Alternatives to Open Burning:

Conservation Agriculture – the Climate-Smart Agriculture in Global Practice.

International Cryosphere Climate Initiative, ICCI Technical Meeting.
Ottawa, October 24, 2019.

Tom Goddard
Global Conservation Agriculture Network and Government of Alberta

1

Content.

- Why burn?
- What is Conservation Agriculture, CA?
- Drivers for adoption?
- Global policy examples
- Climate smart
- Future opportunities and levers.

2

Why Burn?

- Clearing land
- Diseases, pests
- Physical impediment of residue
- “Cheap”

3

Conventional agriculture

- Erosion – water, wind
- Soil degradation
- High operating costs
- Environmental costs

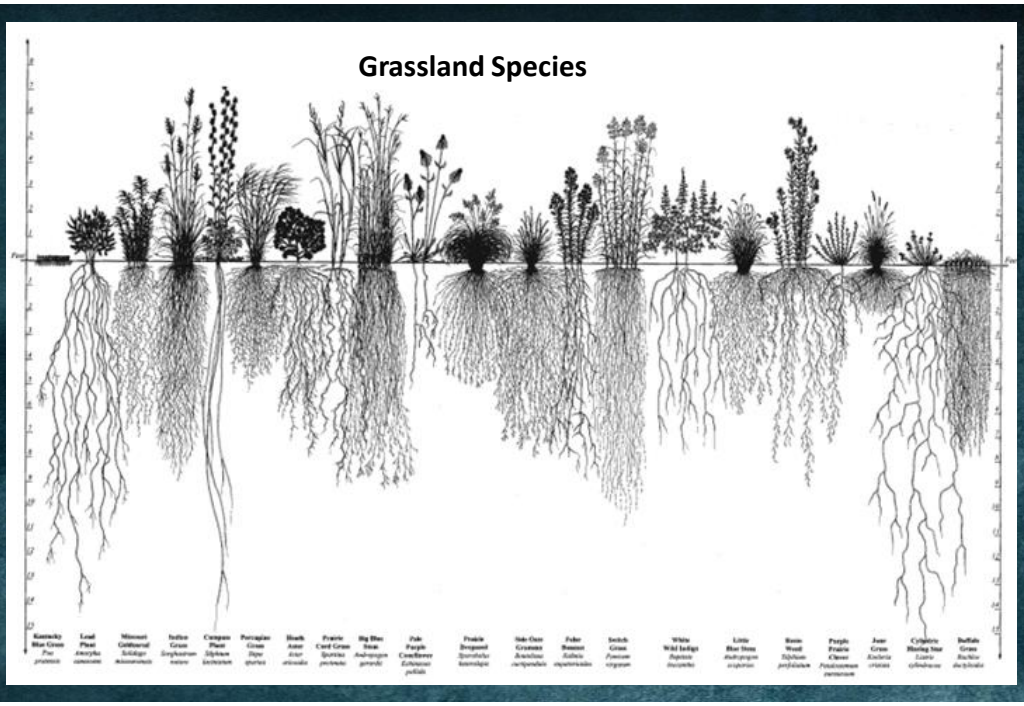
4

Conservation Agriculture

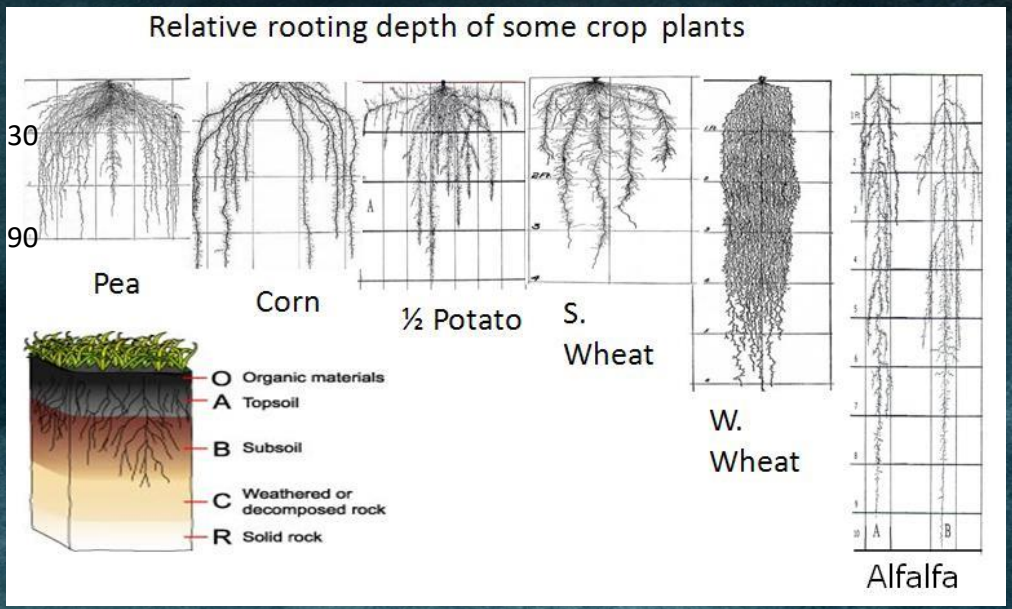
- No Till
  - Less C oxidation, nutrient cycling
- Keep the land covered
