

# The Story of Ancient Grains

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and

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ORGANIC  
EMMER  
VARIETY TRIAL

Sponsored by Sunrise Flour Mill of North Branch, MN and  
USDA Organic Research and Extension Initiative

# What do we mean by “grain”?



Einkorn at  
Cornell Field Trials 2012



Buckwheat: No



UGA5235014



Amaranth: No







Quinoa: No





*Triticum* is a true, cereal grain





# Value-Added Grains for Local and Regional Food Systems:

## OREI Project Overview



# What do we mean by “value-added”?

- ✿ Adding grains to crop rotations adds value
- ✿ Organic production adds value
- ✿ Grain for specialty ethnic markets adds value
- ✿ Direct marketing adds value
- ✿ Higher nutrient density adds value
- ✿ Processing into flour, pasta or bread adds value



# Project Objectives – Add Value

- ✿ Evaluate germplasm of wheat varieties with potentially high market value for adaptability to organic systems and for desirable characteristics
- ✿ Develop management recommendations for heritage bread wheat, emmer, and einkorn
- ✿ Optimize grain quality through cost-effective and appropriate management
- ✿ Document a variety of approaches to dehulling and milling to provide processing options
- ✿ Investigate multiple strategies to access local and regional markets

# Project Partners

- ✿ Cornell University
- ✿ Organic Growers Research Information-Sharing Network
- ✿ North Dakota State University
- ✿ Northern Plains Sustainable Agriculture Society
- ✿ Northeast Organic Farming Association - NY
- ✿ Pennsylvania Association for Sustainable Agriculture
- ✿ Pennsylvania State University
- ✿ Greenmarket/Grow NYC
- ✿ Oregon State University



# Project Advisors-1

- ❁ Sam Sherman: Champlain Valley Milling, Westport NY
- ❁ Luke Stodola: Small World Bakery, Rochester NY
- ❁ Roberta Strickler: Daisy Flour, Lancaster PA
- ❁ Joel and Eric Steigman: Small Valley Milling, Halifax PA
- ❁ Thor Oechsner: Oechsner Farm, Newfield NY
- ❁ Nigel Tudor: Weatherbury Farm, Avella PA
- ❁ Kit and Cathy Kelley: White Frost Farm, Washingtonville PA

# Project Advisors-2

- ✿ **Blaine Schmaltz: Blaine's Best Seeds, Rugby ND**
- ✿ **Troy DeSmet: Nature's Organic Grist, St. Croix Falls WI**
- ✿ Michael Anthony: Gramercy Tavern, New York NY
- ✿ Matt Funicello: Rockhill Bakehouse, Glens Falls NY
- ✿ Klaas Martens: Lakeview Organic Grain, Penn Yan NY
- ✿ **Gil Stallknecht: Retired from Montana State University, Lewistown MT**
- ✿ Patricia Jackson: I Trulli Ristorante, Enoteca NY





**It is all about food...**






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## Slow Food Presidia

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Presidia

History

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Propose a Presidium

## Slow Food Presidia

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## Haute-Provence Einkorn

### France

For thousands of years, the history of einkorn (*Triticum monococcum*) has been closely linked to that of the Mediterranean. Until Roman times, this cereal was widely eaten, but later it was almost totally replaced by wheat, tender and durum, which ousted the various minor cereals, due to its higher yield and the fact it needed no processing. As einkorn has a hull, it must always be decorticated (with a similar technique to that used for rice). For a dozen or so years now, einkorn has enjoyed renewed interest, thanks to its rustic sturdy plant that adapts to rather dry climates and poor soil, to its nutritional and organoleptic qualities (it is rich in protein and magnesium). Haute Provence Einkorn (in French *petit épeautre*) from is a local plant, which can be traced back to

Presidium

Producers

Info & contacts

Consumed as a grain or used to make flour, pasta and even beer, the presidium will seek to create appreciation for this eclectic cereal outside of France. The taste qualities and sensorial features that make einkorn so highly prized and distinctive will also be defined in order to allow producers to compare and exchange with other small-scale minor cereal productions throughout the world. Unrivaled by recent industrial varieties, the presidium will work to rediscover and reintroduce the Haute Provence Einkorn's history and quality to the consumer.

