

**CIMMYT - *the challenge today and the way
it is likely to evolve.***

Dr. Abdelfattah A. DABABAT

One Earth Soil and Root Health Forum

[9:00 – 11:30 CET on 1 March](#)

Highlight

Growers in CWANA basically do not recognize soil/root health as a problem. In fact, most of them do not know that what soil borne diseases are in their fields affecting yield, this is why the term “hidden enemy” perfectly applies to the problems in the region. SBP management is therefore, not practiced in the entire region and those disease induced yield losses are simply accepted.

How does Climate Changes Impact Agriculture?

HOW DOES CLIMATE CHANGE IMPACT AGRICULTURE?

Climate change causes erratic weather patterns, extreme temperatures, and changes in natural resources, threatening farmers' ability to sustainably produce and maintain quality crops.

EXCESSIVE HEAT

Reduces carbon water and depletes supplies
 Disrupts flowering and pollination of crops
 Increases weed, insect and disease pressures

LOSS OF NATURAL RESOURCES

Removes habitats and food for beneficial insects
 Dries up water sources

DROUGHT

Causes crop failures and loss of arable land

EXCESSIVE PRECIPITATION

Increases difficulty of planting
 Raises flood risk
 Damages crops

NEW PESTS AND DISEASE PRESSURES

More competition for soil and water resources
 Greater damage to crops

FLOODING

Removes topsoil
 Drowns crops

HOW CAN FARMERS MITIGATE AND ADAPT TO CLIMATE CHANGE?

A full suite of crop protection and plant biotech products can help farmers:



Farmers need access to the best mix of technologies to look after our planet, feed a growing population and progress their communities.

TODAY'S TECHNOLOGIES

No-Till Agriculture

Farmers remove yield-robbing weeds using herbicide-tolerant varieties and crop protection products instead of tillage practices.



INCREASE YIELDS 67%
 No-till can increase global maize yields on irrigated hectares!

Plant Biotechnology

In 2012, biotech crops helped slow the advance of climate change by

REDUCING CARBON EMISSIONS 27 BILLION KG,
 equivalent to 11.9 million cars off the road for a year, due to less tillage, less fuel use and more carbon capture!



Drought tolerance can **INCREASE YIELDS NEARLY 15-20%**

In times of severe drought for these key regions in 2050?



Drought Tolerance

Plant science researchers are developing plants that are drought-tolerant and water-efficient.



Crop Protection
 Insecticides, Herbicides, Fungicides

Crop protection products prevent nearly 40% of global rice and maize harvests from being lost every year!



FUTURE PIPELINE

Plant science researchers are developing products that could revolutionize agriculture in

2050

Nitrogen-use efficient varieties

enable a crop to better absorb and utilize nitrogen fertilizers, reducing carbon footprints and enabling a good harvest even in a volatile climate. Biotech varieties are currently in development that could nearly double yields in Africa and Latin America when combined with irrigation!



Heat-tolerant varieties

are in development for rice and wheat. If successfully created, they could cut global wheat and rice prices by approximately 10%!

Greater yield stability in erratic weather

Long-term studies of biotech crops find significant reductions in risk and yield volatility after adoption. As new varieties reach the market, farmers will continue to build their resilience to climate change.

Greater control of insects, weeds and diseases through new crop protection products could improve global staple crop yields 20-30% and African maize yields by nearly 50% in 2050!

BY 2050



our world's
population
will surpass
9 BILLION



HOWEVER, OUR WORLD'S CLIMATE IS CHANGING

rapidly and as droughts, floods
and unpredictable weather become
more common, it is becoming harder
for farmers to grow our food.

TO MEET OUR NEEDS
GROWERS WILL
need to produce more
food—as much as **70%
more than today**—
while reducing
farming's footprint.



WE NEED NEW AGRICULTURAL TECHNOLOGIES

that can help our farmers adapt, become
more resilient and meet the growing
challenges our world will hand to them
in the decades ahead.



