

2017 Stable Reduced Converter (SRC) Dark Tobacco Crop

K. Lion; M.F.G. Lusso; A. Adams; W. Morris; D.
Xu; U. Warek and J. A. Strickland



Altria

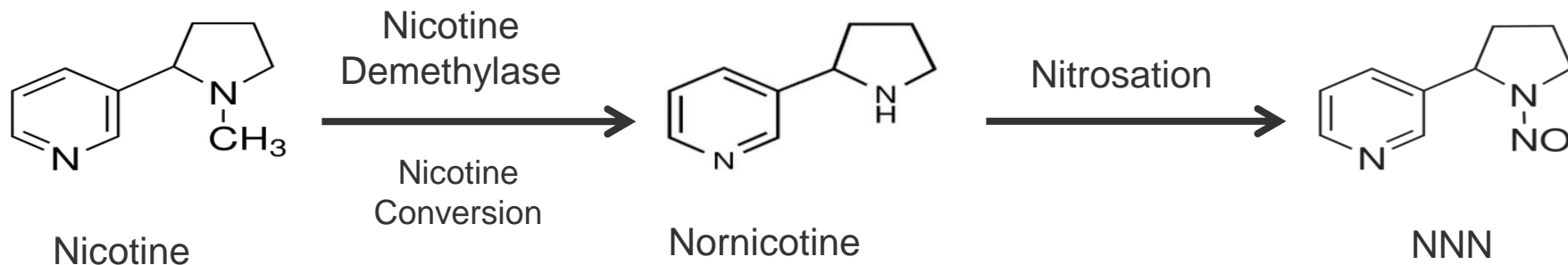
Altria Client Services

Outline

- Background
- SRC Tobacco Variety Development and Performance
- ALCS's Dark Tobacco Sampling Project
- N-Nitrosonornicotine (NNN) data for the 2017 Dark tobacco LC and SRC Crop



Background – N-nitrosornornicotine (NNN) Formation



Bush et al., 1999. Biosynthesis of nicotine and related alkaloids. Pp 13-44

Bush et al., 2001. Rec. Adv. Tob. Sci. 27:23-46

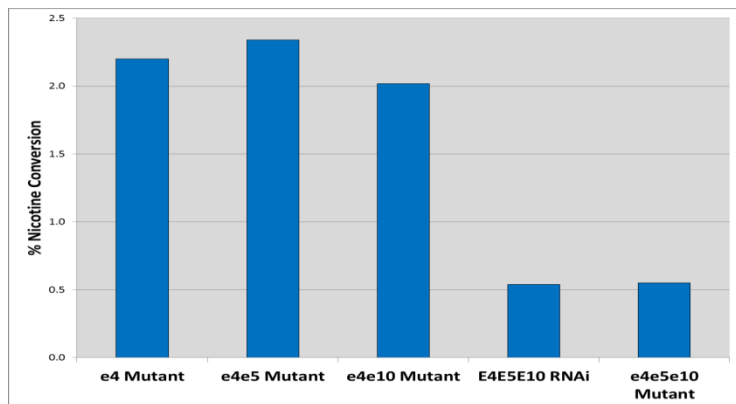
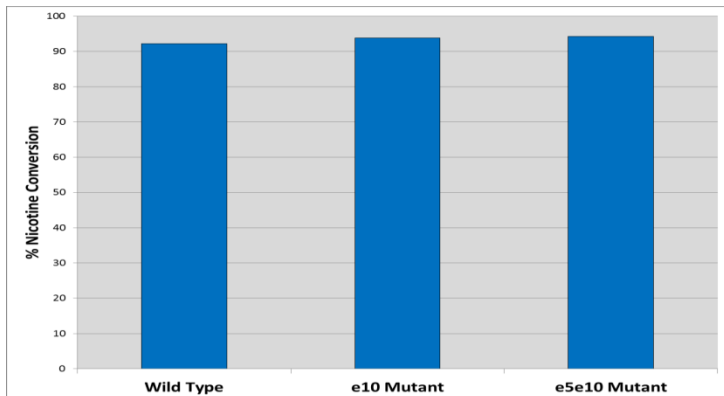
Xu et al., 2007. Physiologia Plantarum 129:307-319



Altria

Altria Client Services

Background – Genetic control of nicotine conversion



Lewis et. al., 2010. Three nicotine demethylase genes mediate nornicotine biosynthesis in *Nicotiana tabacum* L.: Functional characterization of the CYP82E10 gene. *Phytochemistry* 71, 1988-1998

