



**MORE  
MILK  
ZURI?!**

BY ELIZA WOLFSON

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THERE ONCE WAS A SPECIAL LOCAL COW CALLED ZURI, WHO WAS KIND, HEALTHY AND BRAVE

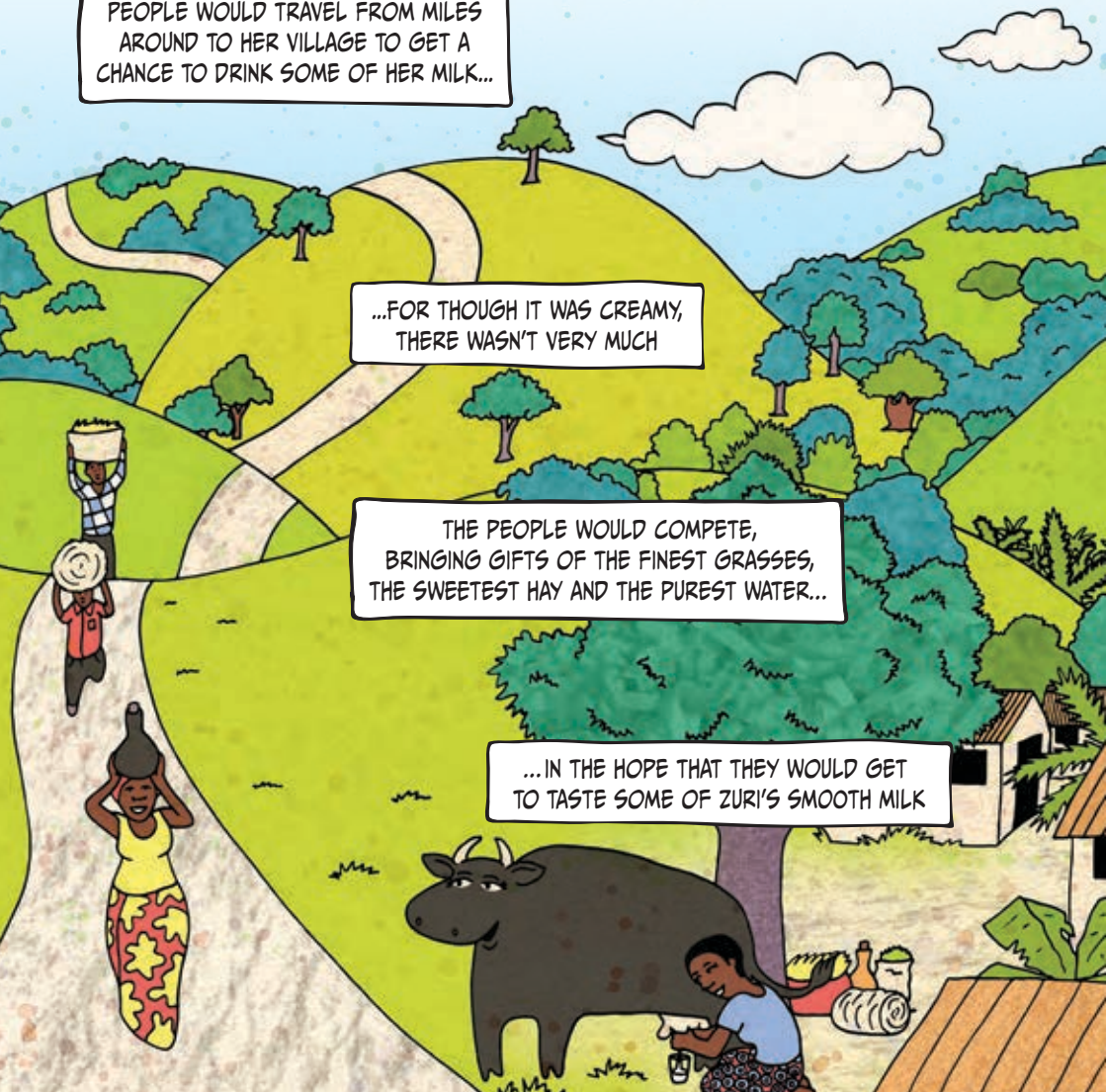


PEOPLE WOULD TRAVEL FROM MILES AROUND TO HER VILLAGE TO GET A CHANCE TO DRINK SOME OF HER MILK...

...FOR THOUGH IT WAS CREAMY, THERE WASN'T VERY MUCH

THE PEOPLE WOULD COMPETE, BRINGING GIFTS OF THE FINEST GRASSES, THE SWEETEST HAY AND THE PUREST WATER...

...IN THE HOPE THAT THEY WOULD GET TO TASTE SOME OF ZURI'S SMOOTH MILK



ZURI BECAME VERY RICH...

