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Comments for USDA's Advisory Committee on Biotechnology and 21st Century Agriculture (AC21) Meeting

August 1, 2007

Worldwide GM Crop Acreage By Trait or Trait Combination

(expressed as % of overall GM crop acreage)

Trait(s)	1999	2005	2006
Herbicide tolerance (HT)	71%	71%	68%
Insect resistant (IR)	22%	18%	19%
HT and IR	7%	11%	13%
TOTALS	100%	100%	100%
HT alone or stacked	78%	82%	81%

Source: ISAAA Briefs for each year. Note that biotechnology and agricultural chemical companies are major funders of ISAAA, and its statistics and analysis particularly with respect to GM crops in developing countries have been criticized for inaccuracies (see, for example, "Who Benefits from GM Crops," Friends of the Earth International, 2006, at http://www.foei.org/en/publications/pdfs/gmcrops2006full.pdf). Still, it is the only source we know of for global statistics on GM crops. For 2006, see: http://www.isaaa.org/resources/publications/briefs/35/executivesummary/default.html

- 4 of every 5 acres of GM crops worldwide are modified for herbicide-tolerance
- Transgenics in agriculture is essentially herbicide-tolerance technology, and this fact should be clearly understood and discussed in AC21 deliberations and reflected in its reports
- AC21 should address the numerous adverse impacts associated with HT crops, such as farmers' increasing reliance on glyphosate herbicide, and the dramatic increase in glyphosate-resistant weeds associated with Roundup Ready crops

The 12 GM Crops Pending Deregulation (Commercial Approval) by USDA

(as of July 13, 2007)

Trait	No.	Notes
Tolerate 1 herbicide	4	All glyphosate (Roundup) tolerant: cotton, soy, alfalfa, creeping bentgrass
Tolerate 2 herbicides	**2**	**Tolerate glyphosate and either ALS inhibitors (soy) or imidazolinone (corn), both Pioneer**
Insect-resistant	2	Corn, cotton
Virus-resistant	1	New version of old papaya trait
Enzyme added	1	Syngenta, corn w/ alpha-amylase enzyme derived from deep sea microorganism for processing into ethanol. First GE industrial crop. Some alpha amylase enzymes cause respiratory allergies. South Africa has refused import clearance on grounds that Syngenta has not provided an adequate analysis of potential health impacts from consumption of this corn.
Oil alteration	1	High oleic acid soy for processing
Color alteration	1	Carnation

Source: Petitions of Nonregulated Status Granted or Pending by APHIS as of July 13, 2007 (last accessed August 1, 2007). See: http://www.aphis.usda.gov/brs/not_reg.html.

- One-half (6) of near-future GM crops are herbicide-tolerant; all 6 are tolerant to glyphosate
- Two of the 6 HT crops are each modified for tolerance to two herbicides (glyphosate and one other), a novel development driven by the dramatic increase in glyphosate-resistant weeds
- Despite the fact that HT is by far the dominant transgenic modification in agriculture now and for the future, AC21 failed to even mention herbicide-tolerant crops in "The next ten years" section of its recent report: "Opportunities and Challenges in Agricultural Biotechnology: The Decade Ahead," July 13, 2006. See: http://www.usda.gov/documents/final_main_report-v6.pdf
- AC21 needs to assess GM crops not on the basis of speculative future applications that may or may not be realized, but rather on the basis of the GM crops that are actually being grown now and in the near future

GM Crops Increase Pesticide Use

- According to the most comprehensive, independent analysis based on USDA data, GM crops increased pesticide use in the U.S. by 122 million pounds from 1996-2004

  + Herbicide-tolerant: + 138 million lbs.
  + Insect-resistant: - 16 million lbs.
  + NET: + 122 million lbs.

See: Benbrook, C. (2004). "Genetically Engineered Crops and Pesticide Use in the United States: The First Nine Years," Charles Benbrook, Technical Paper No. 7, October 2004, available at: http://www.biotechinfo.net/technicalpaper7.html. Dr. Benbrook is the former chair of the Board on Agriculture of the National Academy of Sciences.

The Myth of Reduced Pesticide Use

- Selective reference to and illegitimate extrapolation from the pesticide use impacts of GM crops in the early years of adoption, before herbicide-resistant weeds led to steadily increasing herbicide use (see Benbrook, C. 2004, op. cit.):

  * 1996 – 1998: - 20.6 million lbs
  * 1999 – 2004: + 143.1 million lbs
  * 1996 – 2004: + 122.5 million lbs.

- Pesticide use reductions from Bt corn sometimes greatly exaggerated by assuming all current Bt corn growers would use insecticides to control European corn borer (ECB) if they switched back to conventional corn. In fact, only 5.2% of corn acreage was sprayed for ECB prior to availability of Bt corn.

  Source: "Genetically Modified Pest-Protected Plants: Science and Regulation," Board on Agriculture and Natural Resources, National Research Council, National Academy of Sciences, 2000. http://books.nap.edu/catalog/9795.html. See Section 3.1.2 for the following quote:

"… the European corn borer, which is the major target of transgenic Bt field corn, has not commonly been controlled with insecticides. A survey of the literature (Gianessi and Carpenter 1999) indicates that across the corn belt only 5.2% of the acreage is sprayed annually for corn borers and in Iowa only 2.6%. Some of the reasons for the lack of chemical control are that the perceived yield loss has always been considered small (estimated at about 4%), the cost of pesticides is high relative to the crop's value, and typical insecticides have not been very efficient at killing the pest after it bores into the plant."

