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Dear Student, Artist, Thinker,

When I think of **agriculture**, I always consider the history behind it. The agricultural revolution led to the rise of civilization and forms the very fabric of human life today. Prehistorically, humans were hunter-gatherers, who migrated with the seasons to survive. Some would hunt animals, and others would walk about gathering grains, fruits, and other vegetables. Eventually, they figured out that plants could be grown on their own land. They also started to domesticate animals and keep them contained for products such as meat, milk, leather, and fur. After these findings, people began to remain in one place for extended periods of time.

Because of humanity's newly concentrated population distribution, cities began to form. People learned how to manipulate the flow of water to efficiently water crops and supply water to their fellow residents. Also of note, ideas were able to be exchanged more freely because people could gather easily in places such as town halls and other community spaces. People also had more time on their hands due to the increased efficiency of food production. This led to the development of fields such as art, music, philosophy, theater, and natural sciences, which enhanced the advancement of civilization and human knowledge.

Feudal societies contained a social hierarchy that was strongly based off Agriculture. Peasants and serfs were required to work land for knights who provided them with protection. Of course, if it wasn't for the peasants, anyone higher on the social ladder would not have been able to survive. In a similar light, empires led by Roman or Aztec civilizations would not have been able to be sustained without agriculture. Without a steady supply of food, they wouldn't have been able to expand, and the British-American colonies would never have been established.

If we fast-forward in time, agriculture has remained imperative to industrialization. In fact, the agriculture industry employs over a billion people today. It produces wood for buildings, textiles for clothing, chemicals for medications, and biofuel tech has advanced to make the fuel economy more sustainable. We will continue to depend upon innovation within agriculture (which you will read about in the next few pages) as human civilization moves forward into the future.

Best wishes,

Taylor and the APAEP Team

"No race can prosper till it learns there is as much dignity in tilling a field as in writing a poem."

BOOKER T. WASHINGTON // First president and principal developer of Tuskegee University

WORDS INSIDE

FROM "THE DEVELOPMENT ..."

Progenitor | A biologically related ancestor, or a person or thing that first indicates a direction, originates something, or serves as a model

Mutation | A change or alteration, as in form or nature. An individual, species, or the like, resulting from such a departure

FROM "IF WE WANT ..."

Arthropod | Any invertebrate of the phylum Arthropoda, having a segmented body, jointed limbs, and usually a chitinous shell that undergoes moltings, including the insects, spiders and other arachnids, crustaceans, and myriapods

Desiccate | To become thoroughly dried or dried up

Vying | To strive in competition or rivalry with another; contend for superiority

HISTORY

The Development of Agriculture

NATIONALGEOGRAPHIC.ORG | August 19, 2019

The Farming Revolution

Taking root around 12,000 years ago, agriculture triggered such a change in society and the way in which people lived that its development has been dubbed the "Neolithic Revolution." Traditional hunter-gatherer lifestyles, followed by humans since their evolution, were swept aside in favor of permanent settlements and a reliable food supply. Out of agriculture, cities and civilizations grew, and because crops and animals could now be farmed to meet demand, the global population rocketed — from some five million people 10,000 years ago, to more than seven billion today.

There was no single factor, or combination of factors, that led people to take up farming in different parts of the world. In the Near East (modern Turkey, Lebanon, Syria, Iraq, Israel, Jordan, Saudi Arabia, etc.), for example, it's thought that climatic changes at the end of the last ice age brought seasonal conditions that favored annual plants like wild grains. Elsewhere, such as in East Asia, smaller amounts of natural food resources may have forced people to find homegrown solutions. But whatever the reasons for its independent origins, farming sowed the seeds for the modern age.

Plant Domestication

The wild progenitors of crops including wheat, barley, and peas are traced to the Near East region. Cereal grains (wheat, oats, rye, rice, oats, and maize) were grown in Syria as long as 9,000 years ago, while figs were cultivated even earlier; prehistoric seedless fruits discovered in the Jordan Valley suggest fig trees were being planted some 11,300 years ago. Though the transition from wild harvesting was gradual, the switch from a nomadic to a settled way of life is marked by the appearance of early Neolithic villages with homes equipped with grinding stones for processing grain.