  - Residue, cover crops
- Diverse crops
  - Rooting, decay, nutrients

5

6



7



8

CA drivers for adoption

- Farmers – self organized
- Institutions – barriers and bright lights
- Industry – innovation, leadership
- Policy – government programs, incentives, R&D, supportive frameworks
- Public – private policy development and traits (government issues)

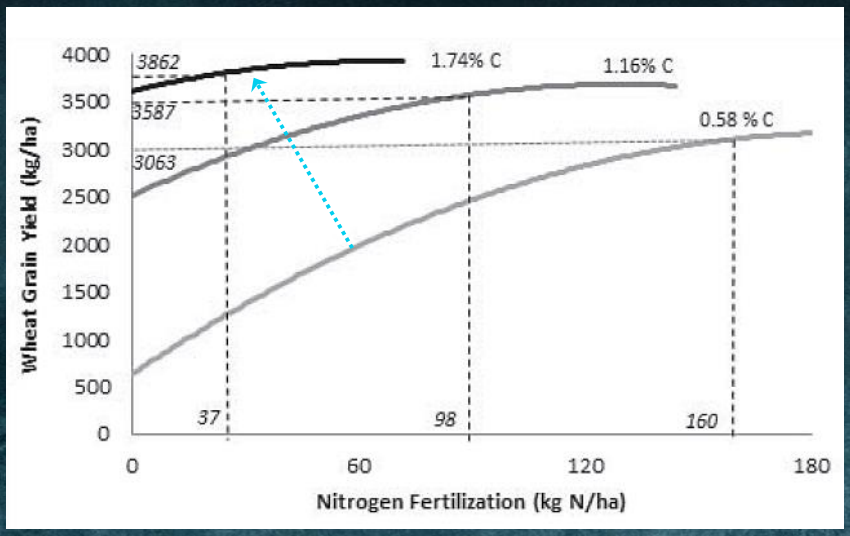
9

Catalysts for CA adoption

- Education – extension,
- Leadership – farmers, organizations
- Research – answers
- Systems thinking
- Linkages
- Government support – R&D, Aid
- Private policy, service providers

Goddard et.al. 2019

10



From 0.58% to 1.74% SOC →

- ✓ **160 …. to 37 kgN/ha (4X savings)**
- ✓ **19 – to –104 kg wheat/kg N fert (+4.5X efficiency)**

(Carvalho, 2012. Portugal)

11

Farmer Field Schools, Arusha, Tanzania (Owenya, 2011)

