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Module 13: Risk Mitigation and Adaptation in Extension and Advisory Services

LECTURER GUIDE

Module 13: Risk Mitigation and Adaptation in Extension and Advisory Services

Pre-assessment

After reading through the module overview and introduction complete the following pre-assessment in order to determine how comfortable you are with the topic of risk management and adaption in extension. Rate your knowledge on the topics on a scale of 1 to 5 by circling the corresponding number.

	Question	Self-assessment				
		Low				High
1	Are you familiar with the concepts risk and uncertainty?	1	2	3	4	5
2	How confident are you in your ability to identify factors that influence risk perception?	1	2	3	4	5
3	Are you able to identify, measure and evaluate risk?	1	2	3	4	5
4	Are you familiar with the concept of climate, weather, climate change and extreme events?	1	2	3	4	5
5	How confident are you in your ability to explain the link between climate change and agriculture?	1	2	3	4	5
6	How confident are you in your ability to explain the relationship between climate change and socio-economics?	1	2	3	4	5
7	Are you able to explain how climate change affects the health of rural communities?	1	2	3	4	5

	Question	Self-assessment				
		Low				**High**
8	Are you able to list the steps needed to plan for and implement adaptation approaches?	1	2	3	4	5
9	Are you able to explain the role of EAS in mitigating risk and uncertainty?	1	2	3	4	5
10	How comfortable are you with explaining the role of climate and market forecasts?	1	2	3	4	5
11	Are you able to outline examples of best practices in risk mitigation?	1	2	3	4	5
12	Are you familiar with tools used in adaptation and risk managements?	1	2	3	4	5
13	How comfortable are you with resilience tools?	1	2	3	4	5
14	Are you able to use climate and socio-economic forecast tools for risk management?	1	2	3	4	5
15	How confident are you in your data collection skills and the visual presentation of collected data?	1	2	3	4	5

Answer: Learner's own answer.

Study unit 1: Introduction to risk and risk management

Session 1.1: Understanding risk and uncertainty

Activity 1.1 Individual activity: Risk and uncertainty

Read through the case study below and answer the question that follows.

Imagine that a farmer has two routes to the market; the quickest route being over rough terrain and the longer route being on well-maintained roads and likelihood of traffic congestion. The shorter route will get him to the market before the other vendors, allowing him to increase his sales, but there is the risk that his wagon will not be able to make the journey.

The farmer now needs to consider the following:
- The shorter path has a higher uncertainty as to whether he will make it to the market but the positive outcome of increasing his sales if he takes the risk; and
- The longer route has a lower uncertainty that he will make it to the market but carries the risk that he will sell less.

What would you do if you were in the farmer's position?

Answer: Learner's own answer.

Activity 1.2 Individual activity: The Irish potato famine

The Great Famine in Ireland saw the loss of over 20–25% of the population between 1845 and 1852. Research the topic and identify the risks that lead to the famine as well as vulnerabilities.

Answer: The following two key aspects need to be addressed in the report:

• *Risks: Monoculture farming resulted in vulnerability to blight; and*

• *Vulnerability: Tenant system and restrictions on the Irish due to government policy at the time.*

Activity 1.3 Individual activity: Measuring uncertainty and risk

Read through the scenario below and answer the questions that follow.

Looking at the routes to market example in Activity 1.1, the farmer finds out from his neighbour that the short path was travelled safely in the last month but recent rains may have affected the route. You can now assume a 'possible' uncertainty and assume the outcome as being 'severe' due to the fact that not making it will result in no sales. For the short path a negative outcome is 'very unlikely' and a negative outcome is 'negligible'. You can now rank the risk of the two options and see that although the farmer could increase his profits, the risk is high and he would be safer taking the short path.

Consider the following changes to the above case and determine the risk for each. Which route would you suggest based on your analysis?

1. The farmer finds out that someone safely travelled the short route the previous day. Assume that the long route conditions remain the same. (2)

Answer: Short route: Medium/High, Long route: Low. Long route is still favourable.

