Kelsi J. Stubblefield

Center for Agroforestry

College of Agriculture Food and Natural Resources

University of Missouri

Nov. 13, 2020
I. Title
Experience! Eat! Create! Understanding Multifunctional Food Forests

II. Goals
a) This lesson will engage students with food forests, encourage them to be creative with forest food products, and introduce students to the concept of multifunctional landscape systems.

III. Objectives
After participating in these activities, students will be able to:
   a) List three to five edible products that can be grown in food forests
   b) Describe how these edible products can be made into value added products (soups, jellies, ice creams, baked goods, etc.)
   c) Create their own multifunctional food forest design
   d) Explain how food forests serve multiple purposes

IV. Background
Unsustainable agricultural practices contribute to various environmental issues such as erosion, soil degradation, water pollution, deforestation, and climate change. High tillage, chemically intensive monoculture farming systems and unsustainable livestock grazing operations are persistent within modern agriculture. Both leave a significant global footprint and may threaten the ability of future generations to produce adequate amounts of food. Despite the data, there remain many farmers and members of society who refuse to acknowledge the damage that traditional monoculture farming causes. With the world’s population expected to grow exponentially in the coming decades, food insecurity has become an ever-increasing concern. There is a need for citizens to recognize the threat that modern farming systems pose to environmental health and food security while investing in meaningful solutions. As this topic directly affects younger generations, there are many benefits to engaging young adolescent students in lessons of food production and sustainable alternatives. Youth engaging in such lessons may gain knowledge, skills, attitudes, and values that remain with them throughout their lives. Those who engage with the program may influence their parents or grow up themselves to participate in, or advocate for, sustainable agriculture and responsible food production/consumption.

With trees being clear-cut at an alarming rate to make way for modern agricultural operations, there is a pressing need for land use systems that integrate trees (Nair, 2014). Agroforestry, or the cultivation of trees alongside crops/livestock, offers a sustainable alternative to modern agricultural methods. Food forests, both in rural and urban settings, are an example of agroforestry. These practices allow urban or rural lands to produce food while simultaneously reducing erosion, improving water quality, providing wildlife habitat, sequestering carbon, and increasing land resilience (Nair, 2014). Exposing individuals to food forests would help them to understand sustainable food production, tree growth and cultivation, and the many benefits that result from integrating the two.

We believe that all individuals would benefit from learning about food forests. All people participate in the food system, so it is vital that citizens be informed of food production techniques and their resulting impacts. There already exist many curriculums for teaching adult landowners about agroforestry systems, and the University of Missouri Center for Agroforestry recently developed a curriculum for
educating Missouri high school students about agroforestry. Thus, a lesson aimed at educating young Missouri adolescents about food forest agroforestry systems would be highly beneficial.

a) Key Terms:
   i. Food forest
   ii. Sustainable food production
   iii. Multifunctionality
   iv. Environmental/ecosystem services

V. Audience Identified
   a) Fifth grade students
   b) Boone County fifth grade students during their weeklong visit to the Boone County Nature School (BCNS)
   c) Group size: 15+

VI. Duration
   a) Lesson: Approximately 90 minutes
   b) Travel time: Will depend on the school’s proximity to the Boone County Nature School

VII. Location
   a) Food forest, outdoor/indoor kitchen with chairs and tables
      a. The Boone County Nature School will have kitchen and classroom facilities and an on-site food forest. Students will be able to walk from the classroom and kitchen facilities to the food forest.
      b) Safety concerns: Students may trip or fall in the forest setting. There is some danger of students being exposed to ticks, burrs, or other environmental hazards. The kitchen setting carries risks such as cuts or burns.

VIII. Subject & Teaching Standards
   a) Grade level: 5th
   b) Missouri Learning Standards: Earth and Human Activity (ESS3.C.1), Engineering Design (ETS1.B.1)

IX. Content & Methods

Step I. (30 minutes):
Students will travel in a group (possibly multiple groups if needed) with a BCNS educator and explore the food forest. The students will gather edible food products such as elderberries, pawpaws, blackberries, blueberries, raspberries, hazelnuts, mushrooms, etc. (This will largely depend on what is ripe and seasonally available). As they walk and collect edibles, students will also be asked to point out any wildlife they notice. Educators will also ask students to describe how the forest farm is different from typical farms, and they will ask students to speculate why forest farms may be better for the environment. Using student responses, educators can engage the students in discussions about the forest farm’s many benefits (such as their ability to purify water, clean the air, store carbon, provide wildlife habitat, prevent erosion, and provide food.) Once the students have collected multiple edible products from the forest, they will walk back to the commercial kitchen facility.
Step II. (30 minutes):
Within the kitchen facility, students will break into small groups with an educator as a guide. The group will decide on one dish (value-added product) to make with the edible products they’ve gathered. (Examples: Elderberry jam, mushroom soup, blackberry cobbler, or candied hazelnuts.) Suggestions/recipes for dishes can be provided, but it’s best for the students to come up with their own! Let them use this as an opportunity to express their creativity. They will spend 20-30 minutes preparing their dishes with educator assistance.

Step III. (30 minutes):
While the student dishes are baking/cooling/setting, the students will remain in their small groups and gather around a table with a large piece of blank paper and some writing utensils.

The students will be given a prompt that describes theoretical site conditions such as healthy soil, degraded soil, wet conditions, or dry conditions. Small booklets will be provided that detail different tree, shrub, and understory species. The booklets will describe the conditions that the species best grow in, and it will provide details on if the species provides food products, wildlife habitat, or ecosystem services (such as water purification). The students will then design their own food forest system to meet the given site conditions, and they must design their systems for multifunctionality! This means that the students must pick at least one species to provide food products, one to provide wildlife habitat, and one to provide ecosystem services. Once the species have been selected, the students will draw their food forest on the blank sheet of paper, making sure to include sketches/written descriptions of the specific food products, wildlife species, and ecosystem services provided by their system.

