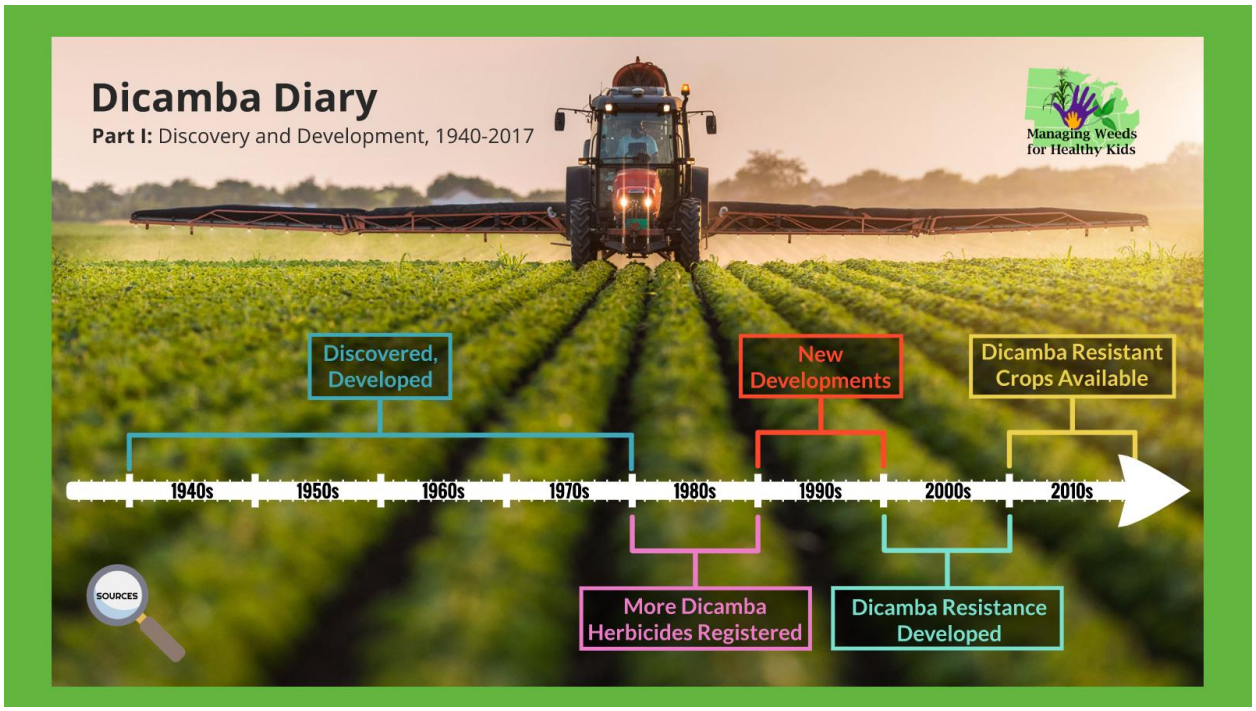
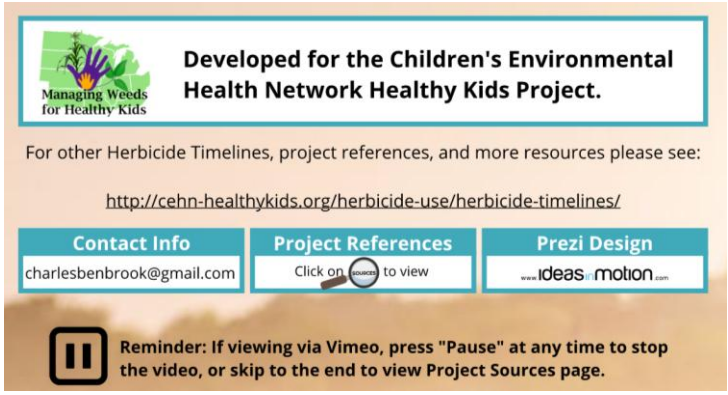
Dicamba Diary

Part I: Discovery and Development 1940-2017



Developed By:



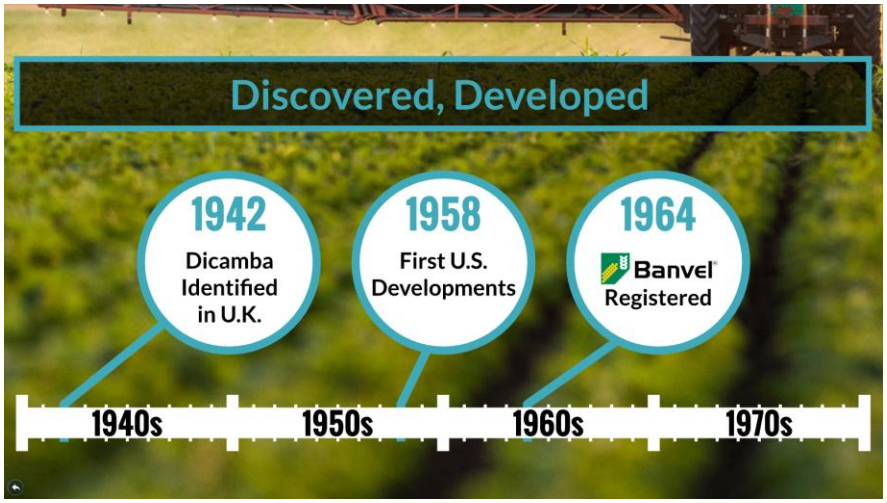
Developed for the Children's Environmental Health Network Healthy Kids Project.

