

UNDERSTANDING POTASSIUM IN OUR WORLD



THE THREE BOOKS IN THIS SERIES ARE UNDERSTANDING NITROGEN IN OUR WORLD, UNDERSTANDING PHOSPHORUS IN OUR WORLD, AND UNDERSTANDING POTASSIUM IN OUR WORLD. TEACHERS, AGRONOMISTS, PARENTS, STUDENTS, AND EVERYDAY PEOPLE TOOK PART IN THE CREATION OF THESE BOOKS SO THAT THE READER WOULD DEVELOP A BETTER UNDERSTANDING FOR THE IMPORTANCE OF PLANT NUTRIENTS IN OUR LIVES.

IT IS OUR GOAL TO PROVIDE SCIENTIFIC-BASED INFORMATION IN SUCH A WAY THAT STUDENTS, TEACHERS AND PARENTS WILL EASILY DISCOVER HOW CLOSELY RELATED PLANT NUTRITION AND HUMAN NUTRITION ARE TO ONE ANOTHER.



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A BOOKLET DEVELOPED FOR
FOURTH THROUGH EIGHTH GRADE

ILLUSTRATIONS BY
GREG CRAVENS

WORDS TO THINK ABOUT

THESE ARE SOME WORDS I WANTED TO WARN YOU ABOUT.
I'LL SPRING THEM ON YOU LATER, SO HERE'S A SNEAK PREVIEW.

BACTERIA-SINGLE CELL ORGANISMS.

DEFICIENCY-LACKING A NECESSARY NUTRIENT.

ENZYME-AIDS CHEMICAL REACTIONS.

GPS- GLOBAL POSITIONING SYSTEM-A NETWORK OF EARTH-ORBITING SATELLITES THAT IS DESIGNED TO HELP GROUND-BASED UNITS DETERMINE THEIR CURRENT LOCATION IN LONGITUDE AND LATITUDE.

INERT- NON-REACTIVE.

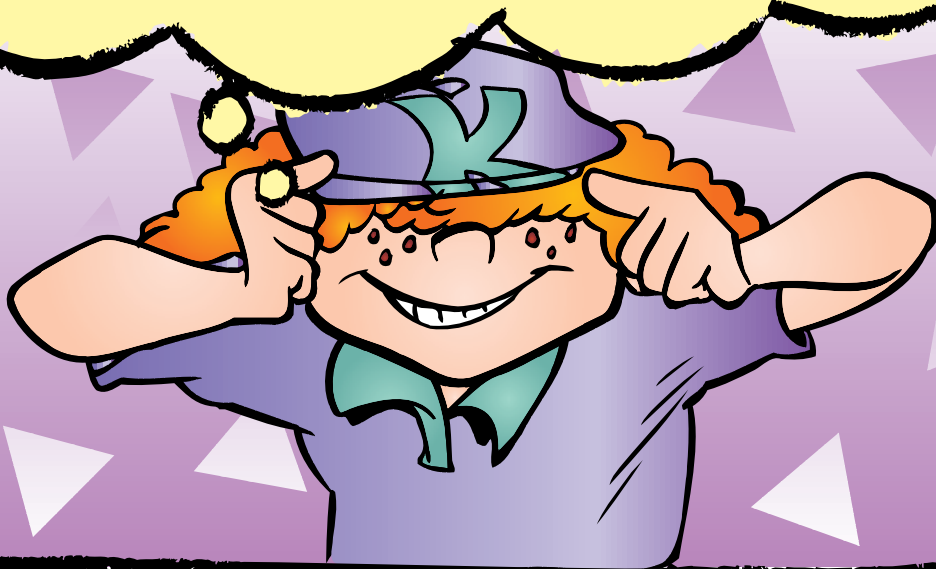
MINERAL- A MIXTURE OF NATURALLY OCCURRING INORGANIC COMPOUNDS OFTEN MINED FOR THE USEFUL SUBSTANCES THEY CONTAIN.

NUTRIENT- FOOD FOR PLANTS AND ANIMALS.

SITE-SPECIFIC MANAGEMENT- OVERALL CARE OF THE SOIL AND PLANTS FOLLOWING A SCIENCE-BASED DIAGNOSIS OF SPECIFIC SOIL AND PLANT CHARACTERISTICS FOR A DEFINED LOCATION.

UPTAKE- TO REMOVE DIRECTLY FROM THE SOIL.

VARIABLE RATE- TO APPLY NUTRIENTS ACCORDING TO SPECIFIC SOIL AND CROP NEEDS BASED ON LABORATORY TESTS AND RESEARCH.



HI! I'M
POTASSIUM
OR "POTASH"

TO SCIENCE
PEOPLE, I'M
KNOWN
AS K!

I'LL ANSWER TO ANY OF THESE NAMES!

I'M AN ESSENTIAL
NUTRIENT THAT PLANTS AND
PEOPLE (THAT INCLUDES YOU,
YOU KNOW) REQUIRE!

I'M PRETTY
INDEPENDENT IN BOTH
PLANTS AND PEOPLE! I DON'T MIX
WITH OTHER NUTRIENTS AND
COMPOUNDS...BUT I HAVE MANY IMPORTANT
JOBS, AS YOU WILL LEARN IN THE
FOLLOWING PAGES!

WHAT IF YOU DIDN'T HAVE ENOUGH POTASSIUM IN THE WORLD? FIRST OF ALL, YOUR FOOD WOULDN'T BE VERY GOOD TO EAT, AND BECAUSE OF THAT, YOU WOULDN'T BE TOO GOOD, EITHER. WHEN THE ASTRONAUTS IN SPACE GOT TOO LOW ON POTASSIUM (OR K) THEY EXPERIENCED IRREGULAR HEARTBEAT AND HAD TO FIX THE PROBLEM QUICKLY! BE GLAD YOU CAN GET YOUR K!



