

Two decades of GMO socio-economic research in the SA context

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GM crop commercialisation history

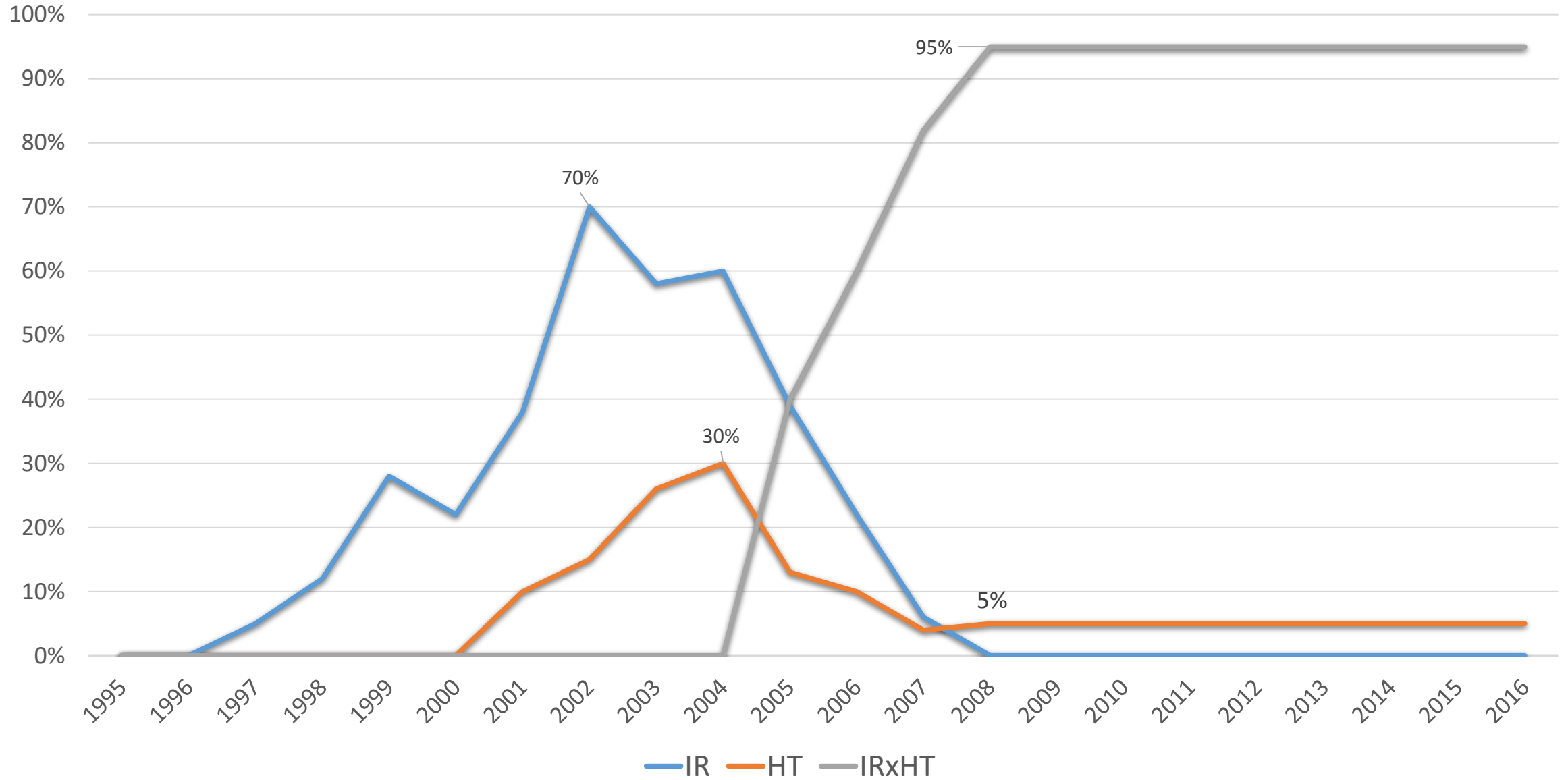
First production season	Trait and crop
1997/1998	Insect resistant (Bt) cotton
1998/1999	Insect resistant (Bt) yellow maize
2001/2002	Herbicide tolerant (HT) cotton
2001/2002	Herbicide tolerant (HT) soy beans
2001/2002	Insect resistant (Bt) white maize
2003/2004	Herbicide tolerant (HT) maize
2005/2006	Stacked gene (Bt+HT) cotton
2007/2008	Stacked gene (Bt+HT) maize

