FALL 2023

Western Harvest

REACHING 30,800 HOMES IN EASTERN WYOMING AND WESTERN NEBRASKA

A sweet secret

BY SHAUN EVERTSON

SHAUN EVERTSON/WYOMING NEWSPAPERS INC.

At the receiving station north of Kimball Sunday, sugarbeets tumble out of trucks onto the conveyor system of the piler, where most of the dirt is shaken off before the beets are added to a pair of enormous linear piles.

WESTERN NEBRASKA – When we think about sugar, most of us think of table sugar, the white crystalline stuff. Everyone knows it comes from sugarcane. Most of us are aware of other forms of sugar such as corn syrup and maple syrup. Most of us learned in school about simple sugars such as glucose and fructose, and even complex sugars such as maltose and dextrose. But when we hear the word sugar, we usually think of table sugar, which is the disaccharide sucrose, a combination of glucose and fructose.

Sugar is much more than a sweetener. It's the energy source that fuels all animal life. Carbohydrate sugar in the form of monosaccharide glucose or dextrose is the only fuel animals burn at the cellular level.

Carbohydrates come from plants, where solar radiation powers the photosynthesis of carbon dioxide and water, yielding cellulose, sugars, and starches, which are all complex carbohydrates. In consuming plants, herbivore animals cleverly metabolize glucose/dextrose from complex carbs. Carnivores run on sugar too, but their supply comes from the glycogen stored in the flesh and fats of their prey. In that sense, carnivores are one step removed from their energy source. Omnivores consume plants and animals, of course, metabolizing sugar from both meat and veg.

Our bodies, often with the assistance of gut bacteria, metabolize carbohydrate into glucose, whether the original form is lettuce, rutabaga, grain, apples, high fructose corn syrup or a spoonful of table sugar. Obviously we don't need table sugar to survive. We could derive perfectly good nutrition from roadkill and wild fruits and grains. We'd all be foragers then, with no time to waste on school or jobs or perpetual activism.

*see **SWEET** page **2***

Sweet: A fifth of the world's production comes from sugarbeets

FROM PAGE 1

It's always an option.

In practice, we have a rather more varied diet, where sucrose features mostly as a sweetener. We like sweet stuff, and that's okay. Sweets and sucrose are nutritious. They should be consumed in moderation, of course, but that's true for every other item in our diet. Sucrose is concentrated energy and extremely easy to metabolize. So concentrated and so easy, in fact, that our body usually can't immediately use all the energy made available from gobbling down a candy bar or piece of carrot cake. Waste not, want not, so the body stores the extra energy in the form of glycogen and fat. This happens whenever we take in more nutrients than we use. Fat stores come in handy during those lean times when we require more energy than we consume. At such times stored fat is metabolized and fat energy keeps us going until we can refuel.

It's a great system. However, if we have more fat times than lean times, if we constantly take in more fuel than we use, the fat builds up, and too much fat can cause a host of problems. Sugar is easy to blame, and rightly so to some extent, because it is so concentrated and easy to metabolize and easy to convert to fat for storage, and because it tastes so darned good. Sugar isn't the culprit though. The culprit is over-consumption. We do it to ourselves.

So sugar is good food. It's not bad food. We're fortunate to have it. Which brings us, finally, to the sweet surprise.

Sugar. Sucrose. Crystallized table sugar. Where does it come from?

Many, if not most, of us believe that sugar comes from sugarcane grown tropical and subtropical climates. About 80 percent of it actually does.

But a fifth of the world's production of white crystalline sucrose or table sugar comes from the sugarbeet.

The history of sugarbeets in particular and sugar in general is fascinating.

SHAUN EVERTSON/WYOMING NEWSPAPERS INC.

While sugarbeets flow into the receiving station north of Kimball Sunday, a field of beets awaits harvest just across the highway.

Most people have probably seen images of sugarcane and the labor intensive harvest process in undeveloped countries. Few people know that sugarbeets

*see **SWEET** page **3***

Western Harvest

Published by Wyoming Newspapers Inc., which operates these newspapers in Eastern Wyoming and Western Nebraska:

TORRINGTON TELEGRAM
The Business Farmer
Your Rural Voice in Nebraska, Eastern Wyoming and Northeastern Colorado
The Lingle Guide
The Lusk Herald
The Guernsey Gazette
Platte County Record-Times

Western Harvest is published in January, April, July and November.

