Step 1: Getting started

|  |  |
| --- | --- |
| **Task 1.1**  What do you want to use the Toolbox for? | Education  Information access  Adaptation to climate change  Other \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| **Task 1.2**  What do you want to achieve by using the Toolbox? | How climate change affects me  Identify climate change risks  Decision-making to build resilience  Formulate an adaptation plan  Other \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| **Task 1.3**  Who do you want to work with on the Toolbox? | Family  Neighbours  Community  Councils  Industry groups  Iwi  Organisations  Businesses  Other \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  List of specific groups: |

Step 1 checklist

At the end of step 1 you should:

* know what climate change adaptation is and reasons for you and your organisation to adapt
* know what you would like to use the toolbox for.

Step 2: Current climate effects

|  |
| --- |
| **Task 2.1**  Write down how you currently manage your climate risk. For example:   * To manage drought you bring in water. * Have a rough evacuation plans for people and animals to move to higher ground in a flood. * Have a generator for back-up power in case of a storm. |

|  |
| --- |
| **Task 2.2**  Identify and read through any information that you have on your local climate, weather, environment, or any related information. See the Resources section as part of the Toolbox to get started. Businesses, organisations, your local council, friends and family may also be able to help.  You may want to make notes here, then use Table 2.2 in the Taskpad to record how climate and weather affect you and your business/ organisation. |

**Table 2.2**

Use the following table to record how climate and weather presently affect you and your business/ organisation (Part A is your current climate and Part B is extreme weather events).

|  |  |  |
| --- | --- | --- |
| **Part A: Current Climate** | **Opportunities** | **Challenges** |
| **Average rainfall**  **Approx. 1100mm a year** | Considerable precipitation. | Chance for drought/flooding since rainfall is not even throughout the year. |
| **Average low temperature- winter**  **Approx. 4-5°C** | A comfortable temperature for a cow is 4-20°C, so the average low temperature is within this. |  |
| **Average high temperature- summer**  **Approx. 22-25°C** |  | Very warm, with possible heat stress for livestock.  Facial eczema in hot conditions.  Animals need to be housed in the barn to prevent heat stress. |
| **Prevailing wind**  **Westerlies**  **Low average wind speed** | Slow wind speeds in winter mean that temperatures do not feel colder than they are. | Slow average wind speeds in summer mean that the wind cannot provide relief from the heat for animals.  Move cows from paddocks adjoining tall trees. |
| **Dry times**  **Jan-Feb, 75-80% of normal** |  | Possibility of drought |
| **Wet times**  **June-July, 125% of normal**  **Wet soil conditions** | Use barn to house cows to avoid flooding. | Possibility of flooding  Heavy rainfall may mean there are limited dry places for cows to lie down. |
| **Other**  **Frost- temperatures can drop as low as -3°C**  **Fog in winter**  **Hail in winter** | Cows cope well in cold weather. | Not recommended to spray fertiliser during fog/cold conditions. |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Part B: Extreme Weather Events** | **Impact** | **Critical threshold reached?** | **Opportunities** | **Challenges** |
| **Extreme temperature e.g.**  **1) 2020 heatwaves- three consecutive days over 25°C** | Some of the warmest summers in NZ. | Temperatures rose above 28°C which caused heat stress on livestock.  Also was hot enough to increase chances of facial eczema in livestock. | - | Heat stress  Facial eczema  Dehydration |
| **Extreme wind** | High winds can cause damage to property and injury to people. For example, falling trees. | Generally no, as this region has low winds except for storm events.  Need to be prepared for storms though. | Generally no need to worry about damage to property from wind, as wind speeds tend to be low. | Still need to consider storm events and large trees on the property.  Need to secure irrigators and other farm infrastructure during gusty periods. |
| **Heavy rain** | Flooding from storms in Waikato. | Yes enough rainfall was reached to cause flooding which caused water damage to the farm and injury to livestock. |  | Impact of flooding on the farm infrastructure, and limited place for cows to be located. |
| **Drought**  **e.g. dry 2020** | Dry weather/drought is becoming more frequent. | Low rainfall for 2020, which resulted in having to bring in water for livestock. |  | Water storage and feed for cows remain an issue during dry conditions. |
| **Frost/hail/snow** |  | Hail can damage crops. |  | Hail is hard to avoid, can put cows in barn. |

Step 2 checklist

At the end of Step 2 you have:

* Recognised how you manage risk and your attitude to risk
* Identified how climate and weather extremes affect your land/organisation/ business, what the consequences are, and what actions you have taken
* Identified any critical thresholds where the effects or impacts of climate and weather had a significant impact once exceeded
* Listed what further information you need and whether there are any information gaps/limits.

