Farming a Sustainable Future

TEACHER GUIDE

YEAR 7-10

This resource has been developed by:

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SFIRP STORM & FLOOD INDUSTRY RECOVERY PROGRAM

Contents

NB: Please double click throughout document on underlined text to go directly to website link and/or page.

PIEFA's Storm and Flood Industry Recovery Program (SFIRP) is jointly funded by the Australian and NSW Governments under the Disaster Recovery Funding Arrangements. Although funding for this product has been provided by both Australian and NSW Governments, the material contained herein does not necessarily represent the views of either Government.

SURVEY LINKS TEACHERS, CAREER ADVISORS AND STUDENTS

- Select the teachers and career advisors weblink to complete the survey or use the QR link.

- Select the students weblink to complete the survey or use the QR link.

Your response to the survey questions will be used to continuously improve PIEFA's food and fibre education resources. Your contributions to this endeavour are greatly appreciated.

LEARNING AREAS

NSW CURRICULUM CONTENT

STAGE 5 - Science

- ES4 Science understanding influences the development of practices in areas of human activity such as industry, agriculture and marine and terrestrial resource management.

STAGE 5 - Agricultural Technology

- AG5-8 Evaluates management practices in terms of profitability, technology, sustainability, social issues and ethics.

AUSTRALIAN CURRICULUM CONTENT

YEAR 9 Design and Technologies

AC9TDE8K04 Analyse how food and fibre are produced in managed environments and how these can become sustainable.

Stage 4 and 5 ES-4, AG5-8

Agricultural Technology - Farming a Sustainable Future

Lesson Objective

Farming a Sustainable Future adopts a student-focused, inquiry-based model; a unique sequence of learning experiences for students to engage with, aligned with the ACARA curriculum and the NESA syllabus. Students will be introduced to innovative sustainable farm management techniques at Banyula Farm, Northern NSW, through the locally produced video. Students will then engage with a hands-on learning experience to enhance their knowledge about the application of new agricultural technologies by constructing their own Sustainable Kinetikit Farm Model, with complimentary questions. Ultimately, students will develop an awareness of the delicate balance of transitioning to new farming practices, whilst still ensuring the farm productivity and yields targets are achieved, enabling correlation to the importance of innovation and research in farming practices in the NSW primary industries.

Lesson Overview (1 hour lesson)

ACTIVITY 1 - Introduction to Sustainable Farming Banyula Video (10 minutes)
ACTIVITY 2 - Kinetikit Construction - Build your own Sustainable Farm Model (20 minutes)
ACTIVITY 3 - Worksheet 1 Questions and Activities (30 minutes)

Resources and Equipment

ACTIVITY 1 - Introduction to Sustainable Farming Banyula Video

1. Farming a Sustainable Future - Banyula Farm **(6m39s)** Video

ACTIVITY 2 - Kinetikit Construction - Build your own Sustainable Farm Model

1. Sustainable Farm Kinetikit Pack
2. Climate Smart Agriculture in Action (3.36m).
3. *Worksheet 1 - Farming a Sustainable Future*

ACTIVITY 3 Worksheet 1 Questions and Activities

1. *Worksheet 1 - Farming a Sustainable Future*

Stage 4 and 5 ES-4, AG5-8

Lesson Guide
Farming a Sustainable Future

The Australian agricultural landscape, including NSW primary industries, faces increasing risks from variable climatic patterns resulting in drought and floods. Farming techniques need to be innovative to adjust to variable weather patterns whilst achieving maximum yield capacity within economic, regulatory and environmental constraints. The demand for innovative technologies to ensure food security will only increase as we move through the Anthropocene – it's therefore critical to all the NSW primary industries that the next generation of farmers are equipped and ready for the challenge ahead.

This activity focuses upon sustainable and innovative farming practices. Set the scene with the students by introducing this concept and direct students to watch Farming a Sustainable Future - Banyula Farm (6m39s) which overviews modern farming practices. At the conclusion of the video, provide students with ***Worksheet 1 - Farming a Sustainable Future.***

Stage 4 and 5 ES-4, AG5-8

WORKSHEET 1

Farming a Sustainable Future

Producers are working to create sustainable farms that protect the biotic and abiotic factors of the environment to ensure productive and profitable yields from the farm for long term environmental health and economic prosperity.
Please note: The first section include assembly instructions for the Kinetikit.

