FEED the FUTURE

AGRILINKS




Technologies for Managing Fall Armyworm: Lessons from Brazil

Speakers: Antônio Álvaro Corsetti Purcino, Embrapa Maize and Sorghum; Joseph Huesing, USAID Bureau for Food Security

Moderator: Julie MacCartee, USAID Bureau for Food Security

Date: August 22, 2018

Antônio Álvaro Corsetti Purcino, Embrapa Maize and Sorghum

Dr. Antônio Álvaro Corsetti Purcino is the General Director of Embrapa Maize and Sorghum, Brazil's premiere research organization. He received his PhD from Oklahoma University, completed postdoctoral research in Japan and the US and has published more than 40 research papers in scientific journals.

Joseph Huesing, U.S. Agency for International Development

Dr. Joseph Huesing is Senior Biotechnology Advisor for the USAID Bureau for Food Security. He has spent much of his career in the biotechnology industry where he held positions in Gene Discovery, Intellectual Property and Regulatory Affairs. He was also Director of the Science Project Management and Leadership Masters Degree Program at Webster University where he educated scientists in the art of Project Management. A former Adjunct Associate Professor of Entomology at Purdue University he supported biotechnology efforts in the developing world. With a background in Integrated Pest Management, he won the prestigious Entomological Society of America Team IPM award in 2013.

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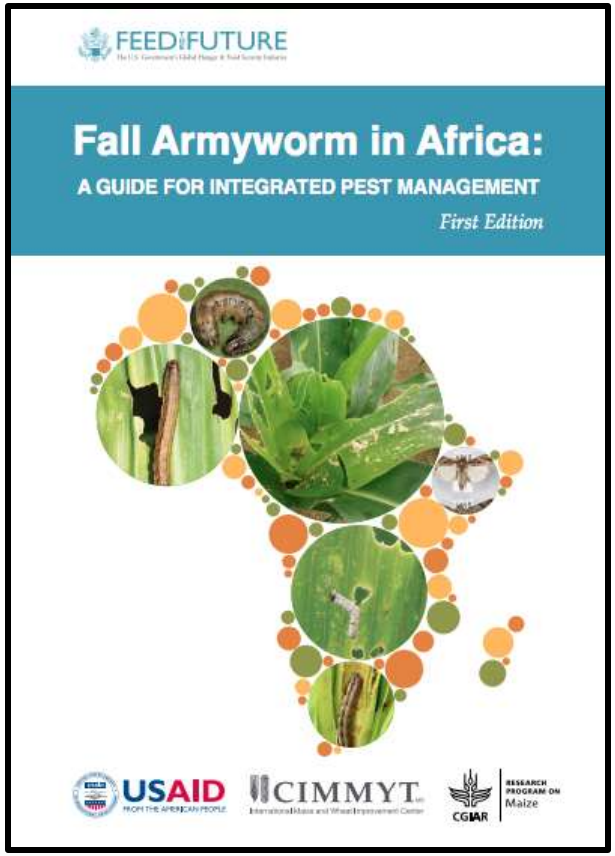
Fall Armyworm in Africa: A Guide for Integrated Pest Management



Follow The Guide!!

Integrated Pest Management (IPM)

The IPM TRIANGLE is Your Framework!

Maize Grain
Is Your Protection Goal

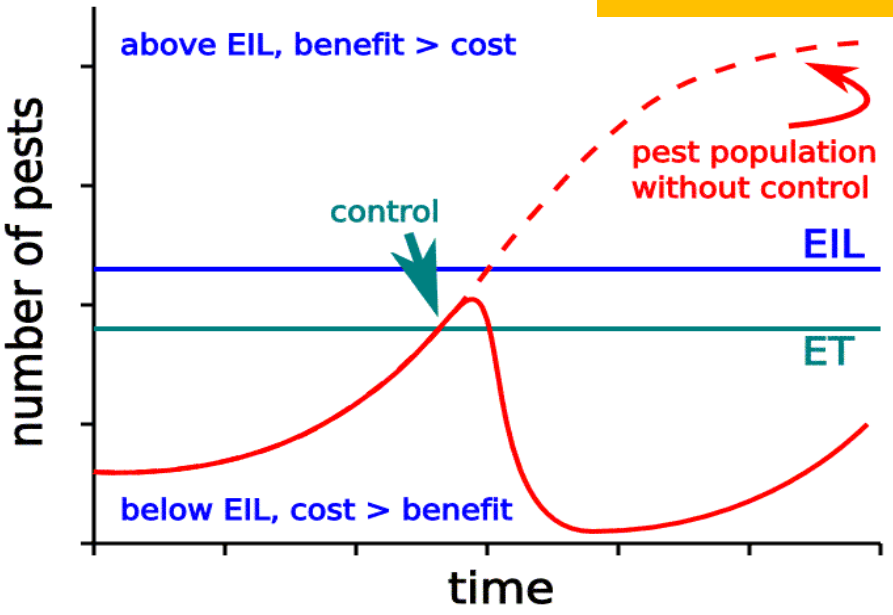
Biocontrol (BioC)