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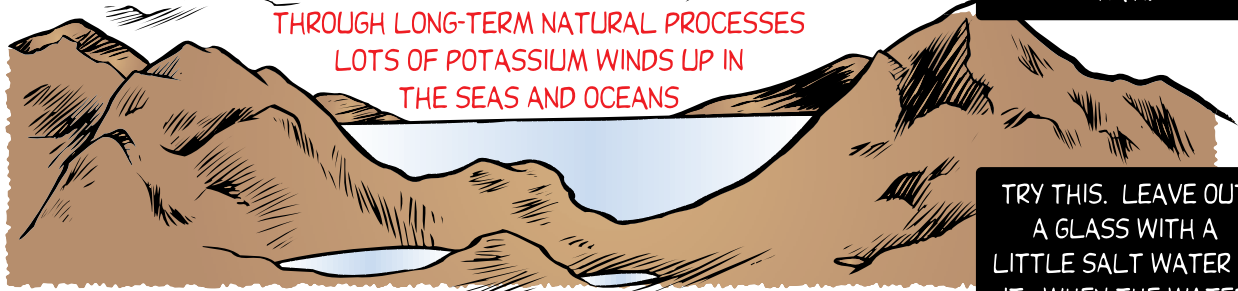
DID YOU KNOW THE GREAT SALT LAKE AND THE DEAD SEA CONTAIN LOTS OF POTASSIUM?

POTASSIUM IS A PART OF SOIL ROCKS AND MINERALS. THAT MEANS IT IS RIGHT IN THE GROUND.



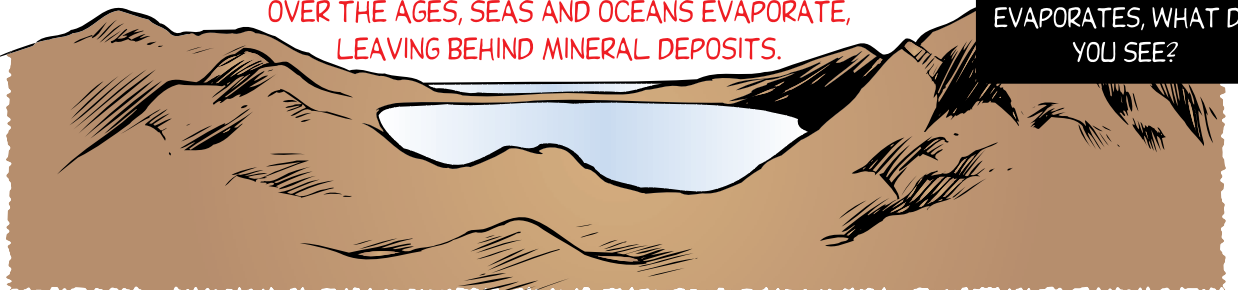
SINCE IT DISSOLVES IN WATER, POTASSIUM WILL FLOW INTO THE OCEANS WITH THE RAIN.

THROUGH LONG-TERM NATURAL PROCESSES LOTS OF POTASSIUM WINDS UP IN THE SEAS AND OCEANS



TRY THIS. LEAVE OUT A GLASS WITH A LITTLE SALT WATER IN IT. WHEN THE WATER EVAPORATES, WHAT DO YOU SEE?

OVER THE AGES, SEAS AND OCEANS EVAPORATE, LEAVING BEHIND MINERAL DEPOSITS.



THROUGH THE ACTION OF EARTHQUAKES, VOLCANOS AND GLACIERS, THESE DEPOSITS WERE COVERED OVER TIME. SOME ARE JUST BELOW THE SURFACE. OTHERS CAN BE COVERED BY SEVERAL THOUSANDS OF FEET OF EARTH.



ANYWAY, WE CAN MINE K AND OTHER MINERALS AND USE THEM TO FERTILIZE OTHER LAND.

FARMERS TAKE THE NEXT STEP IN RECYCLING K BY USING IT ON THEIR FIELDS TO GROW THE FOOD YOU EAT.



NEARLY 90% OF BODY POTASSIUM IS FOUND IN MAJOR ORGANS AND TISSUES, INCLUDING MUSCLES, SKIN, AND DIGESTIVE TRACT.



- APPLE 159 MG 
- 250 ML ORANGE JUICE 496 MG 
- BANANA 467 MG 
- 2 SLICES LEAN BEEF RIB ROAST 308 MG 
- BAKED POTATO WITH SKIN 573 MG 
- 2% MILK, 250 ML 376 MG 

NATURE PROVIDES US WITH A HEALTHY SUPPLY OF POTASSIUM IN OUR MEATS, DAIRY PRODUCTS, FRUITS, NUTS, AND VEGETABLES.

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IN THE CYCLING PROCESS, POTASSIUM FOUND ITS WAY INTO LAKES, SEAS AND OCEANS. WHEN THESE WATER BODIES EVAPORATED, POTASSIUM DEPOSITS WERE LEFT. THE K EVENTUALLY FINDS ITS WAY BACK TO PLANTS, TO COWS, THEIR MILK, TO YOU. FIND THIS PATH IN THE MAZE...

start

DEPOSITS FORMED BY EVAPORATION



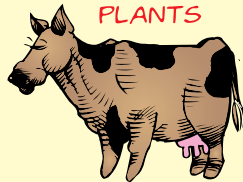
DEPOSITS ARE MINED AND USED AS FERTILIZER