e4e4, e5e5, e10e10 = ZYVERT[®] Technology

SRC Varieties = with ZYVERT[®] Technology



SRC Tobacco Variety Development and Performance



SRC Varieties with
ZYVERT® Technology

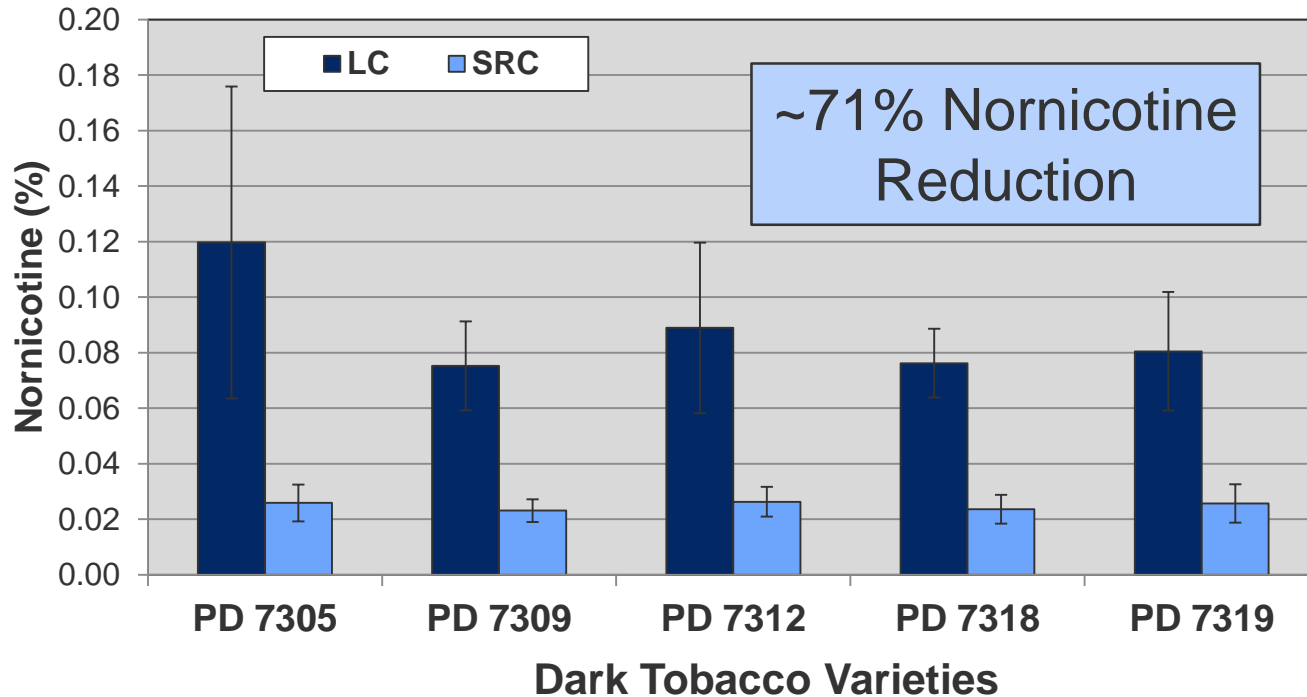
- ALCS Proprietary Dark Tobacco Varieties
 - PD 7305 **LC** – PD 7305 **SRC**
 - PD 7309 **LC** – PD 7309 **SRC**
 - PD 7312 **LC** – PD 7312 **SRC**
 - PD 7318 **LC** – PD 7318 **SRC**
 - PD 7319 **LC** – PD 7319 **SRC**

- Limited quantities of certified seeds were produced in 2016 and 2017



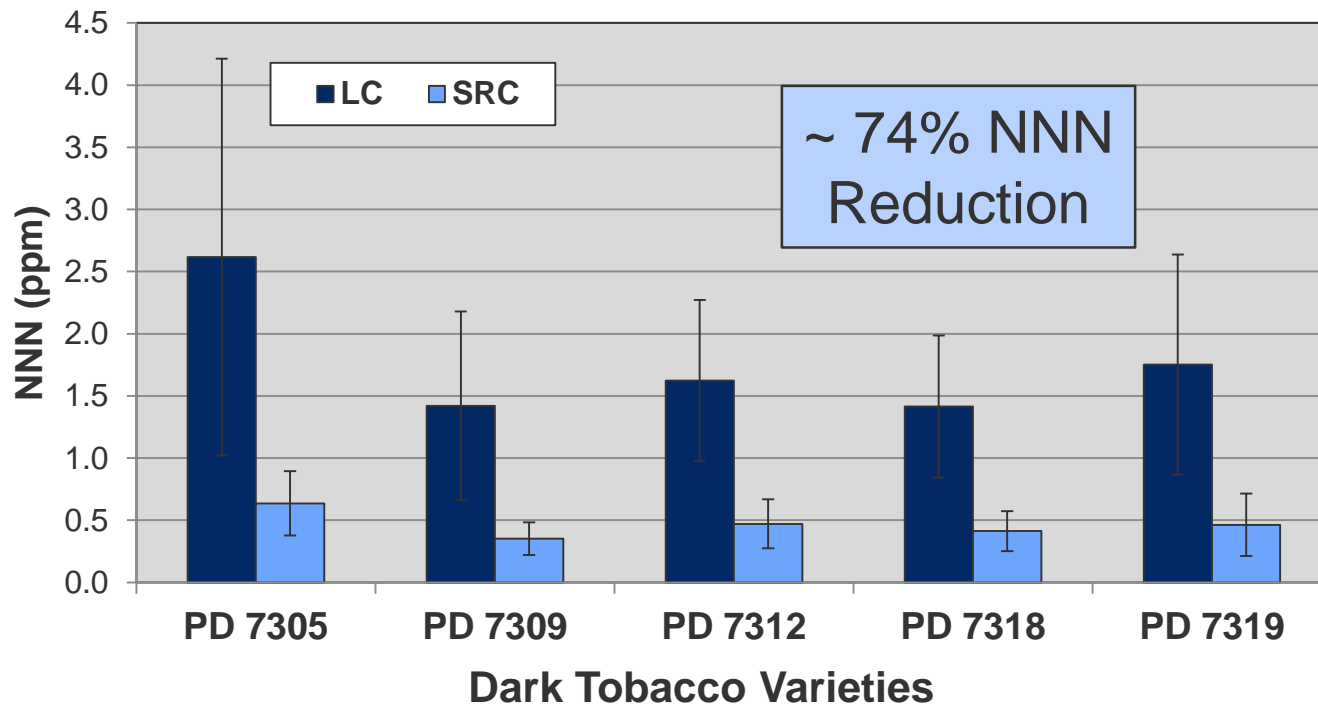
Variety Performance – Nornicotine Levels