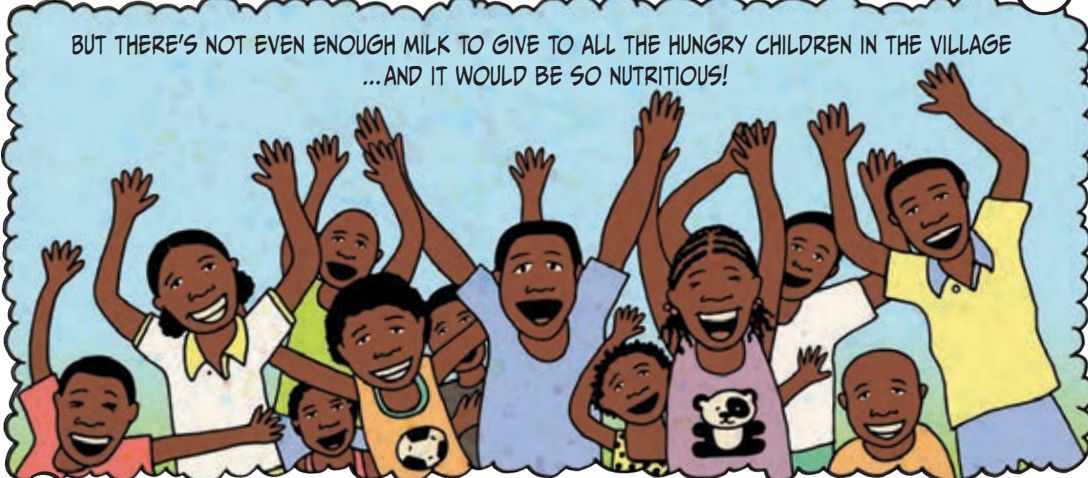


... BUT DESPITE HAVING ALL THE FOOD SHE COULD EAT AND ALL THE WATER SHE COULD DRINK...



I FEEL LIKE I HAVE TO GIVE MILK TO PEOPLE AFTER THEY'VE COME SO FAR WITH GIFTS...

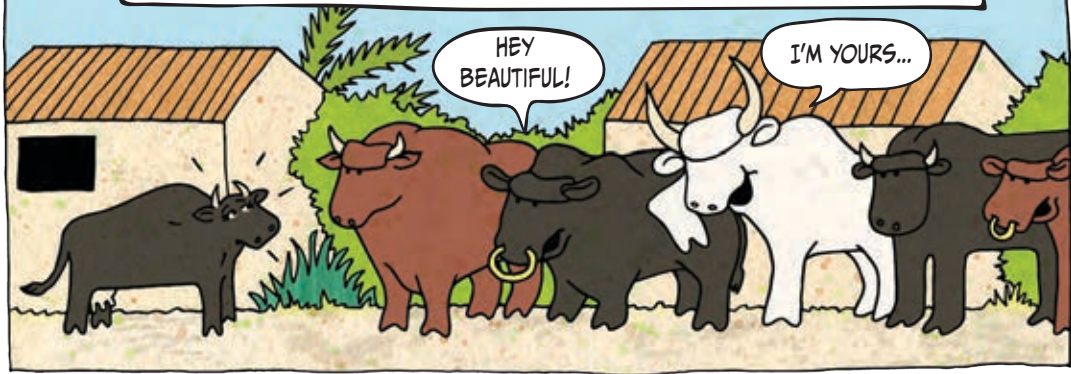
BUT THERE'S NOT EVEN ENOUGH MILK TO GIVE TO ALL THE HUNGRY CHILDREN IN THE VILLAGE ...AND IT WOULD BE SO NUTRITIOUS!



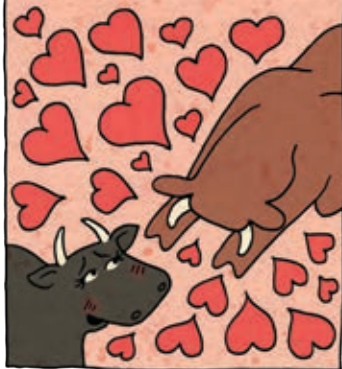
THAT'S IT!  
I'LL FIND A HANDSOME HUSBAND WHO WILL GIVE ME LOTS OF STRONG, HEALTHY BABIES THAT WILL MAKE MORE MILK AND KEEP THE VILLAGE CHILDREN FROM GETTING SICK



WORD SPREAD QUICKLY AND SOON ALL THE LOCAL BULLS WANTED TO MARRY ZURI. EACH BULL TOLD HER WHY THEY WOULD BE THE BEST



SOME OF THEM TOLD HER HOW MUCH THEY LOVED HER...



...OTHERS BOASTED OF THEIR STRENGTH, HEALTH AND FERTILITY...



...OTHERS STILL SPOKE OF HOW MUCH MILK THEIR MOTHERS MADE TO MAKE THEM SO BIG



ZURI DIDN'T KNOW WHICH BULL TO CHOOSE! SHE WANTED HER CHILDREN TO MAKE LOTS OF CREAMY MILK FOR THE VILLAGE CHILDREN, SO HAD TO CHOOSE WISELY...



SO ZURI WENT TO SEE A WISE FARMER CALLED BUSARA, WHO LIVED ON A BIG SHAMBA NOT SO FAR AWAY, TO ASK HIM FOR ADVICE

HI BUSARA!

HI ZURI!

AFTER SOME FRESH WARM MILK...

I WANT A HUSBAND WHO CAN HELP ME HAVE BABIES THAT WILL MAKE LOTS OF MILK. HOW CAN I MAKE SURE I CHOOSE THE BEST BULL FOR THAT?

THEY ALL LOOK HANDSOME ENOUGH AND THEY TELL ME HOW STRONG THEY ARE...

YOU CAN'T TELL JUST BY LOOKING OR ASKING THEM...