Slow Food Presidia for Einkorn in Provence, France





## Einkorn

Einkorn is very different from all other varieties of wheat. It was the first species of wheat grown by man more than 12,000 years ago. Now considered a relic crop, it has practically been forgotten because its yield is low in the fields and its type of gluten makes bread-baking a challenge.

We were determined to find the purest form of wheat to use in Jovial™ products. Our journey for purity led us farther and farther back in time, all the way to the origins of agriculture. We overcame numerous difficulties of locating, replenishing and harvesting Einkorn to once again bring this gift of nature back to life. We feel confident about the exceptional quality of Einkorn- pure, nutritious and surprisingly delicious.

We encourage you to read on and discover how amazing Einkorn really is.

Powerful free radical scavenger    Never hybridized  
Genetically purest wheat    High in Thiamin    Rich in Lutein  
High in Trace Minerals    High in Essential Dietary Minerals  
Good source of Fiber  
Delicious    Good source of Protein  
Good source of B Vitamins

Jovial, a grains retailer, provides information about Einkorn and Einkorn products



Sprouted Emmer

Emmer bread is delicious, it tends to be more dense, as it has a lower gluten content than wheat.



**Emmerbrot**

55% Emmervollkorn\*\*  
Hefe\*  
belebtes Wasser  
Steinsalz

\*\*demeter-Qualität  
\*bio

450 g

CHF 6.-





Photo by Leslie Goldman



Khorosan is a nutritious grain with a strong marketing history under the tradename "Kamut"







Romans, Brooklyn, NY



Bread Alone Bakery, Boiceville, NY



We ♥ spelt breads!

Wide Awake Bakery, Trumansburg, NY

# Cultivated species in the wheat genus

## Diploid (two sets of chromosomes):

Einkorn: usually hulled, some free threshing  
(*T. monococcum* ssp. *monococcum*)





# Cultivated species in the wheat genus

## **Tetraploid (four groups of chromosomes):**

Rivet: free threshing (*T. turgidum* ssp. *turgidum*)

Durum: free threshing (*T. turgidum* ssp. *durum*)

Emmer: hulled (*T. turgidum* ssp. *dicoccon*)

Khorosan: free threshing (*T. turgidum* ssp. *turanicum*)

Polish: free threshing (*T. turgidum* ssp. *polonicum*)



# Cultivated species in the wheat genus

## Hexaploid (6 sets of chromosomes):

Bread wheat: free threshing (*T. aestivum* ssp. *aestivum*)

Club wheat: free threshing

(*T. aestivum* ssp. *compactum*)

Spelt: hulled (*T. aestivum* ssp. *spelta*)

Indian wheat: free threshing

(*T. aestivum* ssp. *sphaerococcum*)