The origins of rice farming date to around 6,000 B.C.E. The world's oldest known rice fields, discovered in eastern China in 2007, reveal evidence of ancient cultivation techniques such as flood and fire control.

In Central America, squash cultivation began around 10,000 years ago, but corn (maize) had to wait for natural genetic mutations to occur in its wild ancestor, teosinte. While maize-like plants derived from teosinte appear to have been cultivated at least 9,000 years ago, the first directly dated corn cob dates only to around 5,500 years ago. Corn later reached North America, where cultivated sunflowers also started to bloom some 5,000 years ago. This is also when potato growing in the Andes region of South America began.

Field corn (Zea mays indentata), is a low-sugar, high-starch variety of corn that is cultivated predominantly as a feed grain for cattle.

Photograph By James P. Blair

Farmed Animals

Cattle, goats, sheep, and pigs all have their origins as farmed animals in the so-called Fertile Crescent, a region covering eastern Turkey, Iraq, and southwestern Iran. This region kick-started the Neolithic Revolution. Dates for the domestication of these animals range from between 13,000 to 10,000 years ago.

Genetic studies show that goats and other livestock accompanied the westward spread of agriculture into Europe, helping to revolutionize Stone Age society. While the extent to which farmers themselves migrated west remains a subject of debate, the dramatic impact of dairy farming on Europeans is clearly stamped in their DNA. Prior to the arrival of domestic cattle in Europe, prehistoric populations weren't able to stomach raw cow milk. But at some point during the spread of farming into southeastern Europe, a mutation occurred for lactose tolerance that increased in frequency through natural selection thanks to the nourishing benefits of milk. Judging from the prevalence of the milk-drinking gene in Europeans today — as high as 90 percent in populations of northern countries such as Sweden — the vast majority are descended from cow herders. ●

Edited for space and clarity

BUSINESS

4 Major Changes That Will Shape Global Agriculture in the 2020s

BY SCOTT SPECK | PrecisionAg.com | January 2, 2020

With another new year coming in, it is always a good time to start reflecting on the previous year and looking ahead to what is next. As we come into the new decade of the 2020s, it is interesting to think about what is to come with the future of agriculture in the next 10 years. We are now 30 years from the 2050 "deadline" we all hear about and have significant opportunity to combat challenges in our industry in the next decade. So, what's next for the future of agriculture?

Technology

The technology advancements already available are astounding but cost or use is prohibitive to making everyday decisions when margins are tight. We will continue to hear about artificial intelligence, machine learning, data management, and other technologies will move more into everyday use than in an early-adopter or innovator phase. The Global Artificial Intelligence in Agriculture Market Analysis projects the market to grow at a significant Compound Annual Growth Rate (CAGR) of 28.38% during the forecast period from 2019 to 2024 alone. These technologies and advancements for our sector of agribusiness will grow and advance significantly in the next 10 years.

Automation

As connectivity, rural broadband accessibility, and technology intelligence gets better and better, automation is on track to make revolutions in the next 10 years — with both equipment and decision-making alone. The market for agriculture "Internet of Things" (where an object like a household appliance or farm equipment is connected to the internet) is expected to grow from USD 11.2 billion in 2018 to USD 20.9 billion by 2024; it is projected to grow at a CAGR of 10.4% from 2019 to 2024.

We've all seen the autonomous cars and models of tractors, but the next decade may bring more automation outside of the box than we have seen before as technology, connectivity, and data science improves. Irrigation systems based on weather and crop demands, more storage fans and temperature controls, job creation, and easier alerting on potential threats to production or marketing are all in the pipeline to be automated now across agribusiness, but may become more available and confident in the next decade.

Transparency

We continue to hear about transparency, especially over the last few years about things like consumer demand and regulation. In the next decade, with easier data collection, opportunities to sell to specific consumers for food, fiber, or fuel sources may drive more consumer interest from the farm. As regulation continues with government interest in topics such as climate change or water availability, providing records and the bread crumb trail of production could become a necessity for all farms to produce and sell into an open market. Having data records available for audits, insurance, financing, and others, create new opportunities for farms to be better prepared for the tasks ahead.