For other Herbicide Timelines, project references, and more resources please see:

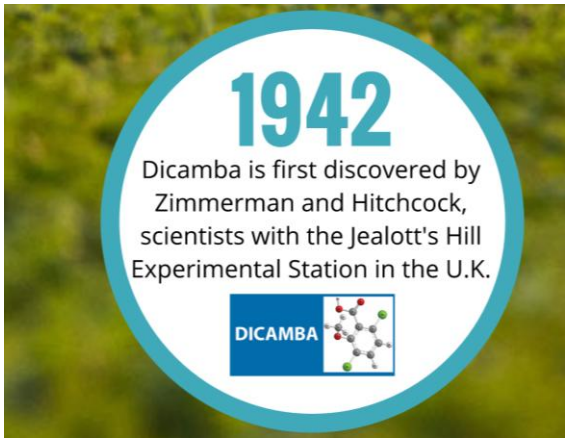
http://cehn-healthykids.org/herbicide-use/herbicide-timelines/

Contact Info: charlesbenbrook@gmail.com

1940s-1960s:

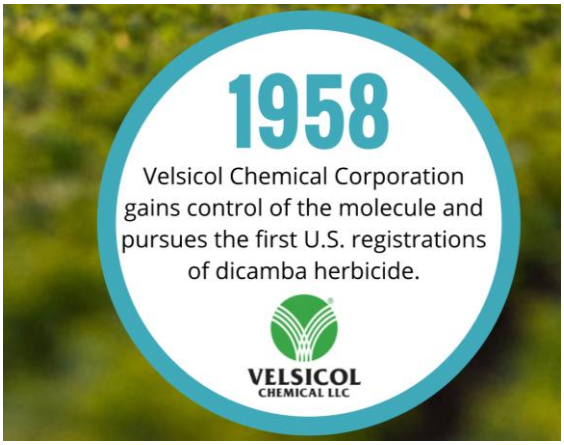


1942: Dicamba Identified in the U.K.



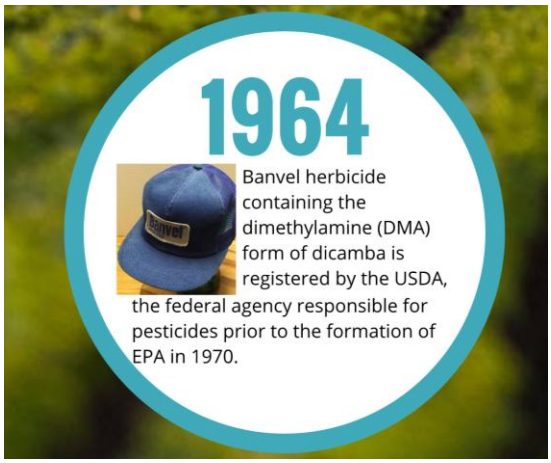
Dicamba is first discovered by Zimmerman and Hitchcock, scientists with the Jealott's Hill Experimental Station in the U.K.

1958: First U.S. Developments



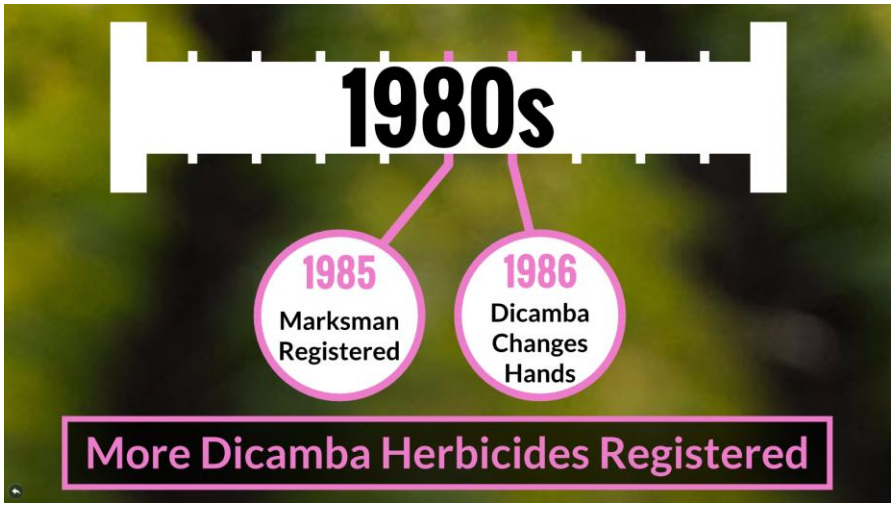
Velsicol Chemical Corporation gains control of the molecule and pursues the first U.S. registrations of dicamba herbicide.

