**The relationship between agriculture and lifestyle**

**Pillar 4 D. Identify how agricultural products can contribute to a healthy lifestyle**

(9th – 12th Grade)

|  |
| --- |
| **Website**: <http://www.discoveringfarmland.com/lessons>  <http://www.nourishlife.org/teach/curriculum/>  **Hands On**: <http://www.agclassroom.org/teacher/matrix/lessonplan.cfm?lpid=582>  **Video:** [7 Billion: How Did We Get So Big So Fast?](https://www.youtube.com/watch?v=VcSX4ytEfcE)  [World Population](https://www.youtube.com/watch?v=khFjdmp9sZk&feature=youtu.be)video/animation |

**Journey 2050 Lesson 1: Introduction to Sustainable Agriculture**

**Purpose**

Students will explore and understand the core question, “How will we sustainably feed 9 billion people by the year 2050?” and begin to think about the challenges and opportunities presented by this question. Students will explore factors such as expected population growth, food waste, and various positive and negative factors impacting sustainable agriculture.

**Materials**

* *Introduction to Sustainable Agriculture* PowerPoint
* [Journey 2050 Introduction video](https://www.youtube.com/watch?v=42JEkYvi4cc)
* Sustainability Farming Game: Level 1 Demo
  + [Download App](http://www.journey2050.com/play-the-game/)
  + *Optional:* [Create Free Teacher Account](http://journey2050.rnp.io/teachers/sign_up) to track student progress and print reports.
* Computer or tablet device for each student
* *Optional:* Student Handout 1: World Population Growth

**Essential Files (maps, charts, pictures, or documents)**

* [Glossary of Terms](http://naitc-api.usu.edu/media/uploads/2017/04/12/0-J2050_Glossary_of_Key_Terms.pdf)
* [Introduction to Sustainable Agriculture PowerPoint](http://naitc-api.usu.edu/media/uploads/2017/04/12/1-J2050_Lesson_1.pptx)
* [Optional Student Handout: World Population Growth](http://naitc-api.usu.edu/media/uploads/2017/04/12/1-J2050-Student_Handout_1-World_Population_Growth.pdf)
* [Teacher's Guide: Getting Started](http://naitc-api.usu.edu/media/uploads/2017/04/12/0-J2050_Getting_Started.pdf)

**Vocabulary**

**Sustainable:** meeting the economic, social and environmental needs of the present without compromising the needs of the future

**Sustainable agriculture:** using best farming practices to grow the most food and fiber on the land for long term economic, social and environmental success

**Did you know? (Ag Facts)**

* Sustainable agriculture is critical in the global effort to eradicate hunger and poverty.
* Hunger is often caused by food waste and inequality of distribution, not scarcity.
* There are an estimated 1.4 billion7 people living in extreme poverty and about 870 million people that are hungry, malnourished and food insecure (have difficulty acquiring food).
* Unfortunately, about one-third8 of our current global food supply is wasted. In developed countries food is thrown out and over consumed, and in developing countries food is lost to unreliable storage and transportation.

**Background Agricultural Connections**

Journey 2050 takes students on a virtual simulation that explores world food sustainability and answers the question, "How will we sustainably feed over 9 billion people by the year 2050?" The lesson plans and online simulation program allows students to make decisions on a virtual farm and witness their impact on society, the environment and the economy at a local and global scale. The lessons engage students with the important concepts regarding sustainable agriculture. The online simulation contextualizes these concepts as students experience the lives of three farm families in Kenya, India and Canada. As students interact with each family, they learn the role of best management practices in feeding the world, reducing environmental impacts and improving social performance through greater access to education, medical care and community infrastructure. These six lessons can be taught individually or as an entire unit.