Conventional
plough 2X,
Maize +P.Pea +beans +pumpkin
Total Yields = 3.01 t/ha

CA
Maize + P.Pea or Lablab

	M+PP	M+Lablab
	-- % change --	
No Rip	-9	50
Rip	37	78

Land preparation, seeding, weeding

CA required 35% of time and 50% of labour of Conventional

12

Haryana, India: CA rice-wheat–(mungbean), 4 yr. (Jat, 2018)

- ✓ Improved soil properties and nutrients
- ✓ 30% N fertilizer savings
- ✓ 50%+ K fertilizer savings

(Boincean, 2014. Moldova) - Crop Yield - % change

		UnFert.	Fert.	Fertilization
		delta %	delta %	delta %
W.Wheat	Cont.	--	--	22-24
W.Wheat	Rotation	143	82	
S.Beets	Cont.	--	--	36-49
S.Beets	Rotation	281	153	
Maize	Cont.	--	--	11-15
Maize	Rotation	43	7	

13

"Across environmental zones, overall CONV had consistent negative effects on soil functions whereas CA and its component practices had overall positive effects on soil functions."

(Ghaley, 2018. pan EU)

(5 soil functions: productivity, carbon, water, nutrients, habitat)

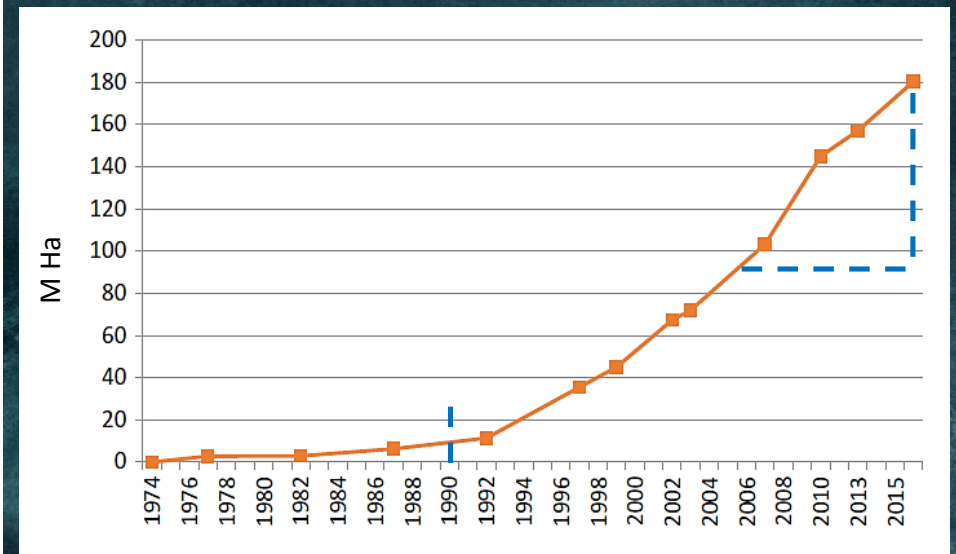
14

Making Climate Change Mitigation and Adaptability Real in Africa with Conservation Agriculture

Global adoption

15

Global uptake of CA



+89% in last decade

+17 times since 1990

Kassam et al. 2018

16

Policies Used	Locations						
	LAC	CWANA	E SE Asia	SSA	Europe	N Amer	Oceania
equipment subsidy	Argentina					few	
tax stimulus	Arge						
cooperative research	Arge						
workshops, think-tanks							
multinational policy							
national Gov support	Braz						
local Gov support	Braz						
foreign aid agencies	Para						
specific CA agencies							
cross compliance							
farmer groups	Paraguay						yes

equipment subsidy
tax stimulus
cross compliance

cooperative research
workshops, think-tanks

multinational policy
national Gov support
local Gov support
foreign aid agencies
specific CA agencies

farmer groups

Goddard et.al. 2017

17

policy Instrument	sub-category	examples
PUBLIC policy - government developed		
Re		vation Act
		forbidden
		tem Service
		Till to seque
Non		tem Service
		ned protecti
		t or ministry
		s initiative. "
		Argentina, C
		(Argentina)
Infra		ablish an explicit organization. (Soil Health division, USDA)
		(Zimbabwe)
		Development Corporation (GRDC-Australia)
		)
		d coalition or collaboration of universities (Canada)
Ec		t for curicula review or CA initiatives - non known for CA but existant for
		tainable energy.
		. TV, radio, webpages
F		fications to suit or support CA (CWANA, Canada, USA,)
Soci		