PLANTS ABSORB POTASSIUM



COWS GIVE MILK

COWS EAT PLANTS



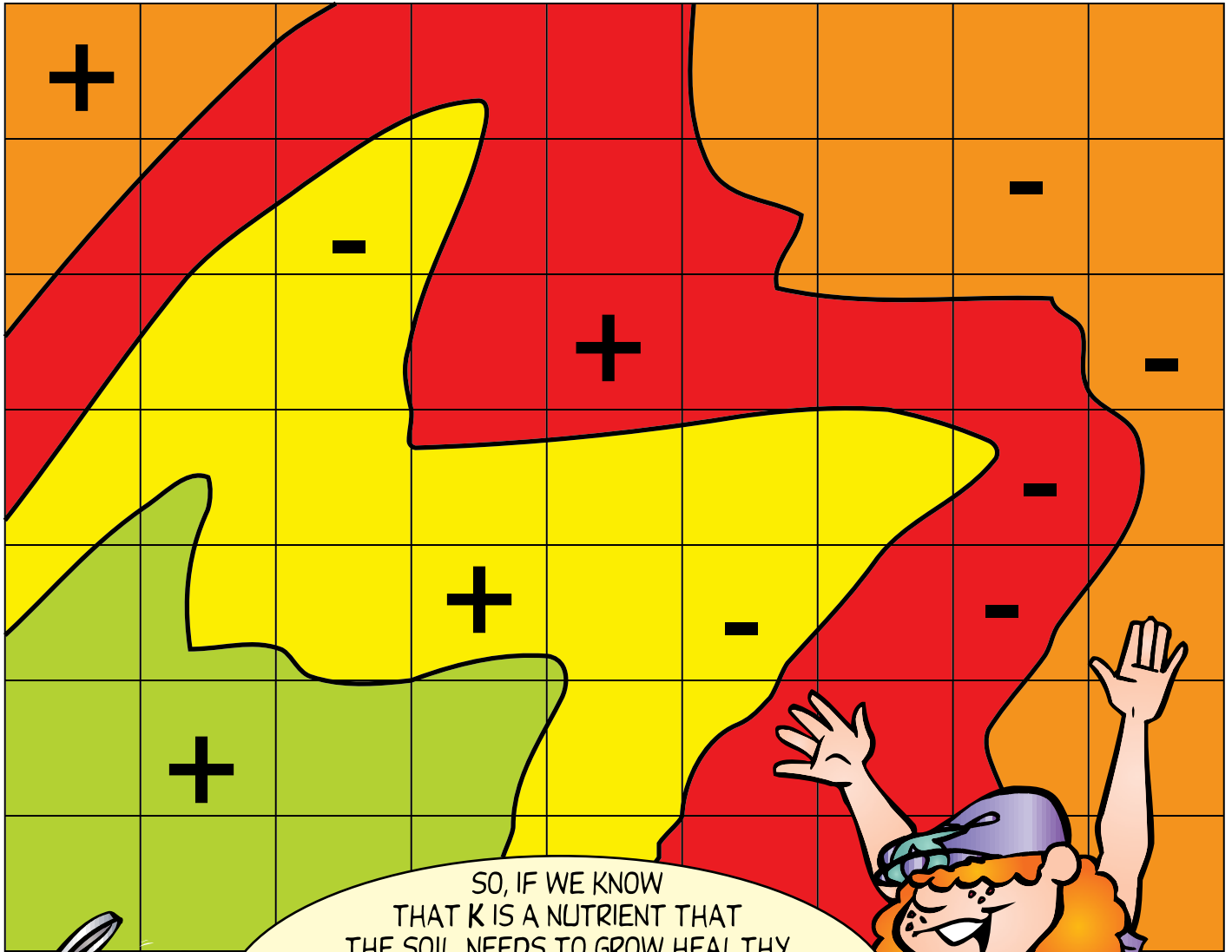
WE DRINK MILK



finish

YOU WILL BE SURPRISED BY ALL THE GOOD DEEDS POTASSIUM DOES TO HELP YOUR FOOD LOOK AND TASTE BETTER. THESE DEEDS WILL BE EXPLAINED AS WE CONTINUE ALONG OUR PATHWAY FROM SALT BEDS TO YOUR HEALTHY BODY...

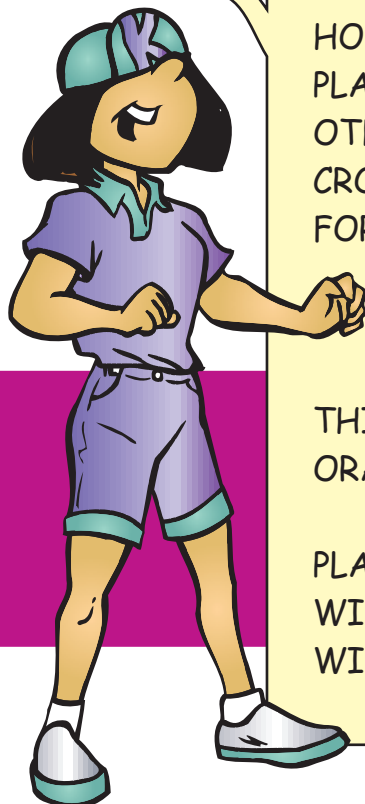




SO, IF WE KNOW THAT K IS A NUTRIENT THAT THE SOIL NEEDS TO GROW HEALTHY PLANTS, HOW DO WE KNOW IF THE SOIL NEEDS EXTRA K APPLIED TO GIVE IT ENOUGH? LABWORK! LABORATORIES CAN HELP FARMERS DECIDE WHEN AND WHERE TO ADD K TO THEIR SOILS!



UNDERSTANDING POTASSIUM IN OUR WORLD.



HOW DO YOU GET THE K YOU NEED? BY EATING THE PLANT AND ANIMAL PRODUCTS THAT CONTAIN THE K AND OTHER NUTRIENTS THAT HELP YOU GROW AND BE HEALTHY. CROPS HAVE A GREAT BIG APPETITE FOR POTASSIUM. FOR EXAMPLE: A TYPICAL CORN CROP WILL TAKE UP MORE THAN 200 KILOS OF POTASSIUM ON AN ACRE IN ONE YEAR. THAT AMOUNTS TO ABOUT 600,000 METRIC TONS OF K TAKEN UP BY CORN IN CANADA. THINK ABOUT HOW MUCH K IS TAKEN UP BY APPLES, ORANGES, CARROTS, BANANAS ... ALL THE FOODS YOU EAT.

PLANTS COULDN'T CARRY OUT PHOTOSYNTHESIS WITHOUT POTASSIUM. THERE WOULD BE NO PROTEINS WITHOUT IT. THING WE HAVE ALL THAT K.

POTASSIUM IS KNOWN AS THE REGULATOR!

YOU LEARNED EARLIER THAT K DOESN'T GET TIED UP WITH OTHER STUFF IN PLANTS. IT'S MORE OF A LONER. HOWEVER, IT HAS MANY JOBS TO DO, LIKE KEEPING THE PLANT'S ENZYME SYSTEMS WORKING...SEEING THAT SUGARS ARE MADE AND USED PROPERLY...THAT THE PLANT USES WATER EFFICIENTLY. ACTUALLY, POTASSIUM IS LIKE A REGULATOR OR TRAFFIC COP. IT HELPS TO MAKE SURE THAT ALL ACTIVITIES IN THE PLANT MOVE ALONG QUICKLY AND EFFICIENTLY WITHOUT ANY ACCIDENTS OR DELAYS.