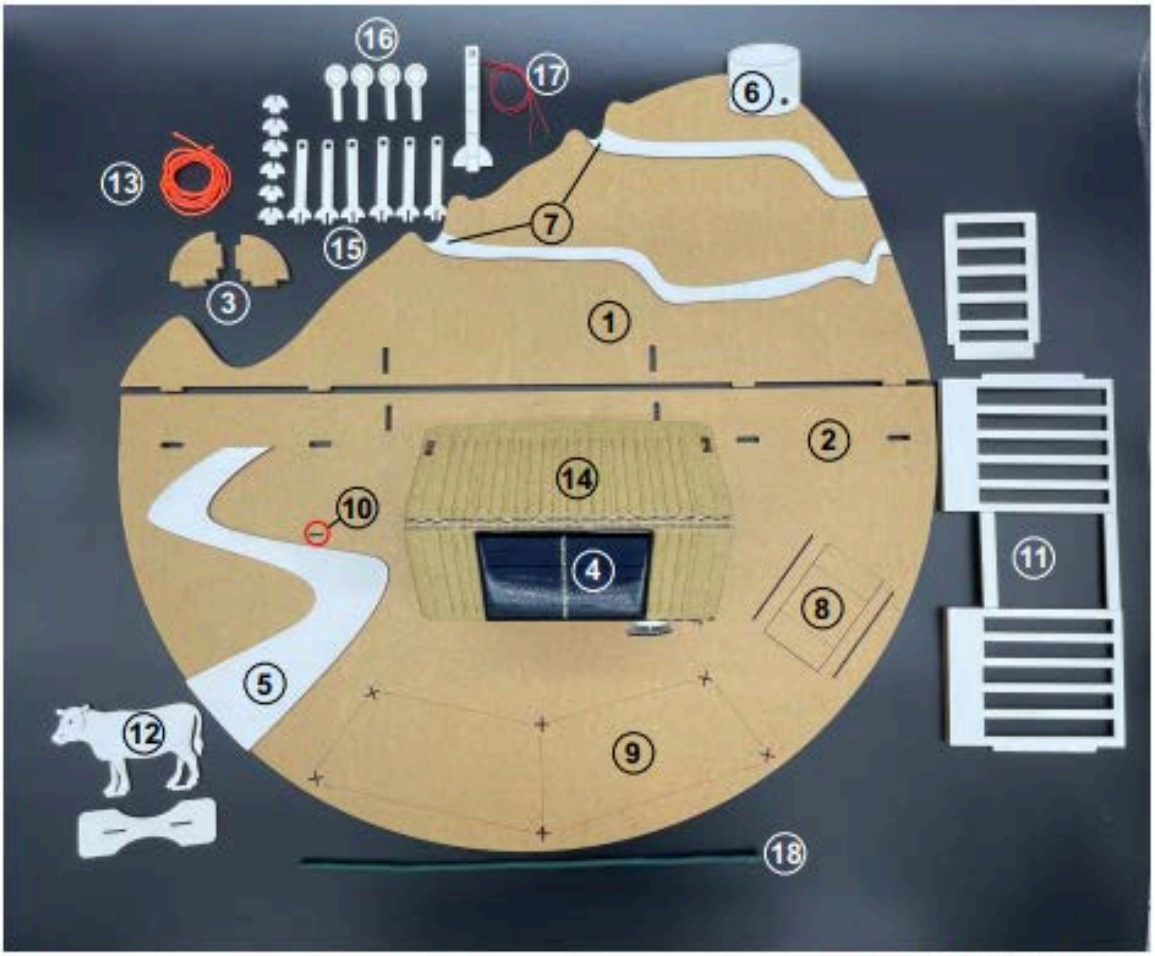
1. Construct your own Sustainable Farm KinetiKit by following the assembly instructions. Your final product should look like the image below.