YOU CAN KNOW HOW WELL A BULL'S CHILDREN MIGHT DO BY KNOWING ALL ABOUT THEIR FAMILY. AFTER ALL, IT IS ALL WRITTEN IN THEIR DNA

DNA IS A SPECIAL CHEMICAL ALPHABET...

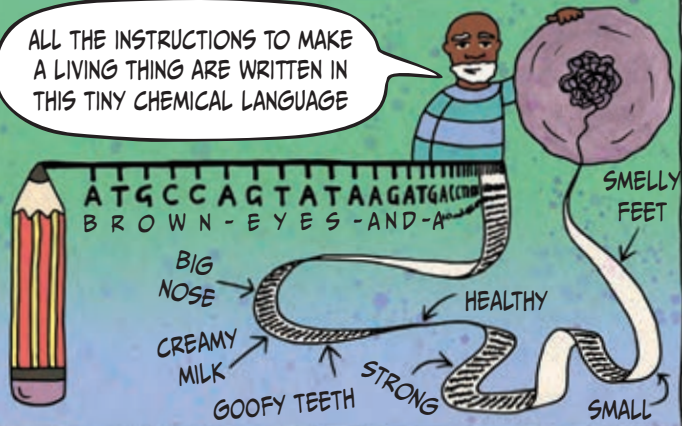


...HIDDEN INSIDE EVERY CELL...



...OF EVERY LIVING THING

ALL THE INSTRUCTIONS TO MAKE A LIVING THING ARE WRITTEN IN THIS TINY CHEMICAL LANGUAGE



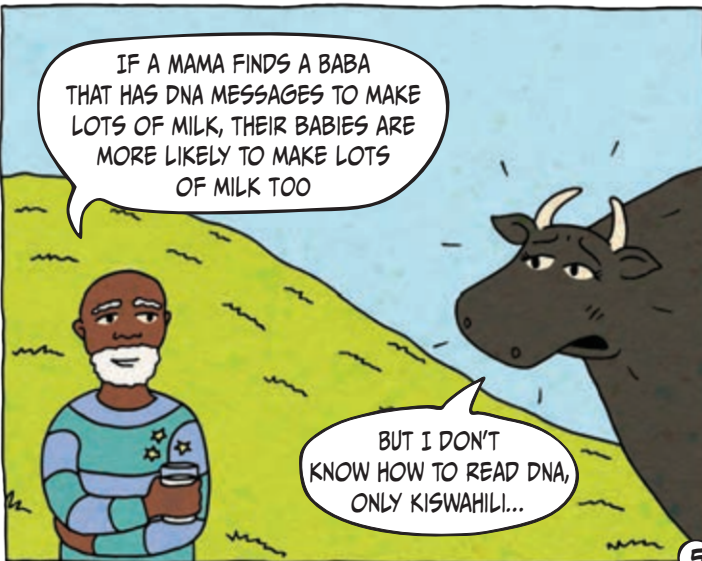
EVERY TIME YOU MAKE A BABY COW, HALF THE MAMA'S AND HALF THE BABA'S DNA COME TOGETHER...



...BUT THE WAY IT DOES THIS IS A LITTLE BIT DIFFERENT EVERY TIME

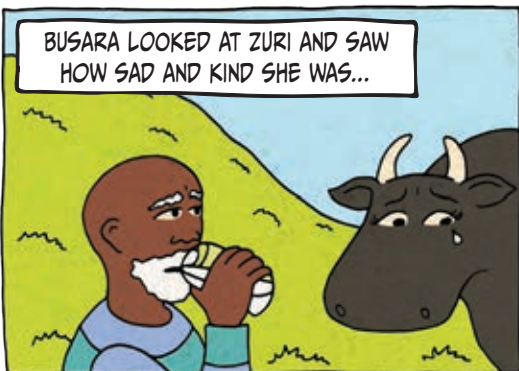


IF A MAMA FINDS A BABA THAT HAS DNA MESSAGES TO MAKE LOTS OF MILK, THEIR BABIES ARE MORE LIKELY TO MAKE LOTS OF MILK TOO



BUT I DON'T KNOW HOW TO READ DNA, ONLY KISWAHILI...

BUSARA LOOKED AT ZURI AND SAW HOW SAD AND KIND SHE WAS...