Host Plant Resistance (HPR)
(Conventional & Biotech)

Pesticides
(Conventional & Biopesticides)

Integrated Pest Management (IPM)

It's All About Economics



To Calculate the ET & EIL We Need to Know:

1) Value of the crop yield

2) Cost of the treatment: active ingredient, labor & risk

Two concepts:

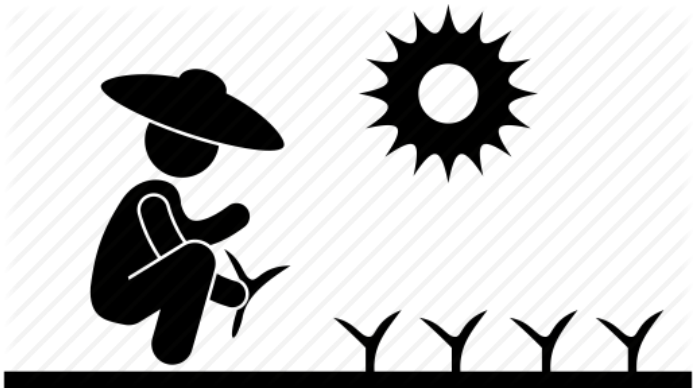
- **Economic Injury Level (EIL)**
  - The smallest number of insects (amount of injury) that will cause yield losses equal to the insect management costs.
- **Economic Threshold (ET)**
  - **The pest density at which action should be taken to prevent an increasing pest population from reaching the EIL.**

Scout Your Field!!

Scout – Assess - Decide

Pre-Scouting (Prepare)

- Host Plant Resistance
- Agronomics
- Cultural Controls & Landscape Management
- Biocontrol



Post-Scouting (Respond)

- The goal is NOT to Spray!
- Pesticides
- Mechanical control
- Biocontrol

Damage Level = ET
Take Action

FAW IPM Technology Table VERSION 20180817_SHORT

	Technology	Efficacy	Safety		Cost relative to current costs in Africa		Needs prior to implementation			Years to launch	Scalable in Africa?
			User safety	Compatible with biocontrol	Direct cost of product	Indirect	Policy action	Infra-structure/ supply chain	Training		
Host plant resistance (HPR)	Conventional resistance	++	✓	✓	Low – hybrid seed system	None	✓	Seed dealers in place	Minimal	0–3	✓
	GM maize	++++	✓	✓	Low – hybrid seed system	None	✓	Seed dealers in place	IRM Plan	0–3	✓
Chemistry	Conventional pesticides	+++	PPE needed	Not always	Higher for newer/safer	Applicators	✓	✓	✓	0–3	✓
	Conventional chemistry seed treatments	+++ (early stage)	Some PPE	✓	Higher for newer/safer	Applicators	✓	✓	Minimal	0–3	✓
Biopesticides	Bt spray; Baculovirus NPV spray	+++ if timed correctly	Some PPE	✓	Higher – multiple sprays	Applicators	✓	✓	✓	0–3	✓
Botanicals	NEEM spray & botanicals	?	Some PPE	Not always	Depends on source	Applicators	✓	✓	✓	✓	✓
Biocontrol	Pheromone disruption	?	✓	✓	Higher	Applicators	✓	✓	Variable	2–3	✓
	Trichogramma wasp inundative release	++	✓	✓	Higher – multiple applications	Biofactory Extension Service	✓	✓	✓	3–5	?
	Biocontrol	++	✓	✓	NA	NA	✓	NA	✓	0–3	NA
	Self-limiting insects	?	✓	✓	Higher	Higher	✓	High	High	3–5	?
Landscape	Landscape management	++	✓	✓	Depends on cropping system	Depends on cropping system	✓	✓	Difficult & complex	0–2	✓

The IPM Pillars
Host Plant Resistance
Conventional & Genetically Modified

Host Plant Resistance

Effectiveness:

- Can provide complete control of FAW
- No safety issues

Constraints:

- Hybrid maize
- Regulated at country level
- Policies & laws need to be in place
- Requires stewardship

The IPM Pillars
Biological Control – Natural & Augmentative

Generalist predators of FAW in the Americas

Predators:

- *Olla v-nigrum* (Mulsant) (Col.: Coccinellidae)
- *Hippodamia convergens* (Guérin-Méneville) (Col.: Coccinellidae) etc.
- *Doru luteipes* Scudder (Derm.: Forficulidae)
- spp. (Hem.: Reduviidae)