Step 3: Future climate effects

|  |
| --- |
| **Task 3.1:**  Find out the expected changes in New Zealand’s climate in coming decades, e.g. 2050 and 2090, and specifically for your area. Record your responses in Table 3.1.  **Task 3.2:**  Identify what assets/elements of your business/organisation could be affected by climate change. Consider any critical thresholds that could affect the assets e.g. 100mm of rain can lead to the dam breaking; a temperature of -2°C can lead to frost sensitive crops dying.  **Task 3.3:**  Assess the risk (likelihood and consequence) of each climate change effect listed in Table 3.1. Use the risk table provided in the toolbox website to estimate the risk (low, low-medium, medium, medium-high or high). |

**Table 3.1**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Climate change effect** | ***Task 3.1*** | **Expected change in climate** | A) High temperatures/more heatwaves. | B) Less frosts. | C) Increased storm events. | D) Increased rainfall. | E) More and longer dry spells. |
| **Amount of change and timeframe** | +1°C by 2050  10-20 more hot days a year by 2040. | 10-25 less frost days by 2040. | Intensity of cyclones/ex-cyclones expected to increase. | Rainfall expected change +13.6% for every 1 degree increase. | Time spent in drought is expected to double or triple by 2040. |
| **Impacts on your business/ organis-ation** | ***Task 3.2*** | **Vulnerable assets/ elements** | Livestock, land. | Livestock, crops. | Livestock, crops, property, land. | Livestock, property, land. | Land, property, livestock. |
| **Potential critical thresholds** | Temperatures higher than 20 result in livestock being more vulnerable to heat stress | Fewer frosts will mean less extreme temperatures for animals | Wind levels high enough to cause damage, significant rain for flooding to occur | Significant rain that can cause flooding. | Dry season to increase resulting in water shortages, higher fire risk |
| **Timeframe for critical thresholds** | Seasonally | Seasonally | Severity of 1 in 100 year flood events expected to increase | Seasonally | Seasonally |
| **Opportunities** |  | Increased lamb/calf survival. |  |  |  |
| **Risk** | ***Task 3.3*** | **Likelihood** | Very likely | Likely | Likely | Likely | Very likely |
| **Consequence** | Significant | Negligible | Severe | Severe | Significant |
| ***Task 3.3*** | **Risk** | High | Low | High | High | High |

**Task 3.4**

In Table 3.4 below list the climate risks (from Table 3.1 above) affecting your business/organisation – add rows to the table if you need to. Note how you could potentially manage these risks.

**Task 3.5:**

Prioritise the most significant climate risks from Tasks 3.4, using the column in Table 3.4 for ranking them by importance.

List high and low priority risks in different colours e.g. red for high risk, green for low risk.

Table 3.4:

|  |  |  |  |
| --- | --- | --- | --- |
| **Climate risks and timeframe** | **Potential risk management** | **Uncertainty/ additional resources needed** | **Priority of importance** |
| **Drought risk** | Rainwater tanks  Sprinklers  Replace grass with chicory  Feed supplementation  Focus feeding on prime cattle – sell off other cattle  Reduce the area irrigated | How much water may be required if dry spell length is also expected to occur?  Requires purchasing rainwater storage system and sprinklers  Access other water sources (groundwater, river, ponds/lakes) | High |
| **Fire risk** | Fire-break  Sprinklers | What is the best way to do this? | High |
| **Flooding risk** | Evacuation plan | Where to evacuate to for both people and animals?  Feed supplementation | High |
| **Higher temperatures/more heatwaves** | Rainwater tanks  Plant trees for shade  More watering troughs for animals  Shelter/sheds/barn homes? | Requires trees and water infrastructure. | Medium |
| **Increased tropical cyclone intensity/storm risk** | Evacuation plan  Generator for back-up power | Where is the best place to evacuate?  How to evacuate livestock in storms? | High |
| **Fewer frosts** | Increased pest risk |  | Low |

Step 3 checklist

At the end of step 3 you should have:

* an understanding of how New Zealand's climate is expected to change
* identified key climate impacts in your area and to your business/organisation
* understood your climate risk, and its importance in relation to other risks
* identified priority risks that require action
* an awareness of information gaps and uncertainties associated with the information you are using.