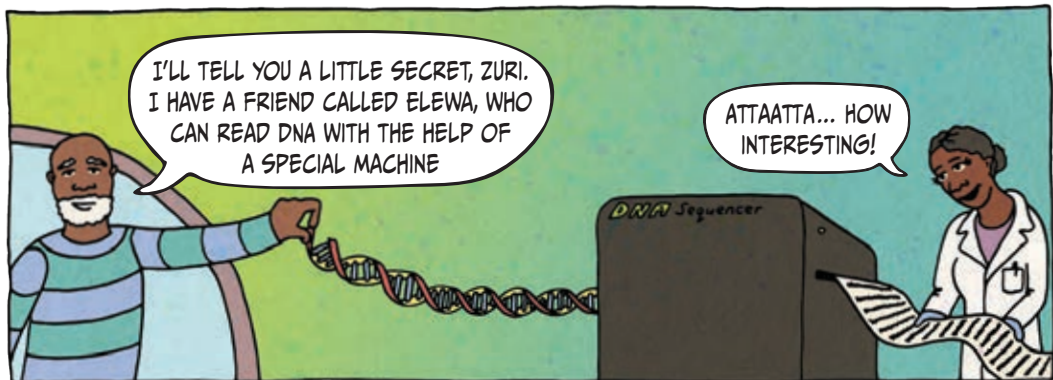


I WAS HUNGRY WHEN I WAS LITTLE

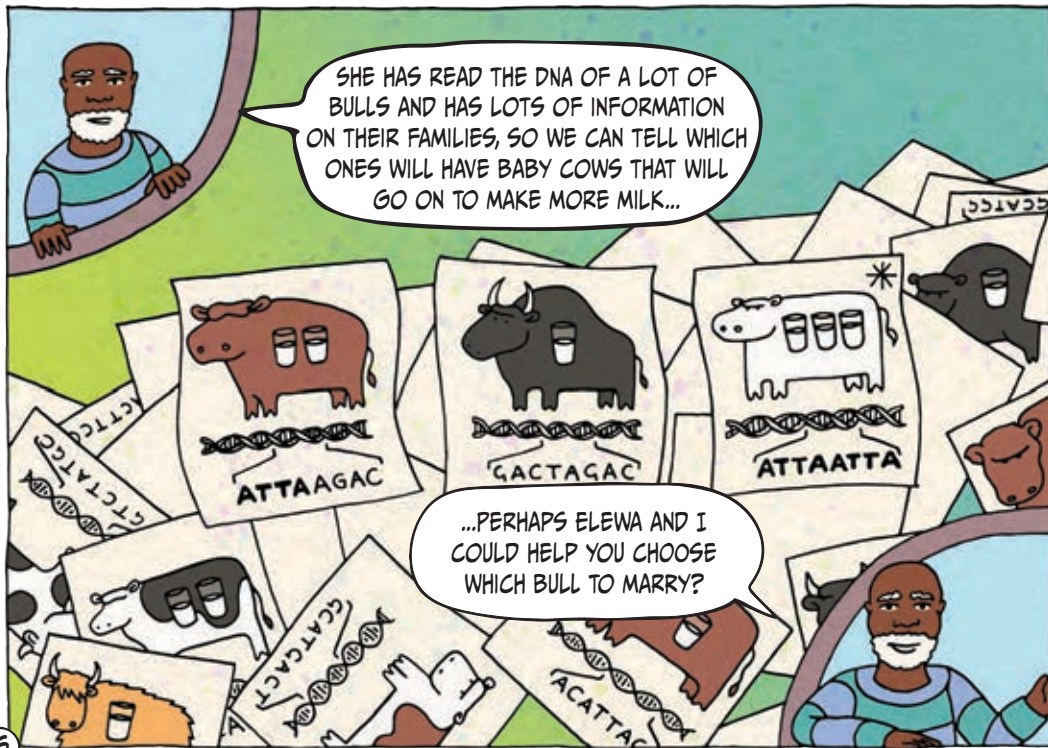


I'LL TELL YOU A LITTLE SECRET, ZURI. I HAVE A FRIEND CALLED ELEWA, WHO CAN READ DNA WITH THE HELP OF A SPECIAL MACHINE

ATTAATTA... HOW INTERESTING!



SHE HAS READ THE DNA OF A LOT OF BULLS AND HAS LOTS OF INFORMATION ON THEIR FAMILIES, SO WE CAN TELL WHICH ONES WILL HAVE BABY COWS THAT WILL GO ON TO MAKE MORE MILK...





ZURI WAS DELIGHTED AND THEY LEFT FOR HER VILLAGE AT ONCE



HI GUYS! MY FRIENDS ARE GOING TO HELP ME CHOOSE WHO TO MARRY, BUT WE NEED TO KNOW ALL ABOUT YOUR FAMILY, AND WE'LL NEED SOME OF YOUR DNA

OUR DNA?

HUH?! YOU'RE TOO PICKY!



WHAT'S WRONG? ARE YOU SCARED?!



HA! HA!  
HA! HA!  
HA! HA!

SCARED? ME?! OUT OF MY WAY - ME FIRST!

NO, ME!

MY DNA IS THE BEST!

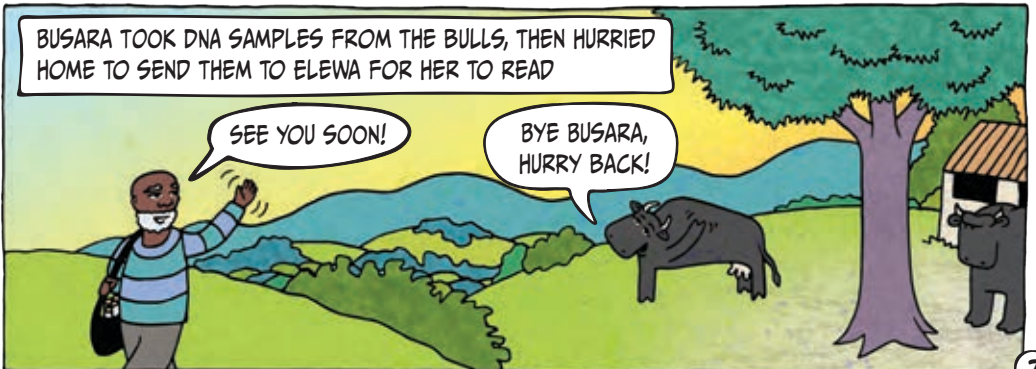
BUT WHAT IS DNA?



BUSARA TOOK DNA SAMPLES FROM THE BULLS, THEN HURRIED HOME TO SEND THEM TO ELEWA FOR HER TO READ

SEE YOU SOON!