GM field trials approved 2015

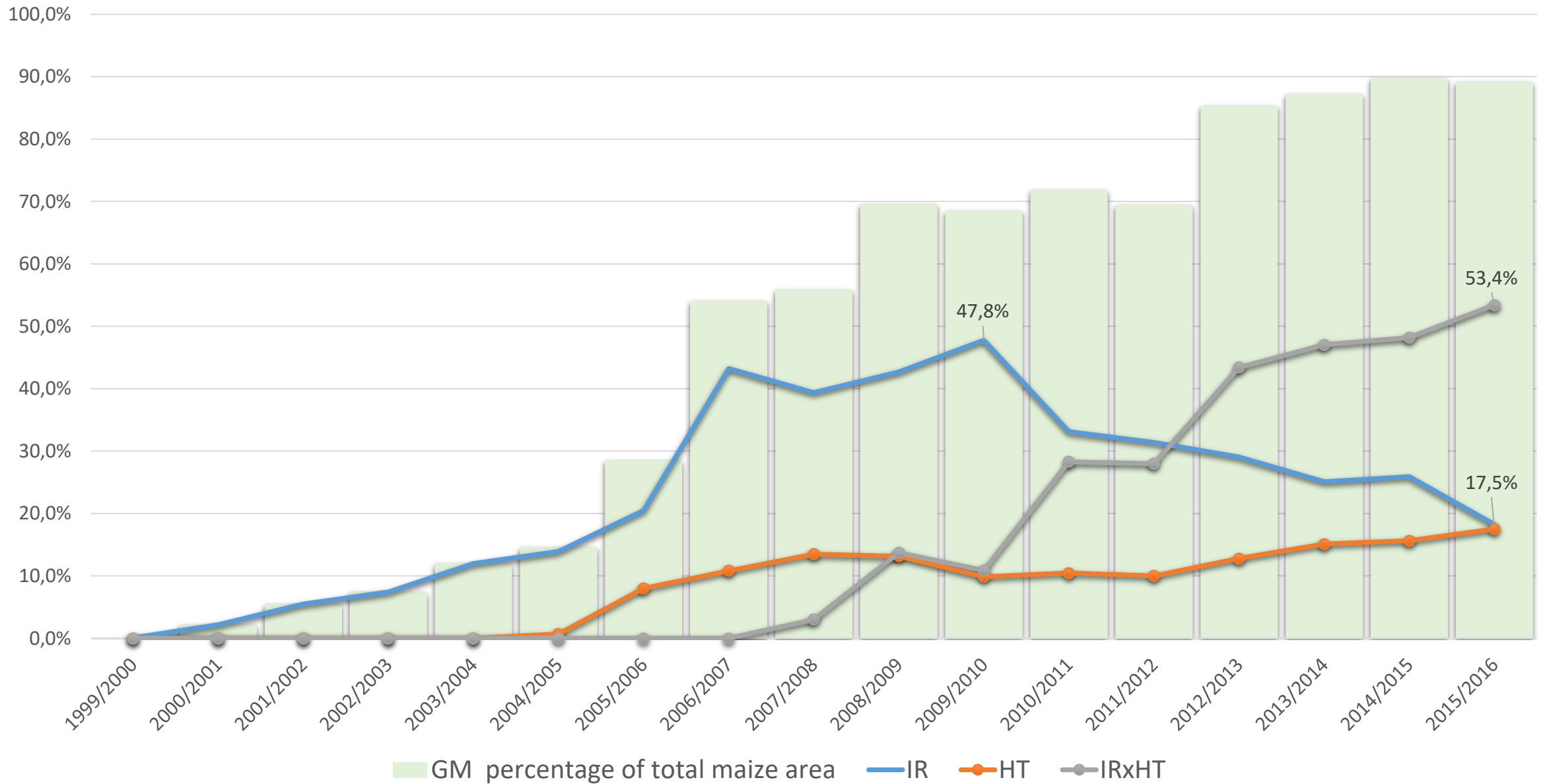
Bt11 x 1507 x GA21: IR-HT, IR-HT, HT
 Bt11 x MIR162 x TC1507 x GA21: IR-HT, IR, IR-HT, HT
 Bt11 x MIR162 x GA21: IR-HT, IR, HT
MON87460 x NK603: **Abiotic stress (DT)**, HT
 MON87460 x MON89034: Abiotic stress (DT), IR-IR
 MON87460 x MON810: Abiotic stress (DT), IR
 MON87460 x MON89034 x NK603: Abiotic stress (DT), IR-IR, HT
DAS-40278-9: HT (2,4-D tolerance)
 GA21: HT