Effectiveness:

- Generalists attacking members of several families of insects including FAW

Constraints

- Abundant when FAW are already high;
- Often weak host specificity
- Effect only measurable on high densities of FAW

Photos: Ivan Cruz

The IPM Pillars
Biological Control – Natural & Augmentative

Known effective egg parasitoids of FAW in the Americas

Parasitoid:

- *Trichogramma pretiosum, T. atopovirilia* (Egg parasitoids)
- Mass rearing and inundative field releases ca 100,000/ha

Effectiveness:

- Reported to be effective in Brazil where in use. Good results in conjunction with pheromone based thresholds

Constraints

- Rearing technique not widely established;
- Intervention thresholds need to be adjusted to local cropping conditions
- Need for alternative host to rear large populations
- Vicinity of rearing facility / transport to release site / repetitive releases
- if cost effective opportunity for local business
- Competition with other parasitoids / predators attacking FAW?

Photos: Heraldo Negri / Divulgação & Ivan Cruz

PESTICIDES

Active Ingredient (a.i.) & Efficacy, Hazard & Exposure, Quality (Fraud), Cost

Synthetics

- FORTENZA™ Duo Seed Treatment
- Upold

Botanicals

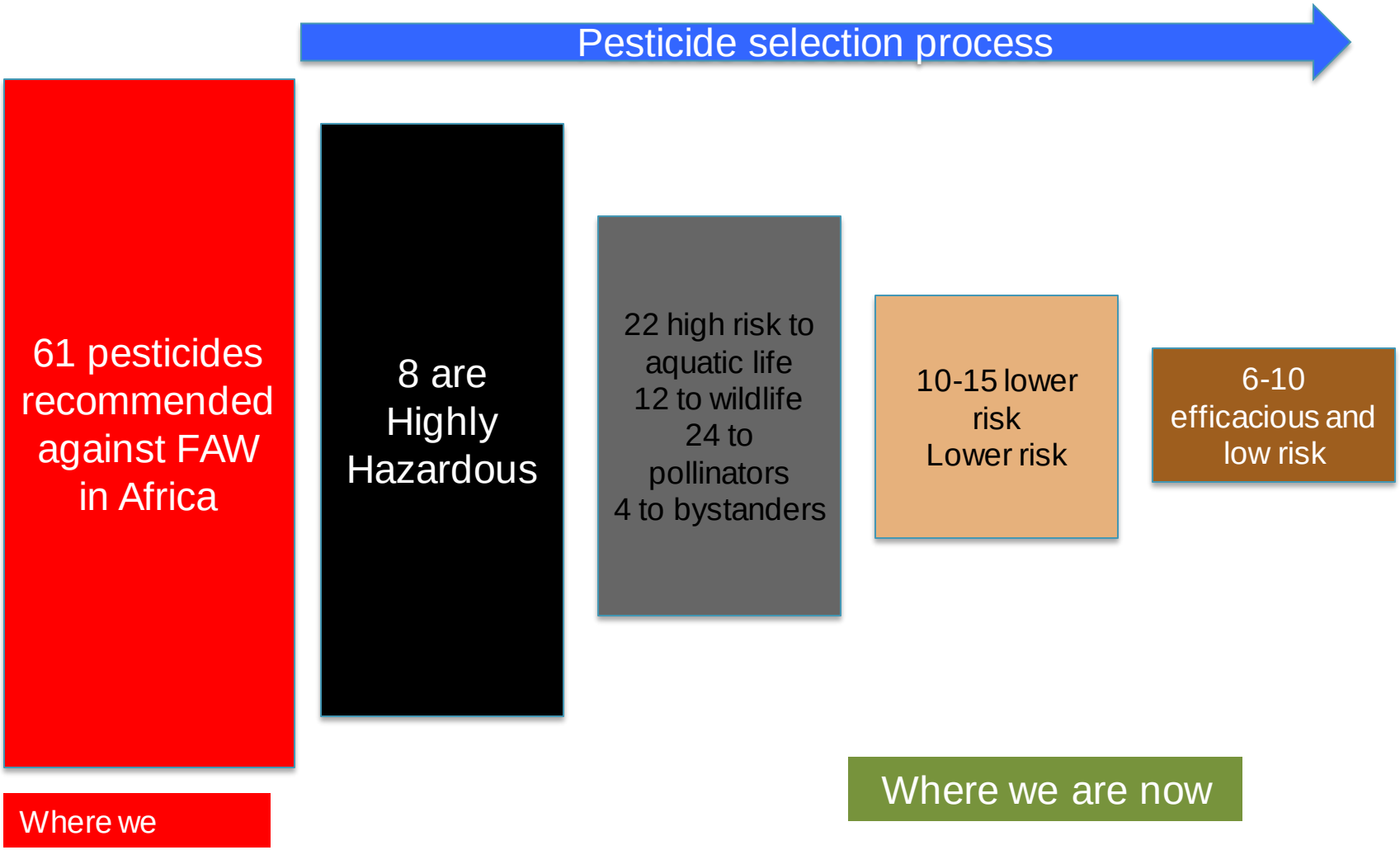
- NEEM (Azadiratin)
- Tephrosia vogelii - fish-poison-bean