Step 4: What actions should you take?

**Task 4.1**

What are the possible ways you could adapt to the climate change risks you identified in Step 3. Try working with others in your area or industry to identify as many options as possible. Use Table 4.1 to record your answers.

There are many ways you can incorporate adaptation into your business or organisation, such as:

* reviewing your regular business/organisation plan and practices
* creating contingency plans for storms, droughts, floods etc.
* incorporating actions into your financial and growth plans
* taking out insurance against climate impacts
* undertaking training yourself or for your employees
* exploiting new opportunities
* offsetting losses by sharing or spreading the risk
* avoiding or reducing exposure to climate risks
* accepting the impacts, and planning ahead

Think widely at this stage, don't limit your options. Use Step 1 to help you identify options, for instance research or training, as well as actions such as changing land-use practices.

**Task 4.2**

Write down when you need to act (or not act) and prioritise your actions. Use Table 4.1 to record your answers.

You may want to consider:

* any current weather or climate related issues you are facing
* how soon (or how likely) you expect climate risks to exceed any critical thresholds
* how long it will take to plan and implement solutions - consider pathways for adapting over time
* reducing risk by modifying regular maintenance to take climate change into account
* incorporating climate considerations into long lived decisions, such as business remodelling.

**Task 4.3**

Compare the costs of acting with the impacts you avoid (or the income you might realise) to estimate the benefits of acting. Think about the level of adaptation you want, as well as the potential for under- or over-adapting. Add these to Table 4.1.

**Task 4.4**

Consider which of your adaptation options are a priority for you currently based on weighing the level of risk, as well as the cost of acting vs. the avoided impacts. You can use the action priority matrix in the Toolbox to assist you, and then prioritise your actions in Table 4.1.

Descriptions for the action priority matrix are as follows:

* **Quick wins (high impact, low effort):**are the most attractive projects, because they give you a good return for relatively little effort. Focus on these as much as you can (e.g. minimising water usage by fixing leaky taps and pipes).
* **Major projects (high impact, high effort):**these give you good returns, but they are time-consuming. This means that one major project can "crowd out" many quick wins (e.g. building a major permanent stop bank).
* **Fill ins (low impact, low effort):**Don't worry too much about doing these activities – if you have spare time, do them, but drop them or delegate them if something better comes along (e.g. building a small temporary stop bank).
* **Thankless tasks (low impact, high effort):**Try to avoid these activities. Not only do they give little return, they also soak up time that you should be using on quick wins (e.g. short-term replacement/repair of infrastructure in flood prone locations).

**Table 4.1:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Adaptation options (Task 4.1)** | **When- urgency (Task 4.2)** | **Cost of acting (Task 4.3)** | **Avoided impacts (Task 4.3)** | **Result from the action priority matrix (Task 4.4)** | **Priority for implementation plan? (Task 4.4)** |
| 1. **Updating the evacuation plan** | Plan before winter as this is the time when most extreme rainfall | Low cost | Livestock drowning/ being flooded out | Quick win | High priority |
| 1. **Plant trees for shade and shelter in summer** | Plant over this winter | Medium cost | Heat stress in livestock | Major project | Medium priority |
| 1. **Install rainwater storage system** | Next winter | High cost | Can be used in drought and hot temperatures | Major project | Medium priority |
| 1. **Facial eczema treatment and preventions** | Over winter | Low to medium cost | Reduce harm to livestock | Quick win | High priority |
| 1. **Formation of fire-break** | Within the next five years | High cost | Limit impacts of fire on farm, could save significant amounts of money, property, land and livestock if a fire were to occur. | Major project | Low to medium priority |
| 1. **Replace grass with chicory** | Over the next five years | Medium cost | Chicory has longer roots for greater access to moisture in the soil.  It is good to reduce Nitrogen leaching as well. | Quick win | High priority |
| 1. **Introduce emergency feed supplementation** | Within the next six months | Low cost | Acceptable feed when short of pasture | Quick win | High priority |
| 1. **Introduce irrigation system** | 2 years from now | High cost | Can link to rainwater storage system to cool down livestock in heat and water crops in drought | Major project | Medium priority |
| 1. **Focus feeding on prime cattle/sell off other cattle** | As required as a back-up plan | Low cost | If short on resources due to extreme events, prime cattle are prioritised | Quick win | Low priority |

**Task 4.5**

Use your responses from Table 4.1 and the rest of the Taskpad to develop your climate change adaptation implementation plan for your priority actions. A template for an implementation plan is provided in Table 4.5 below, but feel free to revise it to fit your needs.