2. The long route is undergoing road maintenance, which may result in delays and have a moderate effect on profits. Assume the short route is as stated in question 1. (2)

Answer: Short route: Medium/High, Long route: Medium/High. In this case the long route may be favourable due to the potential for increased profit.

Total: 4 marks

Session 1.2: Risk perception and human behaviour

Activity 1.4 Individual activity: Risk perception

Answer the following questions in your own words.

1. Is the following true or false? If false, correct the statement.

   a. Experts in the field of risk will share the same views on what constitutes a risk and the level of the risk. (2)

Answer: False, due to aspects of human behaviour and risk perception risk determination differs between individuals, even experts.

   b. Human behaviour is an important factor in risk perception. (2)

Answer: True.

   c. Aggregate data can be used to determine the specific risks faced by rural farmers. (2)

Answer: False, individual farm level risks can vary greatly from the aggregate data.

   d. Aggregate data can be used to study trends which can assist in managing the risks faced by rural farmers. (2)

   Answer: True.

   e. Statistical data allows for the elimination of individual risk perception but also carries the risk of misinterpretation. (2)

Answer: True.

   f. The key to successful risk management is the use of individual risk perception. (2)

Answer: False, risk management is a team based approach with individual risk perception prone to error.

Total: 12 marks

Session 1.3: Risk identification, measurement, analysis and evaluation

Activity 1.5 Individual activity: Flash floods example 1

Two farmers are farming in a low-lying area. Farmer A has seedlings in his field and farmer B has mature crops that are almost ready for harvest. Heavy rains have been reported upstream of the river and there is a good chance of flash floods. Both farmers are dependent on their crops as their only source of income. Use a risk assessment matrix to determine the risk for both farmers for the cases in which:

1. No crops are lost but the soil is flooded. (3)

2. The position of farmer A's farm means it is unlikely to be hit by the flood. (2)

3. Farmer B's house is in the path of the flash flood. (3)

Answer: a) Farmer A will experience a high to very high risk, as a flood could result in the failure of his/her crop. The seedlings will be heavily affected by flooding leading to large loss in future crop yield. Since no crops are lost due to flooding and his/her crops are larger, farmer B only experiences an acceptable risk level.

b) Farmer A will experience a medium to high risk based on unlikely flooding and significant to severe outcome potential. Farmer B will remain at an acceptable risk level.

c) Farmer B will experience an acceptable to medium level of risk, since it has been stated that the flood will not be severe enough to destroy any crops. Incorrect assumptions of risk based on significant property damage, injury or death are will not be considered.

Total: 8 marks

Activity 1.6 Individual activity: Flash Floods example 2

The following risk assessment matrix has been set up based on the location of farms in relation to the valley floor. The damage from flooding is directly related to the location of farms relative to this point.

1. Complete the matrix below by considering the following information from previous flash floods:
   - Flash floods are common at farms located at elevations below 5 m;
   - Elevations above 7 m have very little risk of being affected by flash floods;
   - Structural damage occurs on farms below 3 m, with minor damage reported at up to 4 m;
   - Loss of life has only been recorded for farms on the valley floor, with the exception of a single flash flood in 2012 which claimed the life of 3 farmers at an elevation of 2 m, in this instance; and
   - Flooding which affects crop development has been noted in farms below 5 m.

Negligible		Outcome				
		Minor	Moderate	Major	Severe	
Elevation	8 m					
	6 m					
	5 m					
	4 m					
	3 m					
	2 m					
	Valley floor					

Negligible		Outcome				
		Minor	**Moderate**	**Major**	**Severe**	
Elevation	8 m	Low	Low	Low	Low	Low
	6 m	Low	Low	Low	Acceptable	Acceptable
	5 m	Low	Low	Acceptable	Medium	Acceptable
	4 m	Low	Acceptable	Medium	High	Medium
	3 m	Acceptable	Medium	Medium	High	Very High
	2 m	Acceptable	Medium	High	Very High	Very High
	Valley floor	Medium	Medium	High	Very High	Very High

Total: 35 marks

Summative assessment: Unit 1

Answer the following questions in your own words.