Biopesticides

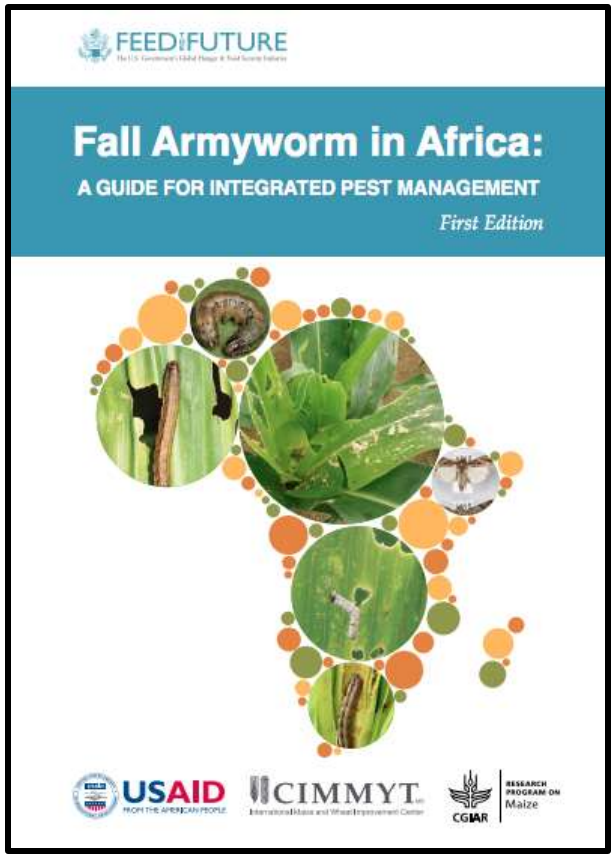
- *Bacillus thuringiensis* (Bt)
- Spinosads – (*Saccharopolyspora spinosa*)
- Avermectins macrocyclic lactones (*Streptomyces avermitilis*)
- SfNPV

Note About Generics

Risk assessment and field data will isolate the pesticides that meet the needs of African farmers



Summary



- Follow the FAW Pest Management Guide
- Use the IPM Triangle - It's the key
- Scouting & Economics
- Technologies – Integration is key

Corn Crop in Brazil and Management Control Technologies for *Spodoptera Frugiperda*

Antonio Álvaro Corsetti Purcino, Ph.D
Director, Embrapa Maize and Sorghum
Sete Lagoas, Brazil

Embrapa

Embrapa Maize and Sorghum Research Center

A Small Family Farm in Brazil

Transformation of the Brazilian "cerrado" in 40 years

The Economist

Brazil's agricultural miracle

How to feed the world

The emerging conventional wisdom about world farming is gloomy. There is an alternative

Aug 26th 2010

The Economist

Brazilian agriculture

The miracle of the cerrado

Brazil has revolutionised its own farms. Can it do the same for others?