Publisher:
Rob Mortimore 307-532-2184

Editorial:
Andrew Towne 307-532-2184
Cindy Sheeley 307-532-2184
Rhett Breedlove 307-532-2184

Advertising:
Scottsbluff: Craig Allen 308-635-3110
Torrington: Hannah Haffner 307-532-2184
Wheatland: Bailey Ervin 307-322-2627
Wheatland: Lalonda Baker 307-322-2627
Lusk: Craig Allen 307-334-2867

Sweet: Sugarbeet production is anything but new

FROM PAGE 2

exist as a crop, let alone that 20 percent of the sugar they see in the store or stir into their coffee comes from sugarbeets. Even fewer have seen the harvest process.

Sugarbeet production is anything but new. Scientists were busy genetically modifying sugarbeets way back in the 16th century, producing plants that yielded ever more sugar.

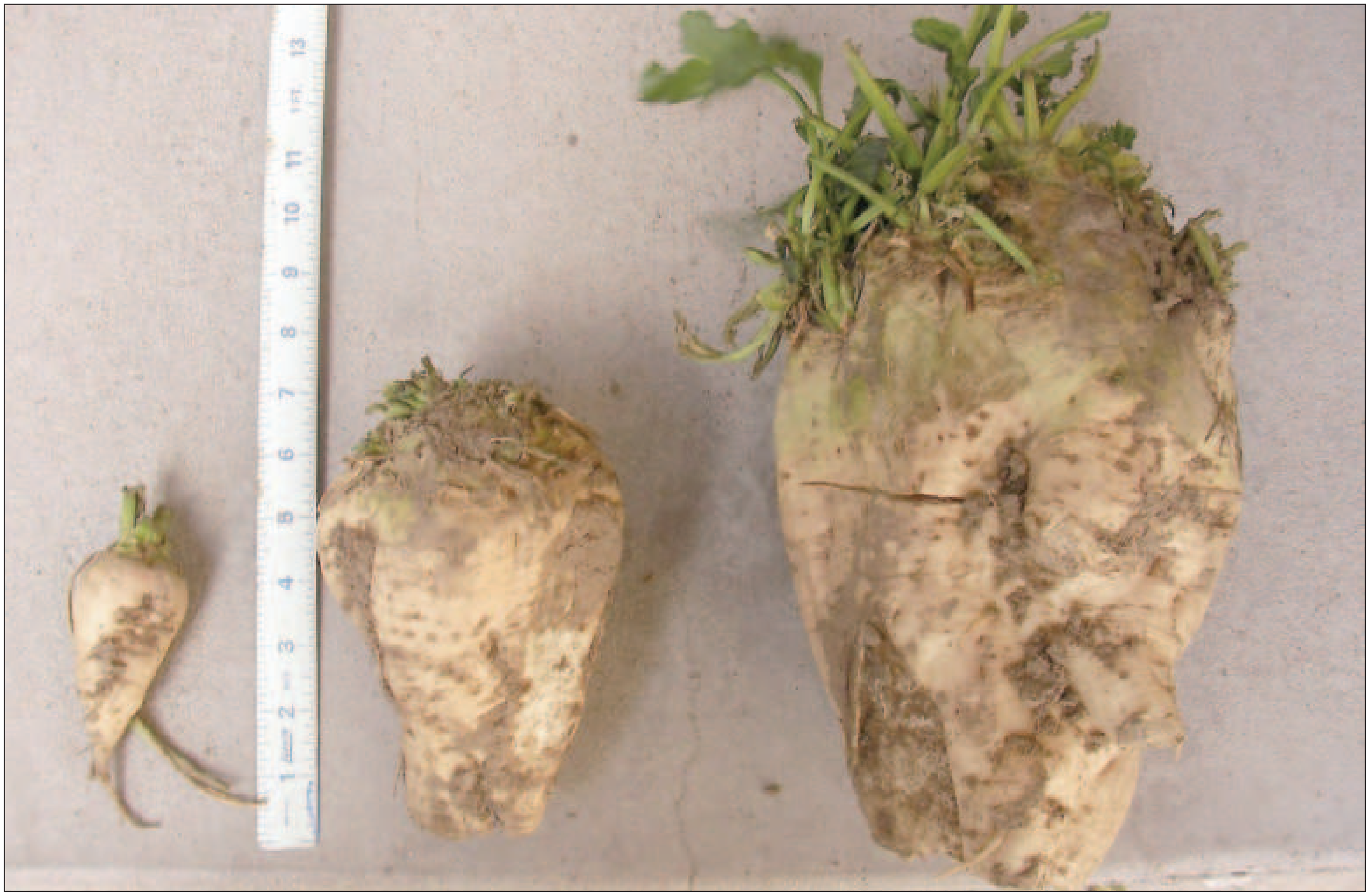
Those 16th century scientists were working to improve a cash crop which was widely grown throughout Europe, both in the east and the west. Developed from fodder beets, sugarbeets were seen as an alternative to sugarcane, which couldn't be grown in Europe. Cane sugar had to come from the New World and was therefore quite expensive by the time consumers could purchase it. In those days most sugarcane was cultivated, harvested, and processed by slave labor.