BYE BUSARA, HURRY BACK!



A MONTH LATER, BUSARA RETURNED...

HI ZURI!

WELCOME BUSARA!  
HAVE SOME FRESH MILK.  
WHAT'S NEW?

IT SEEMS THESE  
BULLS ARE AS FERTILE  
AND HEALTHY AS THEY  
SAY THEY ARE...

GREAT! WHAT  
ABOUT THE MILK?

=SIGH=

WELL, I SCORED  
ALL THE BULLS USING A  
CHECKLIST, JUST LIKE  
ELEWA SAID TO...

SO WHO IS TOP  
OF THE LIST?!

I DON'T THINK THE BEST OF  
THE VILLAGE BULLS IS LIKELY TO  
HAVE CHILDREN THAT MAKE ANY  
MORE MILK THAN YOU DO...

> ZURI	FERTILITY	●●●●●	
	HEALTH	●●●●●	
	MILK AMOUNT	●●●●●	
	MILK QUALITY	●●●●●	14/20
#1	FERTILITY	●●●●●	
	HEALTH	●●●●●	
	MILK AMOUNT	●●●●●	
	MILK QUALITY	●●●●●	14/20
> #2	FERTILITY	●●●●●	
	HEALTH	●●●●●	
	MILK AMOUNT	●●●●●	
	MILK QUALITY	●●●●●	12/20

BUT THAT'S  
NOT ENOUGH!!

IT SEEMS LIKE THE MESSAGES  
TO MAKE LOTS OF MILK ARE JUST NOT  
IN THE DNA OF THE BULLS WE TESTED

SO THERE'S  
NOTHING WE  
CAN DO?

THAT'S IT! MAYBE IT'S NOT A HUSBAND YOU NEED - JUST THEIR DNA MESSAGES TO MAKE LOTS OF MILK



ELEWA KNOWS BULLS FROM ALL OVER THE WORLD, WITH ALL KINDS OF DNA MESSAGES...



YOU COULD GET MORE SUITABLE DNA FROM AN EXOTIC BREED OF BULL...



...ARTIFICIALLY...



(MONTHS LATER)



...AND HAVE A CROSSBRED BABY COW!



I DON'T KNOW, BUSARA... AT LEAST WITH THE LOCAL BULLS I WILL HAVE HEALTHY CHILDREN. HOW DO I KNOW THIS WITH AN EXOTIC BULL?



YOU ALREADY HAVE THE DNA MESSAGES TO KEEP YOUR CHILDREN HEALTHY...

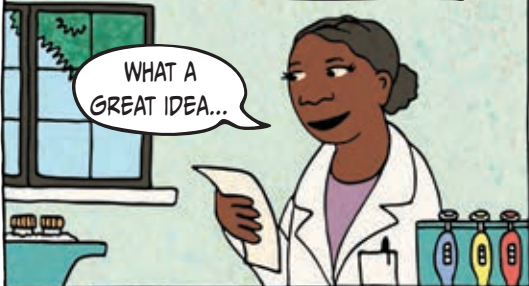
...SO WE JUST HAVE TO HOPE THAT YOUR DNA MESSAGES MIX WITH THE BULL'S IN THE WAY WE WANT

OK, LET'S GIVE IT A TRY!

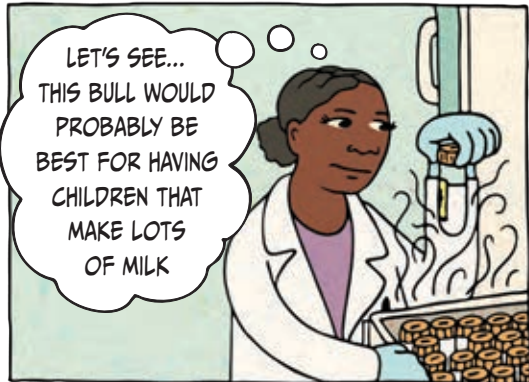


BUSARA WROTE TO ELEWA AND TOLD HER WHAT THEY WANTED TO DO

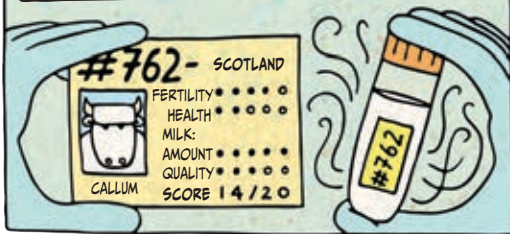
WHAT A GREAT IDEA...



LET'S SEE... THIS BULL WOULD PROBABLY BE BEST FOR HAVING CHILDREN THAT MAKE LOTS OF MILK



HIS DNA CONTAINED MESSAGES TO MAKE LOTS OF MILK, BUT DIDN'T HAVE MESSAGES TO STAY HEALTHY, JUST AS ZURI HAD FEARED



ELEWA SENT THE TUBE AND THAT WARNING WITH HER TOP TECHNICIAN TO ZURI'S VILLAGE



ZURI TOOK A DEEP BREATH WHEN SHE SAW THE TECHNICIAN, BUT IT WAS OVER QUICKLY AND DIDN'T HURT AT ALL...