**Interest Approach – Engagement**

1. Project the *Introduction to Sustainable Agriculture* PowerPoint. Begin with slide 2 and ask your students, “How much is 1 million?” Allow students to offer their answers as they begin visualizing the quantity and value of 1 million. Then ask, “If I spent $1000 every day, how long would it take me to spend 1 million dollars?” *(2.7 years, or 1,000 days)*
2. Once students seem to grasp the value of 1 million, move to slide 3 and ask, “If I spend $1,000 every day, how many days would it take to spend 1 *billion* dollars?” *(1,000,000 days or 2,740 years)*
3. Now that your students are beginning to visualize the sheer quantity of 1 billion ask, “What is the current world population right now?” *(over 7 billion).* Follow up by asking, “Do you know what the world population is projected to be in the year 2050?” *(over 9 billion).*
   * Optional: If time allows, use one of the following activities to help students further visualize and understand the growth trends in world population:
     + Show the [World Population](https://www.youtube.com/watch?v=khFjdmp9sZk&feature=youtu.be)video/animation (5:46 min)
     + Show the [7 Billion: How Did We Get So Big So Fast?](https://www.youtube.com/watch?v=VcSX4ytEfcE)Video (2:33 min)
     + Have students complete the attached *Student Handout: World Population Growth*.

**Procedures**

**Preparation:** Prior to class, review the *Background Information*, video clip, and PowerPoint slides (including the speaker notes) associated with the lesson. Read the [Teacher's Guide: Getting Started](http://naitc-api.usu.edu/media/uploads/2017/04/12/0-J2050_Getting_Started.pdf) document paying particular attention to page 2 where you will find the instructions for downloading the *Sustainability Farming Game*.

**Activity 1: Introduction to Sustainable Agriculture**

1. **Journey 2050**
   * Slide 4: Play the [Journey 2050 Introduction](https://www.youtube.com/watch?v=42JEkYvi4cc)video, (3:51 min). Prepare students for the video by asking them to discover three things: 1) Why is 2050 a significant year? 2) What is the sustainability barrel? and 3) What is the ripple effect? (Background and discussion prompts are outlined in the steps below and in the PowerPoint notes.)
2. **Why 2050?**
   * Slides 5–6: Ask students, “If it is [insert current year] right now, how many years until we reach the year 2050?” Then ask, “How old will you be in the year 2050?” Explain that scientists and world leaders have identified 2050 as a key moment in time when the world’s population will be approximately 9 billion—that is 2 billion more than today. Point out to students that they will be adults! They will have an influence on the decisions that impact everything from what is taught in schools to what they buy at the grocery store.
   * Slide 7: Ask students to identify some of the resources that we will need more of in order to provide for 2 billion additional people on Earth. Brainstorm and list several items on the board. Use questioning to help students identify items such as food, clothing, shelter, fuel, jobs, medicine, etc. Remind students of all the products they get from agriculture (food, fiber, fuel, timber, medicines and by-products that are used in manufacturing or end up in items such as lipstick, paint and batteries). Explain that farmers and many other agricultural professionals are responsible for producing each of these daily necessities.
   * Slide 8: Explain that in order to feed 2 billion additional people, it is predicted that farmers will need to produce 60 to 70 percent more food than we currently produce today on the same amount of land or even less.9 Ask, “Will this goal of sustainable agriculture be easy to accomplish? Will the pressure on farmers increase, decrease or stay the same?” As students are thinking and offering answers, draw their attention back to the *Interest Approach* at the beginning of the lesson, picturing an additional 2 billion people that agriculture must feed. Students should conclude that farmers will have increased pressure to produce more food and fiber for a growing population.
     + Before moving on, formatively assess students to ensure they understand the term *sustainability*.
3. **What is the sustainability barrel?**
   * Slides 9–10: Tomorrow’s farmer will have to feed even more people. It is estimated that by 2050, our growing population will require the equivalent of all the food grown in the last 500 years.10 That’s a lot of food! Ask, “Do farmers have limitations to how much they can produce?” As students think about the answer to this question, give an example of a corn farmer with 100 acres. Can this farmer take their same land, soil, corn seeds, water and tractors and double their crop from one year to the next simply because there is a demand for more corn? No, there are limitations if a farmer wants to produce agricultural goods in a sustainable manner.
   * Slide 11: Ask students to picture a wooden barrel made up of several wooden slats. Explain that we are going to call it a *sustainability barrel*. Each wooden slat of the barrel represents a factor influencing sustainable agricultural production. Each factor can be placed into one of three challenges to sustainable agriculture—producing sustainably while maintaining economic, social and environmental systems. For example, in order to be able to grow enough food to feed the world sustainably, we have to make sure that farmers are able to earn a profit, that communities have access to education and healthcare, and that the soil stays healthy and we don’t destroy habitats.
   * Slide 12: Ask students, “What are some examples of limiting factors?” *(water, available land, soil health, climate, economy, education, etc.)* Ask students to explain how each factor influences our ability to produce our food. Remind students that we must continually improve the weakest part of our sustainability, whether it is education or soil health. They all impact our ability to feed the world. A community or program is only as successful as its least developed sustainability factor.
4. **What is the Ripple Effect?**
   * Slide 14: Ask, “Can a single drop of water impact an entire body of water?” *(Yes, it creates a ripple.)*
   * Slides 15–16: Use these slides to illustrate how sustainable practices in agriculture can create a positive ripple effect.