Frederick William III provided the wherewithal to open and operate the first sugarbeet factory in Silesia in 1801.

Napoleon Bonaparte was perhaps the key driver in sugarbeet production. He willed it and France obeyed. From France, the cultivation of sugarbeet and production of beet sugar spread, eventually, to temperate climates around the globe.

Sugarbeets were first cultivated in the U.S. by abolitionists as a method of producing sugar without the use of slave labor.

Sugarbeets became a huge cash crop across great swaths of the Midwest and High Plains of North America. Production fell off sharply in the 1950's due to disease problems. Most producers switched to alternative crops at that time and for several decades to come. Improvements in disease control and prevention have allowed Sugarbeet production to grow in recent years, and today it is a reliable and profitable crop for many producers across the tri-state region.



SHAUN EVERTSON/WYOMING NEWSPAPERS INC.

Freshly harvested sugarbeets from a field southwest of Kimball.

Water, the wonder molecule

BY SHAUN EVERTSON

SHAUN EVERTSON/WYOMING NEWSPAPERS INC

Solid phase water in the form of snow on a ranch near Kimball. On this bright winter day individual ice crystals reflect sunshine and gleam like gemstones.

WESTERN NEBRASKA – There are a few things that humans cannot live without. One of these is the oxygen-laden air we breathe. If we go without oxygen for as little as four minutes our brain begins to die. After 10 minutes or so, we die, all the way, for good. Another thing we can't live without is food. In general, a healthy human can go without food for about a month, give or take a week or two. Without nourishment, at some point our body fails from a lack of fuel and shuts down for good. In between those extremes is water. Human beings can go about three days without water, but when the body reaches a certain point of dehydration it shuts down for good.

We're not unique. Every form of life on our planet – bacteria, viruses, plants, birds, reptiles, amphibians, mammals – depends on respiration, food, and water. Without any or all of these things every life form we know of will die. It's not negotiable.

Leaving respiration and nourishment aside as topics for another day, let's take a look at water and see if we can wrap our minds around what it is, how it works, and why we can't live without it.

Along the way let's keep in mind that physical law is a real thing. The universe we inhabit operates within the bounds of physical law and no other way. As a species we humans have been working very hard for the last several centuries to figure out precisely what these physical laws are and how they work. We've made a great deal of progress, but those of us who have learned to be rigorously honest about reality must admit that what we know to be true is very little, and what we do not know and do not understand is immeasurably vast. Not only that, but what we do know to be true – those physical laws we've worked out – are incomplete. For some of these laws, such as the physics and chemistry of water, we have a great deal of certainty. We're pretty sure we know what water is and how it works, particularly here on our planet. But we don't have absolute certainty.

Our lack of certainty about physical law is both a blessing and a curse. It's a blessing because it provides an opportunity to learn and grow in understanding, a pursuit which is one of the most beautiful opportunities we have as we live our very short mortal lives. It's a curse because some folks choose to use that uncertainty as a tool with which to manipulate their fellow humans into giving them the "three p's" – power, prestige, and pay. That's a bummer, but it's also part of reality. Fortunately for all of us, we have thinking and reasoning brains, and we don't have to choose to follow the pied pipers of the three p's. It's not easy. It takes work and rigorous, honest thinking and exploration. But that's okay. We're good at this stuff.

