



UNIVERSITY OF RUHUNA
FACULTY OF AGRICULTURE

Third Examination in BSc Agricultural Resource Management and Technology (Part I)

July 2022

SS3102 Land Suitability Evaluation (Elective)

Theory

INSTRUCTIONS

Answer all questions.

Only non-programmable calculators are permitted.

Mobile phones are NOT permitted.

Attach the question paper to the end of the answer script

TIME: 2 (two) Hours

INDEX NUMBER

--

1)

a)

- i) What do you understand by the term "Land Suitability Evaluation"? (10 marks)
- ii) How does "Land Suitability Evaluation" differ from the "Land Evaluation"? (15 marks)
- iii) What is "Land Suitability Classification"? (10 marks)

b)

- i) State three land qualities important for crop cultivation. (15 marks)
- ii) State two generalized land use requirements each for inland fish farming ponds and poultry farms. (20 marks)
- iii) The Forest Department and the Department of Archeology deals more with the scarcity value of lands in land suitability evaluations. Explain why? (30 marks)

2)

a)

- i) Why do the countries having good quality lands usually are strong nations? (20 marks)
- ii) What should those countries do to maintain the quality of their lands? (20 marks)
- iii) Out of the following land types, which type has the lowest degradation potential when used for agriculture? State the reason behind your answer. (20 marks)
Mountainous forest lands, flood plains, savannas, river catchments

b)

- i) State three institutions in Sri Lanka that should participate in a land suitability evaluation for the construction of a large-scale piggery. (15 marks)
- ii) What problems may arise at the implementation stage of a particular land utilization type if you exclude the social aspects during land suitability evaluation? (25 marks)

3)

a) State the country to which the following GNSS systems belong to (12 marks)

- i) GPS -
- ii) GLONASS -
- iii) BEIDOU -

b) Differentiate the uses of Vector and Raster data in representing geographical features. (16 marks)

c) Comment on the statement "Polar orbit satellites provide the widest coverage in the earth observation process". (20 marks)

d) Active remote sensing has more features than passive remote sensing. Explain why passive remote sensing is preferred by researchers over active remote sensing in large-scale spatial studies? (24 marks)

e) What is the importance of forward lapping and side lapping during Arial photography? (28 marks)

- 4) The questions are based on the excerpts of the following research paper:
 Chivasa, W., Mutanga, O., Biradar, C., 2019. **Mapping land suitability for maize (*Zea mays* L.) production using GIS and AHP technique in Zimbabwe.** *South African J. Geomatics* 8, 265–281.

Abstract

The study integrates geographic information system (GIS) and analytic hierarchy process (AHP) to evaluate land suitability for maize production in Zimbabwe using multi-criteria evaluation (MCE) process. Four thematic maps based on rainfall, temperate, soil type and slope were integrated through overlay technique in a GIS environment to produce maize production suitability map. The resultant maize suitability map was overlaid with constraints map to ‘mask out’ all non-agricultural land. The final maize suitability map shows that 3.20% of the total land is highly suitable, 16.56% is suitable, 25.34% is moderately suitable, 32.33% is marginally suitable and 9.57% is not suitable for maize production in its current form. The maize suitability classification was validated by regression analyses using measured maize grain yield of 5 key maize varieties representing 5 different maturity groups. Grain yield was regressed against suitability index (SI) of each land class. There were significant positive correlations between maize grain yield and land suitability classes ($R^2 = 0.63 - 0.85$). Integrating GIS and AHP with MCE is effective in assessing land suitability for targeting location specific interventions for maize production and the result is a comprehensive suitability map for Zimbabwe, incorporating several critical environmental factors affecting maize adaptation. We recommend the use of this suitability map as a decision support tool in land use planning and policy making.

Results

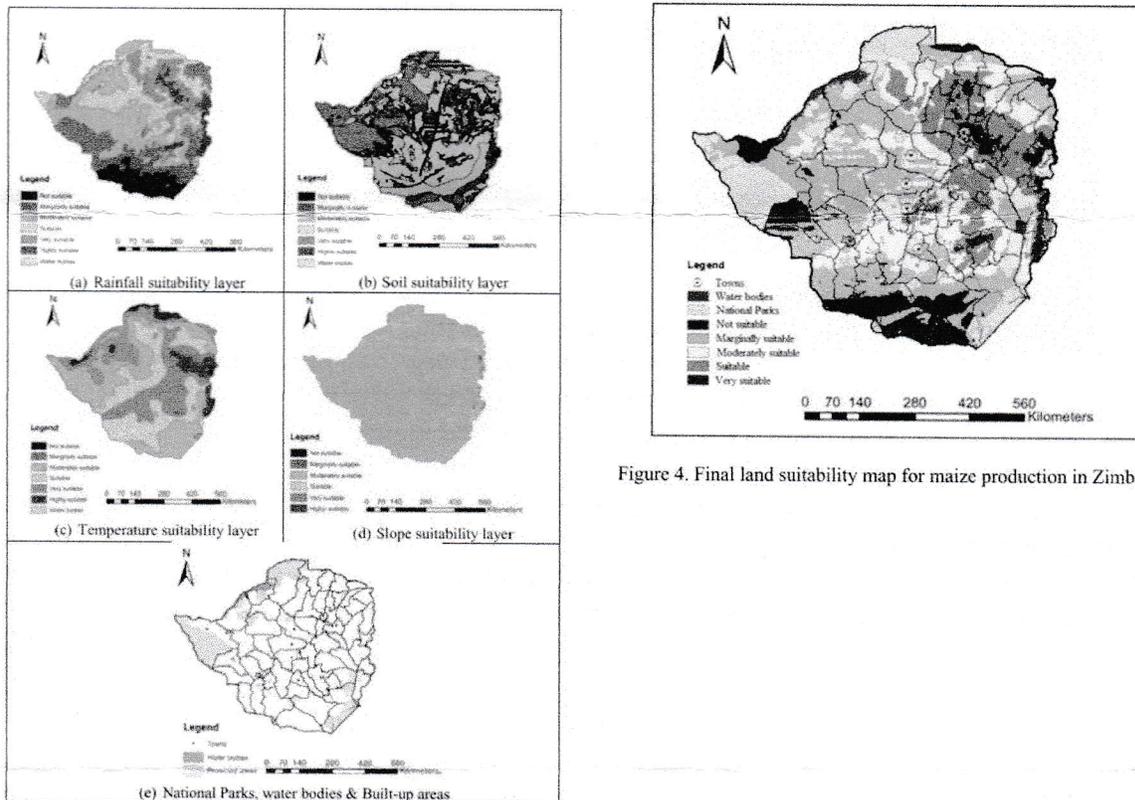


Figure 4. Final land suitability map for maize production in Zimbabwe

- i) What is the area where the land suitability evaluation was carried out? (10 marks)
- ii) What is the scale of the land suitability evaluation work? (10 marks)
- iii) What was the land utilization type of concern? (10 marks)
- iv) How many thematic maps were used in this research to yield the final land suitability map? (10 marks)
- v) What is the importance of using map layer (c) indicated in the result section? (15 marks)
- vi) What are the land suitability classes used in the evaluation? (15 marks)
- vii) What is the most occurring land suitability class when the whole area is concerned? (15 marks)
- viii) What is the method used by the authors to validate (cross check) the land suitability classification? (15 marks)