

Ideas for ECHO Post-Field Trip Activities

Answer Key

Math

Gone Fishing

(Source: Inside Echo Newsletter, June 2019)

At ECHO-Florida the annual intern fish harvesting training brought in 246 fish. In four passes with a net, 170 tilapia (80 pounds) were harvested from the Duck Pond along with invasive species. Forty-six tilapia (35 pounds) were harvested from the aquaponics system (in the Appropriate Technology Center).

What was the combined total of tilapia from both systems?

$$170 + 46 = 216$$

What was the total number of pounds of tilapia from both systems?

$$80 + 35 = 115$$

How many fish were not able to be used from the harvest?

$$246 \text{ netted} - 216 \text{ harvested} = 30 \text{ rejected}$$

What was the percentage of fish that could not be used from the total harvest?

$$30/246 = 12\%$$

What are some possible reasons why they were not used?

Invasive species

Why would it be important for ECHO-Florida to keep track of this percentage from year to year?

If the number of invasive species increases each year, eventually the invasive species could outnumber the tilapia.

Which system produced the largest size fish? Prove it by showing your calculations.

$$80/170 = 0.47 \text{ pond} \qquad \underline{35/46 = 0.76 \text{ aquaponics}}$$

What factors might have contributed to the differences in fish weight between the two systems?

The aquaponics system uses commercial food; measured amounts are fed daily. The pond system relies on duck fertilizer to make the aquatic plants (phytoplankton, algae, duckweed, etc.) grow, which the fish eat. It is a less controlled environment.

Science – Experimental Design -Activity 1

(Adapted from Inside Echo Newsletter, June 2019)

ECHO-Florida initiated a multi-year gliricidia intercropping trial. Researchers are trying to determine if the shade produced by gliricidia trees, spaced six meters apart, will affect the yield of maize and cowpea crops over time. Alternating rows of maize and cowpea were planted. The experimental design included the following: maize and cowpea planted under widely-spaced gliricidia trees, maize and cowpea planted under 30% shade cloth, and maize and cowpea alone. *(The description of the study has been modified for middle school classroom use.)*

What is intercropping? (See photos of plantings in other countries, below).

Intercropping is a farming method that involves planting or growing more than one crop at the same time and on the same piece of land. Usually the crops are in close proximity to each other.

What are legumes?

Legumes are plants which have bacteria in nodules on the roots of the plant. The bacteria in the nodules take nitrogen from the air and fix it into the soil, so that other plants that require nitrogen can use it as well.

Which plants in this study are legumes?

Gliricidia and cowpea

Why are legumes frequently used for intercropping?

Legumes help keep usable nitrogen in the soil, even after they're harvested. This process reduces the need for nitrogen-rich fertilizers, and helps sustain usable nitrogen concentrations in soils for future crops.

Why is 30% shade cloth being used in one plot with maize and cowpea?

Gliricidia trees produce shade and nitrogen. The shade cloth provides shade but no nitrogen. The shade cloth plot acts as a comparison or control to see if just shade, alone, produces a better yield. (In a developing, country it would be less expensive and easier to plant gliricidia trees than to grow crops under shade cloth.)

Why are only maize and cowpea planted in the third plot?

They are also a control group – not receiving shade treatment.

Discuss the experimental design: investigative question, variables

An Investigative Question is a scientific question for which you are trying to find an answer: Does intercropping gliricidia trees with maize and cowpea increase the yield of maize and cowpea plants?

Independent Variable	Dependent Variable	Controlled Variables	Control
-what is being tested or the one thing you change	-result or changes because of the independent variable	-things we keep the same, constant	-group(s) receiving no treatment
Shade from gliricidia trees	yield of maize and cowpea	-soil type	-shade cloth (comparison to gliricidia shade)
		-amount of water	-maize and cowpea only (comparison to both groups- gliricidia and shade cloth)
		-date planted	
		...etc.	

Using the description of the study, design an experimental plot. Compare your completed map with the actual field trial (photos and map below).

In a spacious area on your school campus, measure out a distance of six meters, the spacing of the gliricidia trees. A research plot includes two rows of trees (5 total) and an additional 12 meters for the shade cloth with maize/cowpea and maize/cowpea alone. Try measuring out this area.

Research other uses for cowpea and gliricidia.