NK603 x DAS-40278-9: HT (glyphosate), HT (2,4-D)
 MON89034 x 1507 x NK603: IR-IR, IR-HT, HT
 MON89034 x 1507 x NK603 x DAS-40278-9: IR-IR, IR-HT, HT, HT (2,4-D)
 MON89034 x MON88017: IR-IR, IR-HT
 MON87460 x MON89034 x MON88017: Abiotic stress (DT), IR-IR, IR-HT
 MON810 x MON89034: IR, IR-IR
 MON810 x MON89034 x NK603: IR, IR-IR, HT
 Bt11 x GA21: IR-HT, HT
 Bt11: IR-HT

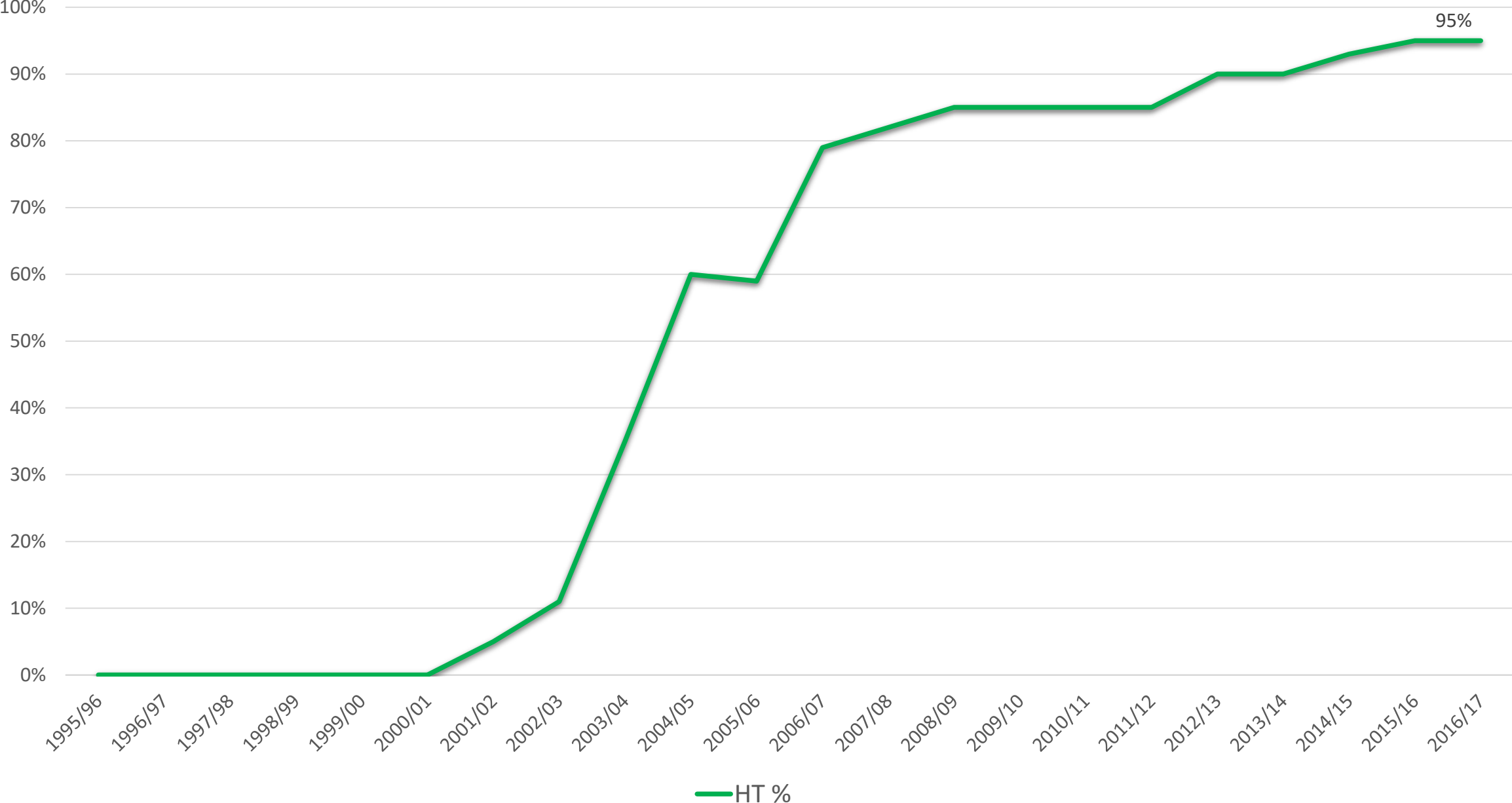
GM cotton area percentage according to trait