1. Name the factors that will affect your ability to identify and
   evaluate risks. (3)

*Answer: The factors that will affect an individual's ability to identify
and evaluate risk are their knowledge, experience, key factors in
risk perception. (2 marks for knowledge and experience, additional
mark for linking them to risk perception).*

2. Define risk in terms of uncertainty. (3)

*Answer: Uncertainty refers to actions in which the outcome
cannot be accurately predicted. Risk is the process of identifying
if uncertainty carries the risk of negative outcomes in the form
of hazards. (2 marks for the definitions, one additional mark for
relating the two terms).*

3. Discuss how the principle of supply and demand can expose
   farmers to risks. Use an example in your discussion. (3)

*Answer: The demand for products can affect the selling price of
crops. This is referred to as supply and demand. Demand for
goods can vary seasonally or due to some crops being more
valued due to their rarity. (2 marks for defining supply and
demand, one additional mark for an example).*

4. What factors should be considered when using
   statistical data in risk management? (3)

Answer: You will need to consider:

- *The correct interpretation of the data;*

- *Whether data is relevant to your context; and*

- *Your ability to assist farmers in understanding what the data
  means to them.*

5. Is the following true or false? If false, correct the statement.

   a. Risk evaluation is the process of identifying the risks which need to be mitigated. (2)

Answer: False, risk evaluation is focussed on identifying the level of risk based on outcome likelihood and severity. The definition in question is that for risk assessment and mitigation.

   b. Your personal understanding of risk can affect your ability to correctly assess risk. (2)

Answer: True.

   c. Risk assessment by individuals is only possible by risk experts. (2)

Answer: False, risk assessment even by experts is based on personal experience and knowledge which is not adequate for all contexts. Group-based approach expected.

   d. Risk matrixes can be used to measure risks caused by hazards and exposure. (2)

Answer: True.

   e. You can perform a risk assessment as long as you know the severity of the risk. (2)

Answer: False, both the severity and likelihood are needed.

6. A farmer needs assistance in decreasing his exposure to market price fluctuation. His family has farmed solely planted cabbage. How would you suggest the farmer decrease his exposure, and what are the hazards of his current approach? (8)

Answer: Marks may be given if the student provides valid exposure prevention methods based on his own experience and knowledge. An example answer is given below.

The hazards faced are as stated are the risk of market price fluctuation (2) which could drastically affect his profits but he is

also exposing his crop to risks from disease (2) and the potential for abnormal weather to which the crop is susceptible (1).

It is recommended that the farmer diversifies his crops (1), this will require identifying crops suitable for the area and which are in demand (1). Diversifying crops protects from being dependent on any one crop and protects his crops from disease (1).

Total: 30 marks

Study unit 2: Understanding adaptation in the context of climate change

Session 2.1: Understanding climate science

Activity 2.1 Individual activity: Climate science

1. Explain the following terms. (10)

Answer:

Term	Description
1. Climate	*Answer: Conditions in the atmosphere over a long period of time, specified for a large area*
2. Weather	*Answer: refers to what is happening in the atmosphere at a given time for a particular place*
3. Extreme event	*Answer: atmospheric conditions which are unexpected, unusual or severe*
4. Vulnerability	*Answer: Degree to which the environment and humans are susceptible to, and unable to cope with, adverse impacts of climate change.*
5. Persistence	*Answer: How likely it for an event to naturally end*

Total: 10 marks

Session 2.2: Climate change and agriculture

Activity 2.2 Individual activity: Adaptation challenges

1. Indicate whether the following statements are true or false. Provide a reason if false. (10)

   a. Small changes of 1–2°C in global average temperature will not result in any noticeable effects

Answer: False. These changes can have a significant effect on factors such as crop yields, rainfall patterns and other aspects related to environmental stability.

   b. There's currently no evidence that global warming is occurring

Answer: False. Student can state a number of points such: Increase in global temperature over the last 100 years, warmest recorded temperatures in the last decade, increases in sea level etc.

   c. Global warming refers to the increase in atmospheric temperatures due to the trapping of the sun's rays by greenhouse gases.

