LESSON 5

The Circular Economy and Modern Agriculture

ELLEN MACARTHUR FOUNDATION

LESSON FIVE:

The Circular Economy and Modern Agriculture

Leontino Balbo

“The biggest challenge is to change people’s minds because the man emancipated himself from the nature rhythms, so we lost a big and important part of ourselves which is the capacity of perceiving ourselves in the environment.”

This lesson is part of a series that introduces students to a different way of thinking about how our economy could work: a circular economy. The series builds up exactly how a circular economy is different from the status quo, and looks at the economic, environmental and social advantages of a new approach.

The series looks like this:

- (1/5) Challenging common conceptions
- (2/5) Exploring the circular economy
- (3/5) Understanding the challenge of ‘finite’ resources
- (4/5) Designing for a circular economy
- **(5/5) The circular economy and modern agriculture**

Subject: Economics, Geography, Environmental Systems, Biology, Chemistry

Age range: 12-19 years

Total time: 45-70 minutes

Learning Outcome:

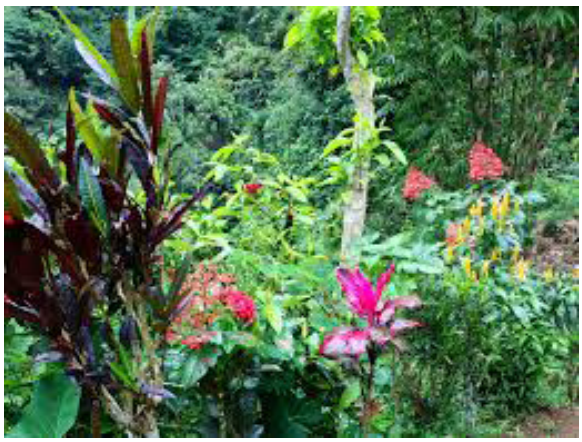
- To understand the challenges around conventional monocultures and soil quality
- To explore the importance of seeing the whole system when designing solutions
- To critically evaluate the challenges in modern agriculture and securing food supply for the future.

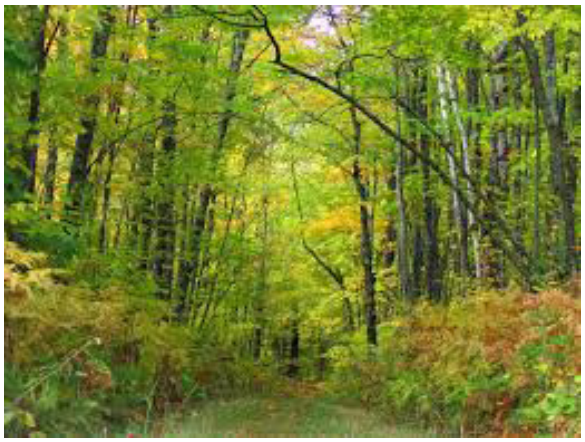
Preparation:

- Read the summary of the basic ideas behind a circular economy as attached in Appendix 1
- Set up projector/video screening facilities
- Prepare somewhere at the front of the class to write up students' responses
- Print out copies of the video questions in Appendix 2 to watch on youtube, or allow students to access Educanon, and watch the video with questions there. (Please allow for some time creating your free playposit account and get to know the blended learning feature, where you can capture students answers)

INTRODUCTION – 15 MIN

Start the lesson by showing the students two images: one of a healthy, rich and diverse forest and one of a monoculture crop.





Ask the students about what they see. What do these systems have in common? What are their differences? Elicit a conversation about monocultures in agricultural production.

Ask students (in pairs or groups) to draw up a list of advantages and disadvantages of monocultures.

Then ask the students: Can you think of a way in which the shortcomings of conventional monoculture farming could be combated?

Some guidance is provided below, but please follow the instructions included in the PowerPoint, 'Designing for a circular economy'

CASE STUDY

Growing Sugar Cane in Brazil – a case study – 25 min

Now show the video: https://youtu.be/G-pr0cYzuDQ of the sugar cane farmer Leontino Balbo, explaining his journey in developing a restorative and regenerative approach to sugar cane monoculture farming. In order for the students to get an uninterrupted impression of Balbo's story and the ideas around resource constrains, watch the video as a whole without interruption.