**Activity 2: *Sustainability Farming Game* Level 1 Demo**

1. Slides 17–18: Inform students that they are about to embark on a “Journey to 2050.” There are many challenges that lie ahead, but they will focus on tackling the following for now: plant nutrients, water, economies, geography, land use and careers. Inform students that they will be using a game to farm virtually in different parts of the world. Along the way they will learn more about where our food, fiber (clothing and shelter) and fuel comes from and how farmers can sustainably produce these items for a growing population.
2. Introduce the *Sustainability Farming Game*. Inform students that they will experience the lives of three actual farm families in Kenya, India and Canada. As they interact with each family, they should pay attention to the farming practices they choose, the technology they use and the community investments they make. Remember, agriculture is the foundation for life, and its success creates ripples locally and globally that will determine whether we meet the challenge of feeding the world.
3. Write on the board a reminder of what the sustainability barrel includes:
   * Social: food, education, infrastructure, healthcare
   * Economy: profits, income, jobs, community
   * Environment: habitats, soil health, water, greenhouse gases
4. Open the *Sustainability Farming Game* Level 1 Demo on each student’s computer or device.
5. Explain that the sustainability barrel will determine their score, and help students understand the significance of balancing the social, economic and environmental pillars of the sustainability barrel throughout the game (e.g., investments in soil health produce better crops, earning more money; investments in roads allow products and people to travel easier, improving access to markets and labor).
6. Explain to the students that it is very important that they listen to you as they will have to stop and wait every time they finish a level. Every student must start and end the game (roughly) at the same time to ensure your class time flows smoothly.
   * Note to teacher: The first level is a demonstration of the game designed to teach students how to play. Students will be in Kenya and will play one round, which will take about five minutes. The game stops after they have completed each teaching moment (such as how to plant, water and harvest).
7. Once time is up, the game will pause on the Results page. When all students have reached the Results page, instruct them to press “continue,” and help them understand what the Ripple Effects screen shows. They will then move on to the Surplus Contribution Opportunities page. Encourage them to invest in their limiting factors (there will be a red arrow under the limiting factor). If the investment matches that factor, there will be a red arrow on the left, beside the investment name. Once their score stops going up they can press “continue” and finish with the demo level.
8. Slides 19–20: Once students have completed the game, use the following questions to help students synthesize what they have learned:
   * After growing your first crop, did you invest some of your money to purchase additional land? Why or why not?
   * What was the limiting factor in your sustainability barrel? What did this mean? *(Answers will vary)*
   * What were some of the ripple effects of your farming choices?