   Answer: True.

   d. Current predictions for seal level, temperature and carbon dioxide increases for 2050 are of low confidence

   Answer: False. The predictions are of a high to very high confidence level.

   e. Global warming suggests that temperatures will increase equally across the globe.

Answer: False. Refers to average temperatures, some areas may even show decreased temperatures.

Total: 10 marks

Session 2.3: Climate change and socio-economics

Activity 2.3 Individual activity: Group participation

1. Draw a line connecting the terms/statements in column A to those in column B that best match said term or statement. (5)

Term	Description
1. Social capital	A. The money a farmer has available to purchases seeds
2. Physical capital	B. A group of farmers that work together to share information
3. Human capital	C. A farmer's tools
4. Financial capital	D. The type of soil and water available to local farmers
5. Natural capital	E. A farmer's experience planting a specific crop

Answer: 1B, 2C,3E, 4A, 5D

Total: 5 marks

Session 2.4: Climate change and health

Activity 2.4 Individual activity: The implications of climate change

Read through the case study on the link between malaria and climate change from the Proceedings of the National Academy of Sciences of the United States of America (PNAS) at the following link:

http://www.pnas.org/content/111/9/3286.full.pdf

1. In your own words describe how climate change has affected malaria distribution. This exercise aims to test your ability to perform independent study and obtain relevant information from complex literature.

Answer: Learners should indicate the major risk areas of Africa, South America and Southeast Asia. Indicate how climate change specifically temperature variation will drive mosquito breeding patterns and disease distribution (of note is the ability to interpret figure 2 in the linked text).

Session 2.5: Example of an adaptation planning and implementation approach

Activity 2.5 Individual activity: Long question

1. List and describe the five steps for effective adaptation planning and implementation. (10)

Answer: Student should be able to state the five steps and mention one of the points in each step.

Total: 10 marks

Summative assessment: Unit 2

Answer the following questions in your own words.

1. Describe the difference between weather and climate. (2)

Answer: Weather normally refers to current atmospheric conditions such as rainfall and temperature for specific locations whereas climate refers to long term patterns in weather over larger areas.

2. Describe the difference between adaptive and reactive adaptation. (2)

Answer: Reactive adaptation is a response to an impact aimed at regaining stability whereas proactive adaptation refers to the process of implementing changes in the present to reduce the impact of future events.

3. Provide an example of a long term and short term extreme event. (2)

Answer: Short term: Flash floods, Long term: Drought

4. What are the two types of adaptation challenges? (3)

Answer: Adaptation measures aimed at addressing farmer adaptation to extreme events and climate variability in their region and adaptation measures aimed at the future effects of climate change.

5. Name the five types of capital related to climate change. (5)

Answer: human capital, social capital, natural capital, physical capital, financial capital

6. Is the following true or false? If false, correct the statement. (10)

   a. Financial capital includes the tools and buildings owned by individuals.

Answer: False, tools and building form part of physical capital.

    b. Increases in temperature due to climate change can result in favourable conditions for malaria carrying mosquitos.

Answer: True.

    c. The magnitude of an event determines how likely it is to occur.

Answer: False, magnitude refers to the scale and intensity of an event.

    d. Climate change and variation have the same meaning.

Answer: False, climate variation refers to medium term changes (months or seasons) in weather patterns whereas climate change generally refers to long term process (years) of either increases or decreases in specific conditions.

    e. Adaptive capacity is the ability of groups to adapt to climate change.

Answer: True.

7. List the vulnerabilities farmers are exposed to in areas with high risks of flooding. (4)

Answer:

- *Damage to structures;*

- *Loss of agricultural land;*

- *Loss of life; and*

- *The social and economic impacts caused by a forced migration of the population out of the city to flee the disaster zone.*

8. Name at least four atmospheric/climate components that will be affected by an increase in average global temperatures. (4)

Answer: Any four. Carbon dioxide levels, sea level, temperature, rainfall/precipitation, extreme events.