LEARNING ACTIVITY

Deep Dive – 25 min (Also ideal for Homework)

Play the video again.

This time use this link: http://www.playposit.com/delivery/186291/372903, which displays questions to help reinforce prior learning or use the printable version in Appendix 2.

Note: Educanon's playposit will allow you to collect and review students' responses electronically.

TAKE ACTION

Preserving diversity of life on land – 10 min

Can you think of another agricultural product that is grown in monocultures resulting in soil depletion? What could farmers of this product learn from Balbo's story?

Ask students to imagine they have the chance to interview one of the farmers of their chosen product and make a list of 10 questions they would ask to stimulate the farmer's thinking about his/her growing and harvesting techniques.

Now that students have explored some of the major arguments for taking into account the whole system when designing solutions in food production,

you can help students deepen their understanding by encouraging them to explore the circular economy from different subject perspectives. For more resources on this, go to **the circular economy teaching resource map:** https://kumu.io/ellenmacarthurfoundation/educational-resources

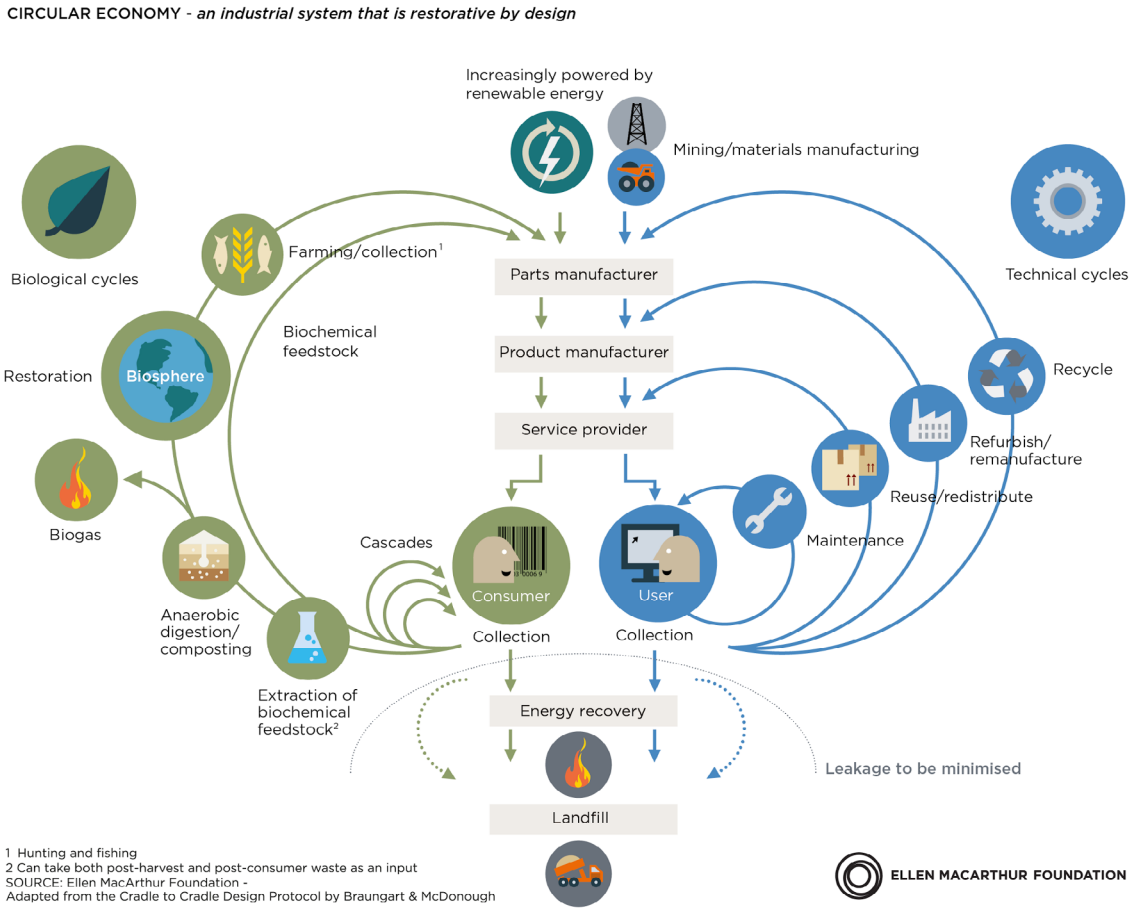
APPENDIX 1: OVERVIEW OF A CIRCULAR ECONOMY

The circular economy refers to an industrial economy that is restorative by intention; aims to rely on renewable energy; minimises, tracks, and hopefully eliminates the use of toxic chemicals; and eradicates waste through careful design.