Stage 4 and 5 ES-4, AG5-8

WORKSHEET 1

Farming a Sustainable Future

STEP 1 Begin to construct your own Sustainable Farm KinetiKit by setting out all the parts provided. Below is an image of the parts for assembly.



1. Hillside backdrop
2. Base
3. Backdrop supports
4. Solar Panel
5. Creek
6. Water tank
7. Swales
8. Walk over weigh Station base
9. Cell Grazing
10. Creek level Monitor slot
11. WOW Station assembly
12. Farm animal
13. Electric fence wire
14. Farm House
15. 6x fence post and base
16. 4 x Soil Probes
17. Creek Level Monitor
18. Water pipe
19. Electric Water Pump
20. 3v Solar output

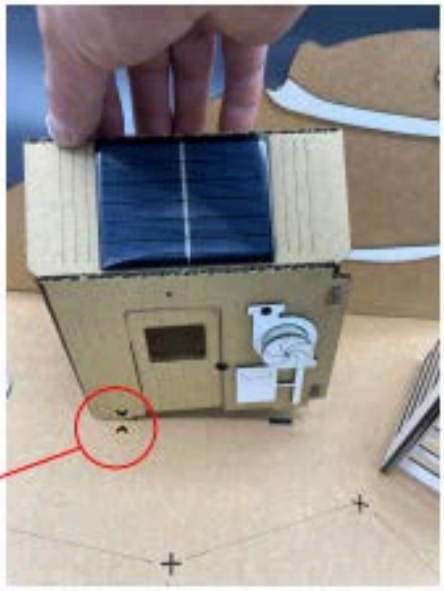
Stage 4 and 5 ES-4, AG5-8

WORKSHEET 1

Farming a Sustainable Future

STEP 2 Assemble the KinetiKit with reference to the images below.

Using parts 1, 2 and 3, slot backdrop supports into Hillside, then fit hillside to base.



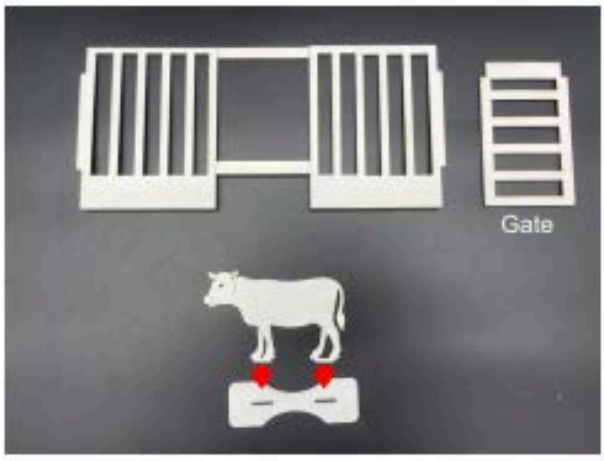
Gently fold Farm House along score lines and push together as indicated. Then place into position aligning the assembly arrows.