1964: Banvel Registered



Banvel herbicide containing the dimethylamine (DMA) form of dicamba is registered by the USDA, the federal agency responsible for pesticides prior to the formation of EPA in 1970.

1980s:



1985: Marksman Registered

Velsicol registers Marksman herbicide, containing the potassium form of dicamba plus atrazine.

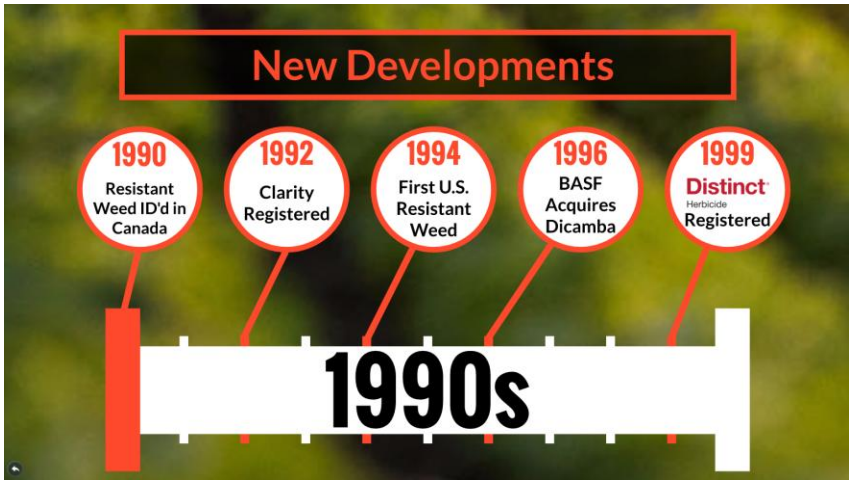
See an early Marksman label here:

http://cehn-healthykids.org/bibliographies/basf-1985/

1986: Dicamba Changes Hands

Sandoz purchases the ag business of Velsicol, taking over dicamba registrations, development, and regulatory support.

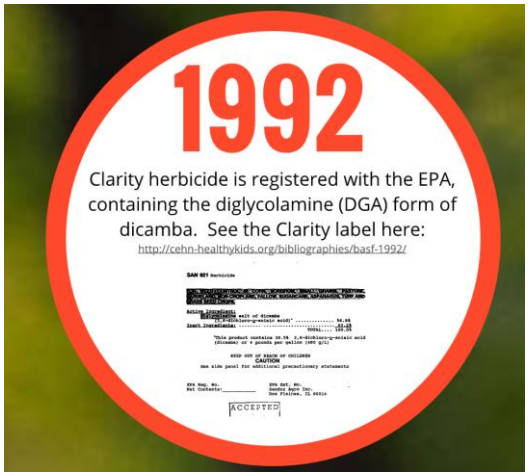
1990s:



1990: Resistant Weed ID'd in Canada

The first dicamba-resistant weed is documented in Canada, a wild mustard (*Sinapis arvensis*).

1992: Clarity Registered



Clarity herbicide is registered with the EPA, containing the diglycolamine (DGA) form of dicamba. See the Clarity label here:

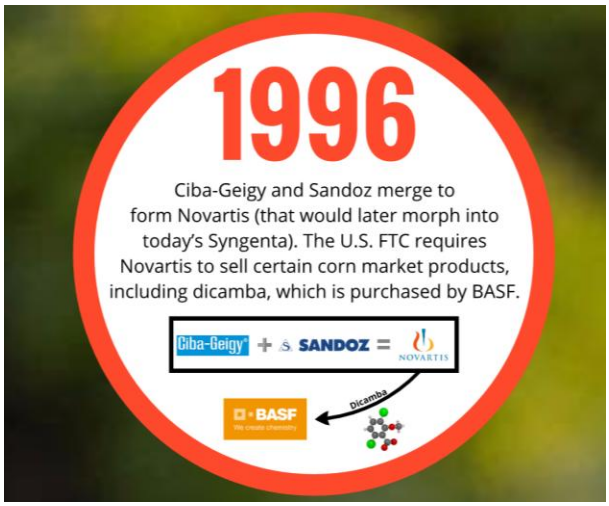
http://cehn-healthykids.org/wp-content/uploads/2017/07/clarity-label.pdf

1994: First U.S. Resistant Weed

The first weed in the U.S. resistant to dicamba is documented in Montana, a kochia in the goosefoot family (*Kochia scoparia*).