Aug 26th 2010 | CREMAQ, PIAUÍ

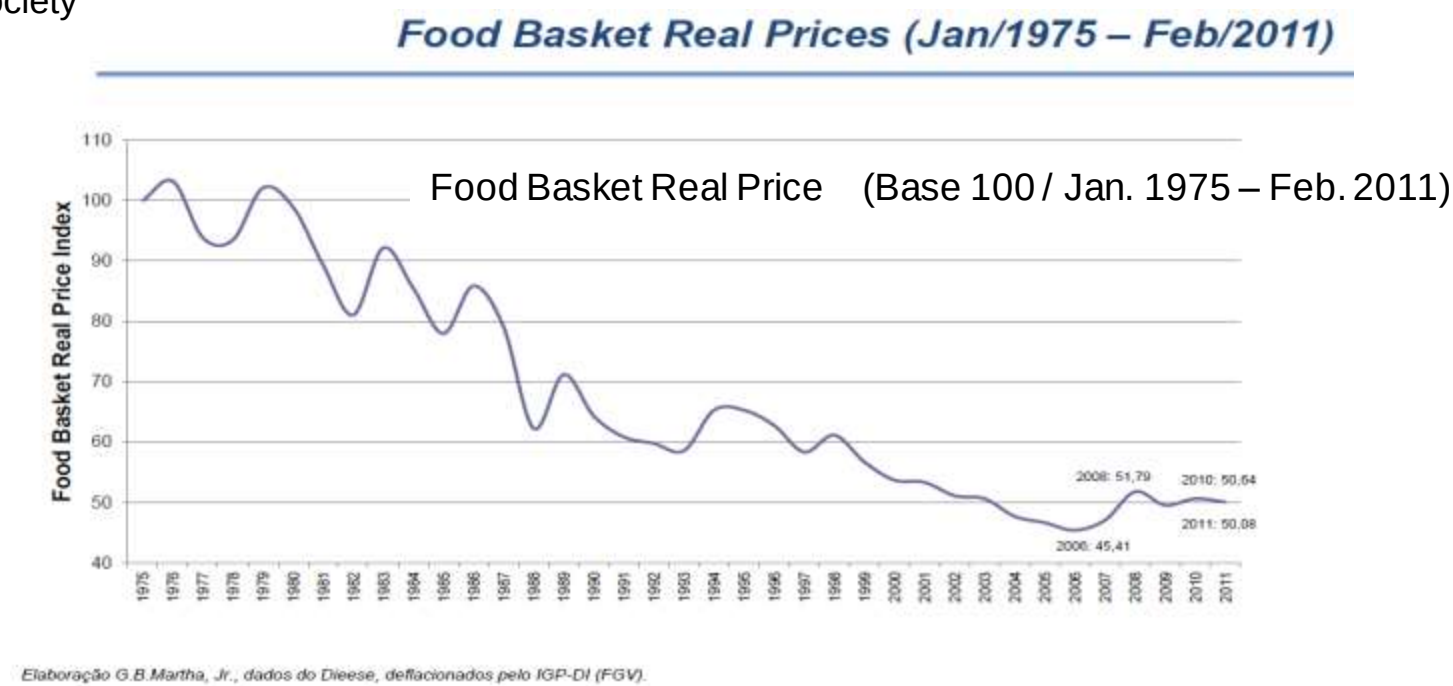
"…1972 …most of the country was then regarded as unfit for agricultural production."

"…In the four decades since, it has become the first tropical agricultural giant and the first to challenge the dominance of the "big five" food exporters (America, Canada, Australia, Argentina and the European Union)."

Source:
The Economist, 08/26/2010

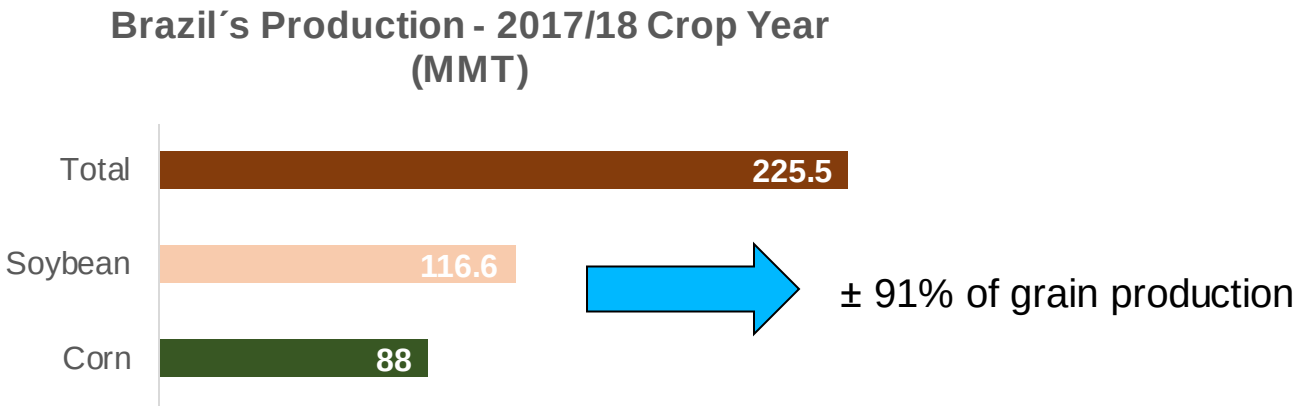
Social Impacts of Technology and Agriculture in Brazil