What is water?

Water is the one common substance required by all forms of life on planet Earth. Our planet's position in the solar system, about 93 million miles from the Sun, places it in the "habitable zone," where abundant liquid water can exist. Water on Earth can also exist in the solid phase, as ice, and in the gaseous phase, as water vapor.

The water molecule is composed of two hydrogen atoms and one oxygen atom. In chemical shorthand, therefore, water is H_2O. The hydrogen and oxygen atoms are

see WATER page 5

SHAUN EVERTSON/WYOMING NEWSPAPERS INC

A county road east of Kimball washed out by liquid water in the form of summer rain.

Water: Earth often times referred to as water world

FROM PAGE 4

held together by covalent bonds, where the molecular elements "share" electrons. Hydrogen atoms have a slight positive electrical charge, while oxygen atoms have a slight negative charge. The unlike charges attract, allowing the atoms to come together and form the molecule. The electrical charges don't cancel each other out, however. Because of the somewhat higher negative charge of oxygen, compared to the negative charge of two hydrogen atoms, water is a polar molecule, negatively charged on the oxygen side and positively charged on the hydrogen side.

This characteristic polarity is a big part of why water is special and essential for life. It gives water its properties of surface tension and capillary force, as well as its ability to act as a universal solvent for other polar molecules such as carbohydrates.

What's it good for?

At the most basic level, living organisms require water to function at the cellular level. Water provides the medium in which cells live, as well as the intracellular medium where metabolism, or cell-function and replication takes place. Water acts as a solvent and transport medium for the many substances required for metabolism to proceed. For instance, after the food you eat is broken down by the digestive system into simple sugars, the sugars are dissolved in the water in your bloodstream and carried throughout the body to the cells, which use the sugars to power cellular metabolism. Likewise, the waste products of cellular metabolism are also dissolved and carried away by water in the bloodstream and ultimately excreted.

Plants use water in a similar fashion, though they use the sun's energy to drive photosynthesis and create carbohydrates (sugar and starch) and cellulose. Unlike animals, which generally have a pump-driven circulatory system (the heart, arteries and veins), plants rely on the capillary action of water to distribute nutrients and wastes through a series of tiny cellulose-bound tubes. Capillary action is powerful enough to push water up against gravity – all the way to the top of the tallest tree. Interestingly, capillary movement is powered by ambient atmospheric pressure, which is the weight of the atmosphere held in place by our planet's gravity.

Water world

Because of the importance of water to life, Earth is sometimes referred to as a water world, though the fraction of our planet's mass made up of water is tiny, about 1.25 percent by volume. Still, this volume of water, 326 million cubic miles, is enough to cover 71 percent of the planet's surface.

Of the very large volume of water on Earth, 97 percent is sea water, and only three percent fresh water. Of that three percent fresh water, about 0.1 percent is groundwater, and about .03 percent is surface water in lakes, rivers and streams. The remainder of the fresh water is present in ice caps, and a very tiny fraction is present as water vapor in the atmosphere.

Water is constantly moving from place to place on the Earth in the water, or hydrologic, cycle.

In this cycle, water is evaporated from sea and surface sources, spends some time in the atmosphere as water vapor, then

*see **WATER** page 7*


We Help You Help.
When you help care for a loved one, you take care of everything. But are you taking care of yourself?
AARP can help with information and useful tips on how you can maintain a healthy life balance, care for your own physical and mental well-being, and manage the challenges of caring for a loved one. Because the better care you take of yourself, the better care you can provide for your loved one.
You're there for them. We're here for you.
Find free Care Guides to support you and your loved one at AARP.org/caregiving
AARP
ad COUNCIL

Water: Key driver in Earth's dynamic climate

FROM PAGE 5

condenses into clouds and precipitates back to the surface as rain or snow. Some of the annual overland precipitation, which totals about 107 teratonnes annually, percolates through the surface and becomes groundwater. Some water flows downhill into the system of streams, rivers and lakes. Most of it, of course, falls directly back into the sea.