Business

As the modern farms of the next 10 years change, agribusiness surrounding and supporting them will also start to see shifts in the day-to-day functions. We've already seen announcements on new pricing models, such as outcome-based pricing, and beginning to see more suppliers and retailers move to offering e-commerce platforms for customers to purchase inputs and supplies. Another large event that we witnessed the last decade that will continue into the 2020s will be the consolidation of businesses, whether by merger or acquisition. Investments in ag technology are still high and maturing as well. Last year was a "record breaking year" for the industry that included $16.9 billion in funding spread across 1,450 investments, and it doesn't look like it is slowing down. New market opportunities both for businesses to begin supporting new farmers and emerging areas will be opening, as well as new opportunities for supporting business in growing countries such as India and Brazil.

No one can see the future, but as we move forward into the next decade it is exciting to see where we have come from in agriculture and where we are going. The last 100 years have been a whirlwind, and to think of the advancements coming is exciting and a challenge for all of us in agriculture to foster adoption of technology but also of change as we work towards our goal of providing profitable farms and a sustainable world. ●

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I RUN ALL AROUND THE PASTURE/ FIELD BUT NEVER MOVE. **WHAT AM I?**

riddlesandanswers.com

Edited for space and clarity

MATHEMATICS

Sudoku

#151 PUZZLE NO. 2922582

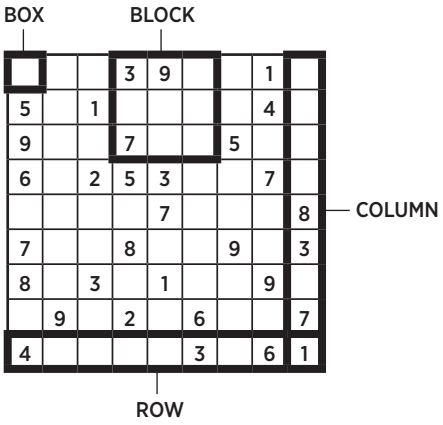
8			4		7			
					5		6	
	4		3				2	
	7			4	1			5
			2	6				
						4	1	
1	3			5				
		5				2		
4				9		8		

#152 PUZZLE NO. 6198745

				3	2			
		1	9		8			
		5	6		1			4
2						4		
	7	6					2	
8			3			6		5
				4				7
6			8					
		8					1	2

SUDOKU HOW-TO GUIDE

1. Each block, row, and column must contain the numbers 1–9.
2. Sudoku is a game of logic and reasoning, so you should not need to guess.
3. Don't repeat numbers within each block, row, or column.
4. Use the process of elimination to figure out the correct placement of numbers in each box.
5. The answers appear on the last page of this newsletter.



What the example will look like solved

2	4	8	3	9	5	7	1	6
5	7	1	6	2	8	3	4	9
9	3	6	7	4	1	5	8	2
6	8	2	5	3	9	1	7	4
3	5	9	1	7	4	6	2	8
7	1	4	8	6	2	9	5	3
8	6	3	4	1	7	2	9	5
1	9	5	2	8	6	4	3	7
4	2	7	9	5	3	8	6	1

"To Mahatma Gandhi, the key to India's progress was the development of its villages. In his unified vision, education, agriculture, village industry, social reform all came together to provide the basis for a vibrant rural society free from exploitation and linked to the urban centres as equals."

RAJIV GANDHI // 6th prime minister of India

DID YOU KNOW?

The average person will eat **twenty 240-pound pigs** in their lifetime.

A **chicken** can run up to nine miles per hour.

An acre of corn will give off **4,000 gallons** of water per day in evaporation.

Henry Ford used **soybeans** for paint and plastic in his cars.

Giant pumpkins can grow **5 pounds per day**.

Many **medicines**, including insulin, are made from the glands of a cow.

China uses more American grown soybeans than any other country

Source:https://beef2live.com/story-fun-ag-facts-104-116898

Conner Overly

Idiom

"A pig in a poke"

Meaning A pig in a poke is an offer or deal that is foolishly accepted without being examined first.