2013, 2014 and 2015 Seasons & Multiple Locations – Research Plots



Variety Performance - NNN Levels

2013, 2014 and 2015 Seasons & Multiple Locations – Research Plots



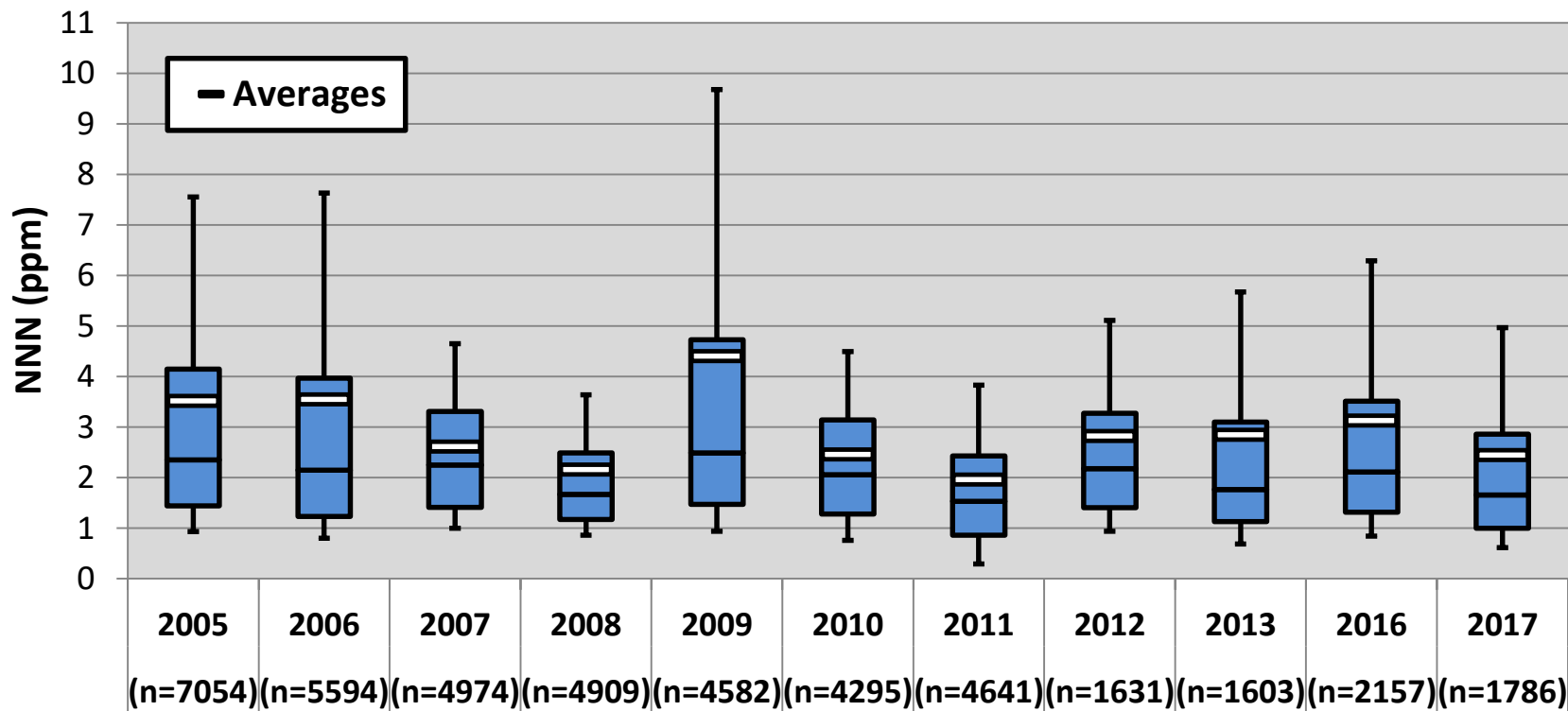
ALCS's Dark Tobacco Sampling Project