Herbicide-Tolerant GM Crops in the U.S.: Quantity of Glyphosate Applied and Share of Overall Crop Acreage

Year	Soybeans		Corn		Cotton		Notes
	Glyphosate applied[1]	% of US crop = HT[2]	Glyphosate applied[1]	% of US crop = HT[2]	Glyphosate applied[1]	% of US crop = HT	
2002	63,816	75%	3,307	11%	n.a.	74%[3]	
2003	n.a.	81%	12,351	15%	12,870		
2005	64,730	87%	23,926	26%	14,558		7-fold increase in glyphosate use on corn from just 2002 to 2005 as HT corn share increases from 11-26%. Nearly all HT corn is glyphosate-tolerant (a small but unknown % is glufosinate-tolerant = LibertyLink)
2006	91,886	89%	n.a.	36%	n.a.	86%[4]	42% increase in glyphosate use on soybeans from 2005 to 2006, despite only minor increase in % of soybeans that are HT. The increase reflects greater use of glyphosate to control resistant weeds. All HT soybeans are glyphosate-tolerant (i.e. Roundup Ready)
2007	n.a.	91%	n.a.	52%	n.a.	n.a.	

[1] Thousands of lbs. Source for all crops: "Agricultural Chemical Usage: Field Crops Summary," USDA National Agricultural Statistics Service, for the respective years. Accessible from: http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1560. Figures represent sum of all versions of glyphosate. n.a. = not available, note that USDA does not survey pesticide usage for all crops in all years.

[2] From USDA's Economic Research Service, see: http://www.ers.usda.gov/Data/BiotechCrops/alltables.xls. Figures are the sum of percentages listed for "herbicide-tolerant only" and "stacked gene varieties." As defined by ERS, stacked gene varieties always contain an HT trait.

[3] May, O.L., F.M. Bourland and R.L. Nichols (2003). "Challenges in Testing Transgenic and Nontransgenic Cotton Cultivars," *Crop Science* 43: 1594-1601. http://crop.scijournals.org/cgi/reprint/43/5/1594.pdf. Figure calculated by adding all HT varieties in Table 1. Based on USDA AMS data, see next footnote.

[4] From USDA's Agricultural Marketing Service, which has more reliable statistics on cotton than ERS. See: "Cotton Varieties Planted: 2006 Crop," http://www.ams.usda.gov/cottonrpts/MNXLS/mp_cn833.xls. Figure calculated by adding percentages of all HT varieties (those with designations R, RR = Roundup Ready or RF = Roundup Ready Flex and LL for LibertyLink). Note that most HT cotton is Roundup Ready (Flex); LL cotton varieties comprised only 3-4% of US cotton in 2006.

Usage of Selected Herbicides Other Than Glyphosate in the U.S.

Year	2,4-D[1]		Atrazine[2]		Notes
	Soybeans	Corn	Corn	% of US corn crop = HT[3]	
2002	1,347	1,018	35,762	11%	
2003	n.a.	1,485	55,642	15%	
2005	1,539	2,148	57,390	26%	From 2002 to 2005, atrazine use on corn increased by over 20 million lbs (60%), while use of 2,4-D (a minor corn herbicide) more than doubled. The 7-fold increase in glyphosate use on corn over the same time span (see last table) has clearly not displaced either atrazine or 2,4-D.
2006	3,526	n.a.	n.a.	36%	129% increase in use of 2,4-D on soy from just 2005 to 2006. Over the same period, glyphosate use on soy rose 42% (see last table). Glyphosate is clearly not displacing use of 2,4-D.

[1] Thousands of lbs. 2,4-D is the second-most heavily used herbicide on soybeans (after glyphosate). 2,4-D is a phenoxy herbicide that formed part of the Vietnam War defoliant Agent Orange. Its use has been associated with a number of adverse health impacts on agricultural workers who apply the herbicide: increased risk of cancer, particularly non-Hodgkin's lymphoma, and increased rate of birth defects in children of men who apply the herbicide. 2,4-D is also a suspected endocrine disruptor. For more, see http://www.beyondpesticides.org/pesticides/factsheets/2,4-D.pdf. For restrictions on residential use of 2,4-D in various countries, see: http://en.wikipedia.org/wiki/2,4-D. Figures cited are the sum of all forms of 2,4-D.

[2] Thousands of lbs. Atrazine is the most heavily used herbicide on corn (not used on soybeans). Atrazine is a triazine herbicide whose use has been linked to endocrine disruption, neuropathy and cancer (particularly breast and prostate cancer). Atrazine is regularly detected in drinking water supplies in the Midwest, and has been associated with low sperm counts in men. Exposure to extremely low levels of atrazine has been linked to sex change and/or deformities in frogs, fish and other organisms. Based on this evidence, and the widespread presence of atrazine in drinking water supplies, the European Union announced a ban on atrazine in 2006. The U.S. EPA re-registered atrazine in 2003 despite objections from scientists and environmental groups. See http://www.beyondpesticides.org/pesticides/factsheets/Atrazine.pdf and http://www.loe.org/shows/segments.htm?programID=06-P13-00016&segmentID=1.

[3] From USDA's Economic Research Service, see: http://www.ers.usda.gov/Data/BiotechCrops/alltables.xls. Figures are the sum of percentages listed for "herbicide-tolerant only" and "stacked gene varieties." As defined by ERS, stacked gene varieties always contain an HT trait.

- When biotechnology companies are forced to admit that GM crops do in fact increase rather than decrease overall pesticide use, they often fall back on a second claim – that increased use of glyphosate is good, because it displaces more toxic herbicides. However, recent trends show that this is decidedly not the case for several widely used and toxic herbicides. Use of both atrazine on corn and 2,4-D on soybeans and corn has increased substantially since 2002.
- Increasing use of 2,4-D on soy (and perhaps atrazine on corn) is largely attributable to the need to control glyphosate-resistant weeds.