Origin The advice being given is 'don't buy a pig until you have seen it.' This is enshrined in British commercial law as *caveat emptor* — Latin for 'let the buyer beware.'

A poke is a sack or bag. A pig that's in a poke might turn out to be no pig at all, since a merchant may try to cheat by substituting a lower value animal. Many other European languages have a version of this phrase. The advice has stood the test of time and people have been repeating it for five hundred years, maybe longer.

Fraser's Magazine, 1858, reprinted a piece from Richard Hill›s (or Hilles') *Commonplace Book,* 1530, which gave this advice to market traders:

When ye proffer the pigge open the poke.

John Heywood included something nearer to our modern-day version of the phrase in *A Dialogue conteinyng the nomber in effect of all the Prouerbes in the Englishe tongue,* 1555-60:

I will neuer bye the pyg in the poke:
Thers many a foule pyg in a feyre cloke.

Source :phrases.org.uk

x 324

ONE BUSHEL OF CORN PRODUCES ENOUGH SYRUP TO **SWEETEN 324 CANS** OF SODA POP

"When you concentrate on agriculture and industry and are frugal in expenditures, Heaven cannot impoverish your state."

XUN KUANG // Chinese Philosopher

Icons from the Noun Project

ART + CULTURE

The Ash Plant

BY SEAMUS HEANEY

He'll never rise again but he is ready.
Entered like a mirror by the morning,
He stares out the big window, wondering,
Not caring if the day is bright or cloudy.

An upstairs outlook on the whole country.
First milk-lorries, first smoke, cattle, trees
In damp opulence above damp hedges –
He has it to himself, he is like a sentry

Forgotten and unable to remember
The whys and wherefores of his lofty station,
Wakening relieved yet in position,
Disencumbered as a breaking comber.

As his head goes light with light, his wasting hand
Gropes desperately and finds the phantom limb
Of an ash plant in his grasp, which steadies him.
Now he has found his touch he can stand his ground

Or wield the stick like a silver bough and come
Walking again among us: the quoted judge.
I could have cut a better man out of the hedge!
God might have said the same, remembering Adam.

nobelprize.org

Seamus Heaney is widely recognized as one of the major poets of the 20th century. A native of Northern Ireland, Heaney was raised in County Derry, and later lived for many years in Dublin. His father, Patrick, was a farmer, whose work very much influenced of Heaney's work, including his most renowned poetry collection *Death of a Naturalist* published in 1966. Heaney's father had passed two years prior to the creation of his poem "Ash Plant," but this inspired him to pen this elegy in memory of his father's dedication to his farm even as he declined in health. Heaney received many awards and accolades throughout his life for his work, including winning the Nobel Prize in Literature in 1995. Heaney died on August 13, 2013, and was buried at the Cemetery of St Mary's Church, Bellaghy, Northern Ireland, with the epigraph "Walk on air against your better judgement" etched on his headstone.

WRITING PROMPT
While some plants need to be planted months in advance to flower in the spring, many trees need to be tended continuously to for years or decades to reach their full potential. What's an aspect of your life that you take care to cultivate over time? Use this to create a poem or short story that reflects your dedication to your chosen item or idea.

Word Search

B	L	M	T	C	B	R	B	B	O	N	E	D	T
L	G	I	U	W	D	M	O	R	N	I	N	G	E
I	O	E	M	A	M	U	I	D	P	A	G	I	O
G	U	L	A	B	G	B	A	R	W	G	N	S	K
H	M	C	T	H	S	G	I	K	A	G	I	E	I
T	O	L	I	E	E	S	E	E	R	T	N	I	M
G	O	O	D	W	S	D	G	E	T	O	E	P	A
C	H	U	A	T	C	A	K	M	I	C	K	I	A
I	T	D	M	U	G	R	W	H	L	A	A	S	E
B	B	Y	P	B	H	M	M	E	E	T	W	M	N
N	A	S	E	A	I	I	H	D	W	T	D	O	H
K	M	D	A	O	D	Y	B	G	O	L	H	K	B
L	E	G	B	S	E	A	G	E	A	E	M	E	T
N	H	E	O	L	H	E	M	S	L	E	L	D	I

DAMP
BOUGH
CATTLE
TREES
CLOUDY
ASH
LIMB
WAKENING
LIGHT
MORNING
ADAM
SMOKE
HEDGES

SCIENCE

What is lab-grown meat?