# Simple genealogy of cultivated wheat species

Diploids

Tetraploids

Hexaploids



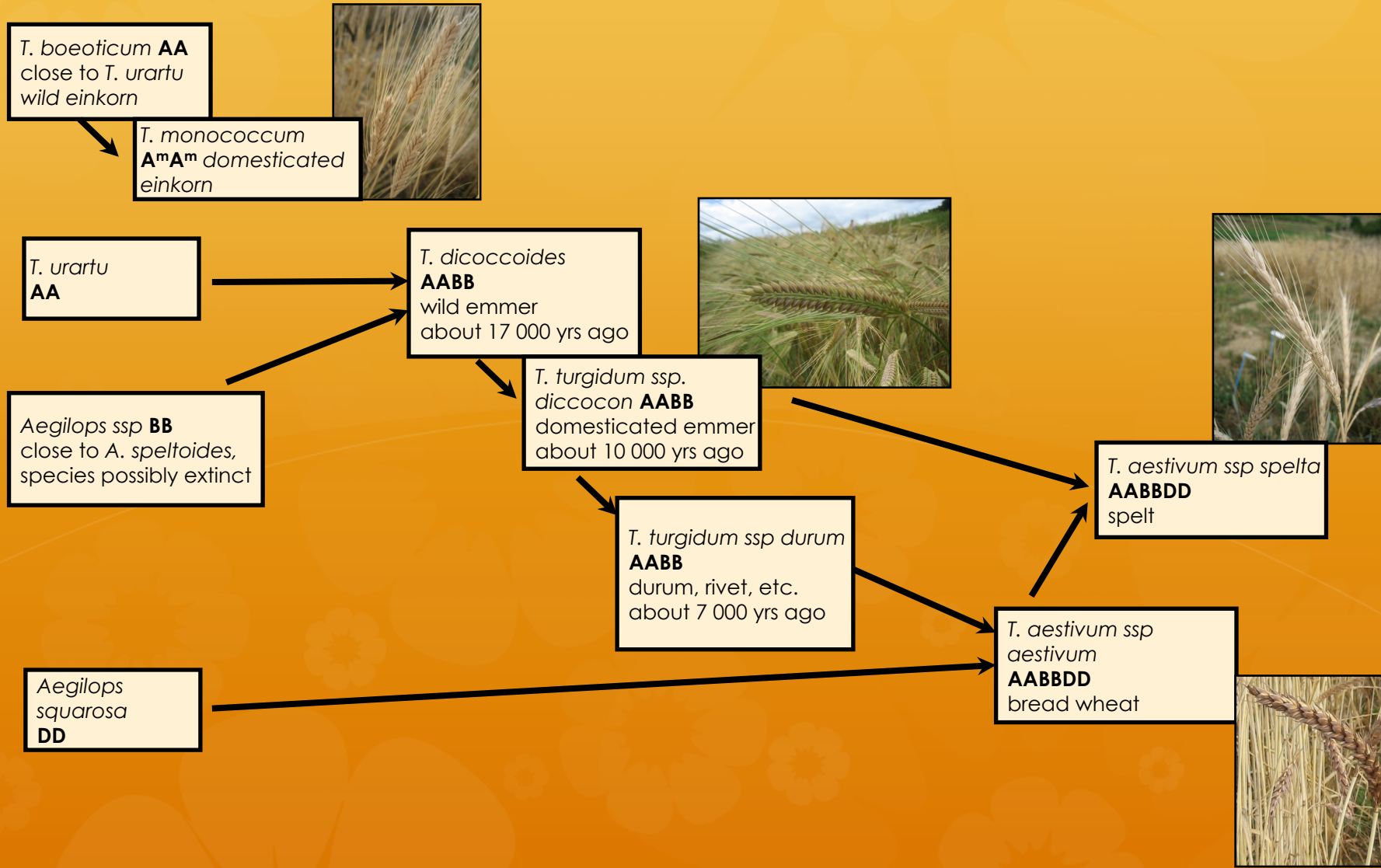
([https://s10.lite.msu.edu/res/msu/botonl/b\\_online/schaugarten/Triticumaestivum/Weizen1.jpg](https://s10.lite.msu.edu/res/msu/botonl/b_online/schaugarten/Triticumaestivum/Weizen1.jpg))