Total: 32 marks

Study unit 3: The role of EAS in adaptation and risk management

Session 3.1: Role of EAS in mitigating risks and uncertainty

Activity 3.1 Individual activity: The role of EAS

1. Describe the role of EAS at the farmers' level. (4)

Answer:

- *Improve risk awareness and understanding to build farmer risk management skills;*

- *Promote the sharing of information between farmers;*

- *Creation of education and training programmes to build capacity; and*

- *Programs should be aimed at building farmer independence in risk management.*

Total: 4 marks

Session 3.2: Climate and market forecasts

Activity 3.2 Individual activity: Factors in climate and market forecasts

1. List the factors that can be predicted by climate forecasts and market forecasts. (4)

Answer:

Climate forecasts:

- *Future temperatures and precipitation; and*

- *Extreme events.*

Market forecasts:

- *Future supply, demand and competition level for products; and*

- *Future trends in crop prices.*

Total: 4 marks

Session 3.3: Best practices

Activity 3.3 Group activity

Read through the document 'What do HIV/AIDS and Climate Change have in common' published by the Research programme on Climate Change, Agriculture and Food Security CGIAR. The document not only outlines the risk associated with Aids but also how many other risks were managed. As a group identify the risks posed to the communities and how they were mitigated. The document can be found at:

https://ccafs.cgiar.org/what-do-hivaids-and-climate-change-have-common#.V5T2Gfl96Uk

Summative assessment: Unit 3

Answer the following questions in your own words.

1. Complete the following table by filling in the missing adaptation strategies. You only have to include two strategies for each event. (8)

Extreme event	Adaptation strategy
Heat waves	*Answer:* • *Early warning systems based on climate forecast techniques;* • *Creating public infrastructure to address these conditions such as* • *Health care facilities in affected areas and* • *Opening cooling centres;* • *Buildings with climate control where the the public can gather to escape the heat; and* • *Public outreach/education approaches to inform the community of available assistance in case of a heat wave.*
Adaptation to drought	*Answer:* • *Public outreach/education such as* • *Supplying farmers with access to and information about drought resistant crops; and* • *Providing infrastructure to ensure there are additional water reserves stockpiled in case of droughts.*

Extreme event	Adaptation strategy

Flooding	*Answer:*
	
	 Improving infrastructure by:
	
	 • *Adopting green approaches which reduces the effect of construction projects on the local plants and wildlife and prevents the loss of ground cover;*
	
	 • *Limiting development in floodplains;*
	
	    • *Flood plains are areas close to bodies of water, such as rivers or streams, and thus with the greatest risk of flooding*
	
	 • *Moving existing building to areas above the flood level;*
	
	    • *Building protective infrastructure such as walls near rivers, storm water drains and dams;. and*
	
	 • *Preserving/restoring wetlands, as they are important natural ground cover that to reduce the impact of flood water.*

Wildfires (often noted during heat waves)	*Answer:*
	
	 • *Managing vegetation through controlled burning to reduce the amount of old, dry vegetation during dry seasons;.*
	
	 • *Creating wildfire response initiatives such as:*
	
	    • *Evacuation plans;*
	
	    • *Fire prevention/control teams;*
	
	    • *Medical response; and*
	
	 • *Creating safe zones such as shelters for those escaping wildfires.*

2. Fill in the missing sections in the following list of successful
   adaptation strategies. (5)
   • Adoption of water and energy ...2.1... practices
   • Developing local market systems
     ƒ   Improving market ...2.2… and the understanding of
         how markets operate
     ƒ   This creates a more transparent market environment
         to assist farmers in understanding the ...2.3... of their
         crops
   • ...2.4… approaches/training
     ƒ   To increase efficient use of available resources
     ƒ   To assist farmers in increasing ...2.5… through new
         farming practices and crop types (crop diversification),
         in order to improve resistance to crop price fluctuation

*Answer: 2.1 efficient, 2.2 access, 2.3 value, 2.4 Educations, 2.5
yields*

Total: 13 marks

Study unit 4: Tools for assessing risk and identifying adaptation strategies

Session 4.1: Adaptation and risk management tools

Activity 4.1 Practical activity: Investigate toolkits

During the course of your training, time should be taken to investigate the above toolkits and familiarise yourself with the tools offered.

Session 4.2: Resilience tools

Activity 4.2 Individual activity: Using the appropriate toolkits

During the course of your training time should be taken to investigate the above tools to familiarise yourself with their use.

