

## **Exercise: Multi-criteria analysis (MCA)**

Total time: **1:30 minutes**

### **Learning Objectives:**

By the end of this exercise, participants will be able to:

- Outline key steps in carrying out an MCA
- Discuss the advantages and disadvantages of using MCA as a tool in appraisal of adaptation options.
- Conduct a simple multi-criteria analysis for adaptation options.

### **Case-study: Improving food security in Taroland**

Taroland is a tropical country, consisting of main land, coastal area and several islands. Taroland's climate is hot, with heavy rainfall, trade winds, tropical cyclones, storms, and hurricanes. More than 90% of the Taroland population lives in rural communities and are dependent on agriculture production such as local food crops, cash cropping, fishing and forest products.

Climate-induced disturbances are observed to be increasing in magnitude in the last 10 years.

Average temperature raise, changing rain patterns, decreasing rain precipitation, as well as intrusion of saline water, loss of arable land and soil due to more frequent and more severe extreme weather events are already affecting food production, putting the local communities dependent on agricultural activities in the coastal lowlands at risk and threatening the entire nation of food shortages.

Safeguarding food security for its people and securing a sustainable economic growth to alleviate poverty are of high priority for Taroland. One of the focus areas for the agricultural sector is the cultivation of an endemic taro variety, characterized by high nutritious value and a unique taste, highly praised also in other countries. This local taro is one of the main root crops traditionally consumed in Taroland and until recently, the entire domestic demand for taro was met through local production in the coastal areas. Taro is also one of the key agricultural products exported by the country. Annually, Taroland export half of its taro production, which contributes to 5% of the GDP.

In the past 3 years taro production has declined by 50% due to the negative impacts of climate change and the production was just enough to meet the domestic demand. Two stronger than usual tropical cyclones hit the country in 2016 and 2017. They swept off 20% of the arable land in coastal areas and damaged 20% more by flooding with sea water. Another 5% was lost due to climate induced pests and climate variations. It has been observed that taro pests are thriving under the higher temperatures in the past three years. Longer draught periods and less precipitation, affected not only the total volume of taro production, but also the size of the crop, making it difficult to meet the export requirements of the export partners.

In addition, the population of Taroland is increasing and is expected to double by 2028, which is also putting pressure on natural resources and land for food production, building materials, and other life support systems. With depletion of forest resources, communities are finding it

increasingly difficult to access forest products, housing materials, food, and clean water, which are all important for village livelihoods. As taro is produced mainly by women, they are expected to be disproportionately affected. Food shortage could also lead to health problems, higher mortality of infants and old people and migration.

A recent economic report showed that the demand for taro in 2028 in Taroland will double and estimated the shortage of taro in 2028 equal to the current production volume.

An interview in the local newspaper with a prominent foreign economist, claiming that the solution to ensuring food security in Taroland is the import of taro, caught the public attention and caused some unrest and critical questions to the government.

The Ministry of Finance is not happy with the proposed solution, as it will lead to loss of economic welfare. The Ministry of Environment is also not happy, because the measure does not advance resilience to the negative impacts of climate change. The Ministry of Agriculture wants to see options that will benefit local small-hold farmers, which comprise the majority of farmers in the Taroland. In response, the Council of Ministers has requested a think-tank to identify more adaptation options that can address the issues of sustained economic welfare of the country, food security, increased resilience and employment for small-hold farmers. The think-tank presented a list of alternative measures.

Your expert group was requested to (i) carry out a Barrier Analysis on the following adaptation options proposed by the think-tank and rank them accordingly AND (ii) present your recommendations to the Minister of Agriculture for decision-making on which three options to improve food security should be prioritized in the National Adaptation Planning:

- A. Import of taro
- B. Marine agriculture - development
- C. Native salt-tolerant crops – development
- D. Non-native salt-tolerant crops – introduction
- E. Genetically modified salt-tolerant crops – introduction
- F. Sea wall for land protection and restoration – construction
- G. Afforestation for land protection and restoration
- H. 'Soil schools' introduction - to help farmers understand their soil and how best to manage it for sustainable food production.
- I. Raised vegetable beds schools – to teach farmers how to grow vegetables in raised beds and use improved home gardening techniques, such as for composting
- J. Small nurseries - establishment of small nurseries to supply high quality vegetable seedlings and agroforestry planting materials, including for restoration of farms after extreme weather events

The Ministerial Committee requested your expert group to prepare recommendations for decision-making on which three options should be prioritised in the National Adaptation Planning, as the available financial resources are limited. You decided to carry out a Multi-Criteria Analysis (MCA).

The available data is insufficient and you will need to rely on estimations and assumptions, based on the expert opinion within the group or other information.

The Multi-Criteria Analysis can be conducted in various forms, depending on the circumstances and the context. For this exercise you may use the simplified worksheet provided.

Carry out a MCA on the adaptation options and advise the Ministerial Committee of the Taroland which three options to prioritise in their National Adaptation Plan.

**Instructions:**

1. Participants are grouped into 4 teams of 8-10 people. Lead Facilitator will assist with the grouping. Ensure that participants from the same country join different teams.
2. Given the limited resources, you are tasked to carry out a multi-criteria analysis on the list of adaptation options and advise the government of Taroland which three options to implement to improve their food security.
3. In your groups of 8 – 10, appoint someone to report; one person to take notes and someone to facilitate the discussion/exercise.
4. Familiarize yourselves with the Handout: MCA worksheet
5. In teams carry out the MCA. You are encouraged to follow the key MCA steps:
  - a. Agree on the adaptation objective and identify potential adaptation options (NB: this step has already been done for this exercise)
  - b. Agree on the decision criteria (refer to Unit 5 of the Participants Manual)
  - c. Score the performance of each adaptation option against each of the criteria
  - d. Assign a weight to criteria to reflect priorities
  - e. Rank the options (refer to the Exercise Handout MCA worksheet)

**Handout: MCA worksheet**

	<b>Criteria</b>	<b>Estimated cost</b>	<b>Increased taro production</b>	<b>Improved health</b>	<b>Reduced emigration</b>	<b>Summary of weighting</b>	<b>Ranking</b>
<b>Options</b>	Weights to be multiplied with standardised results						
Focus on marine agriculture for food and export.							
Increase of cultivation of native salt-tolerant crops, such as beets and coconut palm trees.							
Introduction of non-native salt-tolerant crops, such as barley, quinoa and salt-tolerant taro found on other islands.							
Expedited introduction of a genetically modified salt-resistant taro based on the local variety, which is still in an experimental phase and has not been used for food yet.							

Building of sea walls to protect the coastal area and reclaim land back from the sea overtime;							
Planting mangrove forests and other native salt-tolerant trees along the coast to protect coastal areas, reclaim land back from the sea and restore soil quality overtime;							
Growing vegetables in raised beds and improved home gardening techniques;							
The introduction of the 'soils school' extension methodology to help smallholder farmers understand their soil and how best to manage it for sustainable food production.							