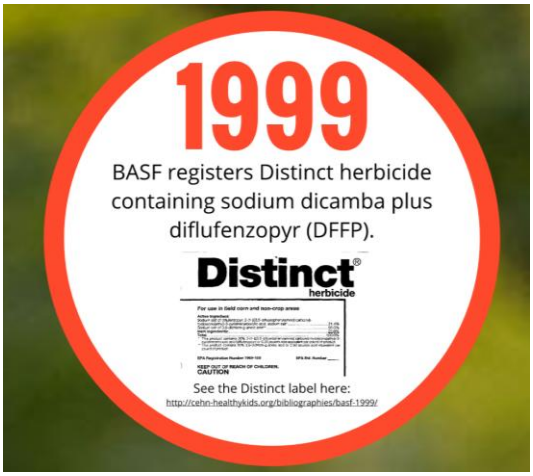
Over the next 5 years, it will spread to North Dakota, Idaho, and Colorado.

1996: BASF Acquires Dicamba



Ciba-Geigy and Sandoz merge to form Novartis (that would later morph into today's Syngenta). The U.S. FTC requires Novartis to sell certain corn market products, including dicamba, which is purchased by BASF.

1999: Distinct Herbicide Registered

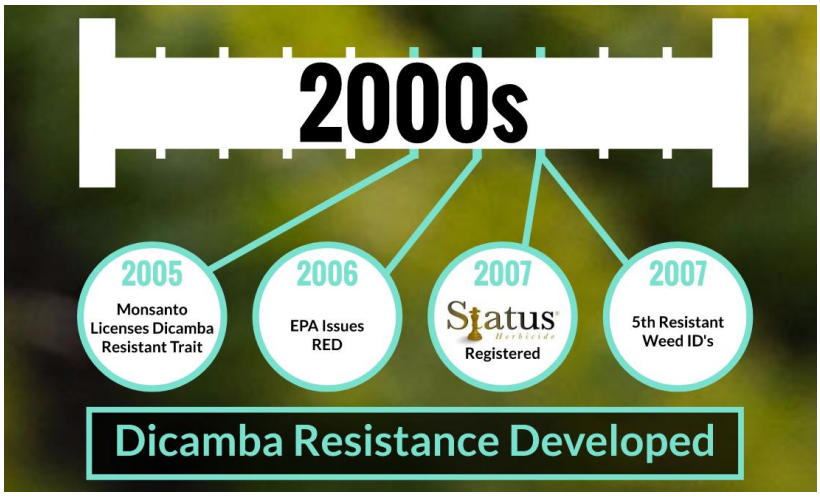


BASF registers Distinct herbicide containing sodium dicamba plus diflufenzopyr (DFFP).

See the Distinct label here:

http://cehn-healthykids.org/wp-content/uploads/2017/07/Distinct-label.pdf

2000s:



2005: Monsanto Licenses Dicamba Tolerant Trait

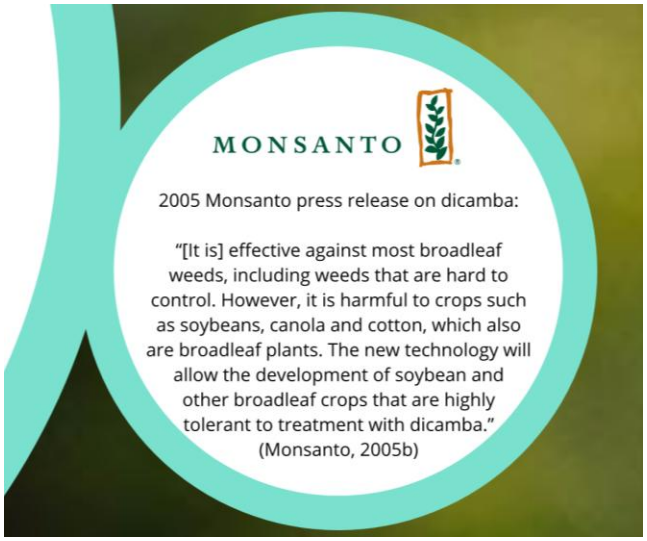
The dicamba-resistance trait was developed at the University of Nebraska, and licensed to Monsanto in 2005.

Under the terms of the agreement, Monsanto has an exclusive license to integrate the trait into commercial crops.

See the report on the development of dicamba-resistant crops here:

http://cehn-healthykids.org/bibliographies/behrens-et-al-2007/

2005, Subtopic:



2005 Monsanto press release on dicamba:

"[It is] effective against most broadleaf weeds, including weeds that are hard to control. However, it is harmful to crops such as soybeans, canola and cotton, which also are broadleaf plants. The new technology will allow the development of soybean and other broadleaf crops that are highly tolerant to treatment with dicamba."