WHEN I DO MY JOB, YOU GET...

HEALTHIER PLANTS, OF A
BETTER QUALITY, WITH NICER
INSIDES.

LONGER SHELF LIVES

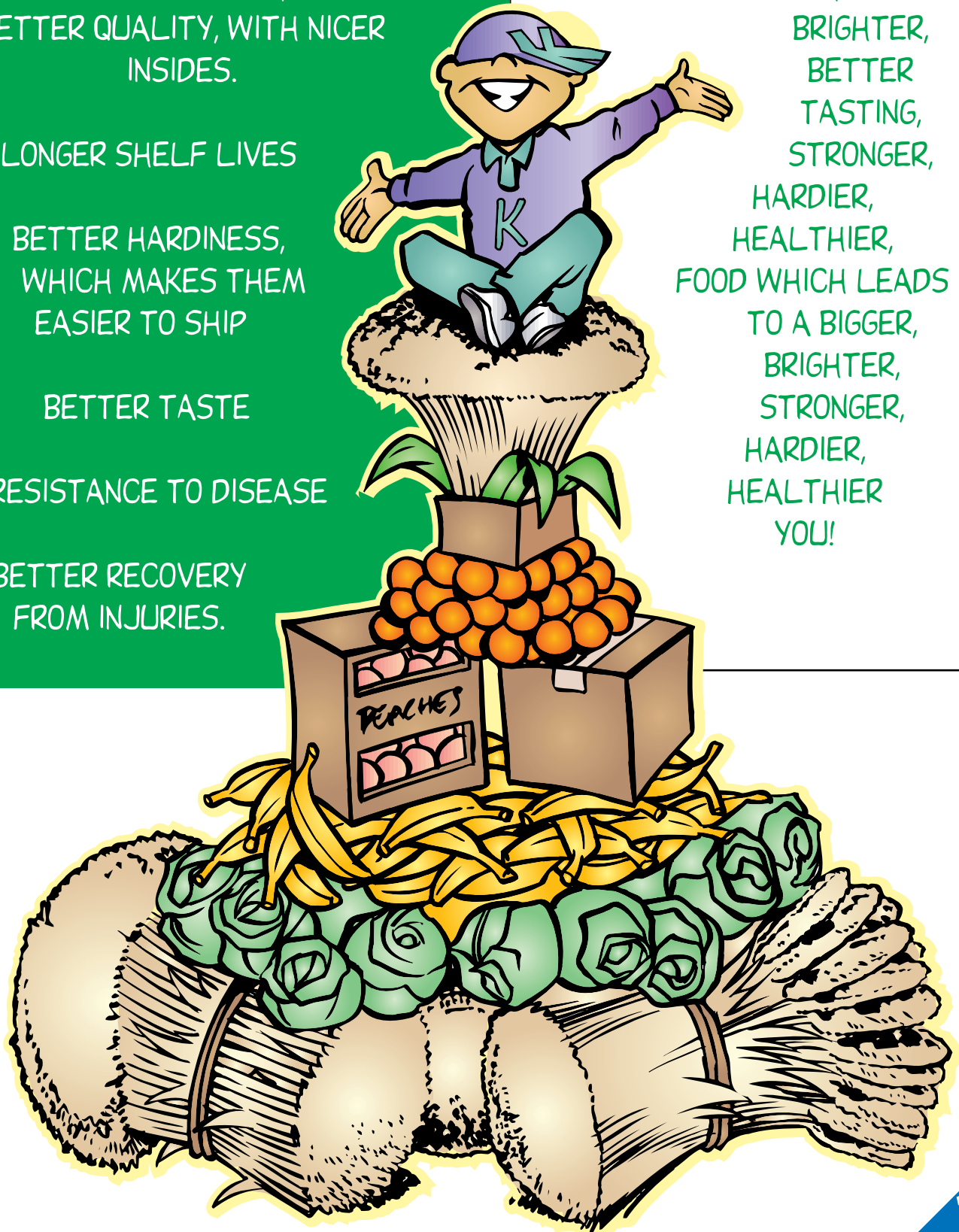
BETTER HARDINESS,
WHICH MAKES THEM
EASIER TO SHIP

BETTER TASTE

RESISTANCE TO DISEASE

BETTER RECOVERY
FROM INJURIES.

BIGGER,
BRIGHTER,
BETTER
TASTING,
STRONGER,
HARDIER,
HEALTHIER,
FOOD WHICH LEADS
TO A BIGGER,
BRIGHTER,
STRONGER,
HARDIER,
HEALTHIER
YOU!





WATER TURNS TO ICE AT 0 DEGREE CELCIUS. WHY DOESN'T THE WATER IN PLANTS BECOME ICE? BECAUSE OF K.

LAWNS STAY GREEN AND SPRINGY IN THE FALL WITH ENOUGH K. CROPS WITHOUT ENOUGH K COULD BE INFECTED BY DISEASES. THEIR STALKS COULD BREAK DOWN!



POTASSIUM ADDS TO THE TASTE AND FOOD VALUE OF THE THINGS YOU EAT EVERY DAY. DO YOU LIKE POTATO CHIPS? I DO. WITH ENOUGH K IN THE POTATOES, THE POTATOES ARE BRIGHT AND TASTE GOOD. WITHOUT ENOUGH K, POTATOES ARE WEAK AND DARK COLORED. I LIKE MY POTATO CHIPS MADE FROM STRONG, HEALTHY POTATOES. THAT WAY THEY ARE BIG, LIGHT COLORED, AND THEY TASTE GOOD.



**TATER
CHIPS**

HOW MUCH POTASSIUM DOES THIS PLANT NEED?