Commercial GM maize area percentage according to trait















GM soybean percentage



Socio-economic impact assessment

- Limited work on consumer perceptions, health and trade
- Largely focussed on farm-level impacts

Farm-level impacts	IR cotton and maize	HT cotton, maize and soybeans
Seed cost		
Yield		
Insecticide expenditure		----
Herbicide expenditure	----	  
Labour expenditure		
Farm income		

Socio-economic impact assessment

According to Brookes & Barfoot (2017)

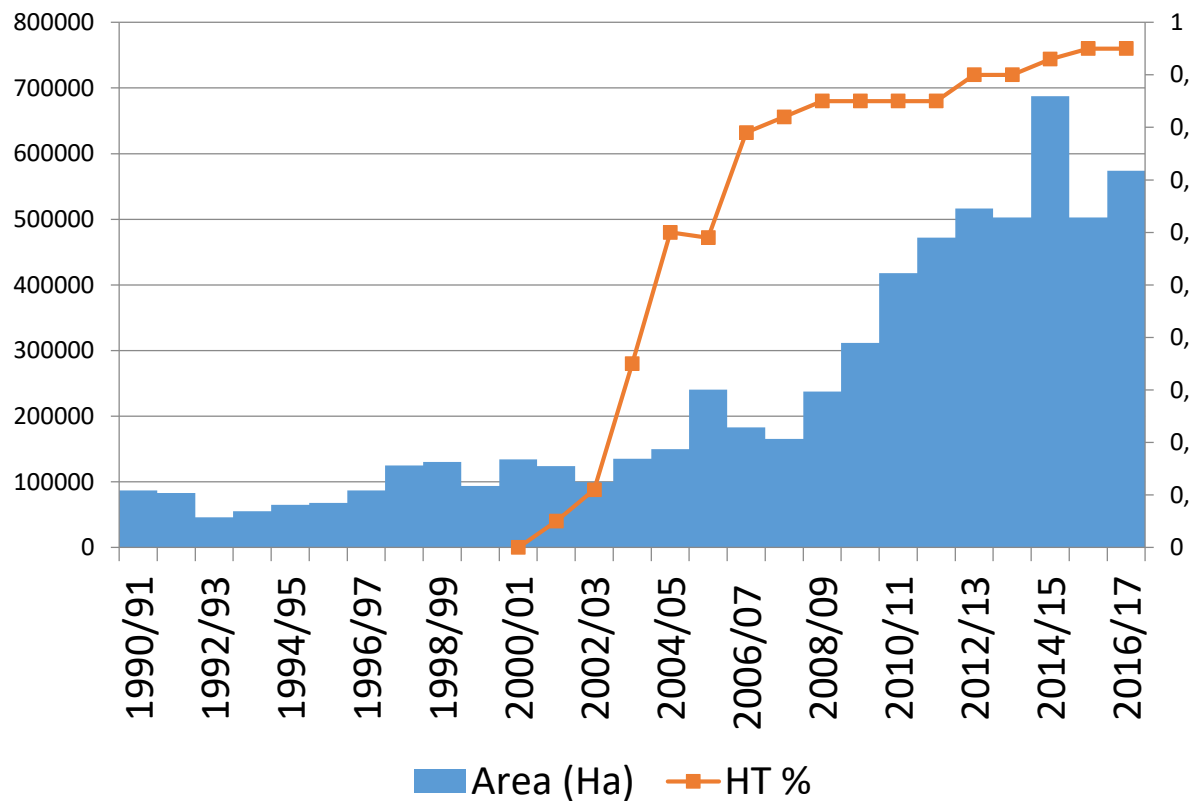
Trait	Crop	Period	Cumulative additional farm level income
IR	Cotton	1998-2015	\$32.1 million
	Maize	2000-2015	\$1.92 billion
HT	Cotton	2003-2015	?
	Soybean	2001-2015	\$22.2 million
	Maize	2003-2015	\$65.6 million
Total			\$2.04 billion
		@R8.05/USD	R 16.414 billion