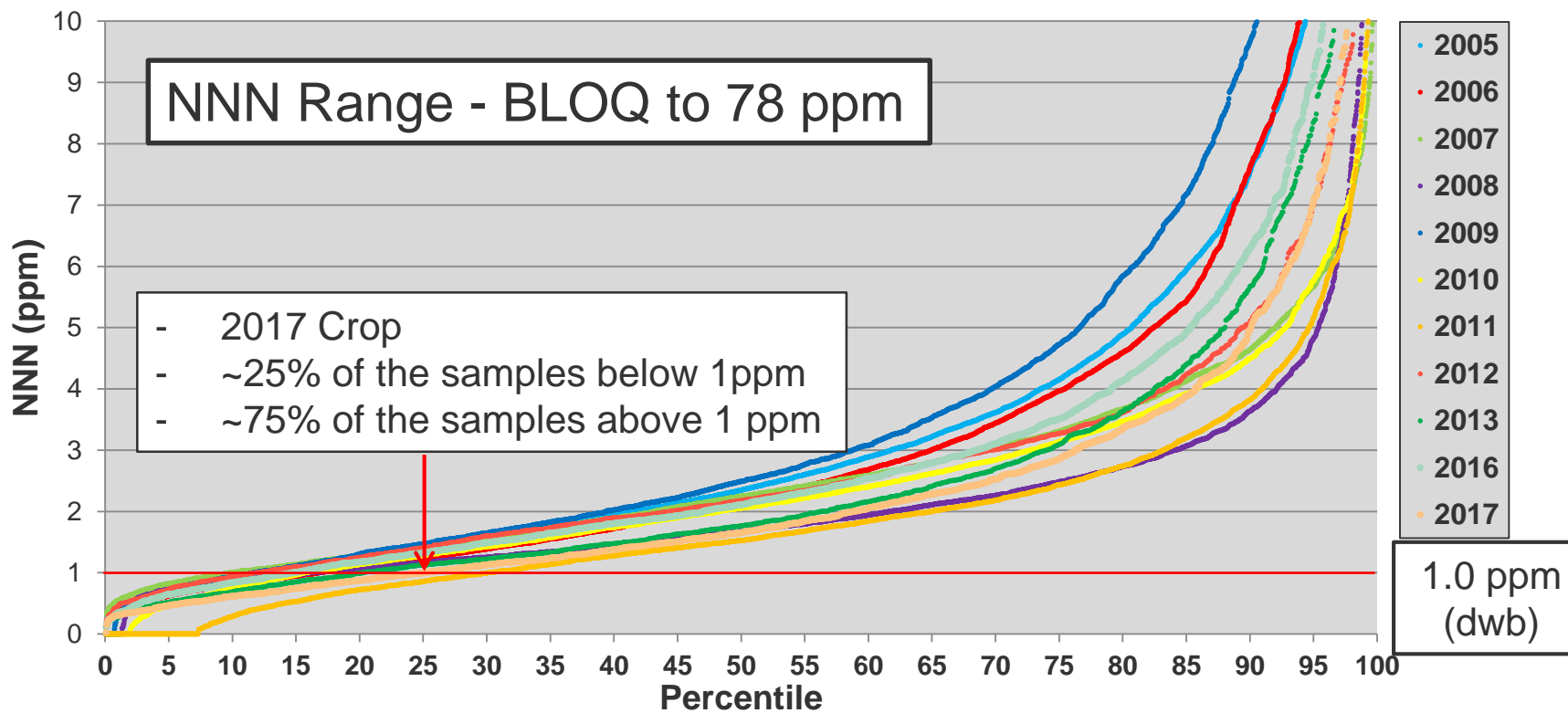
- Objective: Collect end of cure TSNA data for LC dark tobacco crop
 - Years – 2005 - 2013, 2016 and 2017
 - DFC and DAC
 - Every DFC and DAC grower delivery sampled
 - Every individual DFC barn sampled