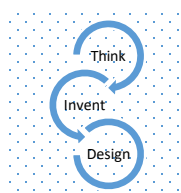
Uses for cowpeas:

- The leaves and growth points can be picked and used as a vegetable dish.
- The leaves can be dried and used as a meat substitute. About one kilogram (2.2 pounds) of cowpeas is a full meal.
- The green seeds are sometimes roasted like peanuts, and these are ground and used as a substitute for coffee.
- Ground dried seeds mixed with onions and spices can be fried in oil.
- The seeds can also be cooked.
- It can be planted for green hay production. Silage (*grass or other green fodder compacted and stored in airtight conditions, without first being dried, and used as animal feed in the winter*) can be made by mixing the green leaves with sorghum or maize.
- Cowpeas can be planted for dried hay production, and the hay can be sold.
- Source: <http://www.arc.agric.za/arc-gci/Pages/Cowpeas.aspx>

Uses for gliricidia:

- Add nitrogen to the soil (legume)
- Cattle forage (plants fed to animals)
- Shade plant for chocolate, coffee, tea, and vanilla
- Hedge or windbreaks
- Timber
- Source: https://hort.purdue.edu/newcrop/duke_energy/Gliricidia_sepium.html#Uses

Science – Experimental Design -Activity 2



ECHO-Asia Regional Impact Center would like to set up a study comparing the growth performance of pigs fed with fermented banana stalk silage and pigs fed with commercial pig food as a supplement to their regular forage (farm harvested plants) diet.

(Source: Inside Echo Newsletter, July 2019)

Design an experimental study comparing the effect of these two diets on pig growth. Include a description of the study, investigative question, variables, charts for recording data, etc.

Description of study (example): Six pigs from the same litter will be fed different diets for ___ weeks, and the weight of each pig will be recorded, weekly. Total weight gains will be compared to see which food caused the most growth.

An Investigative Question is a scientific question for which you are trying to find an answer. Example, does feeding pigs banana stalk silage or commercial pig food, in addition to their regular diet, increase weight gain?

Independent Variable	Dependent Variable	Controlled Variables	Control
-what is being tested or the one thing you change	-result or changes because of the independent variable	-things we keep the same, constant	-group receiving no treatment
Type of food	Weight gain of piglet	-age of piglets -breed (These two variables could be controlled by using siblings from the same litter.)	-pigs fed only forage – no supplement
		-same sex	
		-same amount of forage -same amount of silage or commercial food -same amount of fresh water	

		-same amount of exercise, ...etc.	
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Example of data table for pig food study

Treatment	Initial weight	Week 1 Weight	Week 2 Weight	Week 3 Weightfinal Week # ____ Weight	Total weight gain
Banana Stalk Silage Supplement						
Pig #1						
Pig #2						
Commercial food Supplement						
Pig #3						
Pig #4						
No Supplement-forage only						
Pig #5						
Pig #6						

Science / ELA – Farm Animals (Elementary levels)

During the ECHO tour, you saw several members of the animal kingdom which play an important role on small-scale farms. Use the chart below to list ways they help.

<u>Ways they help</u>	Produce manure for fertilizer/ compost	Clear fields, till soil, consume unusable plant material	Fur or feathers	Foods they provide	Products to sell	Pollination
Pigs	yes	Clear and till soil		Meat	Livestock to increase herds, meat	
Goats	yes	Clear and till soil		Milk, yogurt, cheese, meat	Livestock to increase herds, milk, yogurt, cheese, meat	
Sheep	yes	Control the height of grasses under fruit trees	Wool for clothing and blankets	Meat, milk-sometimes used	Livestock to increase herds, meat, milk	
Rabbits	yes				Livestock, meat	
Worms	Yes -worm casts	Consume kitchen food waste			Live worms, worm casts	
Tilapia	Yes (aquaponics and pond)			Fish	Stock fish for ponds, fresh or dried fish to eat	
Ducks	Yes (fertilize pond plants which tilapia eat)	Consume fallen fruit under trees	Feathers for pillows	Meat, eggs	Livestock to increase flocks, meat, eggs, feathers	
Chickens	yes	Clear and till soil		Meat, eggs	Livestock to increase flocks, meat, eggs	
Bees				Honey	Bee hives, honey	Of flowers to produce fruits and vegetables

Use the information in the chart to complete one of the activities listed below:

- Write a story about a tropical farmer and his/her animal helpers.
- Compose a poem about animal helpers on tropical small-scale farms.
- Create a poster or mural about animal helpers at ECHO.
- Design an illustrated brochure or information sheet describing “How to Raise” your favorite farm animal. Include information on food, shelter, exercise, veterinary care, and ways a farmer could benefit by raising the animal.

ELA

ECHO-Florida intern, Elena in Tanzania, wrote about how many Tanzanians own land that is not optimal for farming. “The best land has been taken for development and poor farmers are left with the marginal, sometimes barely inhabitable, land... steep slopes, erosion, infertile soil, and lack of water. All of these things create immense challenges for farmers who depend on the land for their health and even survival.”

(Source: Inside Echo Newsletter, June 2019)

From what you have observed during your field trip to ECHO, write a letter to Elena describing three farming techniques or ideas that you think would be most helpful to improve the lives of these farmers and their families.