Session 4.3: Climate and socio-economic forecast tools

Activity 4.3 Practical activity: Climate and socio-economic forecasts

Use the tools given in this section, or similar ones for your country, to look up information on climate and socio-economic forecasts for your area.

Summative assessment: Group project

Complete this assessment in groups of three or four.

1. In order to test the skills gained in this module you will be required to select a region from a list provided by your lecturer or one you have identified yourself. You will be required to:
   • Gather climate and socio-economic data on the selected region;
   • Identify risks faced by communities in the region;
   • Identify current adaptation and risk management strategies in place;
   • Suggest additional adaptation and risk management strategies; and
   • Present your findings to the rest of the class.

Requirements:
   • You will need to apply risk management and adaptation strategies discussed in this course;
   • Make use of toolkits
   • Be able to gather data from reputable sources such as those included in this module; and
   • Communicate the data effectively to the rest of the class using visualisation tools.

Total: 40 marks

Answer: See the assessment rubric below.

Criteria	Poor (0)	Improvement needed (2.5)	Acceptable (5.0)	Good (7.5)	Excellent (10)
Application of risk management or adaptation strategies	Students failed to show an understanding of risk management and adaptation strategies	Students were able to show the application of learned skills but failed to show competence in their use	Students showed the minimum skill necessary to complete the assessment criteria	Students showed a good understanding of the skills needed to complete the assessment criteria	The students mastered the necessary skills and exceeded lecturer expectations for the assessment criteria
Use of toolkits	Students have failed to incorporate toolkits in the project	Students ineffectively used toolkits	Students showed the minimum necessary skills needed to use toolkits	Students showed competence in the use of toolkits	The students were able to identify the most suitable toolkit and effectively apply it
Data gathering	Poor data used and lack of understanding of collected data	Students data gathering or interpretation fell short of that needed to evaluate risk	Students showed the minimum skill needed to identify and interpret relevant data	Students collected relevant data with minor errors in interpretation.	Students were able to collect and correctly interpret data for the task at hand
Presentation of findings	The students showed poor presentation skills and did not use appropriate visual tools. The class was unable to understand his findings	The students presented findings and used tools but the methods were not sufficient to understand their findings	Students showed adequate ability to present findings and used visual tools. The majority of the class was able to understand his findings	Students were able to convey his findings so that the class could understand it and showed a good grasp of visual tools usage	The students clearly presented the findings of his research and made effective use of visual tools. The presentation could be followed by rural farmers

Post-assessment

Complete the following pre-assessment in order to determine how much you have learnt on the topic of gender in extension.

	Question	Self-assessment				
		Low				High
1	Are you familiar with the concepts risk and uncertainty?	1	2	3	4	5
2	How confident are you in your ability to identify factors that influence risk perception?	1	2	3	4	5
3	Are you able to identify, measure and evaluate risk?	1	2	3	4	5
4	Are you familiar with the concept of climate, weather, climate change and extreme events?	1	2	3	4	5
5	How confident are you in your ability to explain the link between climate change and agriculture?	1	2	3	4	5
6	How confident are you in your ability to explain the relationship between climate change and socio-economics?	1	2	3	4	5
7	Are you able to explain how climate change affects the health of rural communities?	1	2	3	4	5
8	Are you able to list the steps needed to plan for and implement adaptation approaches?	1	2	3	4	5
9	Are you able to explain the role of EAS in mitigating risk and uncertainty?	1	2	3	4	5

	Question	Self-assessment				
		Low				High
10	How comfortable are you with explaining the role of climate and market forecasts?	1	2	3	4	5
11	Are you able to outline examples of best practices in risk mitigation?	1	2	3	4	5
12	Are you familiar with tools used in adaptation and risk managements?	1	2	3	4	5
13	How comfortable are you with resilience tools?	1	2	3	4	5
14	Are you able to use climate and socio-economic forecast tools for risk management?	1	2	3	4	5
15	How confident are you in your data collection skills and the visual presentation of collected data?	1	2	3	4	5

Answer: Learner's own answer.