PLANTS ARE LIKE PEOPLE THEY COME IN ALL SIZES AND SHAPES, SO THEIR REQUIREMENTS FOR NUTRIENTS LIKE POTASSIUM VARY

YOU LEARNED THAT ONE HECTARE OF CORN CAN TAKE UP AS MUCH AS 200 KILOS OF K IN A SINGLE GROWING SEASON. THERE COULD BE UP TO 25,000 CORN PLANTS OR MORE ON EACH HECTARE, SO THIS SINGLE PLANT WILL NEED ABOUT TWO GRAMS OF K.



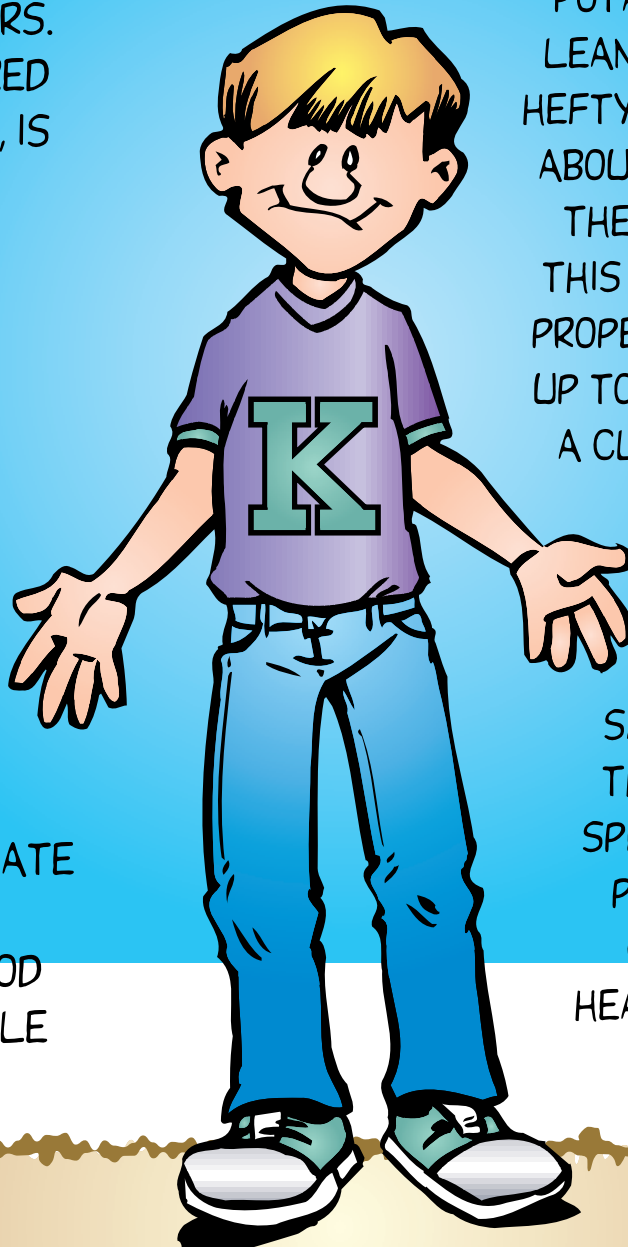
WOW! THAT'S NOT MUCH K. BUT, WHAT DO YOU THINK WOULD HAPPEN IF THE K WASN'T IN THE SOIL AND AVAILABLE FOR THE PLANT? THERE WOULD BE NO PHOTOSYNTHESIS, NO PROTEINS... NO PLANT.

REMEMBER! PLANTS NEED PLENTY OF POTASSIUM TO GROW STRONG AND HEALTHY.

HOW MUCH POTASSIUM DOES THIS PERSON NEED?

HE NEEDS A LOT. POTASSIUM IS THE THIRD MOST ABUNDANT MINERAL IN HIS BODY... AND YOURS. POTASSIUM, REQUIRED IN LARGE AMOUNTS, IS AN ESSENTIAL NUTRIENT FOR NORMAL PLANT GROWTH. IT IS AS IMPORTANT FOR PEOPLE AND ANIMALS AS IT IS FOR PLANTS.

PLANTS GET THEIR K FROM THE SOIL. THIS GUY GETS HIS FROM FOOD. ADEQUATE POTASSIUM IS ESSENTIAL TO GOOD HEALTH... IN PEOPLE AND IN PLANTS.