EDU.GCFGLOBAL.ORG | ACCESSED SEPTEMBER 10, 2021

For as long as we can look back in history, people have been eating meat. We've always taken it for granted that meat comes from animals, but science has recently found a way to change this. It's now possible to grow meat in a lab, entirely outside of an animal's body. This is known as lab-grown meat, or cultured meat. But will it actually make factory farms obsolete?

How is lab-grown meat made?
Compared to terms like free range and farm raised, lab grown leaves a lot to the imagination when it comes to how the cultured meat is made, but it's not as scary as it sounds. Take a cow for example. Scientists will use a cow's stem cells, the building blocks of muscle and other organs, to begin the process of creating the cultured meat. The cells are placed in petri dishes with amino acids (building blocks for proteins) and carbohydrates (sugars and starches) to help the muscle cells multiply and grow. Once enough muscle fibers have grown, the result is a meat that resembles ground beef.

Is cultured meat vegan?
By definition, a vegan diet does not include consuming meat or any form of animal products. For this reason, lab-grown meat would not be considered vegan because the ingredients needed to produce the synthetic meat are all derived from animals.

What do vegetarians think about cultured meats? Many are still on the fence. Lab-grown meat sort of circumvents the ethical issues of eating meat because it doesn't require any animals to be slaughtered. It is still meat, though, which is the main concern for many vegetarians. Some say they're interested in trying the new synthetic meats, but others still find animal tissue (whether or not it's grown in a lab) unappetizing enough to pass on an artificial beef burger.

Aside from the ethical implications of lab-grown meat, members of the Hindu, Muslim, and Jewish faiths question whether cultured meat is in accordance with their religious beliefs, and therefore acceptable to consume.

How much will lab-created meat cost?
The first lab-made hamburger was created in 2012, and it cost about $325,000 to produce. But as technology advances, the cost to produce cultured meat should continue to decrease.

During an interview on an Australian radio show, Dutch startup Mosa Meat estimated that the price could be $80 per kilogram (2.2 pounds) if they're able to reach large-scale production. This would mean that a 5-ounce burger would cost slightly more than $11.

Is cultured meat more environmentally friendly?
It's too soon to say what the environmental impact of producing lab-grown meat will be, but it is already appearing to be much more eco-friendly. Compared to conventional beef, lab-grown beef requires 45% less energy use, 99% less land use, and produces 96% fewer greenhouse gas emissions.

Are other types of meat being made in labs?
In addition to lab-grown beef, cultured chicken and duck products are in the works. Scientists are also experimenting with the same process of cell agriculture to produce milk, eggs, and leather.

What about plant-based meat?
Plant-based meat is not the same as lab-based meat. Instead, it replicates the taste and texture of actual beef, sausage, and other meats without using any animal products. They achieve this by using special recipes and cooking procedures. For instance, one company ferments genetically-engineered yeast to create heme, a protein that's crucial to duplicating the juiciness, flavor, and color of real meat.

When will lab-grown meat be available to consumers?
The scientists behind the production of lab-grown meat haven't been able to make any promises about when it will be available, although some hoped cultured meat products would have hit shelves by 2021. However, the startup companies producing lab-grown meats admit that it's likely to take several more years before production costs are reduced and cultured meats are available for consumption by the public at large. ●

Edited for space and clarity

HEALTH & WELLBEING

If We Want to Save the Planet, the Future of Food Is Insects

BY RICHARD GODWIN | *The Guardian* | May 8, 2021

My first attempts at feeding insects to friends and family did not go down well. "What the hell is wrong with you?" asked my wife when I revealed that the tomato and oregano-flavored cracker bites we had been munching with our G&Ts were made from crickets. "Hang on, I'm vegetarian!" cried our friend — which prompted a slightly testy discussion on whether insects count as meat, how many thousand arthropods equate to one mammal and considering almost all industrial agriculture involves the mass slaughter of insects, what's the difference?