Climate Change in Central Asia

Climate change in Central Asia: key findings, trends and projections

| Indicators | Kazakhs | Kyrgyst | Tajikist | Turkme | Uzbekis |
|---|---------|---------|----------|--------|---------|
| Air temperature ¹ | ↑ | ↑ | ↑ | ↑ | ↑ |
| Precipitation incl. snow ¹ | ↑ | ↑ ↓ | ↑ ↓ | ↑ ↓ | ↑ ↓ |
| Desertification | ↑ | ↑ | ↑ | ↑ | ↑ |
| Extreme weather & hazard ² | ↑ | ↑ | ↑ | | ↑ |
| Melting ice & permafrost ¹ | ↑ | ↑ | ↑ | | ↑ |
| Water availability in future ³ | ↑ ↓ | ↓ | ↓ | ↓ | ↓ |

¹1950-2005

²1990-2009

³2050-2100



increase, enhancement

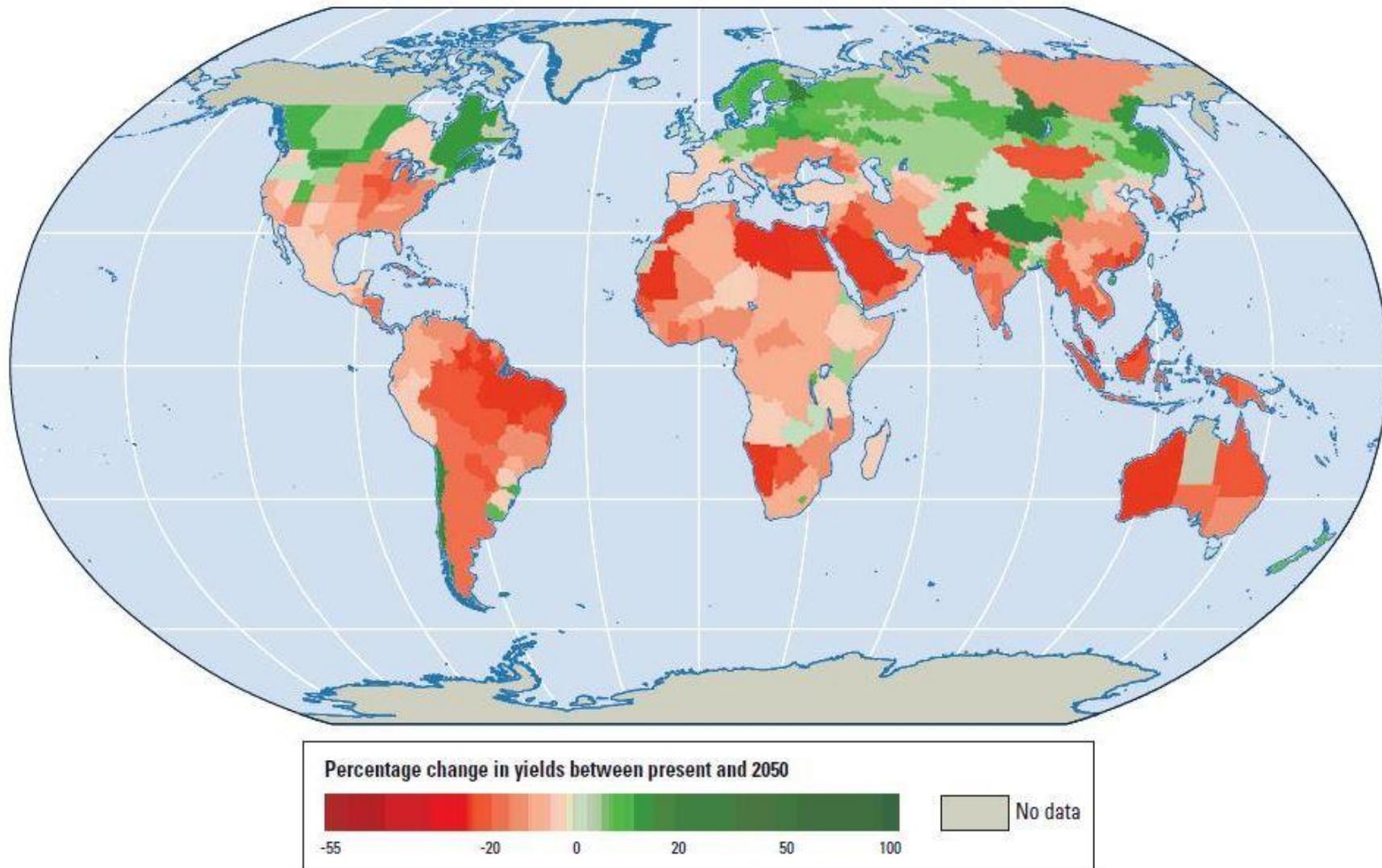


decrease, reduction



mixed trends

Map 1 Climate change will depress agricultural yields in most countries in 2050, given current agricultural practices and crop varieties