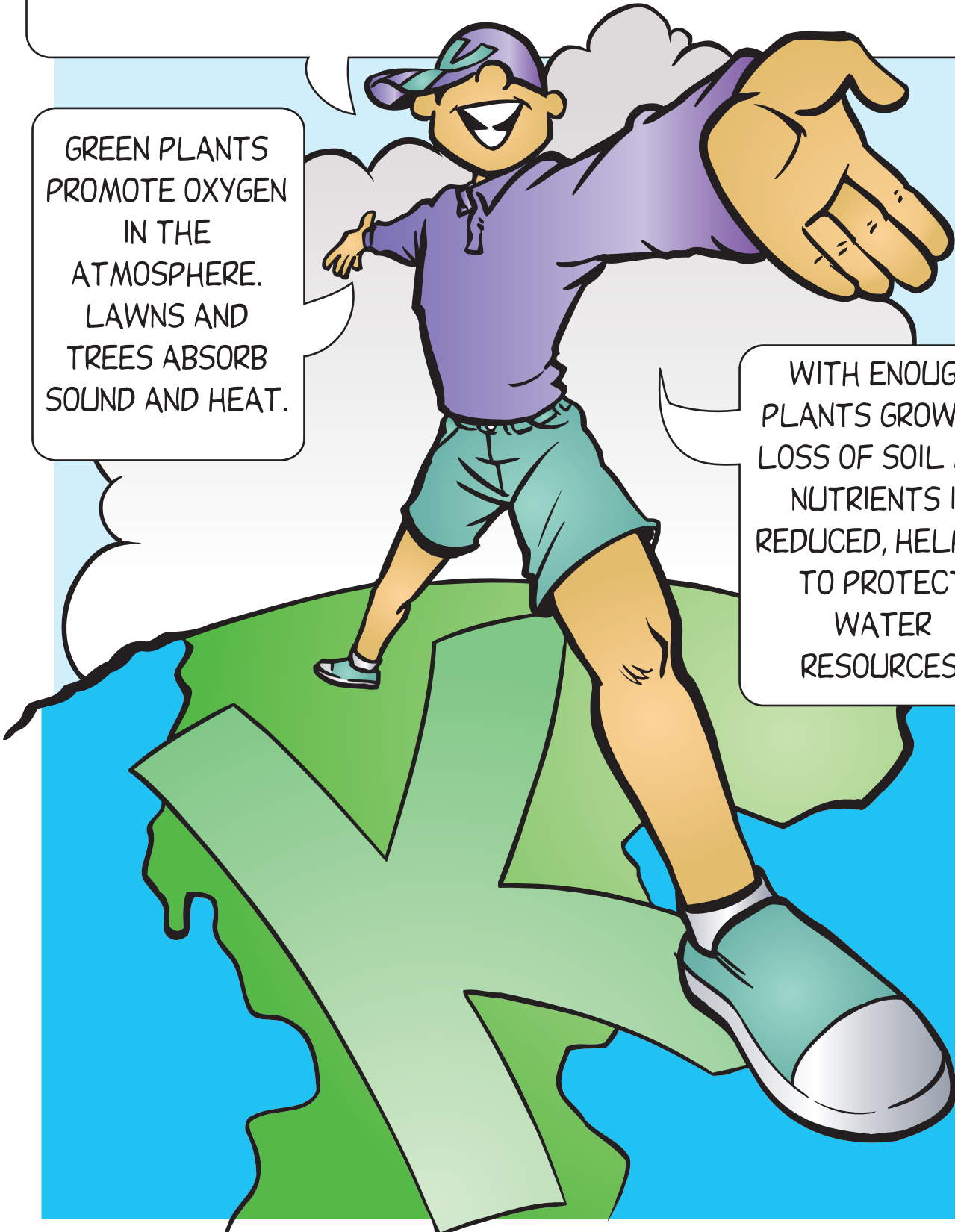


THAT'S WHY YOUR DIET SHOULD INCLUDE FOODS HIGH IN K AND OTHER NUTRIENTS. APPLES, ORANGES, MILK, POTATOES, BANANAS, AND LEAN MEATS ALL CONTAIN HEFTY AMOUNTS OF K. THINK ABOUT THE CORN PLANT ON THE PREVIOUS PAGE AND THIS KID. THEY BOTH NEED PROPER NUTRITION TO GROW UP TO BE HEALTHY. THAT'S A CLOSE KINSHIP. BUT AN EVEN CLOSER ONE IS THE NUTRIENTS THAT MAKE THE CORN HEALTHY ARE THE SAME ONES THAT KEEP THE KID GOING AT TOP SPEED. SO, FERTILIZING PLANTS IS NOT ONLY CRITICAL TO PLANT HEALTH, IT'S CRITICAL TO YOURS, TOO!

POTASSIUM HELPS THE ENVIRONMENT...DIRECTLY AND INDIRECTLY!
WITH ENOUGH POTASSIUM AVAILABLE, NOT ONLY ARE CROPS HELPED,
BUT ALSO LAWNS AND TREES GROW BETTER...

GREEN PLANTS
PROMOTE OXYGEN
IN THE
ATMOSPHERE.
LAWNS AND
TREES ABSORB
SOUND AND HEAT.

WITH ENOUGH
PLANTS GROWING,
LOSS OF SOIL AND
NUTRIENTS IS
REDUCED, HELPING
TO PROTECT
WATER
RESOURCES.



WHAT IS IT THAT MAKES FOOD FOR PLANTS?

PHOTOSYNTHESIS



PLANTS GIVE US FOOD. THAT MAKES THEM VALUABLE. THEY ALSO INCREASE OUR OXYGEN SUPPLY BY TAKING IN CARBON DIOXIDE AND RELEASING OXYGEN DURING PHOTOSYNTHESIS. PEOPLE BREATHE IN OXYGEN AND BREATHE OUT CARBON DIOXIDE. POTASSIUM HELPS INCREASE PHOTOSYNTHESIS... GIVING US MORE FOOD AND OXYGEN.

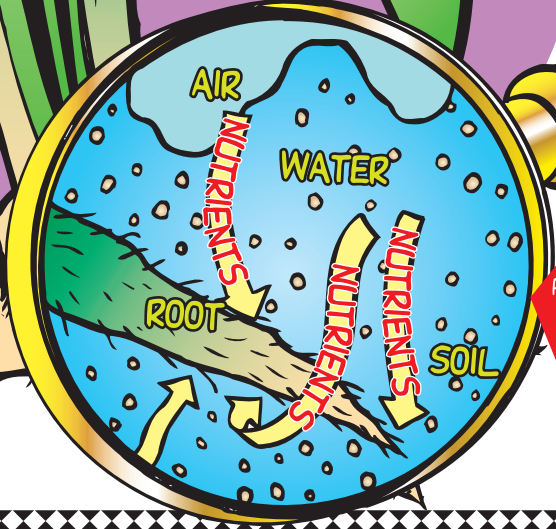
ENERGY FROM THE SUN.

BREAKDOWN OF SUGAR (RESPIRATION) RELEASES ENERGY WHICH IS TRAPPED AS HIGH-ENERGY P-COMPOUNDS

WATER, SOLAR ENERGY, & CARBON DIOXIDE BECOME SUGAR & OXYGEN.

HIGH ENERGY PHOSPHORUS (P) COMPOUNDS CREATE MORE PLANT TISSUE AND GRAIN.

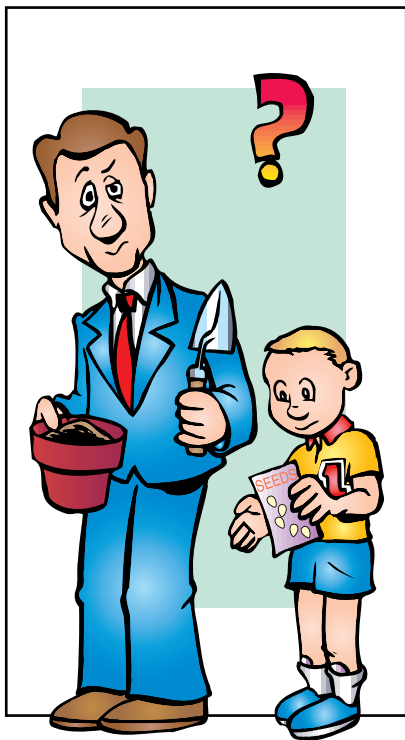
NITROGEN, PHOSPHORUS, POTASSIUM, CALCIUM, OTHER ELEMENTS FROM THE SOIL & FERTILIZERS.