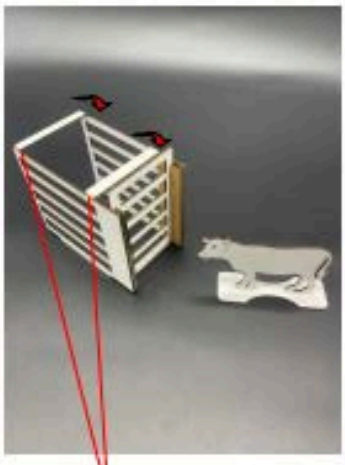
Stage 4 and 5 ES-4, AG5-8

WORKSHEET 1

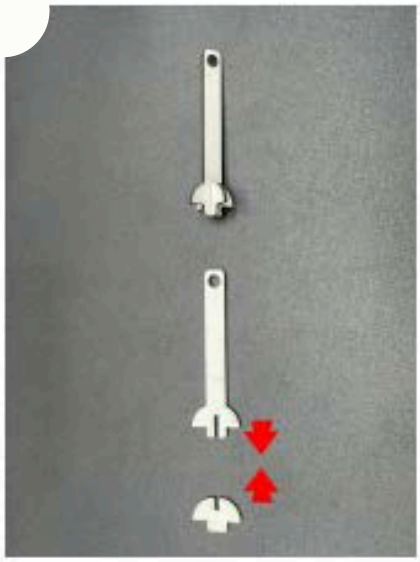
Farming a Sustainable Future

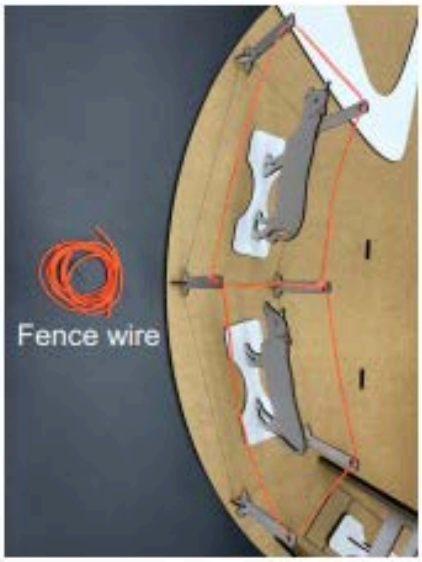
STEP 3 Assemble the KinetiKit with reference to the images below.





Next, fit the Farm Animal into its base. Fold at score lines and assemble the Walk over weigh Station. Slot it into the base applying gentle pressure as indicated. Slide Gate into top of station.





Assemble the 6 fence posts and fit them into the cross shaped slots. Next, thread the electric fence wire through fence posts, forming 2 grazing cells.

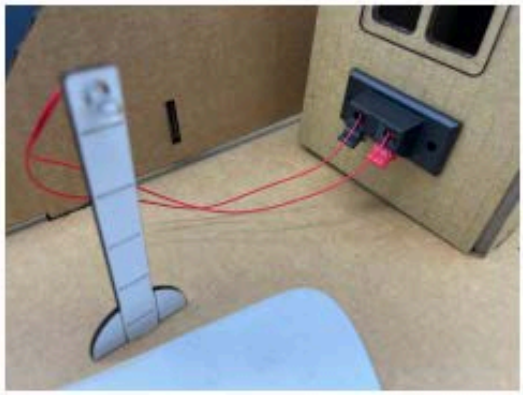
Product disclaimer. KinetiKits accepts no responsibility for any accidental injury incurred during assembly and while using KinetiKits products.

Stage 4 and 5 ES-4, AG5-8

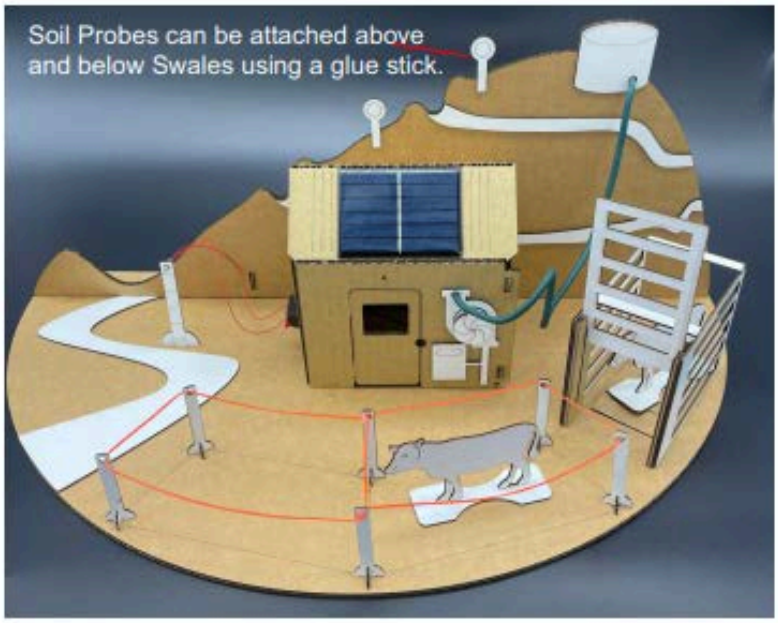
WORKSHEET 1

Farming a Sustainable Future

STEP 4 Assemble the KinetiKit with reference to the images below.



