Energy Balance

WELCOME. TODAY I WILL TELL YOU SOMETHING ABOUT THE ENERGY BALANCE AND HOW IT CAN BE USED IN THE SEBAL COMPUTER MODEL. LET'S START!

THE SUN IS PROVIDING ALL THE ENERGY...

THE ENERGY CAUSES THE WIND TO BLOW!!!!...

...THE BIOMASS TO GROW...

...AND THE WATER CYCLE TO FLOW.

A PART OF THE ENERGY IS REFLECTED BACK INTO SPACE. LET US REPEAT...

INCOMING ENERGY IS USED FOR:

* HEATING
* ET
* BIOMASS PRODUCTION
* DRIVING THE HYDROLOGICAL CYCLE

AAH, I SEE, THAT WENT FAST, BUT LET ME TRY TO REPEAT.

I CAN FEEL THE ENERGY OF THE SUN BY ITS HEAT...

...I CAN FEEL THE BLOWING WIND, IT GIVES MY BOAT ITS SPEED...

...AND I SAW MY TREE GROWING AFTER I PLANTED THE SEED.

DOES THAT MEAN THAT THE ENERGY BALANCE IS COMPLETE?

ALMOST CORRECT, BUT YOU FORGOT THAT PART OF THE ENERGY THAT DRIVES THE WATER CYCLE. LET ME EXPLAIN...

PLANTS AND TREES TRANSPIRATE WATER WHILE THEY GROW, THE WATER WILL EVAPORATE IN THE AIR...

LIKE I SWEAT WHEN I RUN VERY FAST, PLANTS ARE SWEATING JUST LIKE ME...

INDEED. WATER ALSO EVAPORATES FROM SOIL AND WATER SURFACES. YOU CAN TRY THAT AT HOME BY PUTTING A BUCKET OF WATER IN THE SUN. AFTER A WHILE THERE WILL BE LESS WATER IN THE BUCKET.

PLANTS AND TREES HAVE TO USE WATER FROM THE GROUND AND RAIN FOR THEIR GROWTH...

LIKE I NEED TO DRINK WATER WHEN I AM THIRSTY!

WHEN THERE IS MORE SUN, WHEN IT IS HOTTER, THERE IS MORE EVAPOTRANSPIRATION (ET), THAT IS THE TERM USED FOR THE COMBINATION OF TRANSPIRATION AND EVAPORATION. TRY YOUR BUCKET EXPERIMENT ON A SUNNY AND CLOUDY DAY.

AND WHEN IT IS VERY HOT OUTSIDE I AM MORE THIRSTY THAN WHEN IT IS COOLER. IS THAT THE SAME WITH PLANTS?

THAT IS CORRECT! ET IS DIRECTLY RELATED TO GROUND-WATER USE OF PLANTS AND TREES. GROUNDWATER RECHARGE AND DISCHARGE IS THUS ALSO RELATED TO SOLAR RADIATION. LET'S GO BACK TO THE WATER CYCLE.

I SEE! THE GROUNDWATER AND SURFACE WATER ARE RECHARGED BY THE RAIN! SO, IN THE WATER CYCLE: RAIN EQUALS THE GROUNDWATER USE AND EVAPOTRANSPIRATION

THAT IS VERY INTERESTING, BUT WHAT DOES THIS HAVE TO DO WITH SEBAL YOU MENTIONED IN THE BEGINNING?

SEBAL IS A COMPUTER BASED MODEL. FIRST, PICTURES OF THE EARTH ARE TAKEN FROM SPACE, THEY ALSO MEASURE SOLAR RADIATION AND REFLECTION

BY MEASURING THE DIFFERENCE BETWEEN THE INCOMING SOLAR RADIATION AND THE REFLECTED SOLAR RADIATION, WE KNOW HOW MUCH ENERGY IS USED BY CROPS FOR ET AND GROWTH.

THE SATELLITE DATA IS COMBINED WITH CLIMATE DATA AND USED BY THE SEBAL MODEL IN THE COMPUTER...

WITH SEBAL WE CAN CREATE MAPS LIKE THESE.

SEBAL results of 16 August 1999

Evapotranspiration   Crop growth

THAT LOOKS VERY NICE, BUT WHAT CAN WE DO WITH THESE MAPS?

