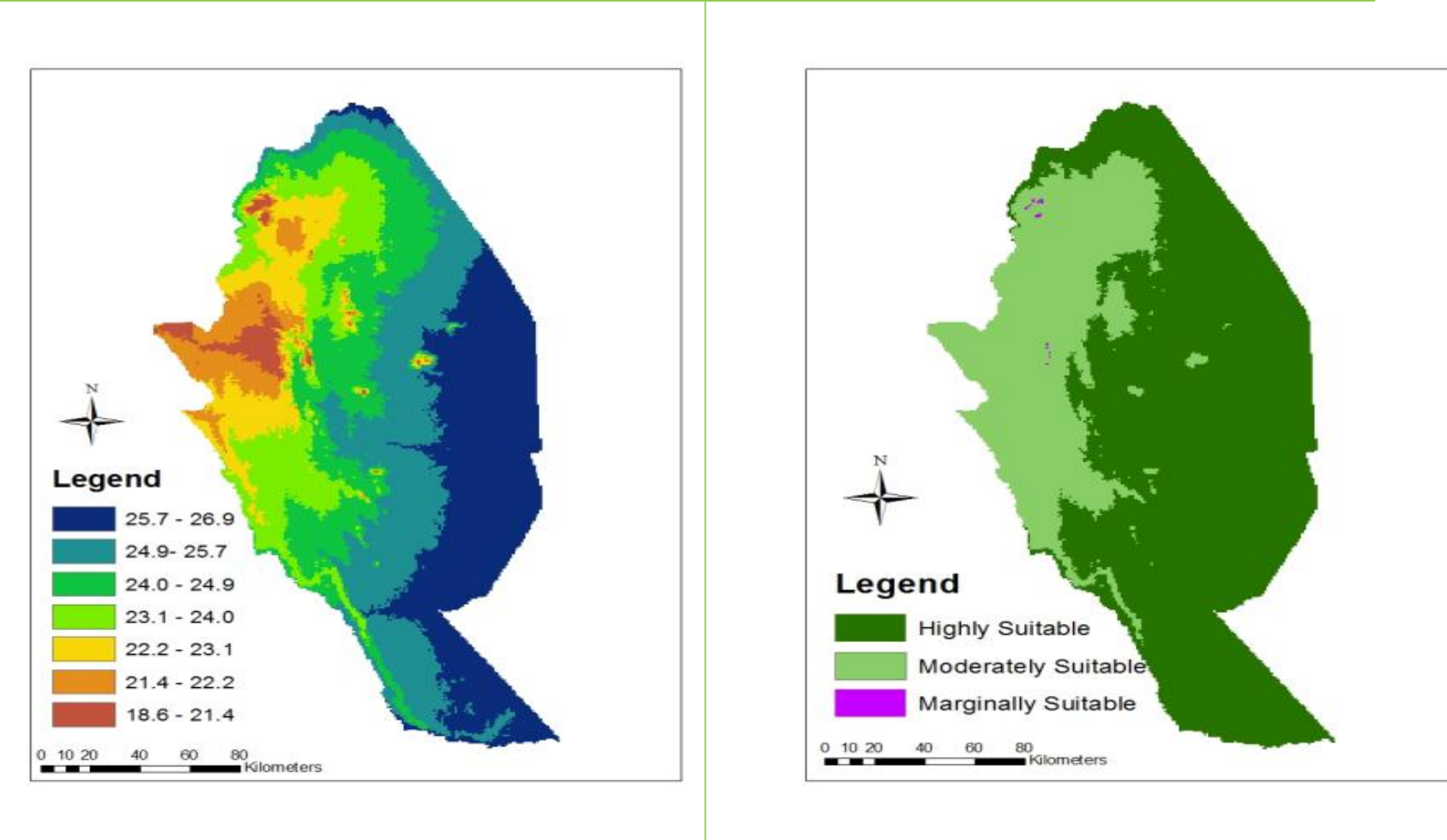
4.2 Unclassified and Classified OND rainfall