Fit the Creek Level Monitor into slot (10) then connect the wires to the 3v Solar output.
Finally, connect the water pipe (18) to the Water Pump (19) and Water tank (6)



Your complete Farm Model

When model is placed in full sunlight, Water pump spins and Creek level Monitor lights up.
(Model will also operate under a 75 Watt heat lamp)

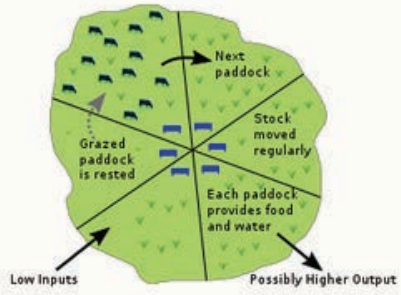
Now that you have built your Sustainable Farm Model, let's investigate the benefits of different farm practices and WHY farm management techniques are constantly evolving to mitigate the adverse effects caused by climate change. You will need a digital device to conduct research to respond to the following questions (smartphone/laptop - check with your teacher).

Stage 4 and 5 ES-4, AG5-8

WORKSHEET 1

Farming a Sustainable Future

2. Research and describe the following grazing methods: set stocking, rotational grazing and cell grazing. Identify and explain one other method of providing feed for livestock on a farm. Support your research by accessing the **Grazing Strategies** and **Rotational Grazing** websites and observing the image below.



- What are the factors to consider when deciding in the best type of grazing?

- How can a farmer use a soil probe indicator to inform decision making with respect to rotational grazing? Investigate how knowledge of available pasture and pasture growth rates can help this process. Please read the information and investigate how knowledge of available pasture and pasture growth rates can help this process. Please see information at **Moisture storage vital for reliable pasture establishment during a dry year** website to help in your response to this question.

Stage 4 and 5 ES-4, AG5-8

WORKSHEET 1

Farming a Sustainable Future

3. Why do farmers need to adjust stocking rates to counter seasonal (weather) conditions? In your response, access the **Tactical Grazing Management** and the **MLA Stocking Rate Calculator** websites.

4. Observe the images above showing tillage and describe what zero tillage is and the advantages of this farming technique. How can pasture improvement with a no seed till air seeder of planting diverse pasture species (such as chicory) help to achieve a sustainable outcome for the farm? Please access **How cultivation affects soil (nsw.gov.au)** to help with your response.

- Which section on the Sustainable Farm KinetiKit do your think represents zero tillage?

Stage 4 and 5 ES-4, AG5-8

WORKSHEET 1

Farming a Sustainable Future




5. The images above include swales, an air seeder and fertiliser. What are the benefits of slowing water across the surface as a management technique on a farm? Write a brief summary and draw a diagram as part of your response, and research what Natural Sequence Farming is by accessing the website **Natural Sequence Farming (nsfarming.com)** to help summarise your understanding.

Stage 4 and 5 ES-4, AG5-8

WORKSHEET 1

Farming a Sustainable Future

6. Match the numbered label to the images showing sustainable practices at Banyula Farm. Where can you identify these practices on your Sustainable Farm Model?

1. Creek side erosion and replanting
2. Native food cropping suited to the local environment
3. Dripline irrigation
4. Riparian revegetation
5. Waterway hardening and improvement
6. Runoff and harvast