NNN in DFC LC Crop



NNN Distribution in DFC Crop



FDA – Proposed NNN Standard

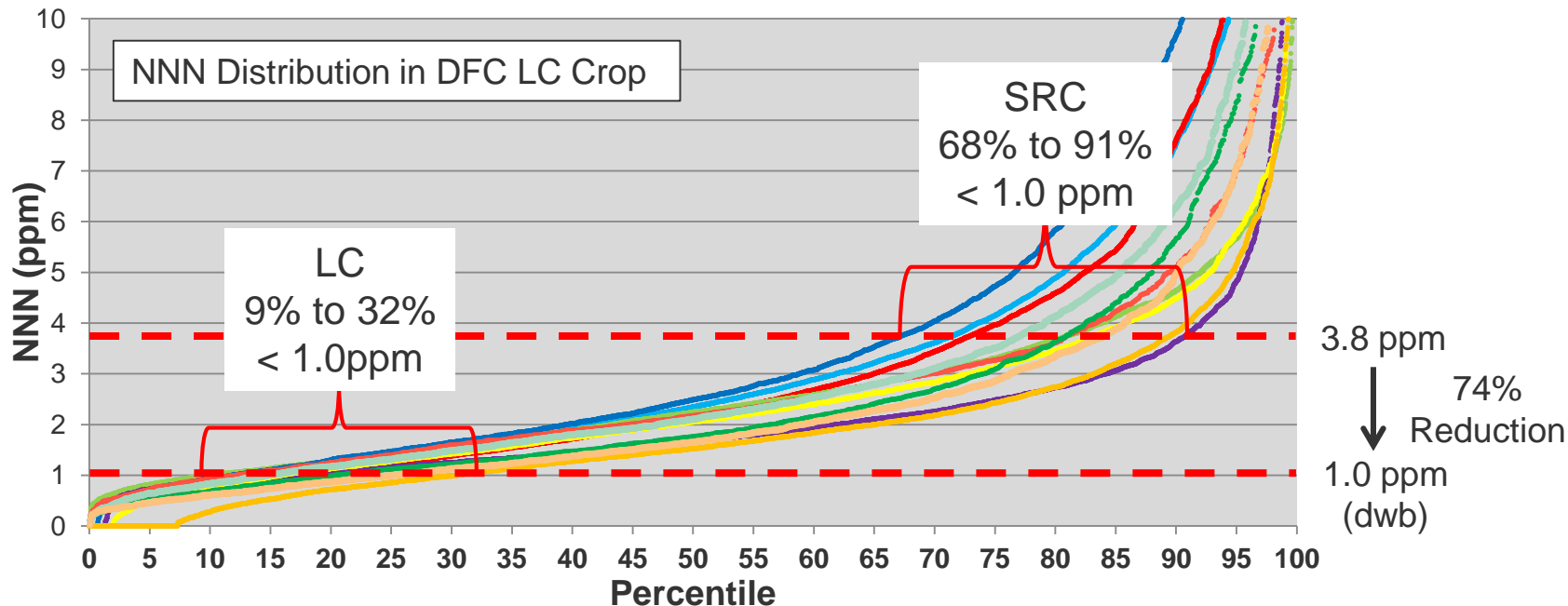
On January 23, 2017 FDA published:

“Tobacco Product Standard for N-Nitrosornicotine Level in Finished Smokeless Tobacco Product”

Limits the mean NNN levels in any batch of finished product to **1.0 $\mu\text{g/g}$ (DWB)** over the stated product shelf life.



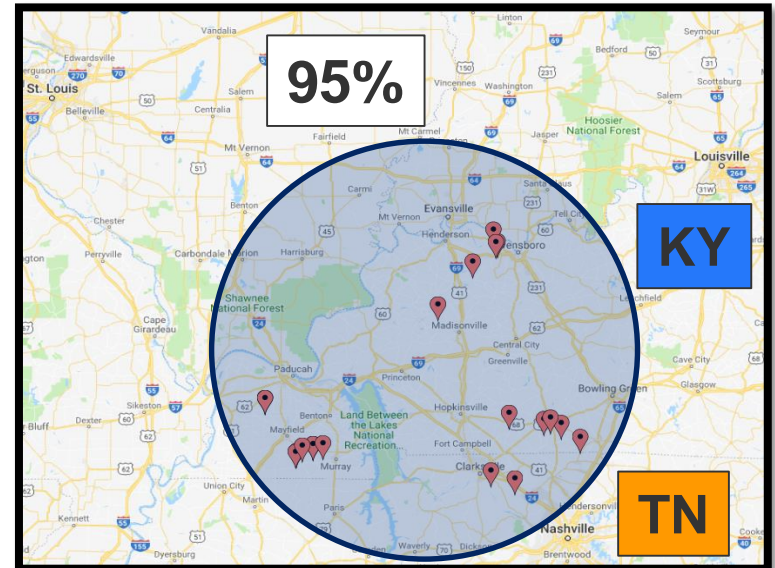
Expected Impact of ZYVERT[®] Technology on NNN Levels