Does not include other direct and indirect impacts

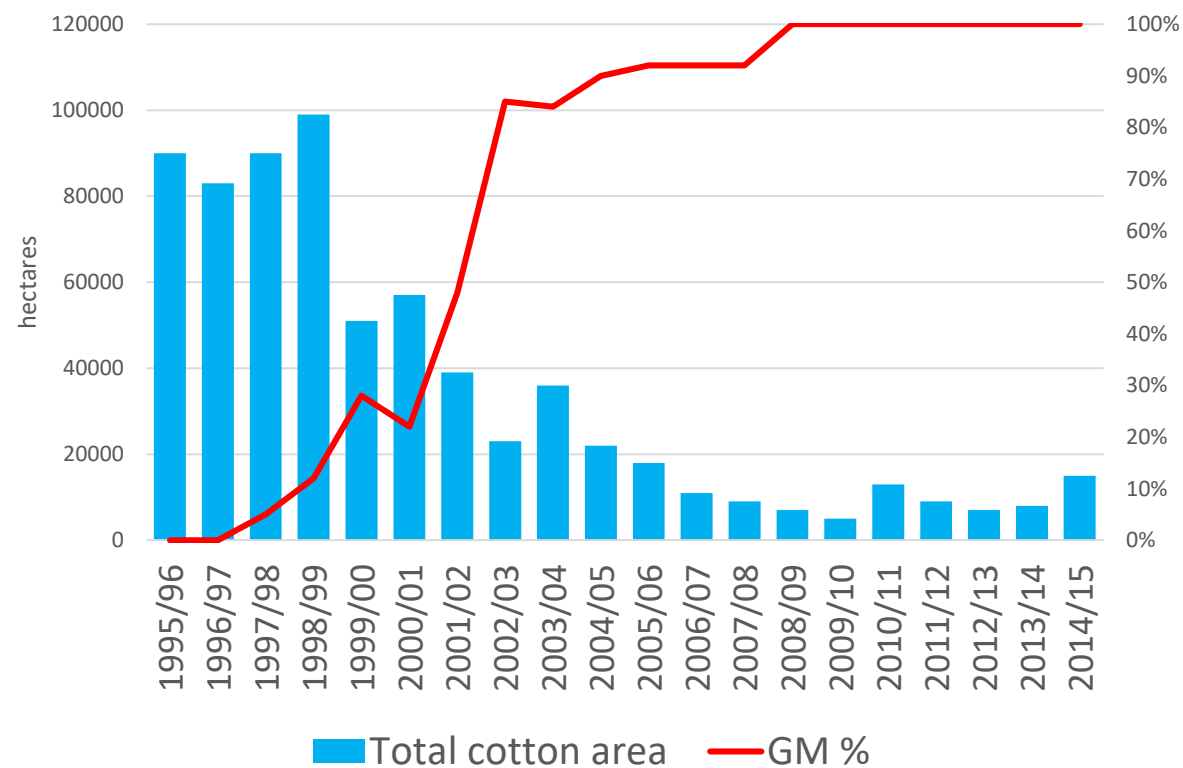
Some socio-economic lessons from last 20 years of socio-economic impact assessment – something to consider for innovation, commercialisation and sustainability