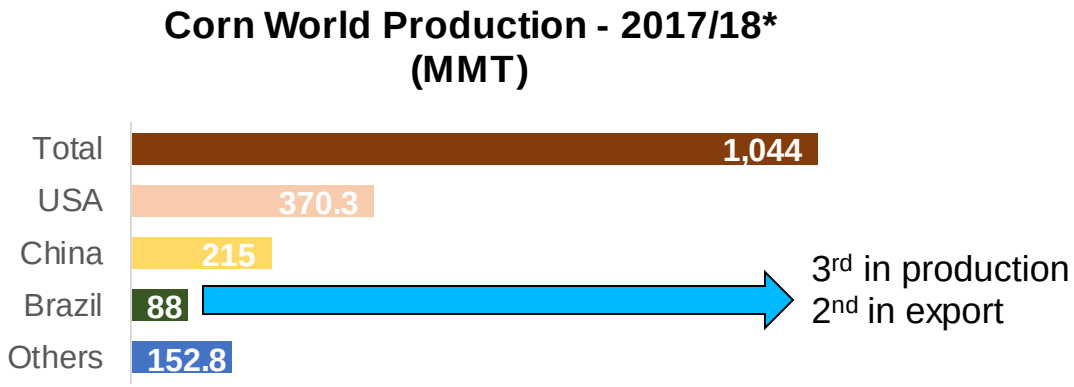
Main impact of production increase and diversity of Brazilian agriculture in the past four decades has been the assurance of a permanent supply of low-cost food for Brazilian society



Elaboração G.B.Martha, Jr., dados do Dieese, deflacionados pelo IGP-DI (FGV).

World and Brazilian Corn Production

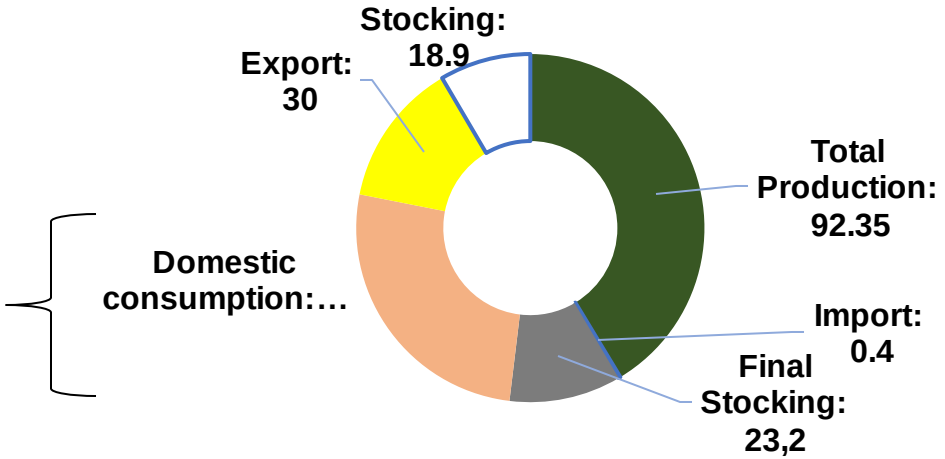


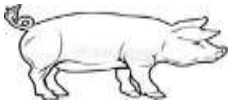


*estimate
Unit: millions of tons
Sources: CONAB (2018), ABIMILHO (2017), USDA(2018)

Corn Supply and Demand in Brazil

Industry 8%
Ethanol (MT) 2%
Human Consumption 3%
Other uses 5%
Losses 3%
Seeds 1%
Animal Nutrition 77%