**Activity 3: Do People Waste Food? (Option to teach as an independent lesson another day)**

1. Slide 21–22: It’s important for students to understand why resources are important. Take some time to help your students understand the risks of food security as we strive to feed a growing population. There are food security risks in all parts of the world, and there is one prominent threat that we all contribute to—food waste. Unfortunately, about one-third11 of our current global food supply is wasted. There are an estimated 1.4 billion12 people living in extreme poverty, and about 870 million13 people that are hungry, malnourished and food insecure (have difficulty acquiring food). In developed countries, food is thrown out and overconsumed, and in developing countries, food is lost to unreliable storage and transportation. Hunger is often caused by food waste and inequality of distribution, not scarcity. Ask your students this question, “How often do you throw food out, and what else could you do with that uneaten food?” Discuss ways students can reduce their personal food waste, such as making or ordering only what you NEED to eat, composting, saving food for leftovers to eat later, etc. Sustainable agriculture is critical in the global effort to eradicate hunger and poverty, and reducing waste can improve the sustainability of agriculture.
2. Slide 23: Play the video clip [The Ugly Carrot](https://www.youtube.com/watch?v=EswyKGgk_Dc)*(*0:54 min). Then ask the following questions: Have you ever seen a carrot or other similarly misshaped produce item at a grocery store? If you did see this carrot (or another similarly misshaped produce item), would you buy it? Why or why not? Would you pay the same price as if it was perfectly shaped?
3. Slide 24: Ask students, “How does food waste impact sustainability and hunger?” Students will likely associate food waste with hunger and recognize the moral, economic and social implications. Provide guiding questions to help students also recognize the impact food waste has on our environment and natural resources. Ask, “Besides the food itself, what else is wasted?”
4. Slide 25 (Optional): On the board, brainstorm potential challenges that could arise when the people of a country are hungry *(malnutrition and health care risks, violence and thievery, vulnerability to markets and storage, decline in education attendance, political distress/corruption, decline in infrastructure, decline in investment in technology and innovation and risk of unsustainable practices across industries).* On the board, brainstorm potential challenges that could arise when a country has an overabundance of food *(quality food is thrown out, obesity, increasing calorie-intake (eating more per meal)*, rise in Western-style diets, desire for food from other places *(increased markets, infrastructure)*, shift to more urban population which can result in disconnect with life on the farm, consumer demands and perspectives influence food value chain *(genetically modified foods, organic, free range vs barn raised animals, herbicides, pesticides, food labels, country of origin traceability, animal care, food preparation, sanitation, packaging, preservatives, etc.).*
5. Optional questions for higher grades: How can governments be involved in food security? *(Governments can provide regulations, policies, education programs, low interest loans, investment in research and development, and share practices with other countries.)* What happens when there is corruption in government or a huge gap between the rich and poor?

**Wrap-Up:**

Review and summarize the following key concepts (Slide 26):

* Our population is growing. By 2050 it is expected that our world will grow from the current 7 billion people to 9 billion people.
* Sustainable agriculture is the practice of producing our food, fiber and fuel in a way that is profitable to the farmer, supports a healthy quality of life and protects our natural resources (land, air and water).
* Many factors can limit our ability to produce food for a growing population. These limiting factors are depicted in the sustainability barrel.
* Using sustainable agricultural practices can improve our society through the ripple effect.
* Over one-third of our food is wasted in both developing and developed countries.
* Hunger is often caused by food waste and inequality of distribution, not scarcity.
* Food waste decreases sustainability due to the inefficient use of natural resources, such as arable land, soil nutrients, water and energy.
* Food waste can negatively affect our quality of life and create undesirable outcomes in a country.

**Essential Links**

* [Journey 2050 Teacher Registration](http://journey2050.rnp.io/teachers/sign_in)

**Enriching Activities**

* Show the animated video, [7 Billion: How Did We Get So Big So Fast?](https://www.youtube.com/watch?v=VcSX4ytEfcE) to illustrate to students why and how our population grew to reach over 7 billion today.
* Assign a supplemental activity for students to research the definitions of the words *sustainability*, *agriculture*, and *sustainable agriculture*.
* As a class or part of an additional assignment, read National Geographic’s [How Reducing Food Waste Could Ease Climate Change](http://news.nationalgeographic.com/news/2015/01/150122-food-waste-climate-change-hunger/).
* Assign students a marketing project. Instruct them that they are to develop a marketing plan to decrease wasted food by marketing produce that is safe and healthy, but imperfect in size or shape. Show the video clip [Inglorious Fruits and Vegetables](https://www.youtube.com/watch?v=qQQMygivn0g) (0:15 min) as an example.
* World leaders are working on solutions to global sustainability. The United Nations has released [17 goals](http://www.globalgoals.org/) that we all need to work towards. There is a free App called Global Hero that highlights each goal in 30-second mini-games. (There are no in-app purchases to play the games.)
* Utilize these 60-second supplementary videos for each of the topics below:
  + [Sustainability](https://www.youtube.com/watch?v=X6HX8D3eZXY&feature=youtu.be)
  + [Best Management Practices](https://www.youtube.com/watch?v=wE9zoEZejkQ&feature=youtu.be)
  + [Ripple Effect](https://www.youtube.com/watch?v=LQuCAYTH0Vw&feature=youtu.be)
* Watch the DNews segment [Why Do We Waste $1 Trillion of Food A Year?](https://www.youtube.com/watch?v=zjNqr4VltAc) (4:28 min). As a class, discuss why consumers are attracted to food meeting specific cosmetic standards and the impacts of the behavioral trend.
* As an example to illustrate growth and improvement in agriculture, explain that a North American farmer in the 1900s produced enough food for 10 people. Today’s farmer feeds over 120 people. Ask students, “Why can farmers produce more food today than they could in the early 1900s?” (increased knowledge and skills about plants and animals, technology, machinery, improved breeding and genetics, etc.)