# Complex genealogy of cultivated wheat species

Diploids

Tetraploids

Hexaploids

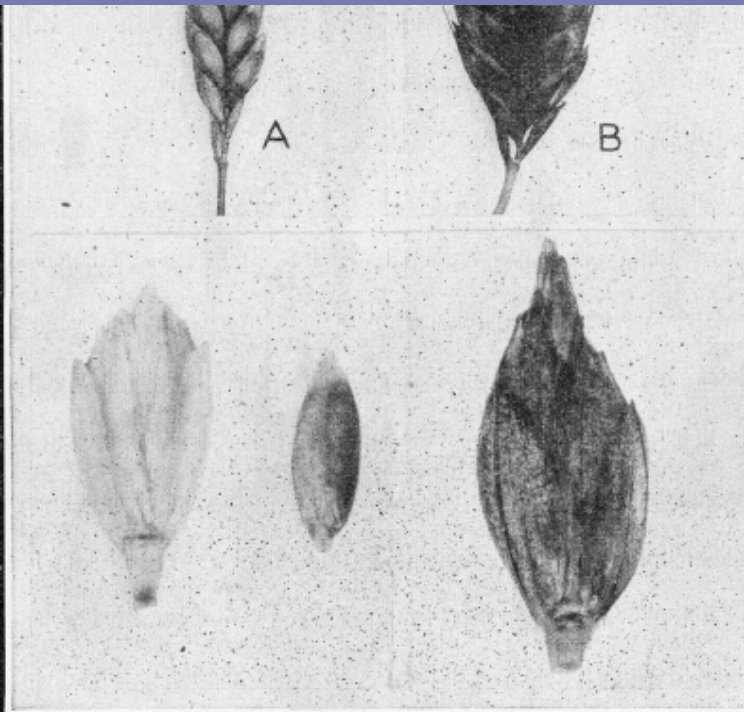




Emmer



1 cm

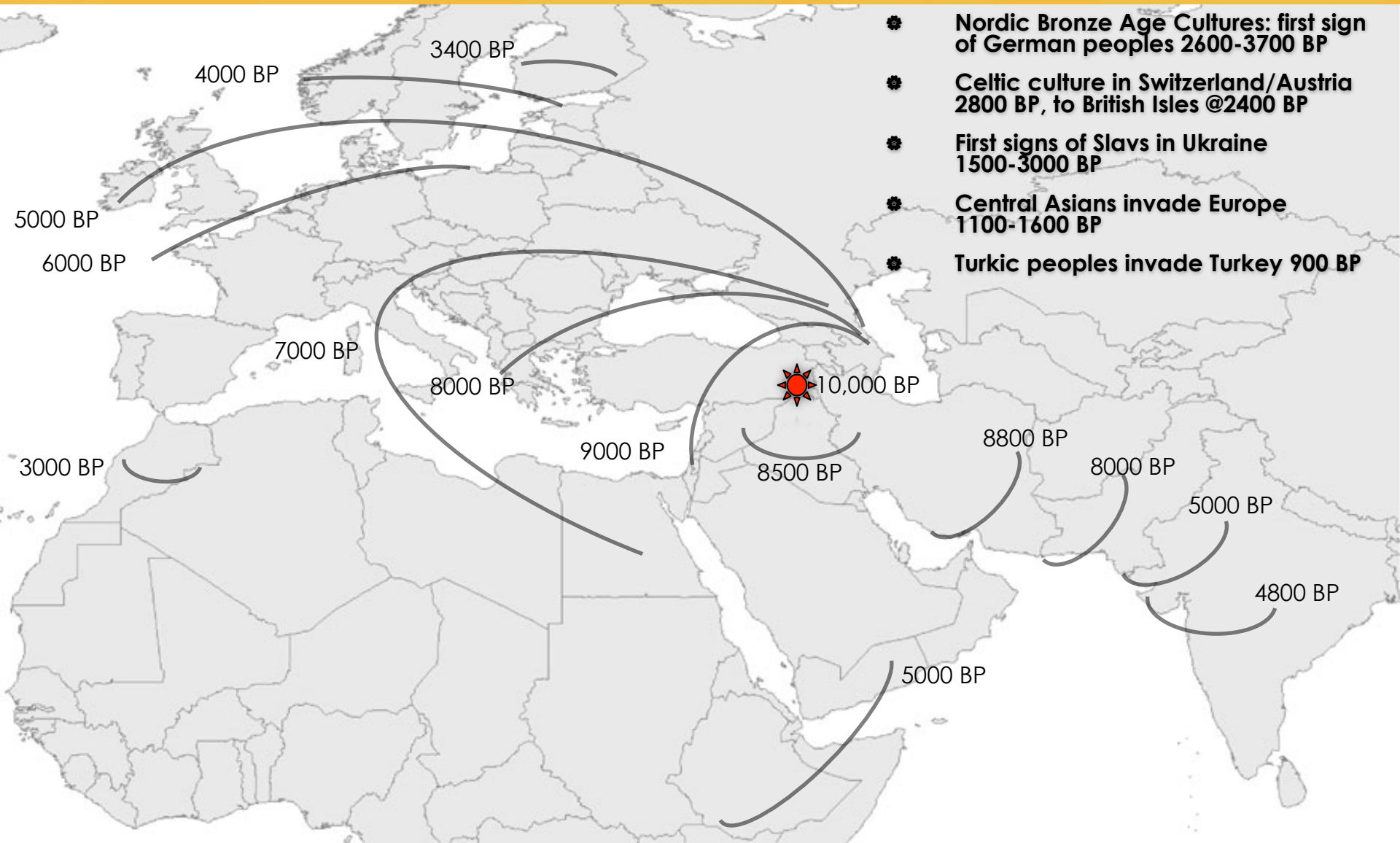


1 cm

Speltz

# Spread of Emmer

(adapted from Zaharieva et al. 2010. Genetic Resources and Crop Evolution)