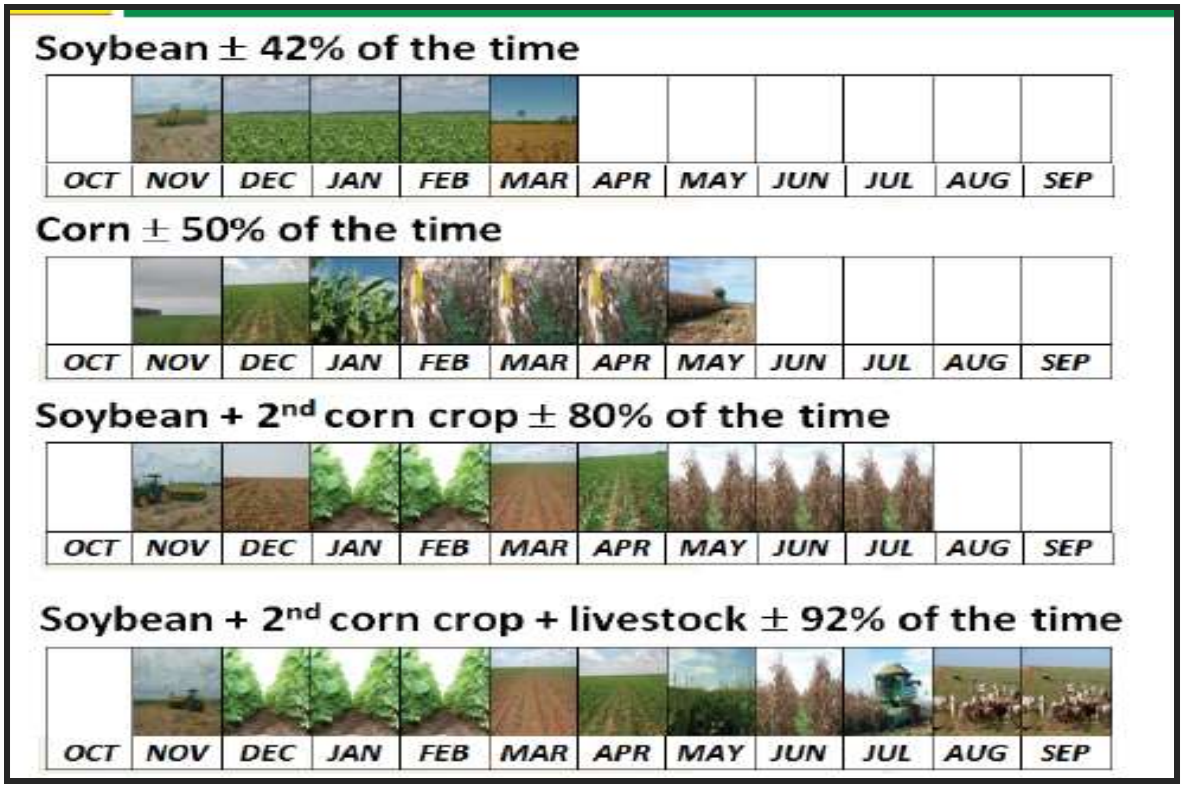


Other uses

45% 20% 7% 5%

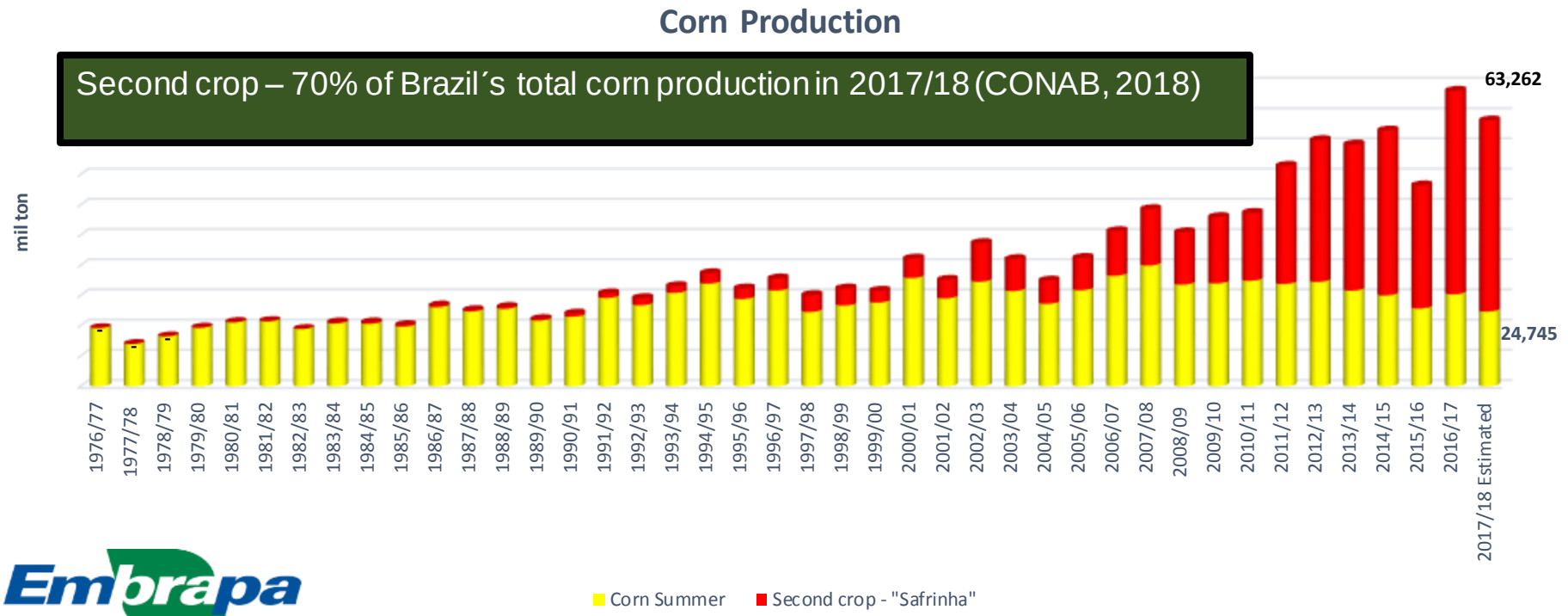
Sources: CONAB (2018), ABIMILHO (2017)

New intensive production systems in Brazil lead to an increase in land use efficiency: from one soybean or one maize crop a year to two crops + livestock



The Increased Importance of a Second Corn Crop

» 2 planting seasons – summer (first crop) and winter (second crop – “safrinha”)



Embrapa

Sources: CONAB (2018), USDA (2018)

"Safrinha" – How Does it Work?