Possible responses:

For steep slopes and erosion control:

- make contours and use walls of deep rooted plants and shrubs to hold back the soil –Napier grass

For infertile soil:

- use animal manure and compost
- plant nitrogen fixing plants (legumes – beans, peas)
- crop rotation
- intercropping with legumes
- use mulch to hold moisture and nutrients

For lack of water:

- use zai hole planting stations instead of plowing up a large area,
- stone bunds - make a half circle of small rocks around the zai hole to divert the rain water toward the hole as it flows down the hill
- use mulch to hold moisture and nutrients
- drip irrigation would decrease water loss due to evaporation

Zai hole information: <https://www.echocommunity.org/en/resources/d676d269-5f1f-47f1-812a-ed6d3e253989>

ELA

“Forests precede a civilization, deserts follow.” François-René de Chateaubriand

Using this quote as a thesis statement, support or refute it based on evidence that you have gathered during the field trip to ECHO.

ECHO teaches strategies to conserve and enrich the soil, so it continues to be productive for generations. See suggested responses from the question above.

Social Studies

<https://www.echonet.org/where-we-work>

ECHO operates Regional Impact Centers (RIC) strategically located around the world to bring much needed agricultural resources within reach of the small-scale farmers that need them. Regional Impact Centers are located in the following areas:

ECHO-Asia RIC - Chiang Mai, Thailand **18° N, 98° E**

ECHO-East Africa RIC - Arusha, Tanzania **3° S, 36° E**

ECHO-West Africa RIC - Ouagadougou, Burkina Faso **12° N, 1° W**

ECHO-Florida - International Headquarters – North Fort Myers, Florida **26° N, 81° W**

Suggested site **for teachers** to check facts:

<https://www.cia.gov/library/publications/resources/the-world-factbook/>

Using a world map find the latitude and longitude coordinates of each center.

For the country in which each center is located find the following information: (modify for your grade level)

- Climate
- Geography
- Type of government
- Major religions
- National language

	Thailand	Tanzania	Burkina Faso	United States
National language	<p>Thai (official) only 90.7%, Thai and other languages 6.4%, only other languages (includes Malay, Burmese) (2010 est.)</p> <p>note: data represent population by language(s) spoken at home; English is a secondary language of the elite</p>	<p>Kiswahili or Swahili (official), Kiunguja (name for Swahili in Zanzibar), English (official, primary language of commerce, administration, and higher education), Arabic (widely spoken in Zanzibar), many local languages</p>	<p>French (official), native African languages belonging to Sudanic family spoken by 90% of the population</p>	<p>English only 78.2%, Spanish 13.4%, Chinese 1.1%, other 7.3% (2017 est.)</p> <p>note: data represent the language spoken at home; the US has no official national language, but English has acquired official status in 32 of the 50 states; Hawaiian is an official language in the state of Hawaii, and 20 indigenous languages are official in Alaska</p>
Climate	<p>tropical; rainy, warm, cloudy southwest monsoon (mid-May to September); dry, cool northeast monsoon (November to mid-March); southern isthmus always hot and humid</p>	<p>varies from tropical along coast to temperate in highlands</p>	<p>tropical; warm, dry winters; hot, wet summers</p> <p>recurring droughts</p>	<p>mostly temperate, but tropical in Hawaii and Florida, arctic in Alaska, semiarid in the great plains west of the Mississippi River, and arid in the Great Basin of the southwest; low winter temperatures in the northwest are ameliorated occasionally in January and February by warm chinook winds from the eastern slopes of the Rocky Mountains</p>
Geography	<p>central plain; Khorat Plateau in the east; mountains elsewhere</p>	<p>plains along coast; central plateau; highlands in north, south</p>	<p>mostly flat to dissected, undulating plains; hills in west and southeast</p>	<p>vast central plain, mountains in west, hills and low mountains in east; rugged mountains and broad river valleys in</p>

				Alaska; rugged, volcanic topography in Hawaii
Type of government	constitutional monarchy	presidential republic	presidential republic	constitutional federal republic
Major religions	Buddhist 94.6%, Muslim 4.3%, Christian 1%, other (2015 est.)	Christian 61.4%, Muslim 35.2%, folk religion 1.8%, other 0.2%, unaffiliated 1.4% (2010 est.) note: Zanzibar is almost entirely Muslim	Muslim 61.5%, Roman Catholic 23.3%, traditional/animist 7.8%, Protestant 6.5%, other/no answer 0.2%, none 0.7% (2010 est.)	Protestant 46.5%, Roman Catholic 20.8%, Jewish 1.9%, Mormon 1.6%, other Christian 0.9%, Muslim 0.9%, Jehovah's Witness 0.8%, Buddhist 0.7%, Hindu 0.7%, other 1.8%, unaffiliated 22.8%, don't know/refused 0.6% (2014 est.)

Using the information above, write an essay comparing two of the countries where Regional Impact Centers are located.

Design an illustrated travel brochure describing the country and city of one of the RIC locations. What important facts would a visitor like to know?

ART

Using the information from the essay, create an illustrated poster comparing two of the countries where Regional Impact Centers are located.

<https://www.echonet.org/where-we-work>

Illustrate an area of the Global Farm and show at least one technique or idea that was used to help small-scale farmers.

Construct a diorama depicting one area of the Global Farm and show at least one technique or idea that is used to help small-scale farmers.