2006: EPA Issues RED

June 6, 2006: EPA issues Reregistration Eligibility Document on dicamba.

- 434 dicamba products registered
- Multiple methods of application approved
- Application rate range is 0.5-2.8 lbs active ingredient per acre (EPA, 2006)

The typical rate on most field crops = ~0.2 pound/acre. Rate on corn has been between 0.15 and 0.35 lbs/acre over the last 20 years.

2007: Status Herbicide Registered

Status herbicide registered, contains sodium salts of dicamba and BASF's DFFP (diflufenzopyr) and a safener.

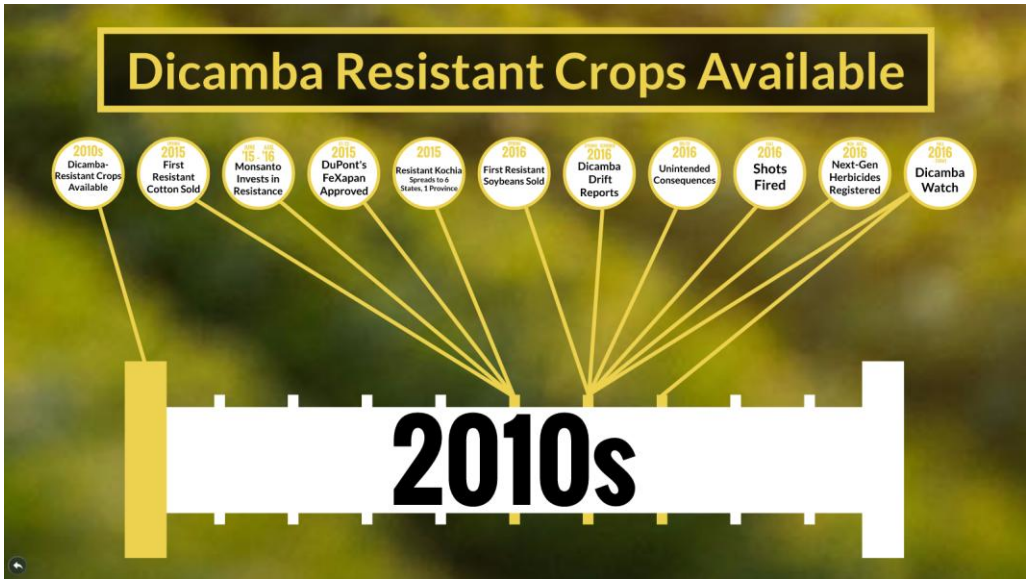
See the label here:

http://cehn-healthykids.org/bibliographies/basf-2007/

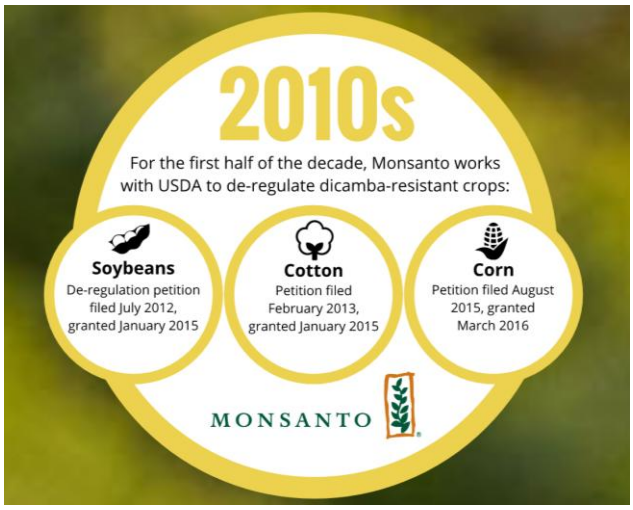
2007: 5th Resistant Weed ID'd

The 5th weed species in the U.S. resistant to dicamba is identified, *Latuca serriola (*milk thistle) in Washington state.

2010s:



2010s: Dicamba Resistant Crops Available



For the first half of the decade, Monsanto works with USDA to de-regulate dicamba-resistant crops:

- Soybeans: De-regulation petition filed July 2012, granted January 2015
- Cotton: Petition filed February 2013, granted January 2015
- Corn: Petition filed August 2015, granted March 2016

Spring 2015: First Dicamba-Resistant Cotton Sold

Farmers plant the first dicamba-resistant crop, Monsanto's Bollgard II XtendFlex Cotton (also resistant to glyphosate and glufosinate-based herbicides).

No dicamba formulations are yet approved for use with the new cotton. Some farmers spray dicamba anyway. Officials register the first complaints of damage to crops not containing the dicamba-resistance gene.