Three faces

Here on Earth, we're accustomed to seeing water appear in all three phases: liquid, solid and gas. Though we aren't able to see water vapor directly as it evaporates or transpires from plants into the atmosphere, we do see clouds on a daily basis, and clouds are made largely of water vapor.

When temperatures are above the freezing point of water, 32 degrees Fahrenheit or zero degrees centigrade, we see liquid water as rain and in rivers, lakes, streams, puddles, etc.

When the temperature falls below 32 F, we see water as ice and snow.

Solid phase water, or ice, is just as interesting as liquid water. Though we curse it when the roads and sidewalks are slippery, when our hydrants or pipes freeze, and when we find ourselves chopping holes in it so livestock can drink, ice has its own special beauty and interesting properties.

Cold and heat

Ice, in fact, is technically speaking, a mineral. It meets all the physical requirements to be classified as such, being a solid with a crystalline structure.

And a funny thing happens when water becomes a mineral. It actually grows in volume, and therefore shrinks in density, essentially two ways of saying the same thing. Water is the only non-metallic substance known to have this property. This is in part due to the polarity and geometry of the water molecule, which when it freezes, cannot form a tight and regular crystalline lattice. Rather, it forms a loose, rather clumpy structure that takes up more room than liquid water.

This is a critical property. When liquid water leaches into rock and freezes, the power of its expansion is so great that it splits the rock on both the microscopic and macroscopic level. Over the eons since water appeared on the planet, this freeze-thaw rock splitting has produced regolith, or powdered rock, a basic constituent of soil. Take some regolith, mix in decaying plant and animal material, add bacteria and other microorganisms and just a touch of water and you have nature's soil, the perfect medium for growing plants.

Expanding ice doesn't just pulverize rock, either. It can damage and destroy most any solid object, sometimes quickly, sometimes slowly. When there is an early, sudden and very hard freeze, for instance, the water frozen in trees can split them wide open. The same mechanism "kills" your garden tomatoes by rupturing the tiny plant cells from stem to fruit, turning them to mush.

Since ice is lower in density, it floats on water, which is another fascinating (and quite fortuitous) property. Just imagine what would happen if ice were more dense than water. It would freeze at the bottom of the lake, river, stream or stock tank and build up toward the top, reducing the volume of the container, causing flooding and overflows, and eventually, during a long cold spell, becoming a solid block of ice.

Speaking of cold, another of water's amazing properties is its ability to hold heat.

Water has the second highest heat capacity of any known substance, after ammonia, and a high heat of vaporization. On a smaller scale, this allows liquid water to exist beneath the ice in a stock tanks, lakes, rivers, and seas, even though the outside temperature is well below freezing. Water simply holds on to heat, through its natural molecular motion, for a very long time. Even in the depths of glaciated ice ages, trillions of tons of liquid water is present.

On the large scale, water's ability to conserve heat allows the oceans to act as a heat sink, moderating temperature and weather extremes around the globe.

Water is a key driver in Earth's dynamic climate. Understanding water is to understand one of the foundational building blocks of climate and climate science. Think about water. Look around and try to see what water is doing. Compare your observations to what you know, and look for real and fundamental answers whenever you scratch your head over something.

Climate change

Earth, like the rest of nature's universe, is a dynamic place which does what it does because of the complex interaction of matter and energy. Our planet is made up of countless particles – atoms and molecules of gas, liquid and solid matter. The sun shines "down" on Earth from a distance of 93 million miles, adding energy to the mix. That energy causes all those particles to move about at ever changing velocities. Those particles are constantly interacting – bumping into one another, as it were. This is what causes the climate to be dynamic, to be ever changing. Human beings, like bacteria and insects, mammals, birds, fishes and plants, are part of the planet's dynamism. We interact with the rest of the planet in a dynamic way. As a species, human beings still haven't found a way to comprehensively and accurately model and understand our climate. It is very, very complex, and with trillions of molecules in play, being acted upon by countless energy inputs, comprehensive understanding of climate is at best a Herculean task. Perhaps it is an impossible task.

What we individual humans can do, however. is to compare claims against facts, data, and the known laws of nature. We can be objective. We can be observant. We can choose not to seek the counsel of our fears. We can do this. We can start with the basics and stick with the basics. Water is one of the basics.


EMERGENCY
32+
specialties