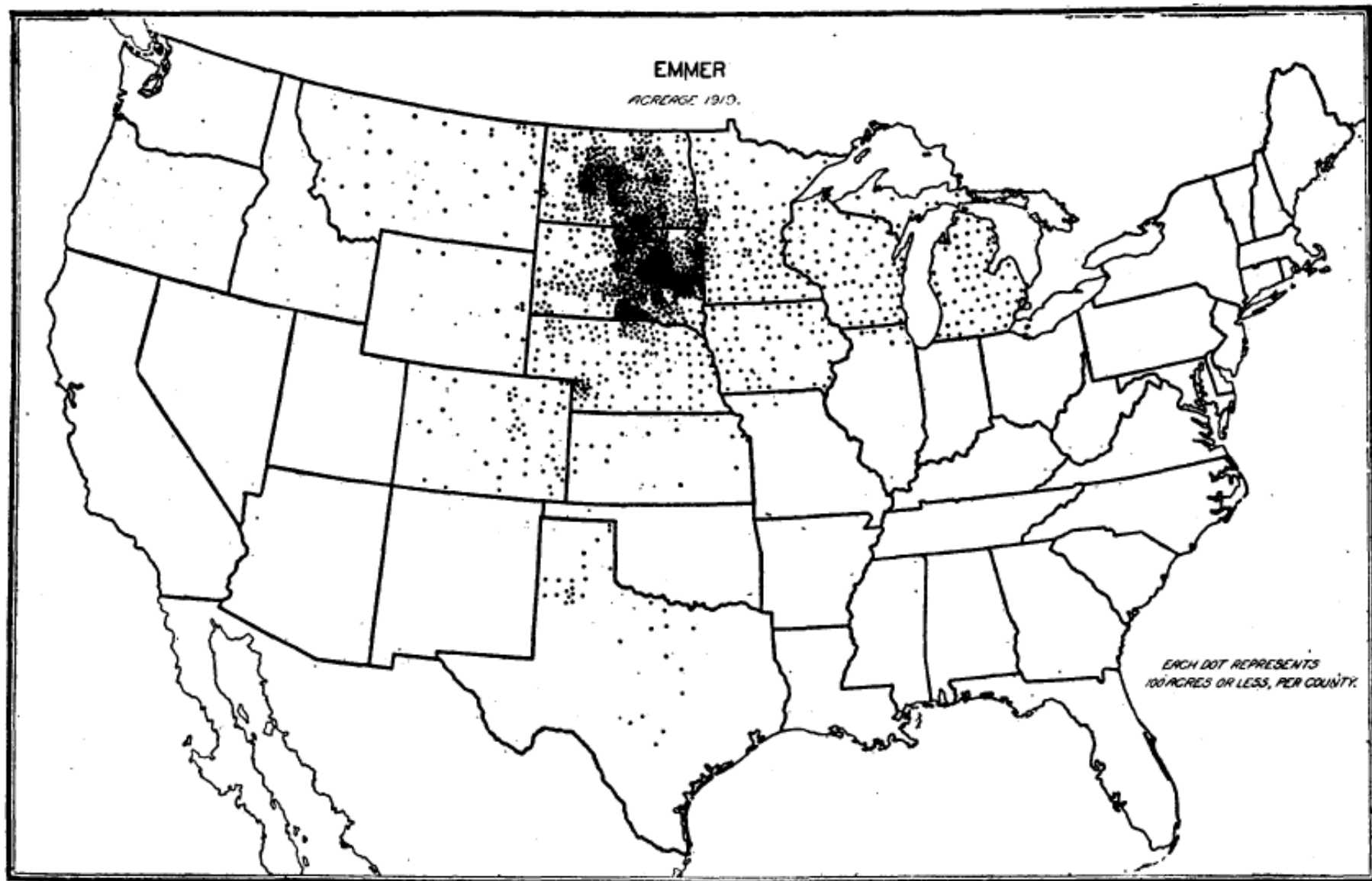


FIG. 5.—Outline map of the United States, showing the distribution of emmer in 1919, according to the United States