Roles can be delegated to the students so that all feel as though they are contributing. For example, two students may be in charge of drawing the system while others may be in charge of selecting the production species and others select the wildlife habitat species.

Once all groups have finished creating their food forests, each group will share their systems with the rest of the class. Students will discuss their site conditions, what species they included, and provide reasons for their selections.

X. Management and Safety
a) There will be at minimum two site educators (in addition to the classroom teachers) present to ensure safety of the students during the lesson.

b) While exploring the food forest and collecting edible species, both the site educators and fifth grade classroom teachers will monitor the students. If it is determined that multiple groups are required, each group of students will always have at least one site educator and at least one classroom teacher present. While in the kitchen setting, each small group will be accompanied by one adult (either a site educator or a classroom teacher) and this adult will delegate cooking tasks appropriately and handle the more dangerous tasks such as using knives or complicated kitchen machinery. Nuts will also be present on site, which may cause allergic reactions in students with nut allergies. Site educators should collaborate with classroom teachers to determine safety precautions necessary for students with nut allergies.

c) Within the food forest, there are potential risks such as: uneven ground/roots causing tripping hazards, the possible presence of snakes and other wildlife, and the presence of
unintended plant species such as poison ivy. To minimize these risks, site educators will walk the food forest prior to the students’ arrival to look for these hazards and remove/mitigate them. Additionally, if one of these hazards is spotted during the outing, the group will take precautions to avoid it. A first aid kit will also be on-hand.

Within the kitchen setting, there are risks for students to injure themselves with accidental cuts and burns. To mitigate this, the educator present in each group will monitor the students, delegate tasks, and take on the more advanced/dangerous tasks such as cutting and using complicated kitchen machinery. A first aid kit will also be on hand.

Within both settings, there will likely be nuts present, so care will be taken to avoid exposing students with nut allergies to the hazelnuts, etc. If the student(s) allergy is severe, the site educators and classroom teachers will make prior plans to avoid collecting nuts/avoid areas of the food forest with nuts present.

All site educators will be trained in first aid protocols and will have access to student emergency contact information.

XI. Equipment/Materials
a) Baskets/buckets for gathering edible forest products
b) Kitchen equipment and general ingredients and pantry staples for dishes (Pots, pans, mixing bowls, spoons, knives, baking dishes. Flour, sugar, salt, butter, etc.)
c) Example recipes for value-added products and forest dishes
d) Paper, writing utensils, agroforestry species booklet, tables/chairs.

XII. Foul Weather Alternative
If inclement weather is possible on the day of the visit, the students should bring rain jackets/umbrellas, a change of clothes, and extra shoes. Educators will attempt to guide students through portions of the food forest with minimal mud/standing water.

If very foul weather should occur, on-site educators should have edible products from the forest already harvested and available to pass around to the students. Within the BCNS classroom, the educators could show students photographs of the food forest, including images of the plants that the food products were gathered from, and images of the different wildlife species found within the food forest. These images would be used in place of the outdoor excursion to prompt discussions on food forests and their benefits.

The remaining two activities, cooking forest product dishes and creating their own food forest, would be unaffected by the weather as these areas are covered/indoors.

XIII. Special Needs Adaptations
In the case of students or groups with special needs, the lesson can be adapted to meet their unique requirements.
   a) Mobility Adaptations: In order to accommodate students in wheelchairs or with other mobility disabilities, educators could attempt to travel along “smoother” and less difficult paths during the food forest tour. If the path is not suitable to the student(s) mobility needs, then educators could engage the group in the alternative activity described in the
previous foul weather section. This would allow educators to show the students images of the food forest and pass around pre-harvested products.

b) Learning Adaptations: In order to accommodate younger students or those with learning disabilities, educators will provide more hands-on guidance in all activities, helping students more in harvesting the products, cooking/creating the dishes, and creating their food forest designs. Additionally, another pamphlet with more simplified language and species descriptions could be created ahead of time by the site educators and distributed to the students during the food forest design activity. The pretest-posttest evaluation could also be modified to be oral rather than on paper. One educator would ask the questions to the class as a whole as another educator records the answers that the students give.

XIV. Learning Assessment

a) To assess learning, copies will be made of the students’ food forest creations. Educators/researchers will qualitatively analyze the drawings to check for student understanding of key concepts. The species selected, the presence of detailed descriptions of the benefits/services of the system, and successful incorporation of multifunctionality will act as indicators of student understanding.

b) Additionally, to assess growth in knowledge, each student will participate in a short pretest-posttest summative assessment. Before the lesson begins, on a piece of paper, students will be asked to list three to five edible products that can be grown in food forests. They will then be asked to describe how these edibles could be made into value added products (soups, jellies, ice creams, baked goods, etc.). Lastly, they will be asked to list at least 2 different functions of food forests (food production, wildlife habitat, water filtration, carbon sequestration, recreational activities, etc.). Students will then be asked to repeat the process at the end of the lesson. The student answers prior to the lesson will be compared to the answers after the lesson to assess knowledge gain.

c) Later, surveys will be sent to the classroom teachers approximately one month after class participation. The survey will assess student gains in understanding, as well as shifts in student attitudes and behaviors toward food forests and sustainable food production.

XV. Follow up – What’s next?

a) The following lesson will compare traditional farms and forest farms and discuss their benefits, detriments, and roles within the larger ecosystem.

b) In order to prepare for this lesson, the students will be asked to study their own food forest design and consider how it differs from a standard farm.

XVI. Reference Materials


Adapted from Bates, Beery & Gilbertson 2003