WATER WRAPPED AROUND SOIL PARTICLES AND PLANT ROOTS ALLOWS NUTRIENTS TO MOVE FROM THE SOIL TO THE ROOTS.

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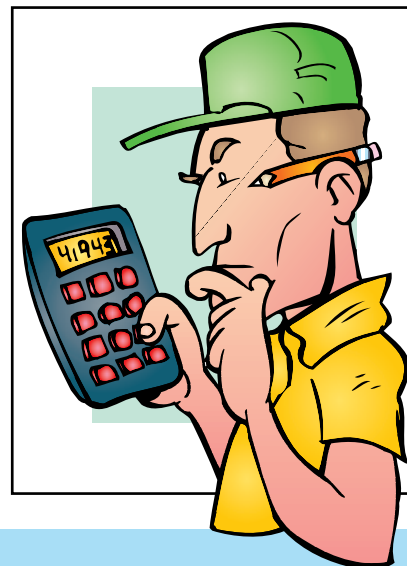
FARMERS PLAY AN IMPORTANT ROLE IN GETTING FOOD ON YOUR TABLE. IN FACT, WITHOUT FARMERS, THERE WOULD BE NO FOOD UNLESS YOU GREW IT YOURSELF! TO KEEP GROWING FOOD, FARMERS NEED TO MAKE A PROFIT, SO THEY AND THEIR FAMILIES CAN CONTINUE TO EXIST.



IT'S NOT ALWAYS EASY TO MAKE A PROFIT ON THE FARM. FIRST OF ALL, FARMERS HAVE LITTLE CONTROL OVER THE PRICE OF THE PRODUCE THEY SELL. THAT'S DONE AT THE WORLD LEVEL. TIMELY MARKETING HELPS. FARMERS CAN'T CONTROL THE WEATHER, EITHER. THEY HAVE TO ADJUST AS BEST AS THEY CAN TO DROUGHT OR TOO MUCH RAIN.



THEY FIGHT INSECTS AND DISEASES AS WELL. THEY TRY TO CONTROL THEIR PRODUCTION COSTS WITH CAREFUL MANAGEMENT.



THEIR BIGGEST OPPORTUNITY TO MAKE A PROFIT, HOWEVER, IS TO GROW MORE CROPS PER ACRE OF LAND. IN FACT, ONE FARMER SURVEY SHOWED THAT ABOUT THREE-FOURTHS OF PROFITABILITY COMES FROM INCREASED PRODUCTION PER ACRE.



HOW DO FARMERS GROW MORE PER ACRE? WITH GOOD MANAGEMENT, INCLUDING THE BEST USE OF POTASSIUM AND OTHER ESSENTIAL NUTRIENTS. WITHOUT ADEQUATE POTASSIUM, PROFITABLE CROP PRODUCTION WOULD BE IMPOSSIBLE. THAT'S HOW IMPORTANT K IS. TO YOU. TO FARMERS.

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HOW MANY EARS OF CORN DO YOU SUPPOSE IT TAKES TO FILL ALL THE WORLD'S CEREAL BOWLS WITH CORN FLAKES EVERY MORNING? HOW MANY BUSHELS OF WHEAT FOR THE MILLIONS OF LOAVES OF BREAD WE EAT EACH DAY?



... OR HOW MANY KILOS OF COTTON TO MAKE THE CLOTHES WE ALL WEAR? WHERE DOES ALL THIS CORN AND WHEAT AND COTTON ... AND OTHER CROPS ... COME FROM? YOU KNOW! FROM FARMERS ... AND FROM POTASSIUM.

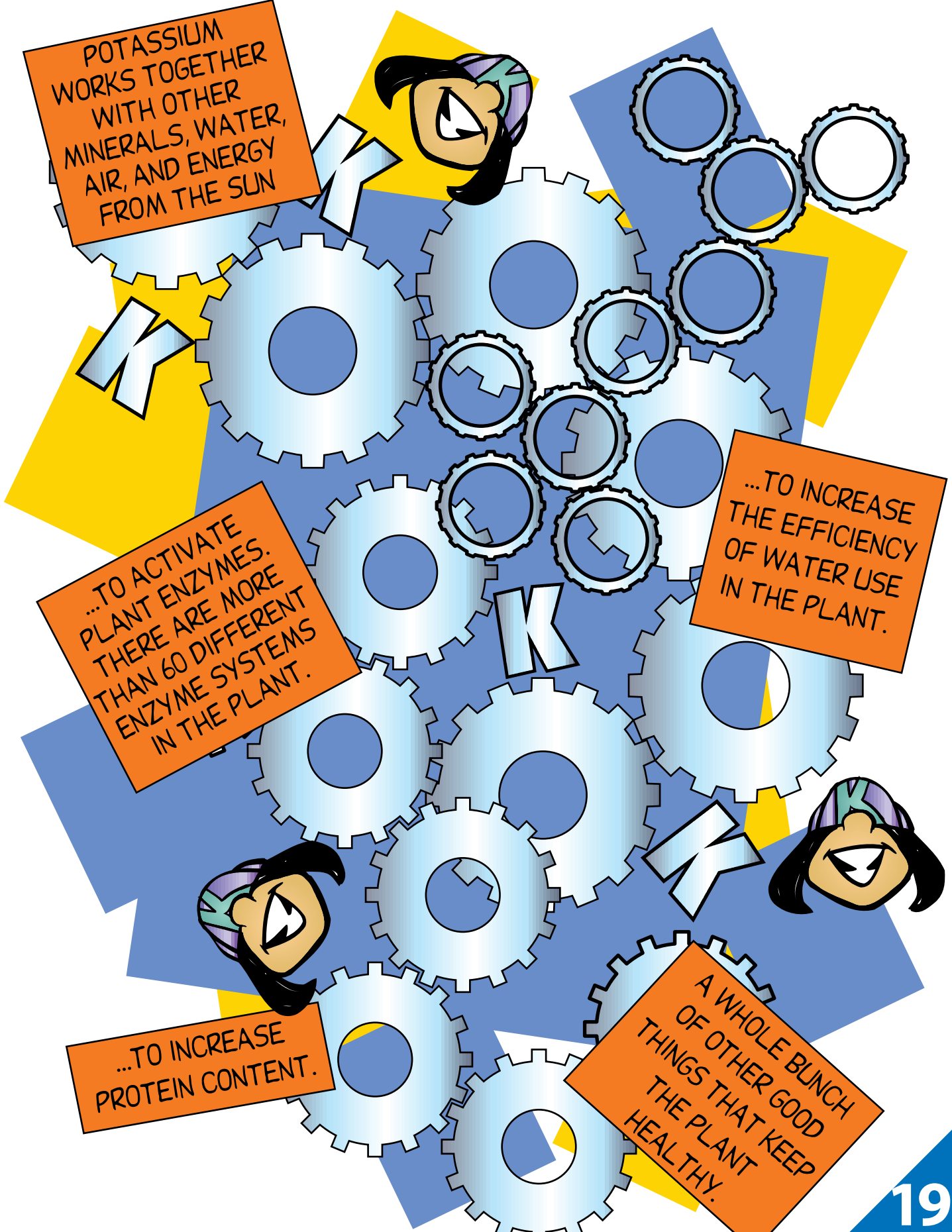
POTASSIUM
WORKS TOGETHER
WITH OTHER
MINERALS, WATER,
AIR, AND ENERGY
FROM THE SUN