6/15-8/16: Monsanto Invests in Dicamba Resistance

June 24, 2015 story by Reuters:

"Monsanto to invest more than $1bilion in dicamba herbicide production"

- Major plant expansion underway in Luling, Louisiana to meet future demand for dicamba.
- Monsanto tells Reuters it sees "a 200 million acre 'practical fit' for its Roundup Ready Xtend system for soybeans and cotton in the Americas." (Gillam, 2015)

6/15-8/16, Subtopic: August 17, 2016

Monsanto ramps up marketing: Day one of "Whistle Stop Tour" for major investors and Wall Street analysts.

- Lengthy, on the record presentations made by top Monsanto executives.
- Bullish projections given on the market penetration of XtendiMax, dicamba-resistant soybeans and cotton.

- Technology will be incorporated in 250 million acres of crops globally within just a few years (Monsanto, 2016a).

7/23/15: DuPont's FeXapan Approved

EPA approves DuPont's FeXapan dicamba, containing DGA dicamba and inert ingredients intended to reduce volatility and drift (BASF, 2015).

2015: Resistant Kochia Spreads to 6 States, 1 Province

Dicamba-resistant kochia (Kochia scoparia), first documented in 1994, has now spread to:

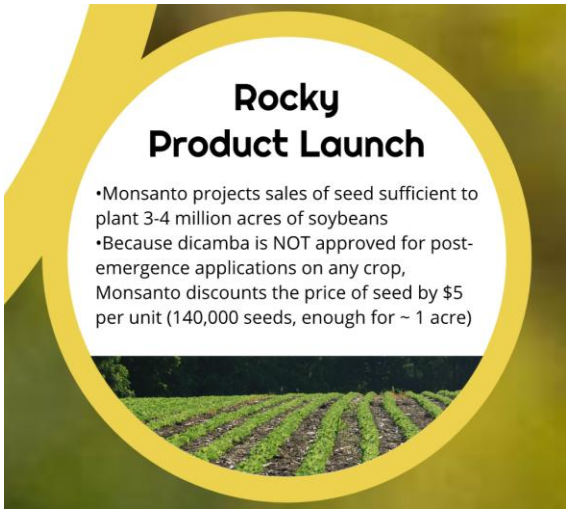
- Montana, North Dakota, Idaho, Colorado, Nebraska, Kansas
- Saskatchewan, Canada

Spring 2016: First Resistant Soybeans Sold

About 100 seed companies sell dicamba-resistant soybeans for the first time, via licenses from Monsanto and DuPont Pioneer.

- Seed sold despite NO approved registrations for any of the new, supposedly "low-volatility" dicamba herbicides.
- ANY application of dicamba herbicide on dicamba-resistant soybeans or cotton would be off-label and illegal.

Spring 2016, Subtopic: Rocky Product Launch



- Monsanto projects sales of seed sufficient to plant 3-4 million acres of soybeans
- Because dicamba is NOT approved for post-emergence applications on any crop, Monsanto discounts the price of seed by $5 per unit (140,000 seeds, enough for ~ 1 acre)

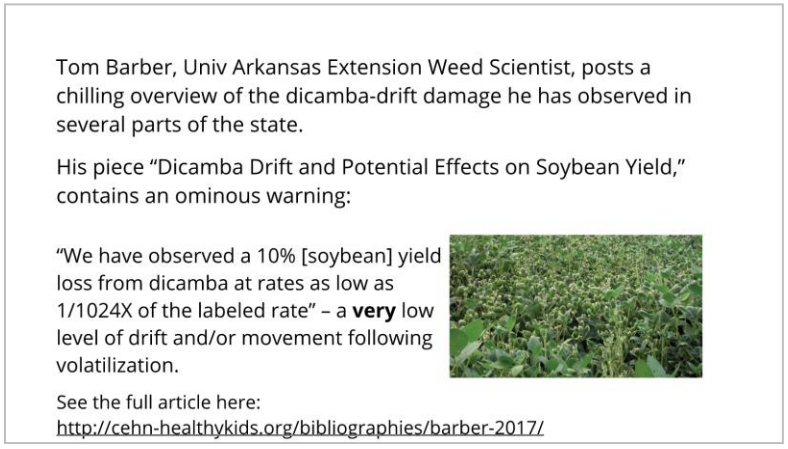
Spring-Summer 2016, Dicamba Drift Reports, Stacked Slide (1/3):

The first dicamba-resistant soybeans are planted in 2016, despite lack of ***any*** dicamba formulation approved for post-emergence use.

Tens of thousands of soybean acres damaged by drift from illegal, post-emergent applications of dicamba.

See the upcoming link to our Dicamba Watch presentation for state-by-state details.