census. Estimated area, 166,829 acres. Each dot represents 100 acres or less per county

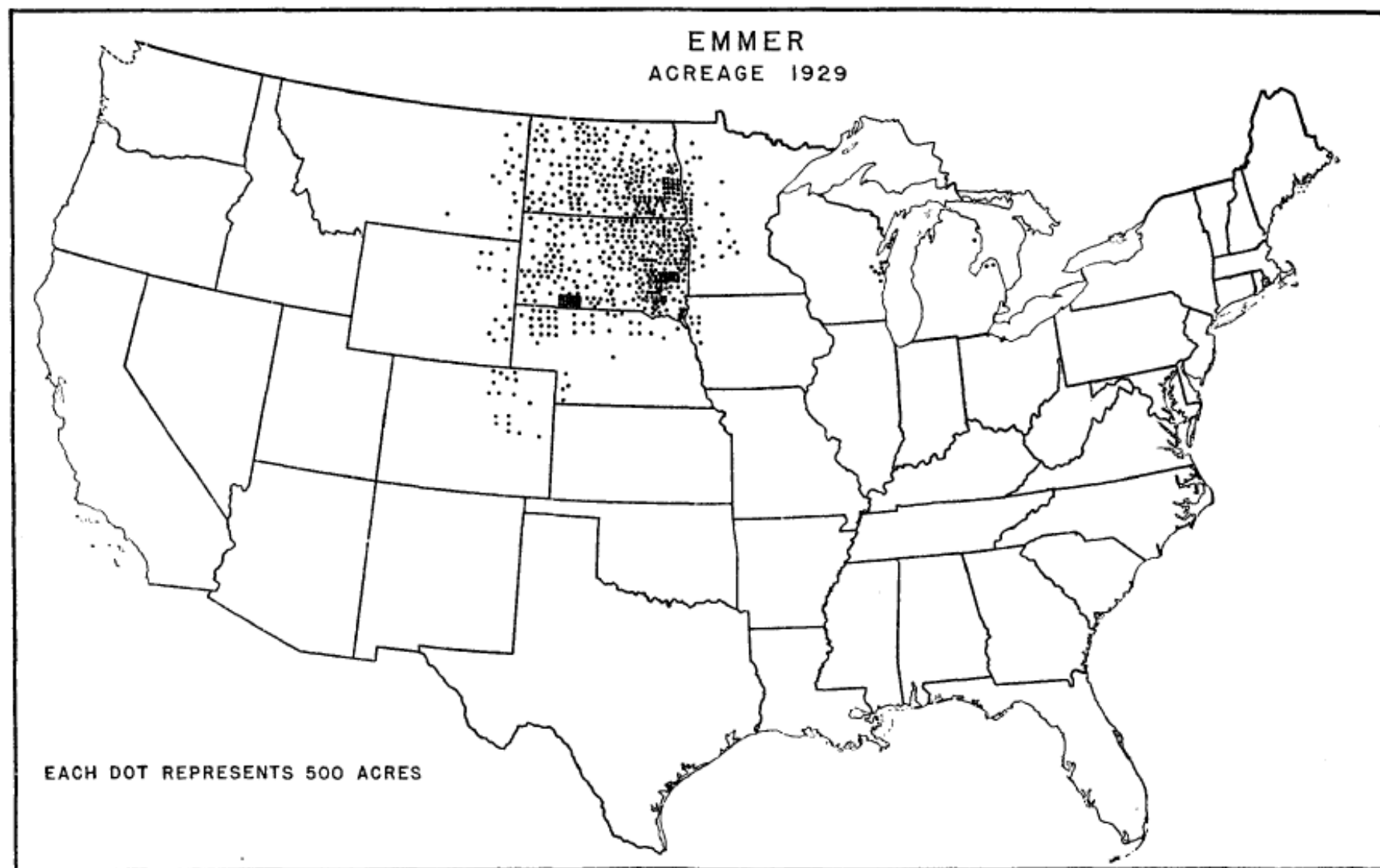
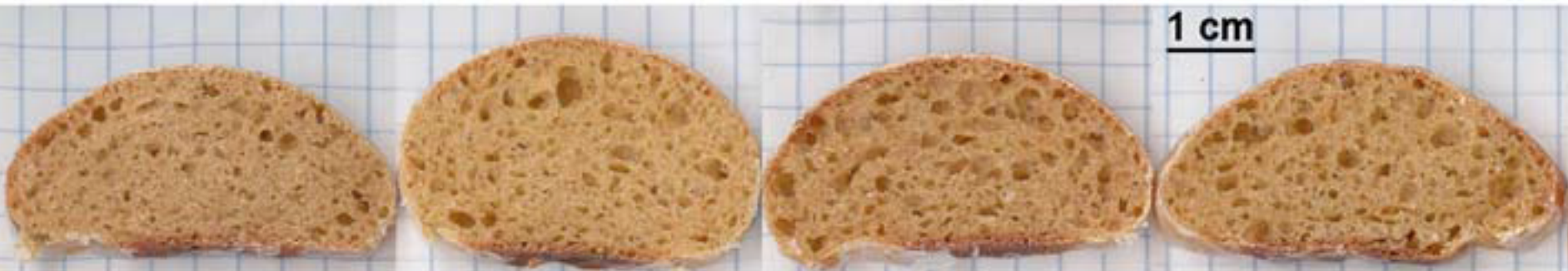