Suggested Companion Resources

* [Journey 2050 Program Summary](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=765) (Activity)
* [Agronomy - Grow with It!](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=771) (Book)
* [9 Billion Mouths to Feed: Leading the Way to Abundance and Sustainability](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=538) (Multimedia)
* [Food Machine](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=475) (Multimedia)
* [Growing Today for Tomorrow Video](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=411) (Multimedia)
* [How Reducing Food Waste Could Ease Climate Change](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=775) (Multimedia)
* [Journey 2050](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=464) (Multimedia)
* [Population, Sustainability, and Malthus: Crash Course World History video](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=760) (Multimedia)
* [Revolutionizing the Way We Grow Food](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=601) (Multimedia)
* [Smarter Food: Does Big Farming Mean Bad Farming?](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=570) (Multimedia)
* [World Population History](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=777) (Multimedia)
* [World Without Farmers--One Hungry Planet](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=9) (Multimedia)
* [Responsible Acre](http://www.agclassroom.org/teacher/matrix/resources.cfm?rid=766) (Website)

**Sources/Credits**

The Journey 2050 program was originally developed by Agrium in collaboration with Calgary Stampede, Alberta Canola Producers Commission, Nutrients for Life Foundation, and Agriculture in the Classroom Canada. Authors and contributors were drawn from each of these organizations under the direction of Lindsey Verhaeghe (Agrium) and Robyn Kurbel (Calgary Stampede.) The lessons were updated and revised in 2017 with contributions from the original J2050 Steering Committee, the National Center for Agricultural Literacy, and the National Agriculture in the Classroom Organization.

**Sources:**

1. http://www.economist.com/node/18200702
2. Sustainable Development Network Solutions (2013). Solutions for Sustainable Agriculture and Food Systems http://unsdsn.org/mwg-internal/de5fs23hu73ds/progress?id=EHV3NQH3C4-PP-EivDwXY4i2HzIjIWty8lBnkNioco0,
3. http://www.fao.org/mwg-internal/de5fs23hu73ds/progress?id=HXecPI0p3XpJtFbAsjLRZd3G4ZjPgUW5N3PqtZYwwio
4. http://waterfortheworld.net/index.php?id=12
5. http://www.un.org/sustainabledevelopment/sustainable-development-goals/
6. Sustainable Development Network Solutions (2013). Solutions for Sustainable Agriculture and Food Systems http://unsdsn.org/mwg-internal/de5fs23hu73ds/progress?id=EHV3NQH3C4-PP-EivDwXY4i2HzIjIWty8lBnkNioco0,
7. http://www.un.org/en/globalissues/briefingpapers/population/vitalstats.shtml
8. http://www.worldfooddayusa.org/food\_waste\_the\_facts, and http://www.un.org/waterforlifedecade/food\_security.shtml
9. Sustainable Development Network Solutions (2013). Solutions for Sustainable Agriculture and Food Systems http://unsdsn.org/mwg-internal/de5fs23hu73ds/progress?id=EHV3NQH3C4-PP-EivDwXY4i2HzIjIWty8lBnkNioco0,
10. http://www.economist.com/node/18200702
11. http://www.worldfooddayusa.org/food\_waste\_the\_facts
12. http://www.un.org/en/globalissues/briefingpapers/population/vitalstats.shtml
13. Sustainable Development Network Solutions (2013). Solutions for Sustainable Agriculture and Food Systems http://unsdsn.org/mwg-internal/de5fs23hu73ds/progress?id=EHV3NQH3C4-PP-EivDwXY4i2HzIjIWty8lBnkNioco0