I then tried some Crunchy Critters dried mealworms on my seven-year-old. "It doesn't taste of much," he said. His friend wasn't wild about his grasshoppers either. "The legs are weird." But connoisseurs insist that dried specimens from a packet simply cannot compare to free-range, seasonal arthropods roasted in their own oils. "The fresh ones are much tastier, of course," says Dr Monica Ayieko, senior insect researcher from the western region of Kenya — and one of an estimated two billion people who regularly eat insects. "I love the smell of roasting lake flies or crickets. It's a nice savory smell. This is one thing we pride ourselves on in Africa — we always eat fresh food."

The only unqualified success I had was with my nine-month-old, who seemed almost as keen on desiccated buffalo worms as he is on, well, just about anything he can shove into his mouth. And that's just as well. If the evangelists for eating insects are to be believed, orthoptera, larvae and any number of the 900+ edible species of insects could form a regular part of his future diet. The UN Food and Agriculture Organization has urged that we all make more of this "underutilized" resource. And given the issues of food supply sustainability, it may not be a question of choice.

It ought to be obvious to anyone with an appetite that the way we eat is not sustainable — and that something fundamental will have to shift if we do not want to end up with half the world obese and the other half under water. "Civilization is in crisis," was the verdict of the EAT-Lancet international commission into the global food chain in 2019, which contained a dire warning of 200,000 years of human history culminating in ecological disaster. Modern industrial agriculture, extractive capitalism, the profit motive, governments cowering before Big Food and our own greedy western appetites all must take a share of the blame.

It is in this context that "future food" — food that promises to be good for you and animals and the environment — has taken on the buzz that was once associated with Silicon Valley start-ups. Younger consumers are increasingly anxious to make ethical, sustainable choices — and tech industry venture capitalists are increasingly keen to invest in them, too. The Californian "alternative meat" company Beyond Meat, valued at around $9bn, has now launched its products in 445 British supermarkets and its rival, Impossible Foods, is expected to follow soon. Cell-grown meat isn't far off: in December, the Singapore Food Agency approved the world's first fully synthetic chicken nugget. Still, recent history suggests that tech investor-backed American processed food companies vying to dominate the protein market isn't likely to lead to utopia.

We're more willing to try what we might have considered gross before. Insect protein is not as "sexy" as the alternative meat companies, admits Leah Bessa of the South African start-up Gourmet Grubb, but she feels anyone interested in food security should be looking for multiple solutions. "I don't think we should be expecting any one food to solve things," she says. "The problem with our agriculture system is that we don't have enough diversity to cater for different climates and landscapes. What's great about insects is that you can farm them anywhere, in any environment. They don't destroy land, you can grow them on by-products of the food industry and they're full of nutrients." But, she cautions: "It has taken the plant-based food movement decades to get to where it is now," she says. "If insects can do the same, it will be a big win."

Currently, most of the investment is heading towards insects-as-feed for other animals. Mars Petcare recently announced a new insect-based cat food range, Lovebug, and insects show great potential as feed in aquaculture and for livestock. The French firm Ÿnsect recently raised

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I GROW IN A FIELD OR ON A FOOT. **WHAT AM I?**

riddlesandanswers.com

$225m to open the world's largest insect farm in Amiens that will soon be producing 100,000 tonnes of protein per year. The British company, Entocycle, has, meanwhile, received a £10m government grant to build a black soldier fly larvae farm outside London. As a sustainable business model, it sounds almost too good to be true. Insects not only make a far more efficient feed — they can also be fed on waste and their "frass" (excrement) can be used as fertilizer. Currently, around 33% of cropland worldwide is used to feed livestock.

Dr. Sarah Beynon, an entomologist who runs the Bug Farm, a working insect farm and visitor attraction in Pembrokeshire, believes we will have to get used to a different idea of farming: hi-tech, robot-operated vertical facilities devoted to maximizing protein yield. As inhumane as that sounds, from the insect's point of view, she stresses, it's a good deal. "With insects, we can farm them intensively without compromising their welfare. They're actually happier when they're close to many other insects of the same species." Insect lifecycles are also highly conducive to factory farming: at certain stages of their lives they produce heat and at other stages they need heat, so an indoor farm can be more efficient than an outdoor farm in a warmer climate.