...AND SURE ENOUGH, AFTER A LITTLE WHILE, ZURI HAD A CALF THAT SHE CALLED PLENTIFUL



BUSARA VISITED ZURI TO CONGRATULATE HER AND SAMPLE SOME OF PLENTIFUL'S DNA, TO SEE IF SHE WOULD LIVE UP TO HER NAME



HI ZURI!  
WHAT'S NEW?

WELCOME BUSARA!  
ONLY GOOD THINGS...

AFTER READING PLENTIFUL'S DNA...



PLENTIFUL IS  
VERY LIKELY TO BE  
HEALTHY AND MAKE  
MORE MILK THAN  
YOU ZURI!

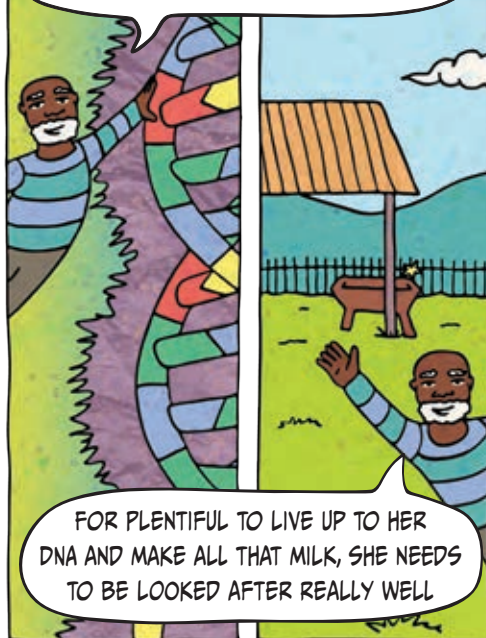


WOOOHOOO!

YES!

YAY!

BUT, DNA IS ONLY EVER HALF THE STORY -  
THE ENVIRONMENT IS IMPORTANT TOO...



FOR PLENTIFUL TO LIVE UP TO HER  
DNA AND MAKE ALL THAT MILK, SHE NEEDS  
TO BE LOOKED AFTER REALLY WELL

ANYWAY, ELEWA AND I ARE HAPPY  
TO HELP READ THE DNA OF ANY  
NEW COWS TO HELP YOU KEEP  
IMPROVING IN THE FUTURE



THANKS! YOU GUYS  
ARE WELCOME TO VISIT  
ANY TIME

SO ZURI AND THE VILLAGE CHILDREN GOT TO WORK!



THEY BUILT A PLACE FOR PLENTIFUL TO SLEEP



THEY MADE SURE PLENTIFUL HAD ENOUGH TO DRINK



THEY GREW TASTY FOOD FOR PLENTIFUL TO EAT



THEY KEPT AN EYE ON PLENTIFUL IF SHE GOT ILL...



...AND GOT THE VILLAGERS TO GIVE HER MEDICINE IF NEEDED



TO KEEP TRACK OF WHAT WORKED AND WHAT DIDN'T...



...ZURI WROTE EVERYTHING DOWN - WHAT THEY GAVE HER TO EAT AND DRINK, AND WHAT HAPPENED WHEN SHE GOT SICK


ZURI SLOWLY WORKED OUT THAT WHAT WAS BEST FOR ZURI...



...WASN'T ALWAYS BEST FOR A CROSSBREED LIKE PLENTIFUL



PLENTIFUL GREW  
UP INTO A  
BEAUTIFUL  
STRONG COW...



...AND WHEN SHE WAS  
OLD ENOUGH, PLENTIFUL  
FELL IN LOVE WITH A LOCAL  
CROSSBRED BULL AT THE  
TOP OF BUSARA'S LIST



THEY HAD MANY HEALTHY  
CALVES TOGETHER...