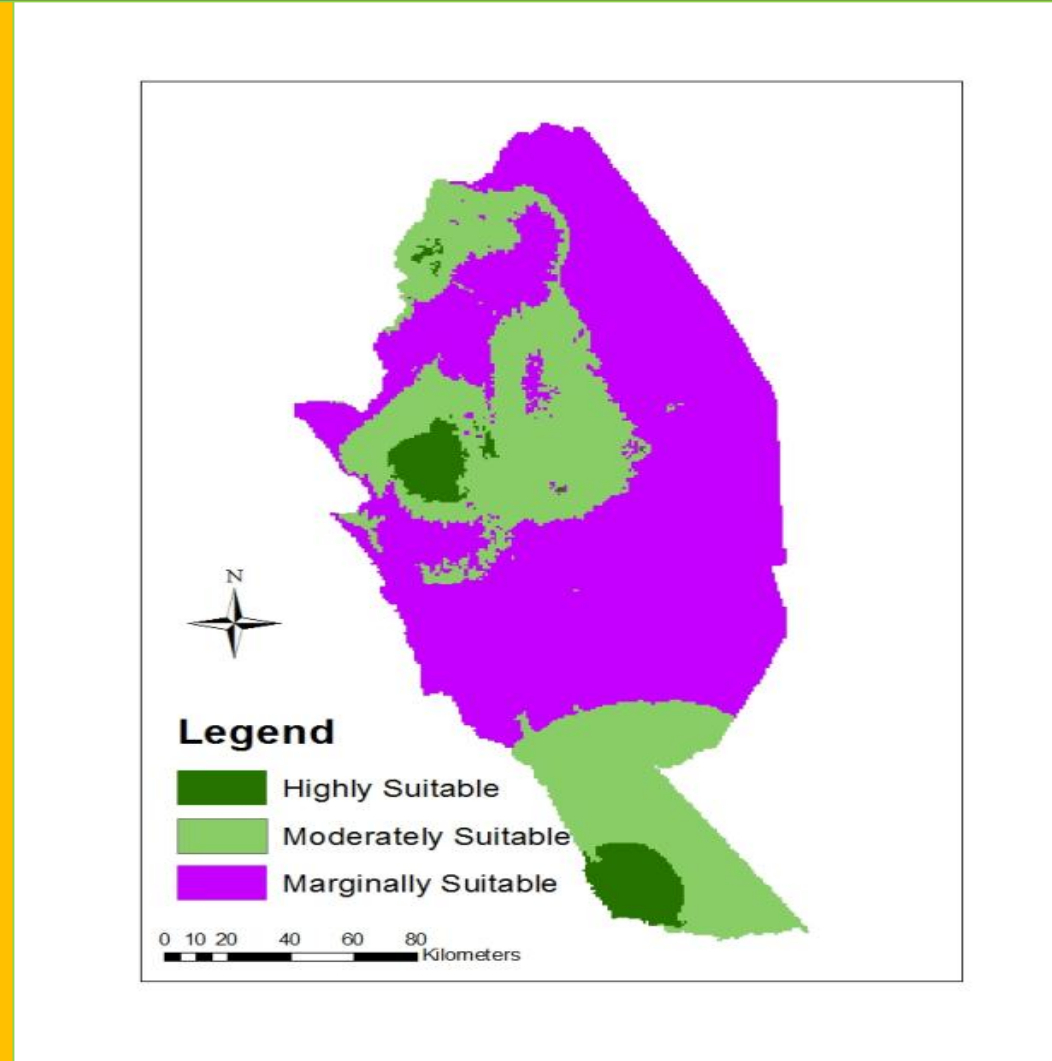
4.3 Unclassified and Classified MAM Temperature