Soybean and corn breeding for short cycles

Kappes (2013)

	Brazil	Mato Grosso	Paraná
Soybean (a)	35	9,52	5,5
Corn Second Crop (b)	11,4	4,33	2,1
b/a	33%	45%	38%

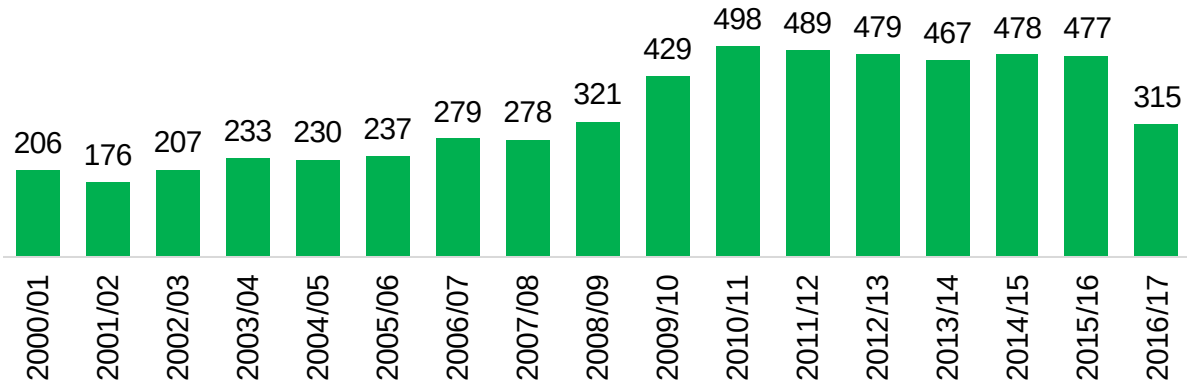
CONAB (2018)

Major Technologies for Improved Crop Yields

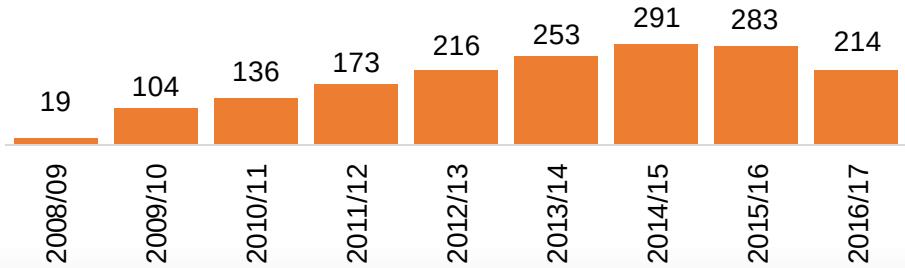
Crop genetics and Improvement
Soil Microbiology
Plant Nutrition
Entomology and Phytopathology
Mechanization
Climatology
Cropping Systems
Pedology, Soil Physics and Chemistry
Soil and Water Conservation
Agronomy
Integrated insect-pest and disease management
Economics
etc, etc, etc...

Access to Several Genetic Technologies

Total number of corn cultivars available in Brazil



Total number of corn transgenic cultivars available in Brazil



2016/17 crop year 68% of cultivars with transgenic technology

Elaboration by Embrapa

Corn – Strategic for No-Tillage System in Rotation with Soybean

Soybean after corn "safrinha" in Goiás

No-tillage system – about 32 millions hectares in Brazil

FEBRAPP and Embrapa

Integrated Crop-Livestock-Forestry Systems: 39 Million Hectares

The Future is Integrated Systems

» Brazil - the only country in the world with 3 harvests during the same year without irrigation

September/January – Soybean
January/May – Crop intercropped with tropical forage
June/September – Livestock

Up to 90% of grain crops and meat produced in the same area using no-tillage system

Corn Intercropped with tropical forages simultaneously

"Green Bridge" provides food for insect pests year around

Thank You!

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Embrapa

Questions and Answers

Coming up on Agrilinks!

1. Join Agrilinks August 29 for the second FAW management series webinar:
   Fall Armyworm Dissemination Tools from USAID
   August 29, 2018, 9a-10a EDT. Register now! https://bit.ly/2Pq8PC9

2. The final webinar in the FAW management series will conclude September 5 with: **Pesticides: Safety, Efficacy and Access**
   September 5, 2018, 9a-10a EDT: Register now! https://bit.ly/2nVSkBp

3. Join the Conversation on **Trends & Challenges in Ag Extension** on Agrilinks **this September**!
   Follow agrilinks.org all month for special events, a blog series and more.

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Contact: jmaccartee@usaid.gov

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