PUBLIC POLICY
- **Regulatory**
  - **Command and control**
  - **Flexible, market based**
- **Non Regulatory**
  - **government**
  - **farmer focus**
- **Infrastructure**
  - **government agency**
  - **research organization**
  - **Institutions**
- **Education**
- **Finance**
- **Social linkages**

PRIVATE POLICY
- **Self organized - farmer**
- **farmer-industry collaboration**
- **Industry/corporate policy**

Goddard et.al. 2017

18

Climate Smart Agriculture, CSA

… "is an integrated approach to managing landscapes—cropland, livestock, forests and fisheries--that address the interlinked challenges of food security and climate change."
World Bank.

CA –

- ✓ Reduces - erosivity, erodibility, erosion, evaporation, temperature stress
- ✓ Increases carbon storage, lowers GHG emissions
- ✓ Improves - soil health, fertility, pests, yield and variance, profit

19

Paradigm Shift?

Conclusions

- ✓ Rapid increase in CA
- ✓ Soil system change
- ✓ Cropping system change
- ✓ Future ≠ past

- Rotation effect → yield increase of 7% - 150%
- Fertilizer reduction → 30% - 75% less N = same yield
- Insects on CA landscapes → gains 24% of the yield gap

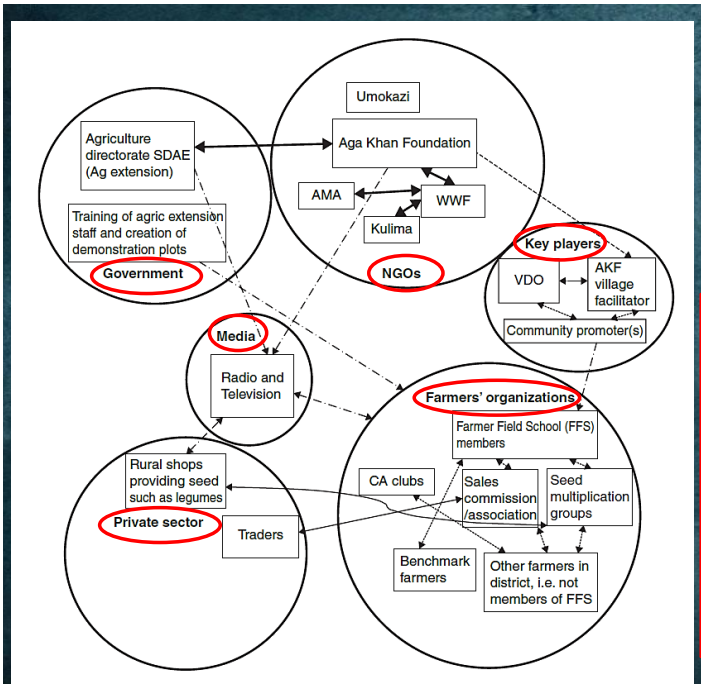
Better research? Farmer experience ('citizen science')? Better information, education?

20

Future?
- levers and opportunities

- Governments –
  - climate policy, SDGs, sustainability metrics,
  - Agriculture policy, research policy
- Farmers –
  - equipment investments, inputs, yield risks, sustainability metrics
- Industry –
  - New equipment markets, tech, service providers
- IOE –
  - R&D beyond institutions, citizen science, service providers
- Public –
  - Awareness, concerns, food safety, environment

21



Change is complex

Scales of

- ✓ time,
- ✓ space,
- ✓ politics,
- ✓ geography

Government
Farmer organizations
Private Sector
Key players
– Research/Education
NGOs
Media

(Lalani, 2017)

22

23