Markets matter – wonderful technology does not mean sector success

Soybeans



Cotton



Markets matter

Makhathini Flats Bt cotton experience

Technology worked wonderfully

But due to droughts, floods, high debt levels, gin competition, adverse selection

“Technology Triumph but Institutional Failure”



Consumers matter - Primary consumers (farmers), industry and secondary consumers (buyers of food)

SA Bt potato experience

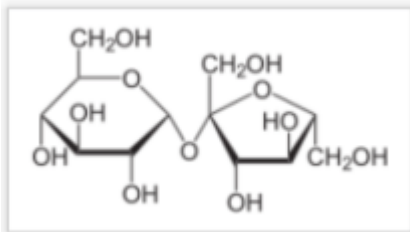
- Michigan State, USDA and ARC - millions spent on research and field trials 2001-2006
- But (in the end) industry did not want it:
 - Tuber moth not that big a problem
 - Spunta is old variety
 - Industry thinks consumers do not want it
 - = too big a risk for a relatively small benefit



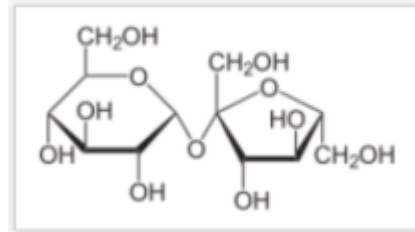
Consumers matter



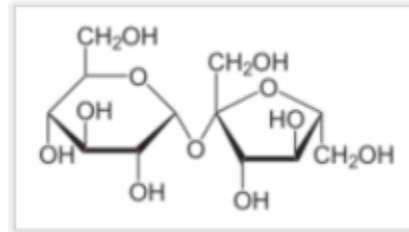
- HT sugar beet was commercialised in 2007 in the US
- Possibly due to GM labelling issues in Vermont and later nationally in US (but more likely a marketing strategy), Hershey's decided to stop putting "GM sugar" in their chocolate. Now only buys 'non-GM cane sugar' .



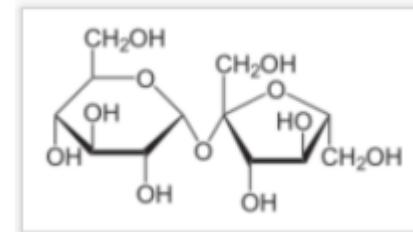
Sucrose from conventional sugar beet



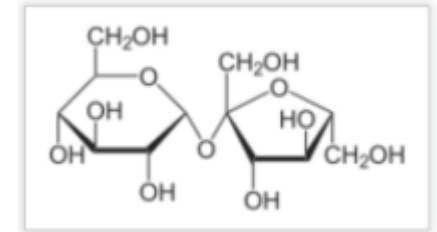
Sucrose from organic sugar beet



Sucrose from GM HT sugar beet



Sucrose from conventional sugar cane



Sucrose from GM sugar cane

National priorities matter

In innovation, regulation, commercialisation need to consider national priorities (from agriculture point of view):

- Job creation
- Rural development
- Food security
- Women and children
- Water efficiency
- Export markets



Thank you