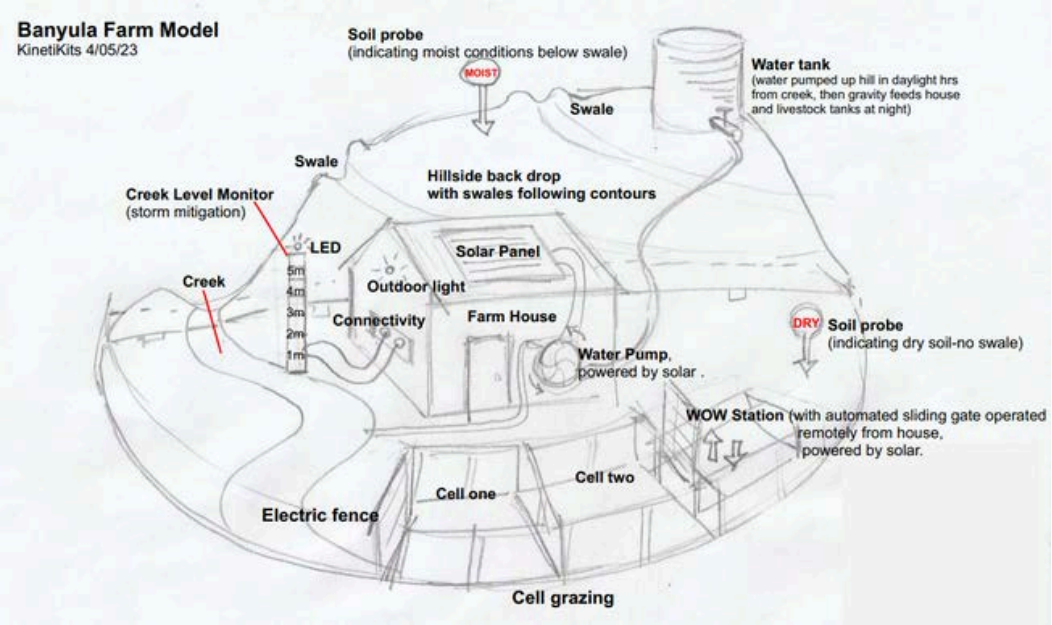
Images from Banyula Farm

Stage 4 and 5 ES-4, AG5-8

WORKSHEET 1

Farming a Sustainable Future

The following schematic describes the Banyula Sustainable Farm Model and shows the different elements on the farm, including practices that are undertaken to ensure productivity and sustainability of the enterprise into the future.



7. Watch the video **Climate Smart Agriculture in Action** (3.36m). Why is it important for farmers to implement sustainable farm management practices? How will this help ensure a prosperous future for our agricultural industry? In your response, observe the schematic image above; what sustainable initiatives can you see?

Stage 4 and 5 ES-4, AG5-8

WORKSHEET 1

Farming a Sustainable Future

2. Research and describe the following grazing methods: set stocking, rotational grazing and cell grazing. Identify and describe one other method of providing feed for livestock on a farm. Support your research by accessing the **Grazing Strategies** and **Rotational Grazing** websites and observing the image below.

- Set stocking describes the practice of grazing livestock in a paddock for an extended period.
- Rotational grazing describes the practice of rotating livestock through a series of paddocks.
- Tactical grazing uses a range of grazing methods including set stocking and rotational grazing throughout a single year or series of years, to meet different animal and pasture objectives. This allows a balance to be struck between feed supply and the demands of various classes of livestock for growth rate, reproduction and maintenance.

Another method of grazing includes:

- Creep grazing is a form of grazing in which smaller animals are allowed to go (creep) from one pasture to another through openings in a fence. The openings are small enough to restrict the passage of larger animals to the creep pasture.

- What are the factors to consider when deciding on the best type of grazing?

The best type of grazing system for a particular farm will depend on a number of factors, including the size of the farm, the type of livestock being raised, and the desired level of production.

- How can a farmer use a soil probe indicator to inform decision making with respect to rotational grazing? Investigate how knowledge of available pasture and pasture growth rates can help this process. Please read the information at **Moisture storage vital for reliable pasture establishment during a dry year** website to help you respond to this question.

Farmers use soil probe indicators to determine when and how grazing will occur on their farm, depending on the value of soil moisture content, pH and other factors that influence farm productivity.

Stage 4 and 5 ES-4, AG5-8

WORKSHEET 1

Farming a Sustainable Future

3. Why do farmers need to adjust stocking rates to counter seasonal (weather) conditions? In your response, access the **Tactical Grazing Management** and the **MLA Stocking Rate Calculator** websites.

Farmers adjust stocking rate to seasonal conditions to ensure that there is enough forage for their animals to eat. Stocking rate is the number of animals per unit area of land, and it is important to adjust this rate based on the amount of forage production in a given season. Forage production is influenced by a number of factors, including weather, soil type, and plant species. In dry years, there is less forage production, so farmers need to reduce their stocking rate. In wet years, there is more forage production, so farmers can increase their stocking rate.

