



PAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF NATURAL RESOURCES AND SPATIAL SCIENCES

DEPARTMENT OF AGRICULTURE AND NATURAL RESOURCE SCIENCES

QUALIFICATION: BACHELOR OF AGRICULTURE	
QUALIFICATION CODE: 07BAGR	LEVEL: 7
COURSE CODE: AGE721s	COURSE NAME: AGROECOLOGY
SESSION: NOVEMBER 2019	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER(S)	IBO ZIMMERMANN
MODERATOR:	ANGELA LILUNGWE

INSTRUCTIONS	
<ol style="list-style-type: none">1. Answer ALL the questions.2. Write clearly and neatly.3. Number the answers clearly.	

PERMISSIBLE MATERIALS

1. All written work MUST be done in blue or black ink
2. No books, notes and other additional aids are allowed, except for a pencil and scientific calculator

THIS QUESTION PAPER CONSISTS OF 4 PAGES (excluding this front page)

Question 1

Copy down the table appearing below. Then in the right-hand column indicate the renewability of energy used by each technology, out of renewable, potentially renewable and non-renewable, in the corresponding row:

Type of technology	Renewability of energy
A photovoltaic panel	
An engine that runs on diesel	
An engine that runs on biodiesel	
A water turbine at Ruacana Dam	

[4]

Question 2

Copy down the table overleaf and then fill in the right-hand column by writing the name of the main type of ecological support service encouraged by the action in the left-hand column, out of the following 12 names of ecological support services (each ecological support service should appear only once in the table. Although many support services are interrelated, choose only the one which relates the most to the action; try with a pencil or on a rough paper before finalising)

Nutrient cycling

Climate control

Air purification

Water purification

Water cycling

Soil protection

Soil formation and renewal

Waste removal and detoxification

Natural pest and disease control

Pollination

Seed dispersal and treatment

Biodiversity.

Question number	Action	Main type of ecological support service encouraged by the action
2.1	A horticultural farmer puts bat boxes around her field	
2.2	A horticultural farmer puts bee hives around her field	
2.3	An agronomic farmer plants windbreaks across his field	
2.4	A farmer applies EM biochar to the floor of his workshop where he services his machinery	
2.5	A dairy farmer feeds EM biochar to her cows, of which the dung gets washed into ponds for anaerobic and aerobic digestion	
2.6	A farmer spreads on his rangeland ash from the burning of charcoal produced from encroached bushes that had previously been harvested on his farm	
2.7	A horticultural farmer applies hay as mulch to her soil	
2.8	The above farmer adds compost and earthworms to her soil	
2.9	An agronomic farmer converts from monocropping to intercropping	
2.10	A beef farmer adds seeds of decreaser grasses to the lick	
2.11	A poultry farmer sprays diluted EM inside her chicken houses	
2.12	An agronomic farmer applies deep ripping in permanent strips as part of conservation agriculture	

[12]

Question 3

Suppose a farmer finds an outbreak of harvester termites in her rangeland and asks for your advice. Explain, with the help of examples, possible causes of the outbreak and advise the farmer on how to prevent such an outbreak in the future. [15]

Question 4

Species that increase to the level at which they are viewed as a problem species, are often thought of by mainstream modern farmers as the cause of the problem, which needs to be got rid of by attacking that species with whatever means is the quickest. On the other hand, Agroecology views such species as symptoms of a problem that should be rather treated at its root cause, which is usually an imbalance in some ecosystem support service/s. The problem species are usually trying to fix the problem and if they are allowed to get on with that task, then it will be much easier for the balance to be restored so that ecosystem support services can proceed with their roles of supporting a diverse and productive ecosystem. For each of the following types of problem species, explain the role that it is trying to play in restoring a healthy balance and suggest how a farmer should treat the root cause.

- 4.1 External parasite on domestic animal (5)
 - 4.2 Plant disease (5)
 - 4.3 Broadleaf weed in crop field (5)
 - 4.4 Encroacher bush in rangeland (5)
- [20]

Question 5

- 5.1 Suppose you census the weevils in a compost heap by randomly trapping and marking 90 of them, releasing them back into the heap and an hour later randomly trapping 60, of which 6 are marked. Estimate the population of weevils in the heap. (3)
 - 5.2 Suppose you record 36 francolin calls along the route of your daily walk in a park. You then harvest 12 francolins from the park and next day repeat the census in the same way. This time you record 30 francolin calls. Estimate the current number of francolins remaining in the park. (3)
 - 5.3 Suppose during a 48-hour waterhole count you record 420 warthogs. Their drinking frequency is 2 times per day. Estimate the number of warthogs that make use of that waterhole. (3)
- [9]

Question 6

Crop land that has been under industrial agriculture tends to have sick soil. If the land is to be later used for agroecological horticulture by avoiding use of harmful chemical inputs and application of no-till, it may still take years before the soil health is restored. However, there are ways whereby such a transition can be greatly sped up through various inputs and management practices. Discuss a variety of such ways. [10]

Question 7

Explain, in terms of benefits and costs, why most Namibians living in rural areas would rationally opt for livestock over wildlife/tourism if given a choice between the two for the use of their land. [8]

Question 8

Suppose a farmer asks for your advice on whether to grow grapes or dates under irrigation, to optimize use of limited irrigation water. You have experienced that farmers who grow grapes usually get a yield of 10 tons/ha and apply the equivalent of 1500 mm of water, while farmers who grow dates usually get a yield of 4 tons/ha and apply the equivalent of 300 mm of water. Suppose further that the price a farmer can get for grapes is N\$10/kg and for dates is N\$30/kg.

- 8.1 Calculate the water use efficiencies of each crop, in terms of litres of water applied per kg of crop produced, (4)
 - 8.2 Calculate the water use efficiencies of each crop in terms of litres of water applied per N\$ gross income (2)
 - 8.3 Calculate by how much the one fruit is more economically efficient in its use of water than the other fruit. (1)
- [7]

Question 9

Explain the main procedures for producing compost in the Johnson-Su bioreactor that you helped to construct and fill at Haydn House. Include the main sequences that occur in the succession as the compost develops. Then explain how the resulting compost can be applied, at which rate, what its expected benefits are and the conditions that are required for these benefits to be attained. [15]