Spring-Summer 2016, Next Slide (2/3):

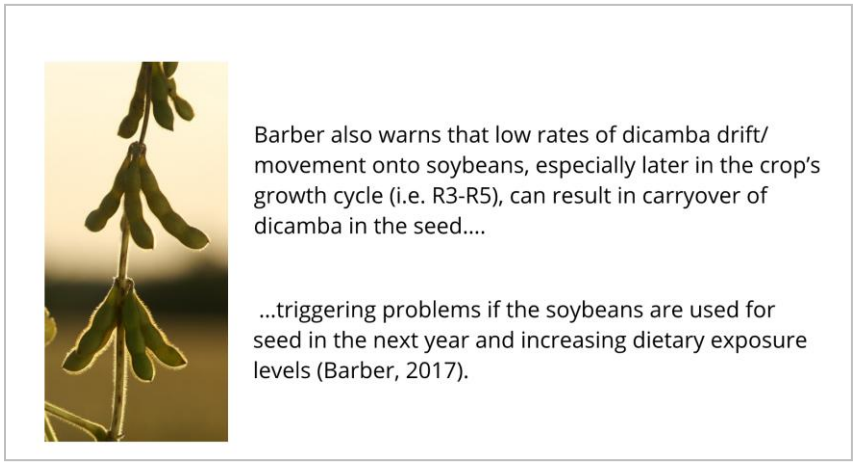


Tom Barber, Univ Arkansas Extension Weed Scientist, posts a chilling overview of the dicamba-drift damage he has observed in several parts of the state.

His piece "Dicamba Drift and Potential Effects on Soybean Yield" (http://cehn-healthykids.org/bibliographies/barber-2017/) contains an ominous warning:

"We have observed a 10% [soybean] yield loss from dicamba at rates as low as 1/1024X of the labeled rate" – a ***very*** low level of drift and/or movement following volatilization.

Spring, Summer 2016, Next Slide (3/3):



Barber also warns that low rates of dicamba drift/movement onto soybeans, especially later in the crop's growth cycle (i.e. R3-R5), can result in carryover of dicamba in the seed....

...triggering problems if the soybeans are used for seed in the next year, and also raising new concern over dietary exposure levels (Barber, 2016).

9/1/16: Unintended Consequences

"Monsanto Seeds Unleash Unintended Consequences Across U.S. Farms" Jack Kaskey and Lydia Mulvany, *Bloomberg News*, http://cehn-healthykids.org/bibliographies/kaskey-and-mulvany-2016/

- Opening line – "There's just something about the herbicide dicamba that's always made it hell on soybean and cotton crops"
- Farmers tell Bloomberg they feel "***compelled*** to buy the engineered Monsanto seed to avoid injury next season" and Wall Street analysts make the same point.

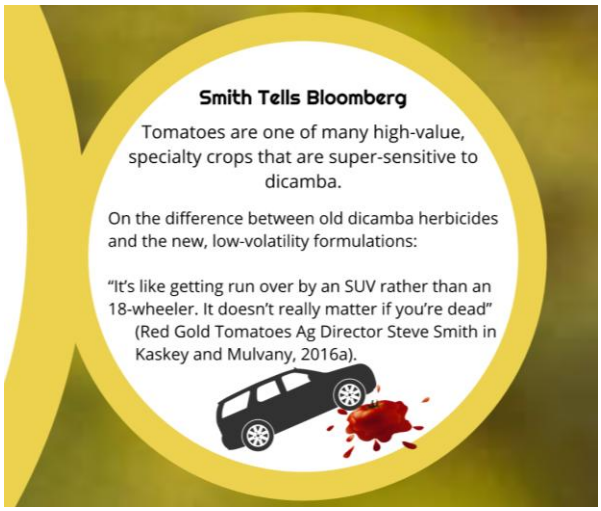
How's that for a marketing strategy?

9/1/16, Subtopic: Red Gold, World's Largest Canned Tomato Processor

Based in Indiana, Red Gold Tomatoes is the largest processor in the world and purchases 80% of the tomatoes produced in the Midwest.

Steve Smith is Red Gold's ag director and also the founder and Chairman of the "Save Our Crops Coalition."

9/1/16, Subtopic, Secondary Subtopic: Smith Tells Bloomberg



Tomatoes are one of many high-value, specialty crops that are super-sensitive to dicamba.

On the difference between old dicamba herbicides and the new, low-volatility formulations:

"It's like getting run over by an SUV rather than an 18-wheeler. It doesn't really matter if you're dead" (Red Gold Tomatoes Ag Director Steve Smith in Kaskey and Mulvany, 2016a).

Fall 2016: Shots Fired

A farmer confronts a neighbor over illegal dicamba use, which drifted onto the farmer's land and caused extensive damage. An argument leads to the murder of Mike Wallace, a longtime Arkansas soybean farmer.