The term goes beyond the mechanics of production and consumption of goods and services, in the areas that it seeks to redefine (examples include rebuilding capital including social and natural, and the shift from consumer to user). The concept of the circular economy is grounded in the study of non-linear, particularly living systems.

Watch this short animation to learn more: https://youtu.be/zCRKvDyyHml

A major outcome of taking insights from living systems is the notion of optimising systems rather than components, which can also be referred to as 'design to fit'—by analogy, the tree is nothing without the forest. It involves a careful management of material flows, which in the circular economy are of two types as described by McDonough and Braungart (Cradle to Cradle, Re-making the way we make things): biological nutrients, designed to re-enter the biosphere safely and build natural capital; and technical nutrients, designed to circulate at high quality without entering the biosphere.



As a result, the circular economy draws a sharp distinction between the consumption and use of materials. In a circular economy there is a need for a 'functional service' model in which manufacturers or retailers increasingly retain ownership of their products and act as service providers, selling the use of the products, rather than the products themselves. This shift has direct implications for the development of efficient and effective take-back systems. It also requires changes in product design and business models to generate more durable products that are designed for disassembly and remanufacture or refurbishment.

Visit www.ellenmacarthurfoundation.org to learn more about what we do and learn about our vision for a circular economy.

This lesson was produced by the Ellen MacArthur Foundation. The Ellen MacArthur Foundation works with business, government and academia to build a framework for an economy that is restorative and regenerative by design.

We have produced a number of educational resources which are free to download from www.ellenmacarthurfoundation.org

If you have any suggestions, questions or feedback about these lesson plans, or just want to get in touch with the Schools and Colleges team, please email info@ellenmacarthurfoundation.org*. You can also sign up to the Schools & Colleges Programme Newsletter to* join our community *and stay in touch.*

APPENDIX 2: WORKSHEET QUESTIONS FOR THE VIDEO

1. What is Leontino Balbo's profession and which approach to agriculture has brought his company recent success?
    - He is a farmer and changed to sugar-beet sugar production.
    - He is an agronomist and transformed his business with a revitalising approach to agriculture.
    - He is an executive and pursued conventional practices in sugar cane farming with great success.
2. Why did Balbo think that a new 'cleaner' approach to sugar cane harvesting was necessary?

3. Once Balbo had implemented 'green cane harvesting', he turned his mind to eliminating chemical fertilisers and pesticides from the production process as well. Why did he care? Why was this important?

4. To find ways of eliminating chemical fertilisers and pesticides, Balbo turned to nature. In what ways can we be inspired by nature in improving our own systems? Can you see any limits to nature's example?

5. How did Balbo's innovations manage to bring the soil to a fertility class higher than before any agricultural practices started?
    - He ensured that the plants received enough water through irrigation systems.
    - He ensured that a specific fungus would remain in the soil even after the harvest.
    - He planted the sugar cane closer to each other so that the roots would build an internet of the soil.
6. What does modern agricultural practice mean for Balbo? Would you agree? Why/why not?

7. Balbo is proud that his practices have extracted 45,000 tonnes of CO2 from other activities of the economy, making his company not just carbon-neutral but 'carbon-sync'. How important do you consider such an attitude and practice for the economy as a whole? And for our future?

8. How did scientists prove that regenerative and restorative agricultural practices have overturned the scientific paradigm that monocultures are bad for biodiversity?
    - They used quantitative indicators counting the number of non sugar cane plants able to grow around the field.
    - They used so-called biological indicators, looking for the kind of species that occur in and around the sugar cane field that have complex demands on their environment.
    - They used a comparative approach, comparing the number of organisms in the soil in Balbo's fields to the number in conventional sugar cane farms.
9. From Balbo's explanation, what did you learn about resilient business models? What is the danger for business models that are not resilient?

10. Balbo believes that the biggest obstacle to change is people's perceptions. Do you agree? Why/Why not?