WITH SEBAL WE CAN ESTIMATE THE AMOUNT OF GROUNDWATER WE ARE USING, ALSO IF THERE ARE NO FIELD RECORDS OF THE PUMPING RATES!
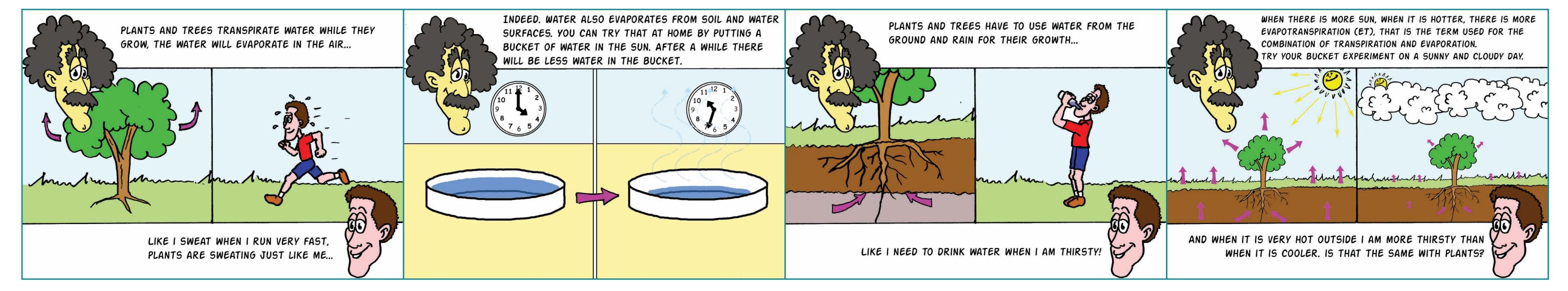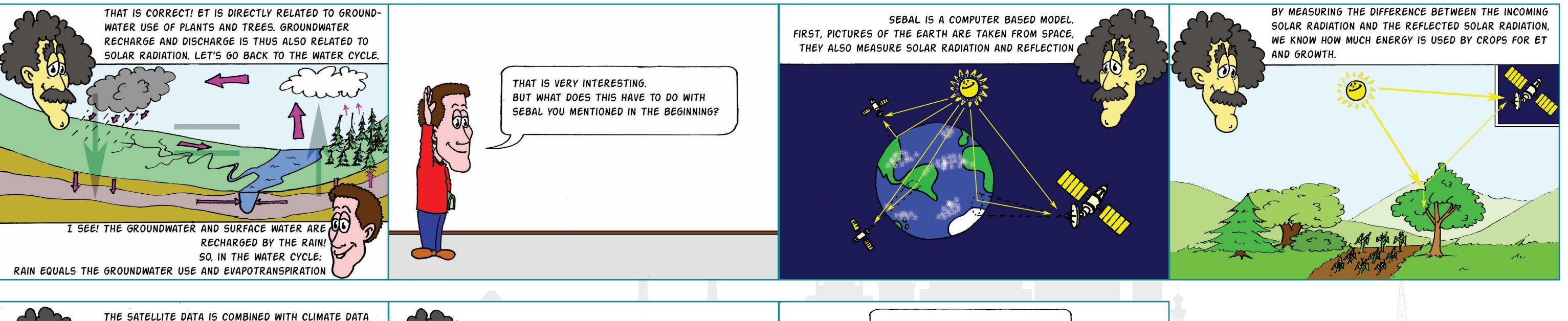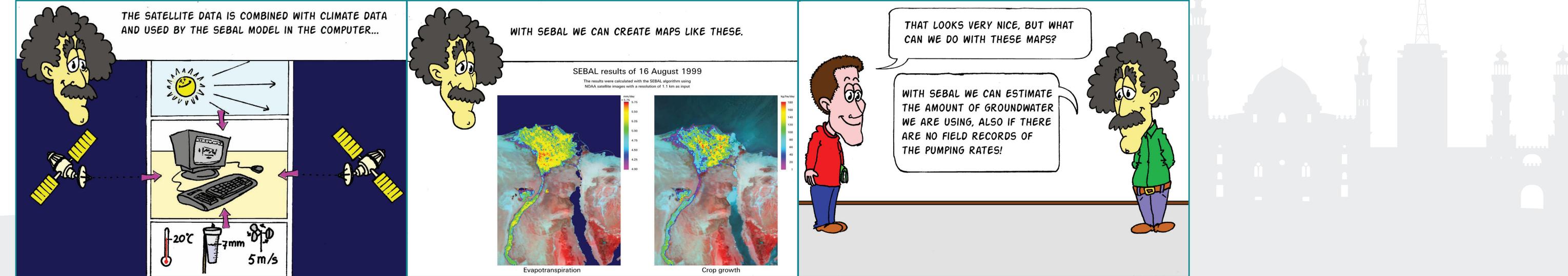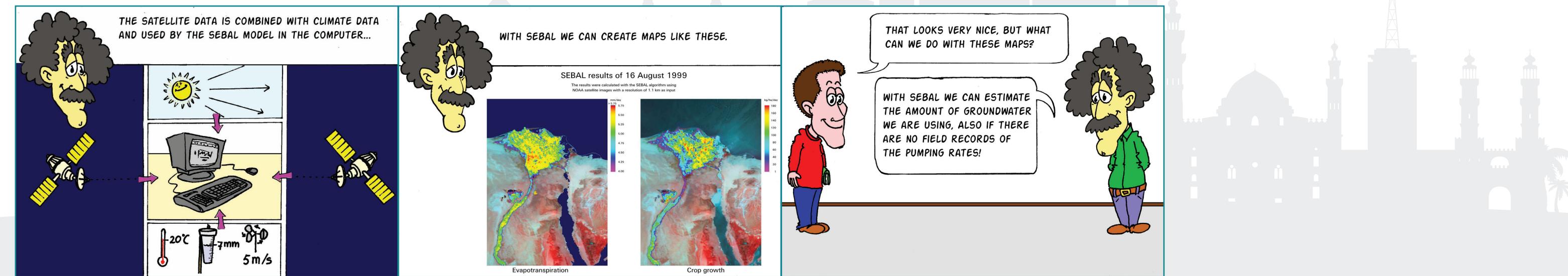
The Great Egyptian Water Productivity Hackathon
Team up, hack out solutions to get more per drop

25 alliance

Ministerie van Buitenlandse Zaken