4. Please observe the images above showing tillage, and describe what zero tillage is and the advantages of this farming technique. How can pasture improvement with a no seed till air seeder of planting diverse pasture species (such as chicory) help to achieve a sustainable outcome for the farm? Please access **How cultivation affects soil (nsw.gov.au)** to help with your response.

Zero tillage is a farming practice that involves planting seeds directly into the soil without first tilling it (tilling is the practice of turning over the soil, which breaks up the soil, aerates it, and helps to control weeds). Zero tillage has several advantages over conventional tillage, including reduced soil erosion, improved water conservation, increased crop yields and reduced greenhouse gas emissions.

Planting diverse pasture species can increase crop yields. For example, companion herbs, such as chicory and plantain can improve infiltration because of the taproot that breaks up compressed soils, with an organic appeal of this option to combat issues associated with infiltration. The tap roots in these types of herbs allow access to deep soil minerals, which can support grazing animals in hard/dry environments. Herbs offer high nutritional quality and production and can enhance permanent pastures.

- Which section on the Sustainable Farm KinetiKit do your think represents zero tillage?

Minimal or zero tillage is represented in cell 1 and 2 on the Sustainable Farm KinetiKit and grazing cell undertaking a pasture improvement cycle of planting diverse pasture species such as Chicory.

Stage 4 and 5 ES-4, AG5-8

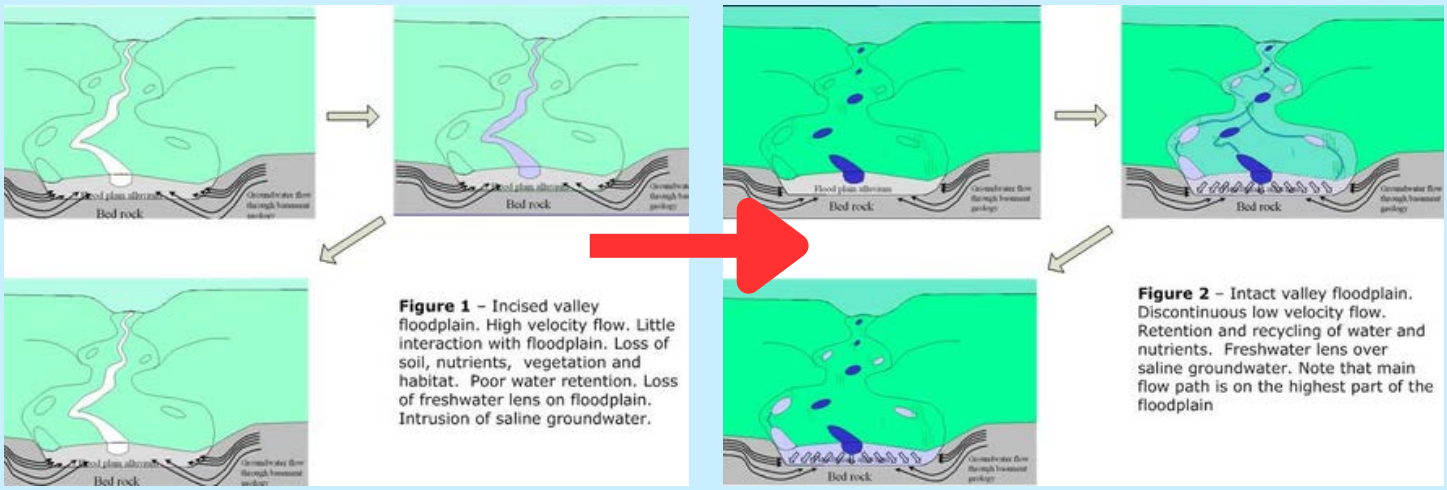
WORKSHEET 1

Farming a Sustainable Future




5. The images above include swales, an air seeder and fertiliser. What are the benefits of slowing water across the surface as a management technique on a farm? Write a brief summary and draw a diagram as part of your response, and research what Natural Sequence Farming is by accessing the website **Natural Sequence Farming (nsfarming.com)** to help summarise your understanding.