To Busara, Our family x x x



...AND PLENTIFUL MADE BUCKETS OF  
RICH, CREAMY MILK



ZURI WAS SO HAPPY TO SEE THAT THERE WAS FINALLY ENOUGH MILK  
TO GIVE TO THE VILLAGE CHILDREN

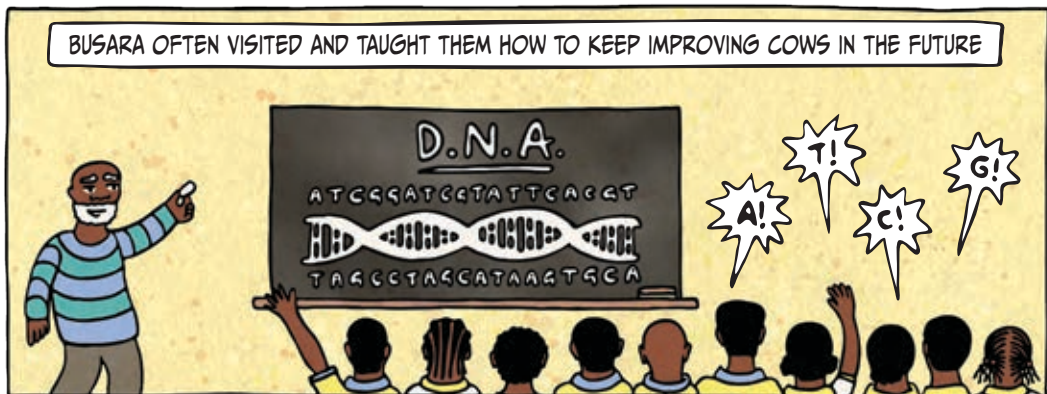
THE CHILDREN LOVED ZURI, HER DAUGHTER AND THEIR MILK



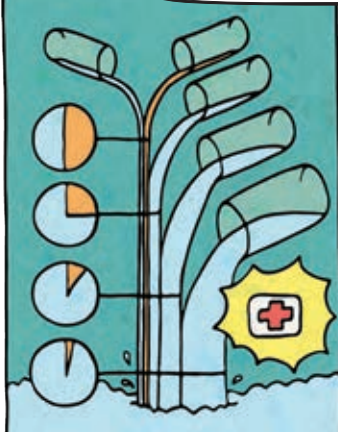
NOW THEY WERE NO LONGER HUNGRY, THE VILLAGE CHILDREN GREW UP STRONG AND CLEVER



BUSARA OFTEN VISITED AND TAUGHT THEM HOW TO KEEP IMPROVING COWS IN THE FUTURE



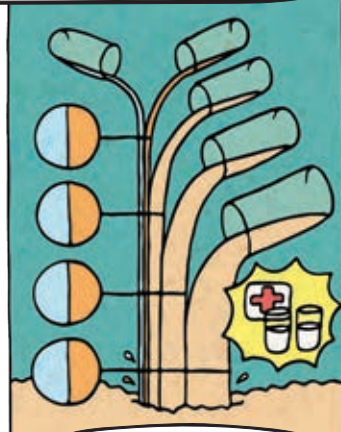
JUST LIKE IF YOU KEEP DILUTING FRUIT JUICE WITH WATER, DNA MESSAGES CAN GET LOST OVER TIME, SO IT'S IMPORTANT TO KEEP USING CROSSBREDS WITH EACH GENERATION



ONLY BREEDING WITH LOCAL BULLS WILL MEAN LESS MILK BUT LESS ILLNESS



ONLY BREEDING WITH EXOTIC BULLS WILL MEAN MORE MILK BUT MORE ILLNESS



BREEDING WITH CROSSBRED BULLS WILL KEEP A GOOD MIX OF MILK AND LESS ILLNESS



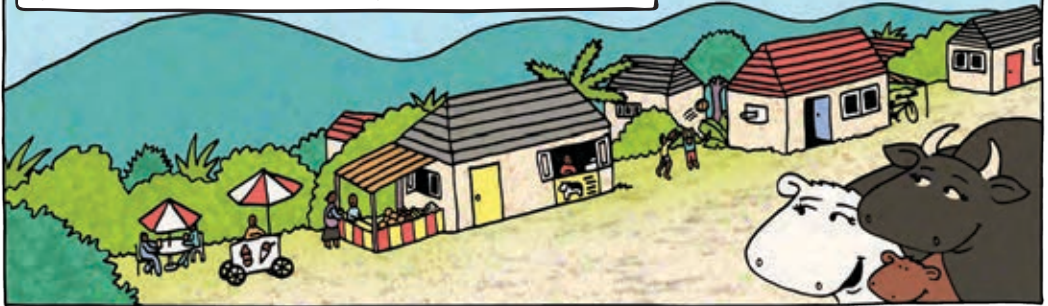
WHEN THE VILLAGE CHILDREN GREW UP,  
THEY HELPED ZURI AND PLENTIFUL  
LOOK AFTER THEIR GROWING FAMILY



WITH THE VILLAGERS' HELP, ZURI'S  
FAMILY CONTINUED TO BE ABLE  
TO FEED THE VILLAGE CHILDREN  
THEIR NUTRITIOUS MILK



THE VILLAGE PROSPERED FROM THEIR WONDERFUL COWS...



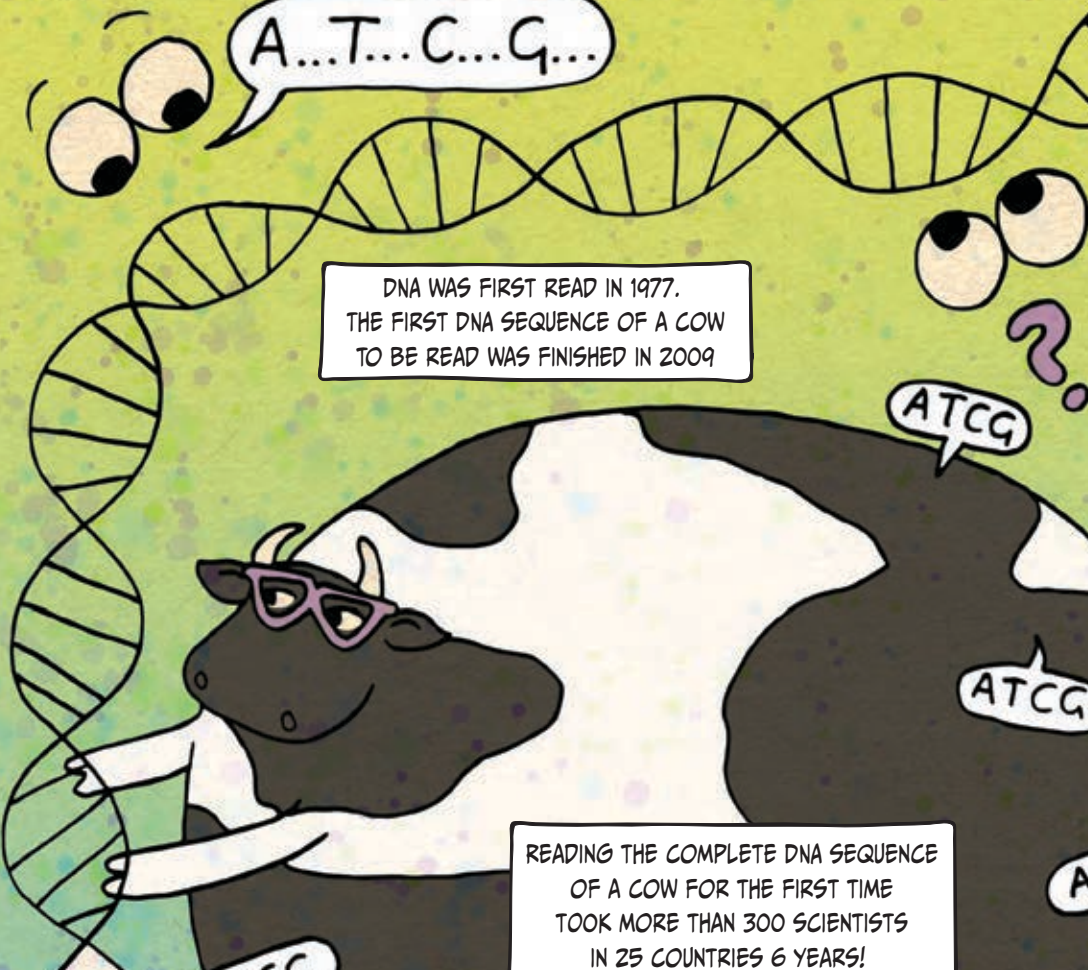
ZURI AND HER VILLAGE BECAME FAMOUS AND SLOWLY THEIR FARMING METHODS  
SPREAD THROUGHOUT THE LAND