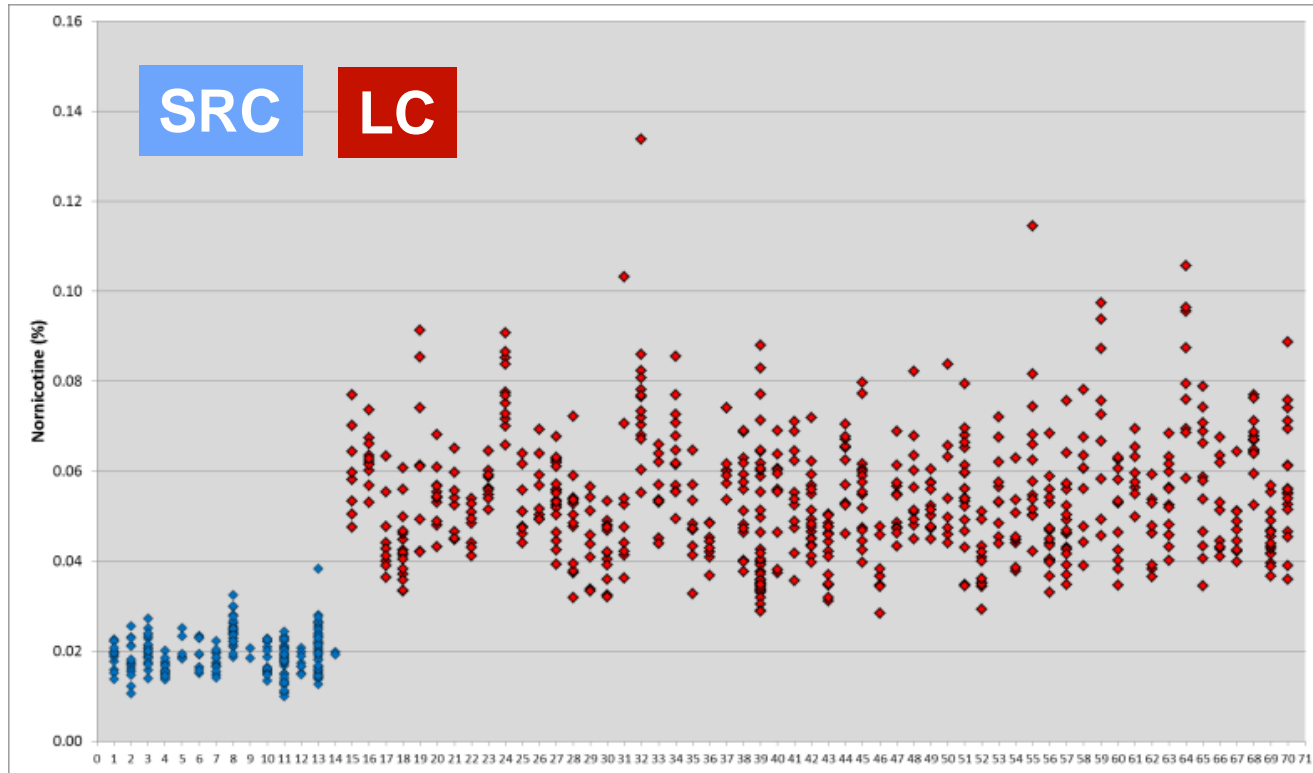
2017 Dark Tobacco Crop With ZYVERT® Technology

Objective: Validate the impact of the ZYVERT® technology during on-farm pilot scale tobacco production

- Varieties/Certified Seeds
 - PD7309 SRC
- Acres
 - ~1000 (~500 DFC and ~500 DAC)
- Location
 - KY and TN
- Sampling and Analysis
 - Collected at delivery
 - Alkaloid and TSNAs (DWB)



