

Dear Educator,

During these uncertain times, Nutrients for Life Foundation wants to help you reach your students with engaging and relevant resources. These resources meet standards for middle school grade levels. Search state standards here: <https://nutrientsforlife.org/for-teachers/educator-resources/>

Digital Middle School Resources Available:

- [Dirt on Soil Science Reader](#) -downloadable pdf
- [Soil Science Reader](#) - downloadable pdf
- Learn the Nitrogen Cycle with [“The Nitrogen Cycle Challenge”](#)

Plants Need Essential Nutrients

Students can complete activity one and two to identify that plants and humans need essential nutrients. The students will identify what those nutrients are and compare them.

Now that students understand that plants need essential nutrients, they can look at how nutrient deficiencies can impact plant growth and producing food. Ask students to go to the website <https://nutrientsforlife.org/product/humanity-against-hunger/> and complete the activity Humanities Against Hunger. At the village students help with the food crisis in Africa. As they encounter three maize farmers, each face a different crop problem. Using a field manual, they must analyze each situation, offer a diagnosis and then recommend a remedy.

How does this apply to everyday food production?

- Go to <https://nutrientsforlife.org/for-teachers/video-library/> and watch the video: *Live From the Farm: Chapter 2: Strawberry Production at Hinton Farms* After students watch the video ask them to answer these two questions.
 - What is plastic mulch and why does Hinton Farms use it?
 - What is the drip tape under the plastic used for?
- Go to <https://nutrientsforlife.org/for-teachers/video-library/> and watch the video: *Live From the Farm: Chapter 4: Process and Methods of Fertigation* After students watch the video ask them to answer these two questions.
 - What is fertigation?
 - What kind of samples do they take and why?

Soil is the Foundation

- Go to <https://nutrientsforlife.org/for-teachers/video-library/> and watch the video: *The Science Behind Sports Turf Management Videos: Chapter 2: Soil is the Foundation*

After students watch the video ask them to answer these two questions.

- What are they looking for in the soil test?
- How will the field management use the test results?

What is the importance of nutrients?

- Go to <https://nutrientsforlife.org/for-teachers/video-library/> and watch the video: *The Science Behind Sports Turf Management Videos: Chapter 4: The Importance of Nutrients*

After students watch the video ask them to answer these two questions.

- What is slow release nitrogen?
- How do the fertilizers used on the field impact the environment?

An essential element.....

1. is required for a plant to complete its life cycle;
2. cannot be replaced by another element;
3. is directly involved in the plant's metabolism; and
4. is required by many different plants.

Essential Plant Nutrients																			
1 H Hydrogen 1.007																	2 He Helium 4.0026		
3 Li Lithium 6.941	4 Be Beryllium 9.012													5 B Boron 10.81	6 C Carbon 12.011	7 N Nitrogen 14.007	8 O Oxygen 15.9994	9 F Fluorine 18.998	10 Ne Neon 20.179
11 Na Sodium 22.98977	12 Mg Magnesium 24.305													13 Al Aluminum 26.9815	14 Si Silicon 28.0855	15 P Phosphorus 30.973	16 S Sulfur 32.06	17 Cl Chlorine 35.453	18 Ar Argon 39.948
19 K Potassium 39.098	20 Ca Calcium 40.08	21 Sc Scandium 44.955	22 Ti Titanium 47.88	23 V Vanadium 50.9415	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.847	27 Co Cobalt 58.933	28 Ni Nickel 58.69	29 Cu Copper 63.546	30 Zn Zinc 65.39	31 Ga Gallium 69.72	32 Ge Germanium 72.59	33 As Arsenic 74.92	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.80		
37 Rb Rubidium 85.467	38 Sr Strontium 87.62	39 Y Yttrium 88.905	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.94	43 Tc Technetium (98)	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.906	46 Pd Palladium 106.42	47 Ag Silver 107.868	48 Cd Cadmium 112.41	49 In Indium 114.82	50 Sn Tin 118.71	51 Sb Antimony 121.75	52 Te Tellurium 127.60	53 I Iodine 126.905	54 Xe Xenon 131.29		
55 Cs Cesium 132.905	56 Ba Barium 137.3	57 La Lanthanum 138.906	72 Hf Hafnium 178.49	73 Ta Tantalum 180.948	74 W Tungsten 183.85	75 Re Rhenium 186.207	76 Os Osmium 190.2	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.967	80 Hg Mercury 200.59	81 Tl Thallium 204.383	82 Pb Lead 207.2	83 Bi Bismuth 208.980	84 Po Polonium (209)	84 At Astatine (210)	86 Rn Radon (222)		
87 Fr Francium (223)	88 Ra Radium (226.0)	89 Ac Actinium (227.028)	104 (261)	105 (262)	106 (263)	107 (262)	108 (262)	109 (268)											
58 Ce Cerium 140.12	59 Pr Praseodymium 140.908	60 Nd Neodymium 144.24	61 Pm Promethium (145)	62 Sm Samarium 150.36	63 Eu Europium 151.96	64 Gd Gadolinium 157.25	65 Tb Terbium 158.925	66 Dy Dysprosium 162.50	67 Ho Holmium 164.930	68 Er Erbium 167.26	69 Tm Thulium 168.934	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.96						
90 Th Thorium 232.038	91 Pa Protactinium 231.036	92 U Uranium 238.029	93 Np Neptunium (244)	94 Pu Plutonium (244)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (247)	98 Cf Californium (251)	99 Es Einsteinium (252)	100 Fm Fermium (257)	101 Md Mendelevium (258)	102 No Nobelium (259)	103 Lr Lawrencium (260)						

Activity 1:

There are 17 elements essential for plants growth.

- 3 are macronutrients
- 3 are nonminerals
- 3 are secondary elements
- 8 are micronutrients

Research the essential nutrients for plants and identify which nutrients are in each category.

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Activity 2:

Create a Venn diagram to compare the essential nutrients of plants vs the essential nutrients of human.