...TO ACTIVATE
PLANT ENZYMES.
THERE ARE MORE
THAN 60 DIFFERENT
ENZYME SYSTEMS
IN THE PLANT.

...TO INCREASE
THE EFFICIENCY
OF WATER USE
IN THE PLANT.

...TO INCREASE
PROTEIN CONTENT.

A WHOLE BUNCH
OF OTHER GOOD
THINGS THAT KEEP
THE PLANT
HEALTHY.



POTASSIUM DOES A LOT IN THE PLANT BESIDES HELPING TO FEED IT. IT PROTECTS THE PLANT AGAINST STRESSES. SCIENTISTS ONCE WROTE THAT K DOES MORE TO PREVENT PLANT DISEASES THAN ANY OTHER SUBSTANCE. POTASSIUM ALSO PROTECTS PLANTS FROM COLD WINTER TEMPERATURES AND HELPS THEM TO RESIST INVASIONS BY PESTS SUCH AS WEEDS AND INSECTS.



THE WORLD IS GOING HIGH-TECH. YOU MAY KNOW MORE ABOUT COMPUTERS THAN YOUR MOM AND DAD DO RIGHT NOW! FARMING ISN'T WASTING TIME, EITHER. ONE OF THE BEST NEW TOOLS IN THE FIELD (PUN INTENDED) IS THE GPS. (THAT MEANS GLOBAL POSITIONING SYSTEM.) FIELDS CAN BE TESTED AND PLOTTED SO THAT FARMERS AND THEIR ADVISERS CAN APPLY FERTILIZER THAT IS EXACTLY RIGHT FOR EVERY PART OF EACH FIELD, WORKING FROM LABORATORY REPORTS AND ELECTRONIC RECORDS.



POTASSIUM

NATURE PROVIDES US WITH A BOUNTIFUL SUPPLY OF POTASSIUM IN OUR DIETS. SO, HOW CAN YOU BE SURE THAT YOU ARE GETTING ENOUGH K? PRACTICE GOOD HEALTH HABITS. EAT RIGHT.

WE ARE FORTUNATE TO HAVE GOOD, SAFE, NUTRITIOUS FOOD TO EAT. THERE ARE LOTS OF PEOPLE RESPONSIBLE, STARTING WITH FARMERS. YOU CAN THANK THEM AND YOU CAN THANK POTASSIUM WHEN YOU SIT DOWN TO YOUR NEXT MEAL.

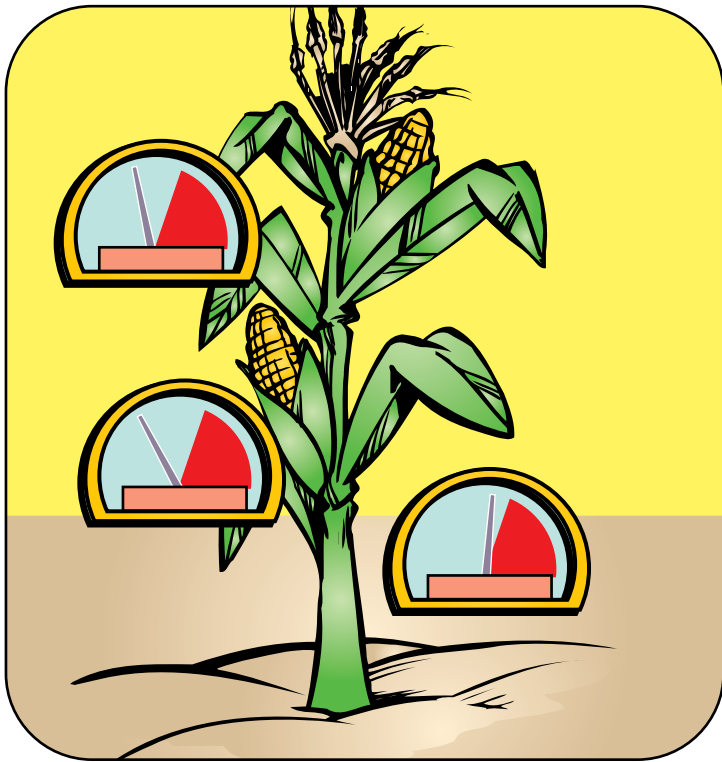


POTASSIUM IS ONE PLAYER ON A 17 MEMBER TEAM OF ESSENTIAL NUTRIENTS AND MINERALS. THEY ALL WORK TOGETHER TO KEEP PLANTS AND ANIMALS HEALTHY AND GROWING.



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