Include ways to integrate climate adaptation into your business-as-usual activities now or over the next 12 months i.e. business/organisation planning, scheduling, maintenance, financial plans, changing management practices, new buildings, new products, training, disaster recovery, or any other management plans.

**Table 4.5** **Implementation Plan:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Priority Action(s)** | **Steps to achieve this** | **Key stakeholders involved** | **Timeframe** | **Budget** | **Additional information required** | **What success looks like** |
| **1. Install rainwater storage system** |  | Property owner, council, water storage company | 6 months | $ 60,000 | Local regulations | New water storage; climate resilience |
|  | 1.1 Identify the size of system you need |  |  |  |  |  |
|  | 1.2 Identify place to purchase |  |  |  |  |  |
|  | 1.3 Purchase the system |  |  |  |  |  |
|  | 1.4 Install the system |  |  |  |  |  |
| **2. Update the evacuation plan** |  | Neighbours, property owner | 1 month | $5,000 | Neighbours evacuation plans | Successful evacuation plan that is simple to follow |
|  | 2.1 Formulate a plan |  |  |  |  |  |
|  | 2.2 Purchase any supplies required to execute the plan |  |  |  |  |  |
|  | 2.3 Discuss with neighbours the plan so they know what will happen in an emergency |  |  |  |  |  |
|  | 2.4 Practice a drill |  |  |  |  |  |
| **3. Plant trees for shade** |  | Property owner, garden supply store | 6 months | $25,000 | Best trees for shade | Sufficient trees planted to provide shade in summer |
|  | 3.1 Determine best trees to purchase |  |  |  |  |  |
|  | 3.2 Purchase trees |  |  |  |  |  |
|  | 3.3 Plant trees |  |  |  |  |  |
| **4. Facial eczema treatment/ prevention** |  | Property owner, animal vet | 1 month but wait till spring | $20,000 |  | Prevention fungicide sprayed |
|  | 4.1 Speak to vet about best treatment/ prevention |  |  |  |  |  |
|  | 4.2 Purchase what is required |  |  |  |  |  |
|  | 4.3 Spray fungicides |  |  |  |  |  |
|  | 4.4 Treat as required |  |  |  |  |  |
| **5. Fire-break formation** |  | Property owner, neighbours | 1 year | $50,000 | Local regulations | A fire break around the farm where necessary |
|  | 5.1 Determine location and materials |  |  |  |  |  |
|  | 5.2 Install firebreak |  |  |  |  |  |
| **6. Replace grass with chicory** |  | Property owner, gardeners | 5 years | $120,000 |  | All grass on farm replaced with chicory |
|  | 6.1  Work in small sections- relocate livestock |  |  |  |  |  |
|  | 6.2  Remove grass and plant chicory |  |  |  |  |  |
|  | 6.3  Let chicory grow |  |  |  |  |  |
|  | 6.4  Bring livestock back |  |  |  |  |  |
| **7. Introduce emergency feed supplementation** |  | Supplier, property owner | 6 months | $100,000 |  | Sufficient feed supplies for 50% of animals in case of an emergency  Consider storage limits |
|  | 7.1  Purchase PKE/maize from supplier |  |  |  |  |  |
|  | 7.2  Store and use as necessary |  |  |  |  |  |
| **8. Introduce irrigation system** |  | Supplier, plumber, property owner | 1 year | $60,000 | Talk to plumber about linking up with water sources | Sprinkler system that works with and with various water sources |
|  | 8.1 Consider water sources- river, groundwater, storage pond |  |  |  |  |  |
|  | 8.2  Purchase sprinklers |  |  |  |  |  |
|  | 8.3  Install sprinklers |  |  |  |  |  |
|  | 8.4  Link sprinklers to water system/other water sources |  |  |  |  |  |
| **9. Focus feeding on prime cattle/sell off other cattle** |  | Other farm owners, property owner | Over the next five years | $1,000 | Selling cattle to other farms | Easier to manage climate change with the amount of cattle remaining |
|  | 9.1  Determine prime cattle |  |  |  |  |  |
|  | 9.2  Sell off other cattle as needed |  |  |  |  |  |
|  | 9.3  In feed shortages focus on the prime cattle |  |  |  |  |  |

Step 4 checklist

At the end of step 4 you should have:

* Decided what you want to do, based on the information you have
* Determined the timeframe for actions
* Identified possible adaptation measures, costed these (if possible) and selected priority climate risks
* Your responses should set out:
* actions you can take now to adapt to climate change
* longer-term actions to ensure you are resilient to climate change
* possible barriers to action and how to overcome them
* how you are going implement your actions and the resources needed.