Sources: Müller and others 2009; World Bank 2008c.

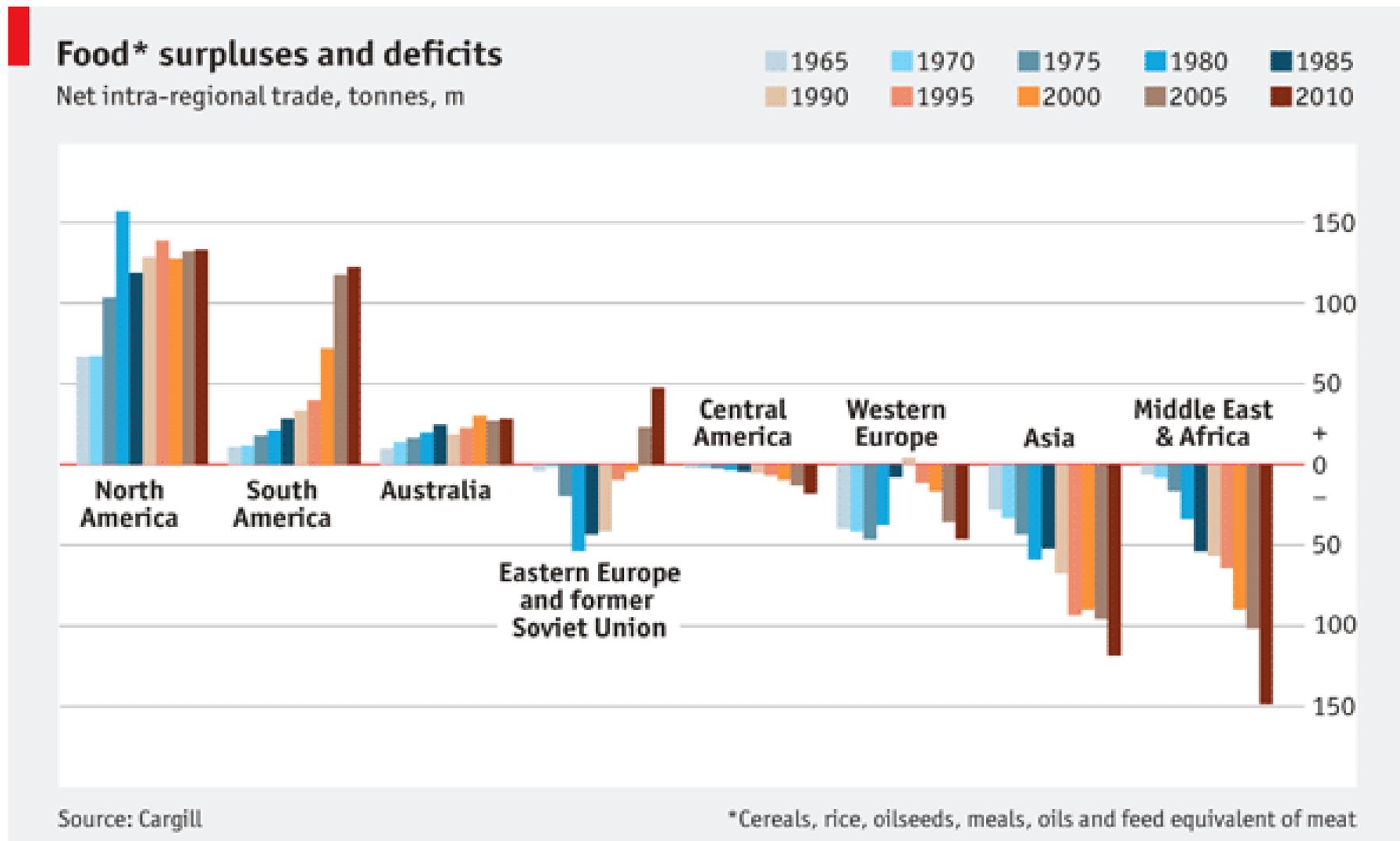
Note: The figure shows the projected percentage change in yields of 11 major crops (wheat, rice, maize, millet, field pea, sugar beet, sweet potato, soybean, groundnut, sunflower, and rapeseed) from 2046 to 2055, compared with 1996–2005. The values are the mean of three emission scenarios across five global climate models, assuming no CO₂ fertilization (a possible boost—of uncertain magnitude—to plant growth and water-use efficiency from higher ambient CO₂ concentrations). Large negative yield impacts are projected in many areas that are highly dependent on agriculture.