Natural Sequence Farming (NSF) is a holistic approach to land management that aims to mimic natural processes and systems in order to improve soil health, water quality, and productivity. An example of NSF is slowing water flow. One of the benefits of slowing water across a surface with swales and contour row plantings is that you retain nutrients in the soil for longer allowing plants to access them as needed instead of it rushing off into watercourses. A NSF harvest growth at the bottom of a slope and returns it to the top as a compost which starts the nutrient cycle again exemplifies a sustainable farming technique.



Images / figures from nsfarming.com

Stage 4 and 5 ES-4, AG5-8

WORKSHEET 1

Farming a Sustainable Future

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1

2

3

4

5

6

Images from Banyula Farm

Stage 4 and 5 ES-4, AG5-8

WORKSHEET 1

Farming a Sustainable Future

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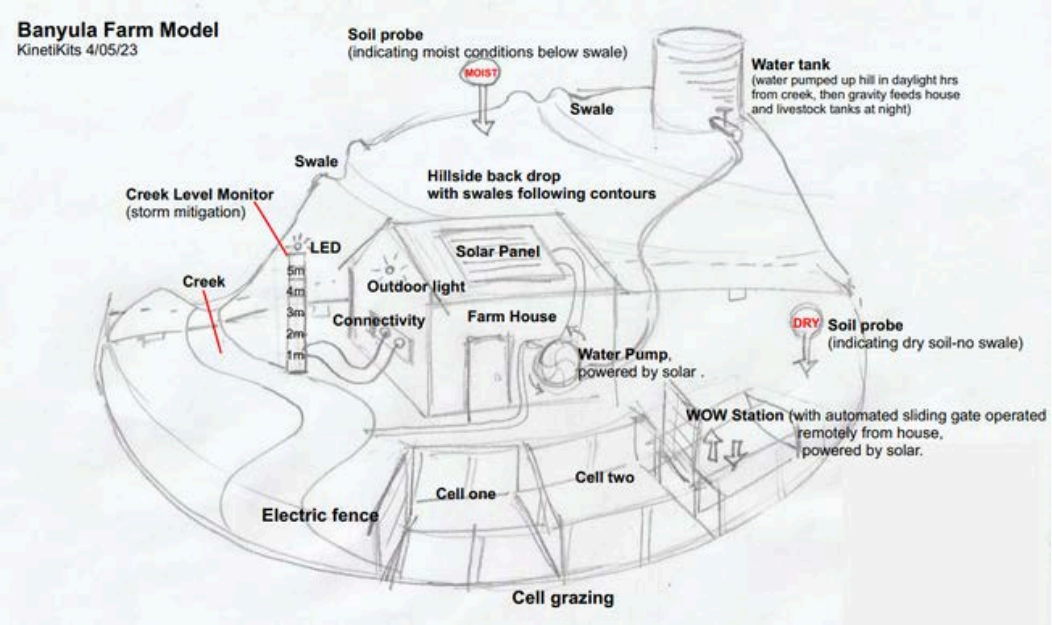

7. Watch the video **Climate Smart Agriculture in Action (3.36m).** Why is it important for farmers to implement sustainable farm management practices? How will this help ensure a prosperous future for our agricultural industry? In your response, observe the schematic image above; what sustainable initiatives can you see?

The Australian agricultural landscape, including NSW primary industries, face increasing risks from variable climatic patterns resulting in drought and floods. Farming techniques need to be innovative to adjust to variable weather patterns while achieving maximum yield capacity within economic, regulatory and environmental constraints. The demand for innovative technologies to ensure food security will only increase as we move through the Anthropocene – it's therefore critical to all the NSW primary industries that the next generation of farmers are equipped and ready for the challenge ahead. It is important for farmers to implement sustainable management practices on their farms, such as:

- maintaining biomass/cover with rotational grazing,
- adjusting stocking rate to seasonal conditions,
- natural sequence farming to slow flow with swales and contours minimal or zero tillage,
- pasture improvement.

This will help the farm to be resilient and adaptive to the changing environment ahead. The Sustainable KinetiKit Model uses renewable solar energy, implements Natural Sequence Farming, swales and contours, employs soil probes to understand soil health and captures rainwater.

Stage 4 and 5 ES-4, AG5-8

REFERENCES

Farming a Sustainable Future

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