Still, Beynon worries that using insects for livestock feed could end up serving to prop up a dysfunctional and wasteful food system. "It's an important stepping stone, especially where it comes to replacing unsustainable fishmeal — but it's not actually attacking the problem itself," she says. The problem being our insane overconsumption of meat. "It's slightly crazy to me to feed the by-products of plant-based farming to insects which are then fed into an animal-based farming system. The more extra steps you have in the food chain, the more energy and food you're wasting. It's always more efficient and sustainable to take a step out."

In other words: if we don't want to take the drastic step of simply eating more vegetables ... we should probably get used to eating insects ourselves.

While western consumers are not ready for whole insects, Bessa believes they aren't necessarily averse to innovations, such as her Entomilk, which is made from black soldier fly larvae ("BSFL" in industry parlance) which are rich in fats and minerals, including calcium. "People are starting to become more aware of what food does, not only to their bodies but to the environment — and they travel a lot now, their minds are much more open. They're more willing to try what they might have considered gross before." ●

Edited for space and clarity

RANDOM-NEST

Sustainable Agriculture Practices

UCSUSA.ORG | UPDATED JUNE 1, 2021

Concerns have been continually raised about the effects of agriculture on the environment. Over decades of science and practice, several key sustainable farming practices have emerged — for example:

Rotating crops and embracing diversity | Planting a variety of crops can have many benefits, including healthier soil and improved pest control. Crop diversity practices include intercropping (growing a mix of crops in the same area) and complex multi-year crop rotations.

Planting cover crops | Cover crops, like clover or hairy vetch, are planted during off-season times when soils might otherwise be left bare. These crops protect and build soil health by preventing erosion, replenishing soil nutrients, and keeping weeds in check, reducing the need for herbicides.

Reducing or eliminating tillage | Traditional plowing (tillage) prepares fields for planting and prevents weed problems, but can cause a lot of soil loss. No-till or reduced till methods, which involve inserting seeds directly into undisturbed soil, can reduce erosion and improve soil health.

Applying integrated pest management (IPM) | A range of methods, including mechanical and biological controls, can be applied systematically to keep pest populations under control while minimizing use of chemical pesticides.

Integrating livestock and crops | Industrial agriculture tends to keep plant and animal production separate, with animals living far from the areas where their feed is produced, and crops growing far away from abundant manure fertilizers. A growing body of evidence shows that a smart integration of crop and animal production can be a recipe for more efficient, profitable farms.

Adopting agroforestry practices | By mixing trees or shrubs into their operations, farmers can provide shade and shelter to protect plants, animals, and water resources, while also potentially offering additional income.