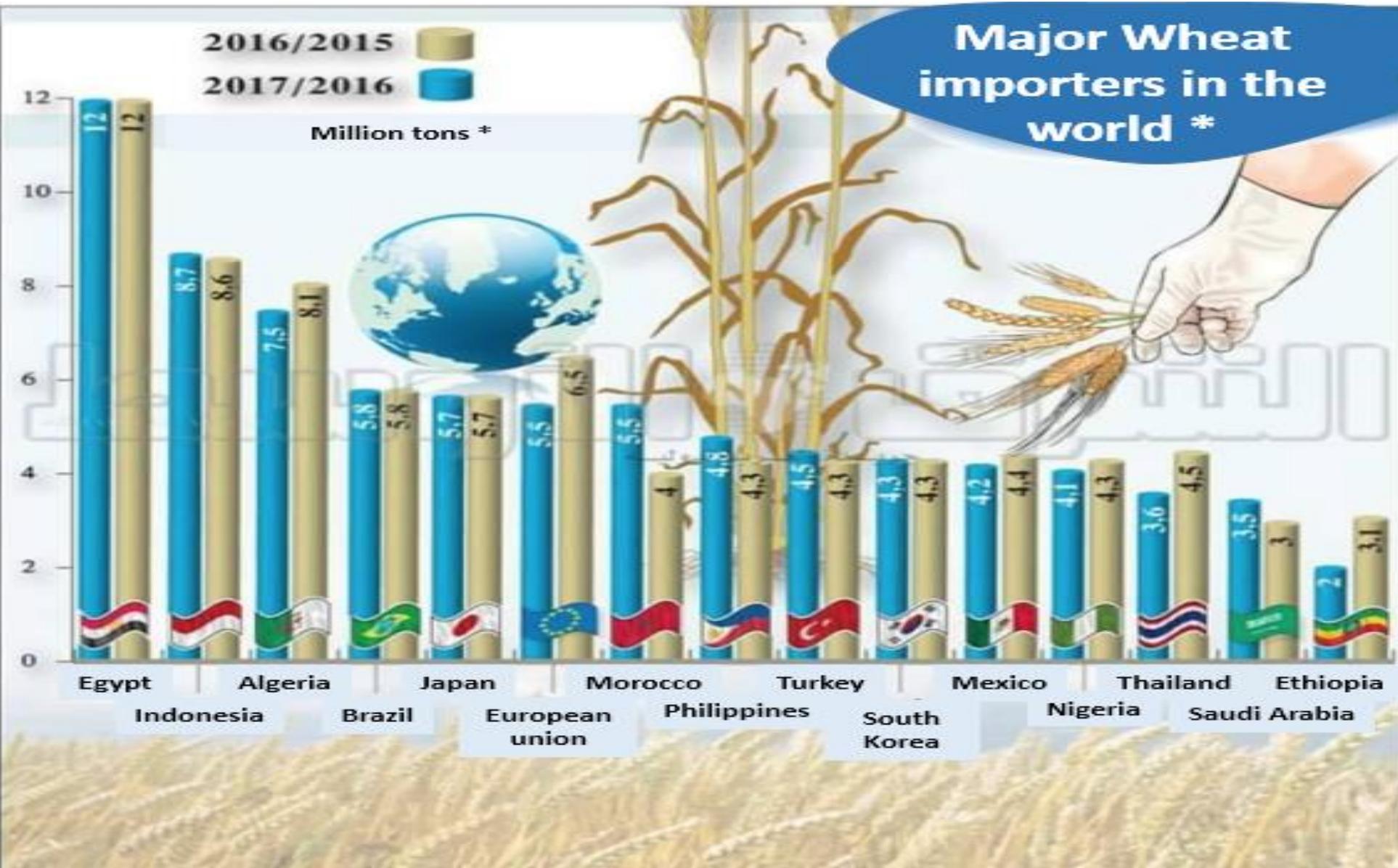
Rain
=
Grain



It seems likely that Asia and the Middle East and Africa will continue to require **increased imports** to satisfy growing populations. To feed itself for the next half century, the world needs an agricultural **revolution** in Africa.

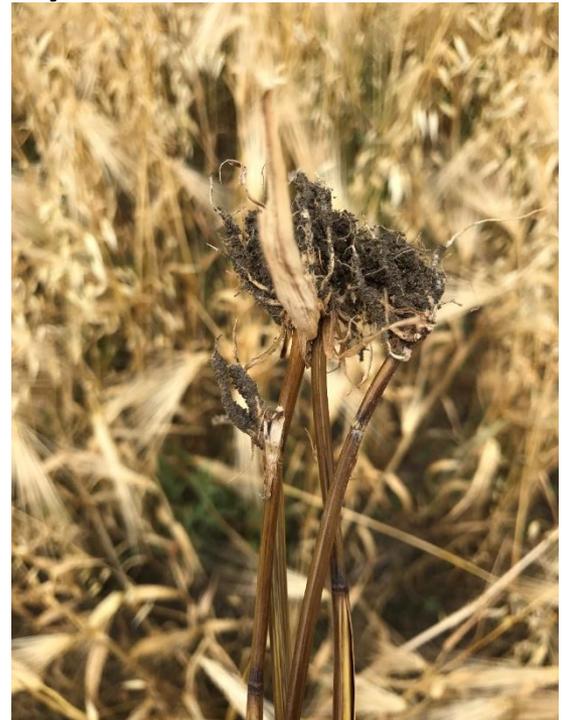


Wheat Import in the world 2015-16 and 2016-17



Technologies to Improve Root Architecture for Small Farmers?

- Breed SBDs/abiotic stress res/tol varieties
- Closer collaboration with breeders (IITA, ICRISAT, CIMMYT)
- Affordable seed treatment
- Plant growth/health promoting biologicals PGPRs
- Soil health/fertility enhancement – agronomy
- Targeted fertilization



CIMMYT CR Yield Trials - KONYA

F. culmorum non-inoculated



F. culmorum inoculated



Future

The yield reduction in wheat due to root rot diseases in CWANA could be lessened by improving and understanding the concept of INM in the region where the practice of winter mono-culturing of wheat is the norm. Management of cereal nematodes especially CCN could involve an integrated approach that includes; crop rotation, genetic resistance, crop nutrition, and appropriate water supply.

The major requirements for the future management are:

1. Create awareness among the farmers in the developing countries especially through educating researchers at the extension services to support growers.
2. Establishment of yield losses caused by root rot diseases in real time which could be challenging due to uneven distribution and presence of multiple species in a single field.
3. New chemistry nematicides, which are less dangerous for the environment and human health, must be developed and tested under the field conditions.
4. Novel biological management options like seed treatment with biocontrol agents need to be examined further.
5. Cell phone apps based on the identification of the damage caused by root rot diseases and other IT and social media services could be developed and utilized for better understanding for the farmers.
6. Understanding the interactions among the different root rot diseases is important to devise management approaches for multiple pathogens in a particular field.