# Step 5: Long-term planning and monitoring

**Task 5.1**

### Analyse your key climate uncertainties and information gaps in detail and get expert help, if needed. Ask yourself the following questions:

* **What are the key uncertainties and information gaps** in the work you have done? Consider the:
* effects of climate change in your area
* impacts on your production system
* ways to manage the impacts
* costs and benefits
* priorities
* thresholds or residual risk.

## Uncertainties regarding extent of climate change – how quickly will these major changes be seen

## Would be good to talk to other farms in the area to see if they have any ideas on how to manage climate risks

## Task 5.2

## Develop an effective monitoring and evaluation programme or include within the existing measurement systems you have. You may use Table 5.2 below as a monitoring and evaluation template, and adjust as required. It may also be helpful to go back and revise your implementation plan (Table 4.5) and other previous tables in the Taskpad, as part of the monitoring and evaluation process.

A monitoring programme should:

* Be clear about what success means for you and the actions you choose. You may need to revise this overtime.
* Describe how the review will feed back into business or organisation decisions.
* Show changes in risks (including opportunities) and options.
* Monitor sources for new information on climate change (i.e. MfE, Regional Councils, NIWA).

### **Task 5.3**

### Alter your previous responses based on your monitoring and evaluation plan, and new information you have collected.

**Table 5.2:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Previous actions**  (as per Table 4.5) | **How success was defined**  (as per Table 4.5) | **Successes achieved**  (what worked well) | **Challenges encountered**  (what didn’t work so well) | **Previous priority level**  (as per Table 4.1) | **Revised priority level**  (if applicable) | **Revised action**  (if applicable) |
| **1. Install rainwater storage system** | New water supply; climate resilience | Rainwater tank installed, used in a drought over summer | More expensive than expected | Medium | - | - |
| **2. Evacuation plan** | Successful evacuation plan that is simple to follow | Evacuation drill undertaken with moderate success | Difficult to move livestock | High | Low-Medium | Adequate evacuation plan in place but could be worth looking at moving livestock to higher ground permanently. Also need to make sure evacuation supplies like food and water is kept updated. |
| **3. 3. Plant trees for shade** | Trees planted | New trees have been planted, and are giving some shade | The trees need to grow more to give more shade | Medium |  |  |
| **4. Facial eczema treatment** | Prevention fungicide sprayed | Fungicide sprayed and prevention treatment bought and used as required | - | High | Medium | Regular spraying and treatment when required |
| **5. Fire break formation** | A fire break around the farm where necessary | First half of firebreak made | Still have a lot of this project to go, it is taking longer than expected. | Medium | Medium | Continue forming firebreak |
| **6. Replace grass with chicory** | All grass on farm replaced with chicory | Less feed shortages in a drought over summer | - | High | - | - |
| **7. Feed supplementation** | Sufficient feed supplies for all animals in case of an emergency | Cost less than expected | Determining best feed supplementation to get | High | Low | Make sure supplies kept maintained- consider expiry dates |
| **8. Irrigation system installation** | Irrigation system that works with and without water tank as necessary | - | Have delayed this project a year due to financial circumstances | Medium | High | Now there is less other work to do this is a higher priority. |
| **9. Focus feeding on prime cattle** | Easier to manage climate change with the amount of cattle remaining | Have sold 50% of the cattle intended to sell so far. | Have to reconsider feed supplements, facial eczema treatment based on present and past numbers of cattle | Low | Low | Continue selling rest of the cattle. |

Step 5 checklist

At the end of step 5 you should have:

* developed an effective monitoring and evaluation programme
* gone back through steps 1 to 4 of the Toolbox and updated any previous responses based on your monitoring and evaluation plan, and new information you have collected.

## Congratulations, you have completed the New Zealand Climate Change Adaptation Toolbox!