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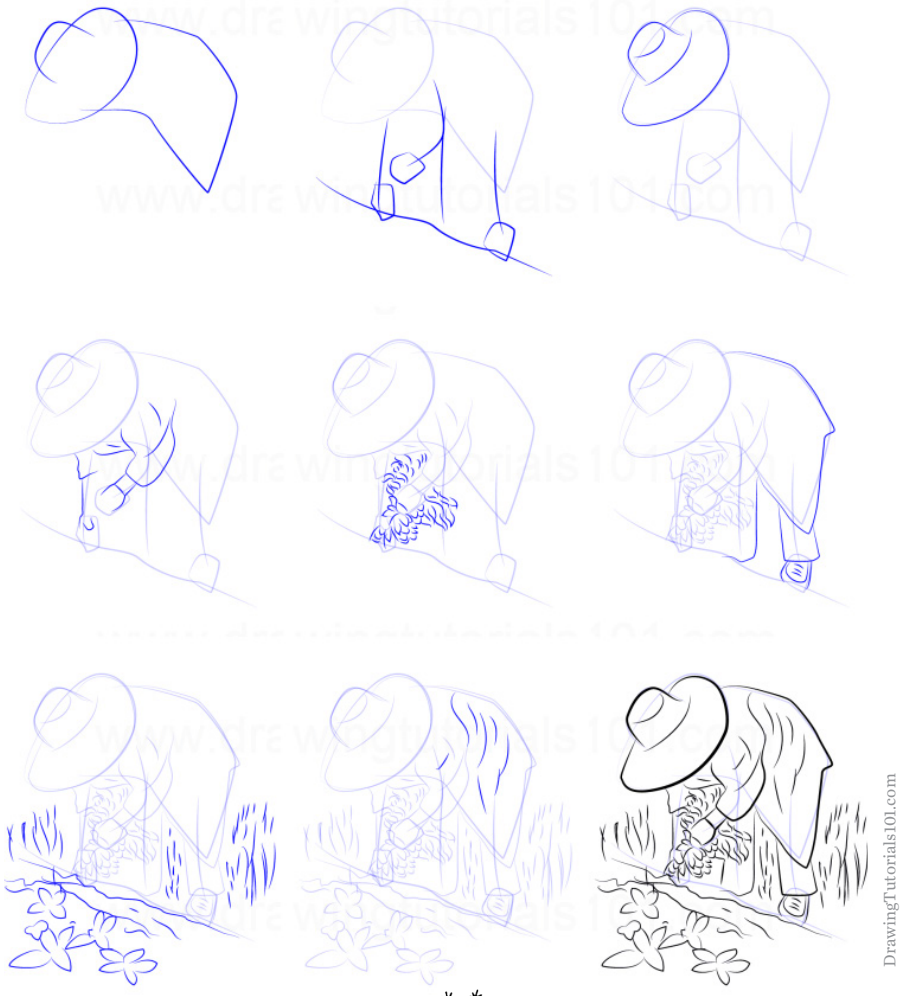
WORD PLAY A Rebus puzzle is a picture representation of a common word or phrase. How the letters/images appear within each box will give you clues to the answer! For example, if you saw the letters "LOOK ULEAP," you could guess that the phrase is "Look before you leap." *Answers are on the last page!*

HOW TO DRAW A FARMER AT WORK



WORDS OF ENCOURAGEMENT

We often think of things in life as strictly linear: time, direction always moving in one unstoppable forward sweep. We really don't give ourselves many allowances on the cyclical nature of life, the ability to start from the same place again and again and still rise again. In the forestry sciences, there is a term called "slash and burn agriculture" that refers to firefighters intentionally setting trees and brush aflame to burn a controlled area. While we mostly think of fire as a purely destructive element and the forest endures so much to regrow, this process allows for trees to germinate, the new minerals of the soil to emerge, the air to temper around these regions to prevent from an even more destructive spontaneous burn. The forest must begin anew in order to thrive. This practice reminds us that we like the forest are always growing anew; that we are always learning and rebuilding ourselves cycle after cycle in life. We hope you enjoyed this edition of *The Warbler*, and we wish you all the best in your journey.

The APAEP Team

Answers

SUDOKU #151

8	5	6	4	2	7	1	3	9
3	2	1	9	8	5	7	6	4
7	4	9	3	1	6	5	2	8
2	7	3	8	4	1	6	9	5
5	1	4	2	6	9	3	8	7
6	9	8	5	7	3	4	1	2
1	3	2	7	5	8	9	4	6
9	8	5	6	3	4	2	7	1
4	6	7	1	9	2	8	5	3

SUDOKU #152

9	6	7	4	3	2	1	5	8
4	2	1	9	5	8	7	3	6
3	8	5	6	7	1	2	9	4
2	9	3	7	6	5	4	8	1
5	7	6	1	8	4	9	2	3
8	1	4	3	2	9	6	7	5
1	5	9	2	4	3	8	6	7
6	3	2	8	1	7	5	4	9
7	4	8	5	9	6	3	1	2

Brainteasers

Page 3 A fence
Page 8 Corn
Page 9 Rebus Puzzle:
1. Made in USA
2. The Good, the Bad, and the Ugly
3. One more river to cross

Send ideas and comments to:

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UNTIL NEXT TIME !