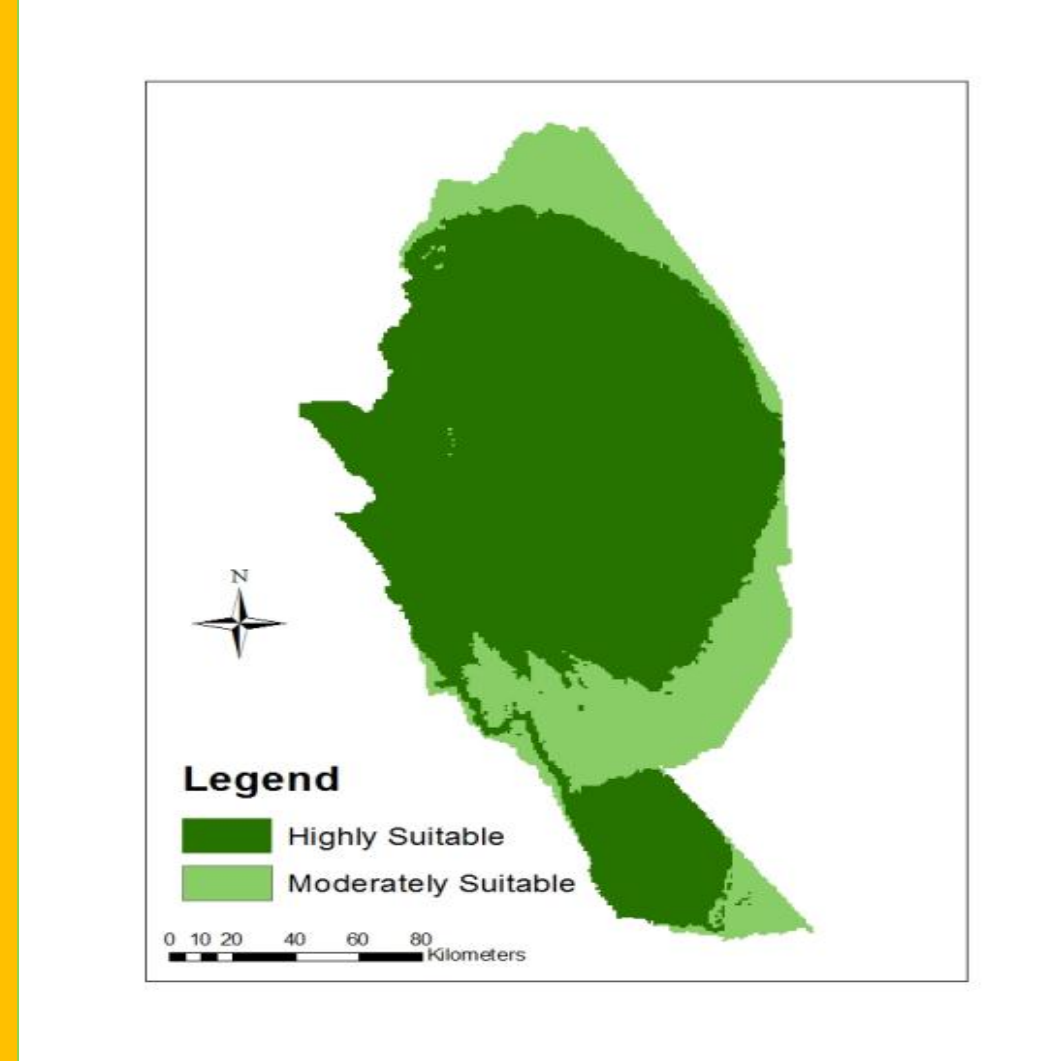
4.4 Unclassified and Classified OND Temperature



4.5 Green gram MAM suitability map



4.6 Green gram OND suitability map



5. Conclusion

All land in Kitui County is suitable for green gram production in varying degrees of suitability and has been ranked in accordance with FAO guidelines as highly, moderately and marginally suitable. Following analysis the main factor limiting suitability is rainfall as temperature variation in the County is mainly highly suitable.

The OND season shows the highest potential for green gram production this is due to the sufficient rainfall received during the season. All players in the green gram value chain should take opportunity of the good environmental conditions and adequately prepare for cultivation as a good harvest is highly likely. Preparation for farmers includes using the appropriate inputs in terms of seeds, fertilizers and pesticides which will ensure positive results as the environment is already suitable for cultivation.

There is need to study the effect that climate change will have on Green gram production in Kitui County in the future.