# DID YOU KNOW?



A...T...C...G...



DNA WAS FIRST READ IN 1977.  
THE FIRST DNA SEQUENCE OF A COW  
TO BE READ WAS FINISHED IN 2009



ATCG

ATCG



READING THE COMPLETE DNA SEQUENCE  
OF A COW FOR THE FIRST TIME  
TOOK MORE THAN 300 SCIENTISTS  
IN 25 COUNTRIES 6 YEARS!

ATCG



ATCG

ATC  
GAT  
AGG  
TCA  
CAG  
CT

ATG  
GAC  
TTC

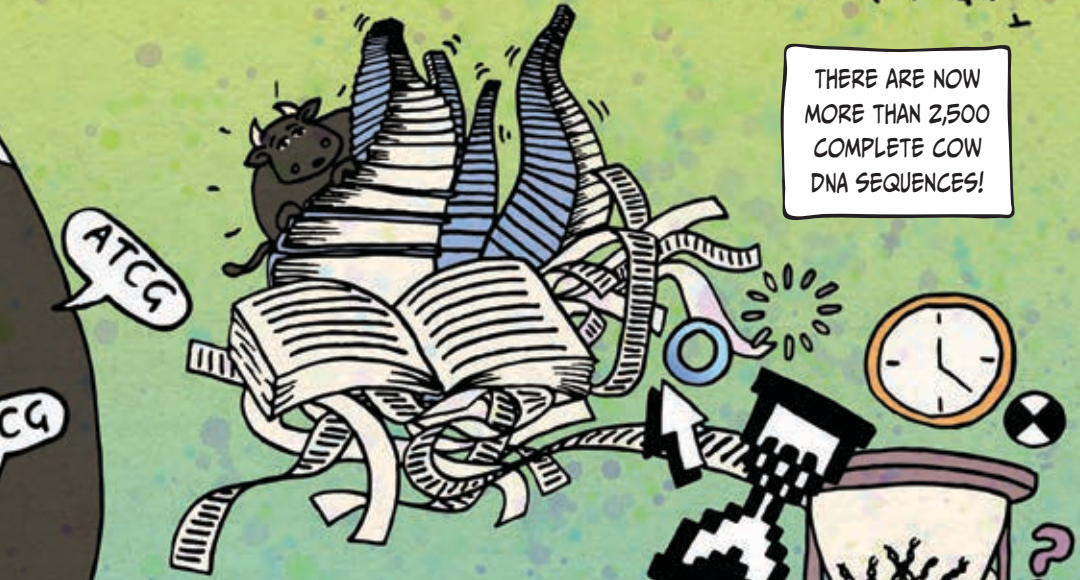
TAC  
TTT



THE COMPLETE DNA SEQUENCE OF A COW CONTAINS ROUGHLY 3 BILLION LETTERS!



THERE ARE NOW MORE THAN 2,500 COMPLETE COW DNA SEQUENCES!



NOW THE COMPLETE DNA SEQUENCE OF A COW CAN BE READ IN LESS THAN 24 HOURS, BUT IT STILL TAKES A WHILE TO UNDERSTAND WHAT IT MEANS



ATCG

CG

ATCG



MEET ZURI THE COW, WHO MAKES THE CREAMIEST MILK IN ALL THE LAND...  
BUT CAN SHE FIND A WAY TO MAKE ENOUGH MILK TO FEED ALL THE VILLAGE  
CHILDREN? MAYBE THE POWER OF GENETICS CAN HELP...

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THE UNIVERSITY of EDINBURGH  
The Royal (Dick) School  
of Veterinary Studies



Centre for  
Tropical Livestock  
Genetics and Health