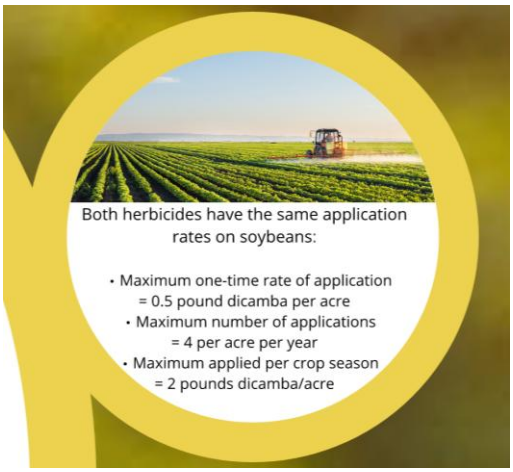
Mr. Wallace's sister is quoted as saying "he could not understand why people would spray things that would hurt others" (Demillo, 2017).

Nov.- Dec. 2016: Next-Gen Herbicides Registered

November: Long-past the harvest of the 2016 soybean crop, Monsanto's XtendiMax (Monsanto, 2016b) and BASF's Engenia (BASF, 2016) form of dicamba are registered for post-emergent use on dicamba-resistant crops:

- Both formulated to (hopefully) reduce volatility and off-target movement
- BASF claims 70% reduction of volatility in Engenia dicamba compared to DGA-based dicamba

11/9/16, First Subtopic (Application Rates):

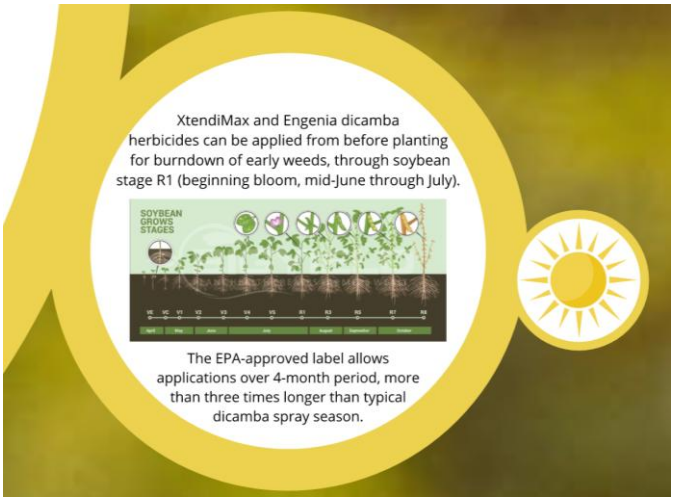


Both herbicides have same application rates

on soybeans:

- Maximum one-time rate of application = 0.5 pound dicamba per acre
- Maximum number of applications = 4 per acre per year
- Maximum applied per crop season = 2 pounds dicamba/acre

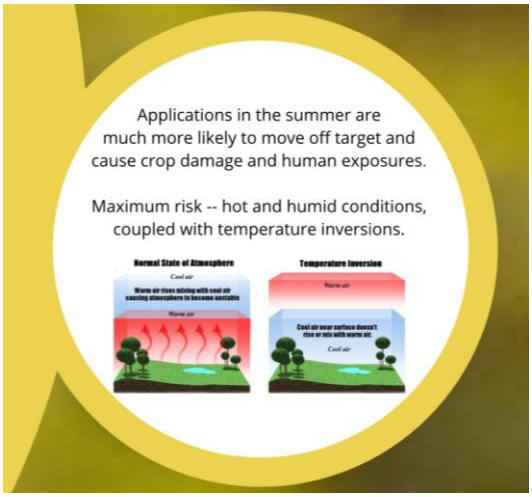
11/9/16, Second Subtopic (Application Timing):



XtendiMax and Engenia dicamba herbicides can be applied from before planting for burndown of early weeds, through soybean stage R1 (beginning bloom, mid-June through July).

The EPA-approved label allows applications over ~4-month period, more than three-times longer than typical dicamba spray season.

11/9/16, Second Subtopic, Secondary Subtopic:



Applications in the summer are much more likely to move off target and cause crop damage and human exposures.

Maximum risk --hot and humid conditions, coupled with temperature inversions.

Fall 2016 - Today:

See "Dicamba Watch" for more on drift and crop damage in 2016-2017, state and federal regulatory actions, and responses by farmers and ag industry leaders.

Access at:

http://cehn-healthykids.org/herbicide-use/herbicide-timelines/

Sources:

Our project team combed through a mountain of EPA documents and herbicide use data to create these timelines, and we are sharing it all with you!

Reference List (PDF):

http://cehn-healthykids.org/wp-content/uploads/2017/09/Dicamba-Diary-References.pdf

Online Bibliography

for Part I:

http://cehn-healthykids.org/bibliography-tag/dicamba-part-i/