DFC Chemistry Variability – Nornicotine 2017 Crop



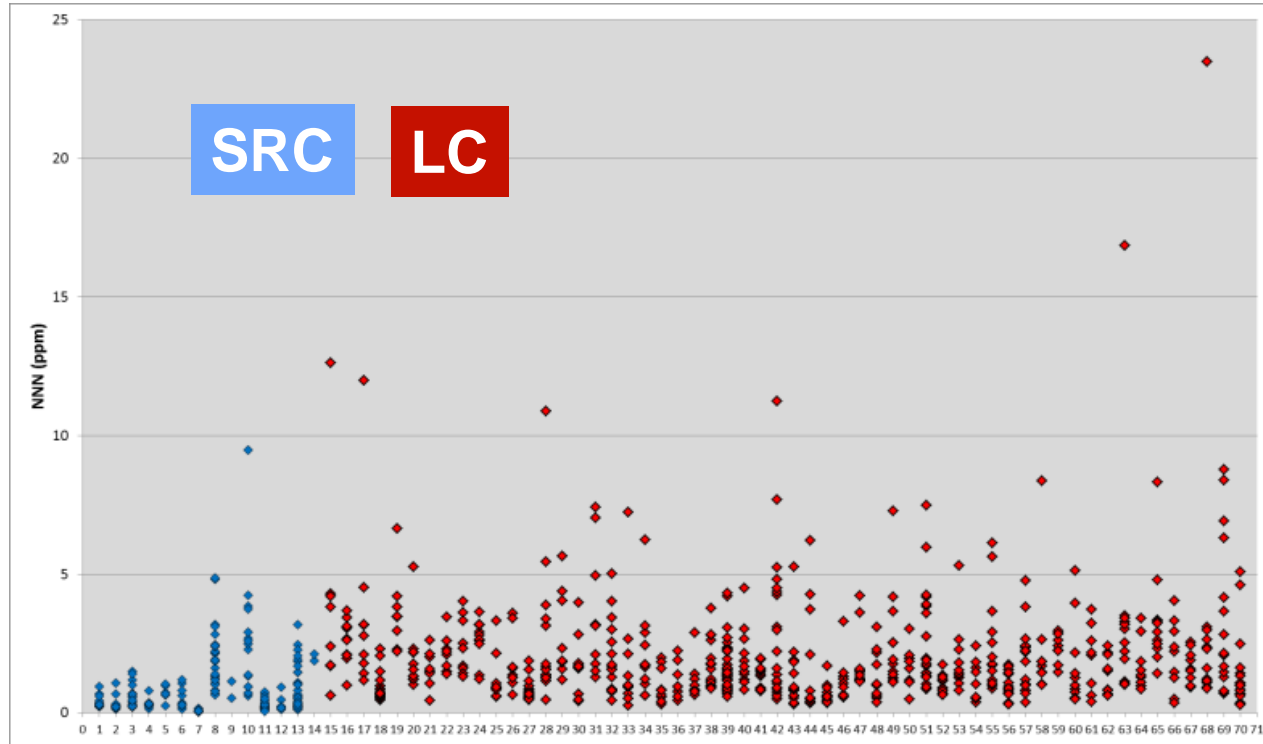
Altria

Altria Client Services

Grower

Altria Client Services | Biotechnology | 10/01/18 | 2018 CORESTA | Final 14

DFC Chemistry Variability – NNN 2017 Crop



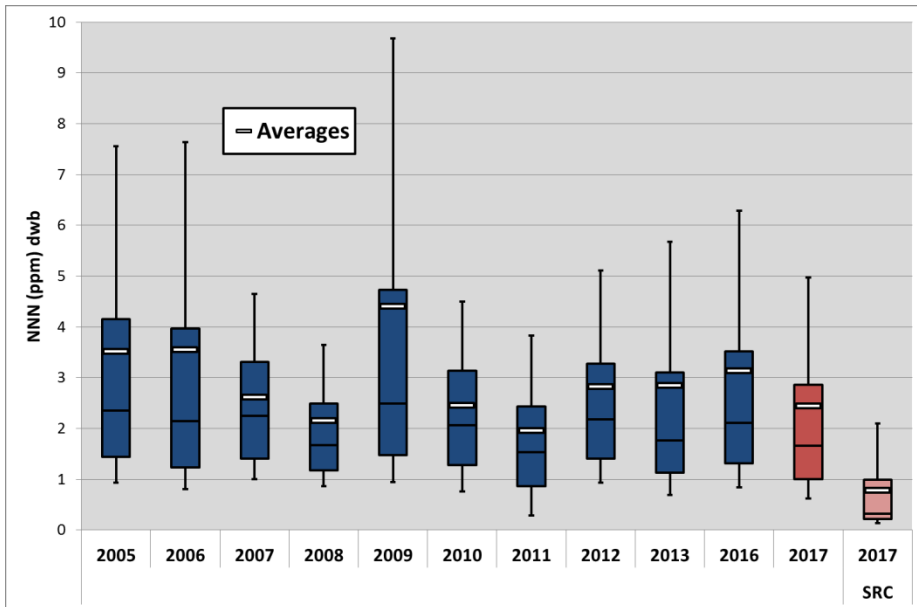
Altria

Altria Client Services

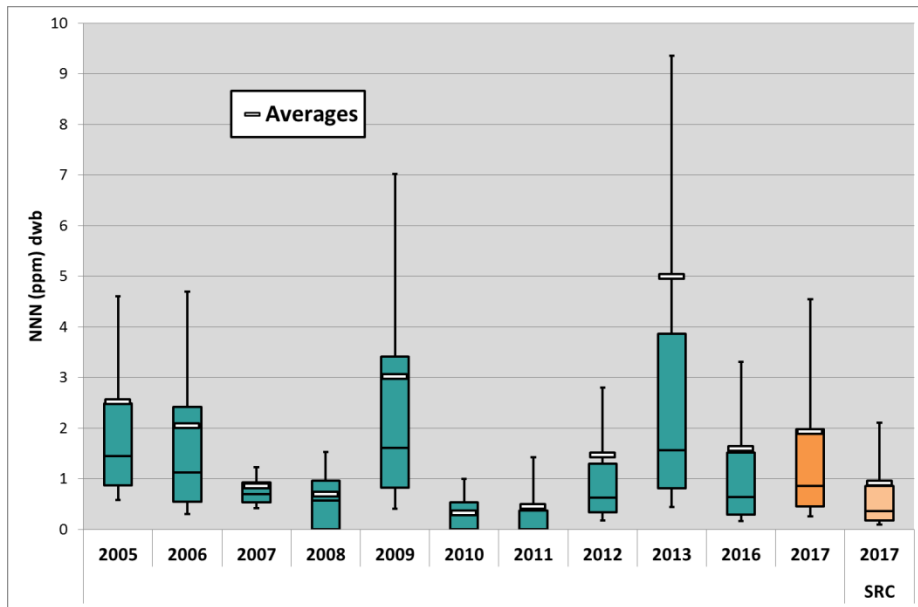
Grower

Dark Tobacco Sampling Project – Crop Average

DFC



DAC



67%

53%

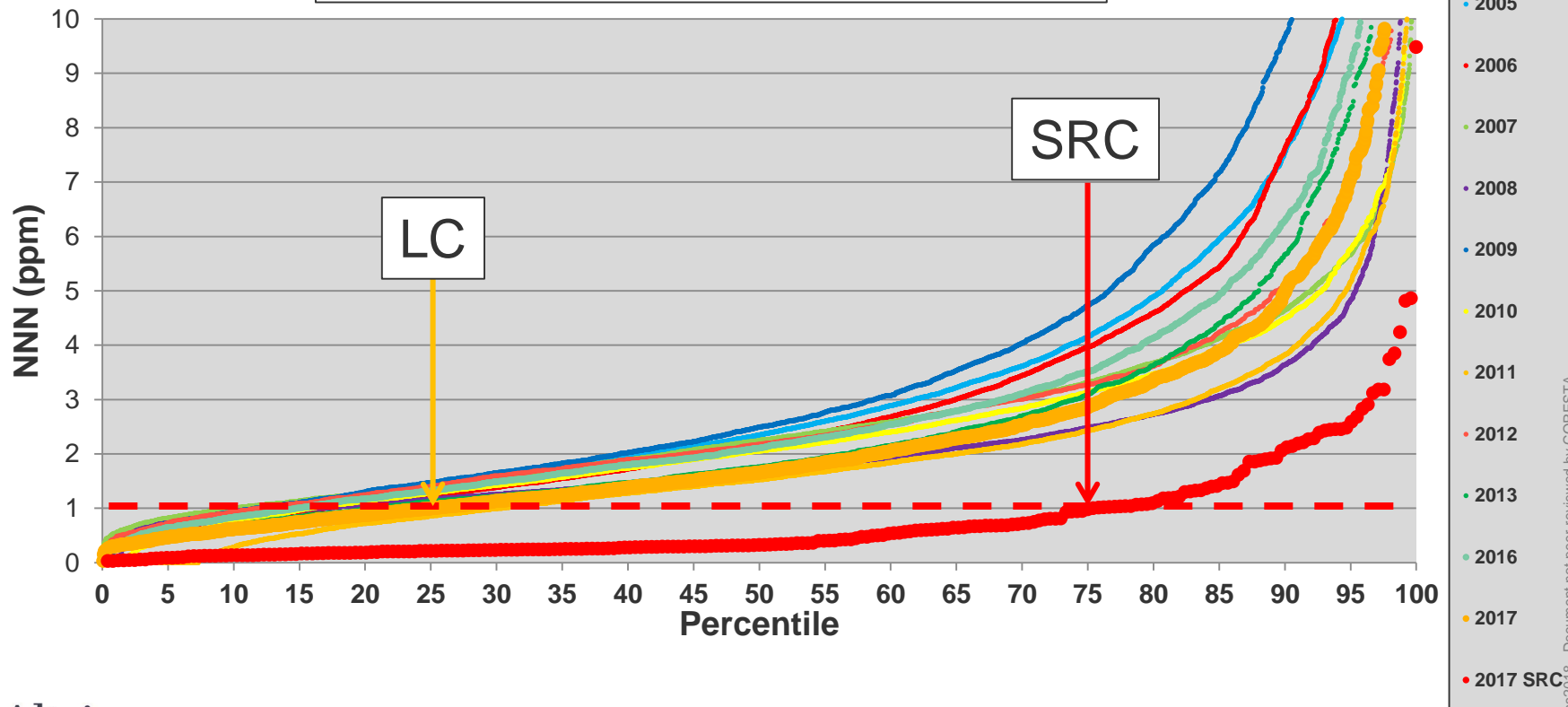


Altria

Altria Client Services

Impact of ZYVERT® Technology on NNN Levels

NNN Distribution in DFC all LC & 2017 SRC Crop



Conclusions

- In 2017 the DAC crop with ZYVERT[®] technology had 53% lower average NNN (dwb) than LC crop
- In 2017 the DFC crop with ZYVERT[®] technology had 67% lower average NNN (dwb) than LC crop
- 25% of the 2017 DFC LC crop had NNN below 1.0 ppm (dwb)
- 75% of the 2017 DFC crop with ZYVERT[®] technology had NNN below 1.0 ppm (dwb)

www.zyvert.com



Reducing risk. Expanding choice.

Altria.

For copies of this presentation visit the Altria's Science Website at www.altria.com/alcs-science



Altria
Altria Client Services