FIGURE 5.—Outline map of the United States, showing the distribution of emmer in 1929, according to the United States census. Estimated area, 344,000 acres. Each dot represents 500 acres.



# Einkorn

- ❁ Favored for adding excellent flavor to foods.
- ❁ Suitable for baked products, some good for bread.
- ❁ Higher lipid content than bread wheat (4.2 vs. 2.8 g/100g).
- ❁ Usually high in minerals although low in Cadmium.
- ❁ Usually higher in protein, lutein, and Vitamin E; Lower in total phenols.
- ❁ Has same allergenic proteins as other wheats and sometimes higher gluten content
- ❁ May be lower in some of the gliadins that promote wheat allergies: more research is needed.



**Line 45**

**78**

**98**

**51**

From Wieser, H. et al. 2009. Studies on the protein composition and baking quality of einkorn lines. European Food Research and Technology. 229:523-532.



# “Emmer”

- ❁ Favored for adding excellent flavor to foods.
- ❁ Recommended for children and new mothers in Ethiopia (high protein) and for diabetics in India (low glycemic index).
- ❁ Gluten varies from very low to higher than bread wheat: bread making properties vary but are usually lower than bread wheat. Missing some gliadin proteins.
- ❁ Usually has higher minerals and higher fiber.
- ❁ Often has higher antioxidants (total phenolics and flavonoids). Not high in carotenoids.
- ❁ Often has higher phytic acid concentration.

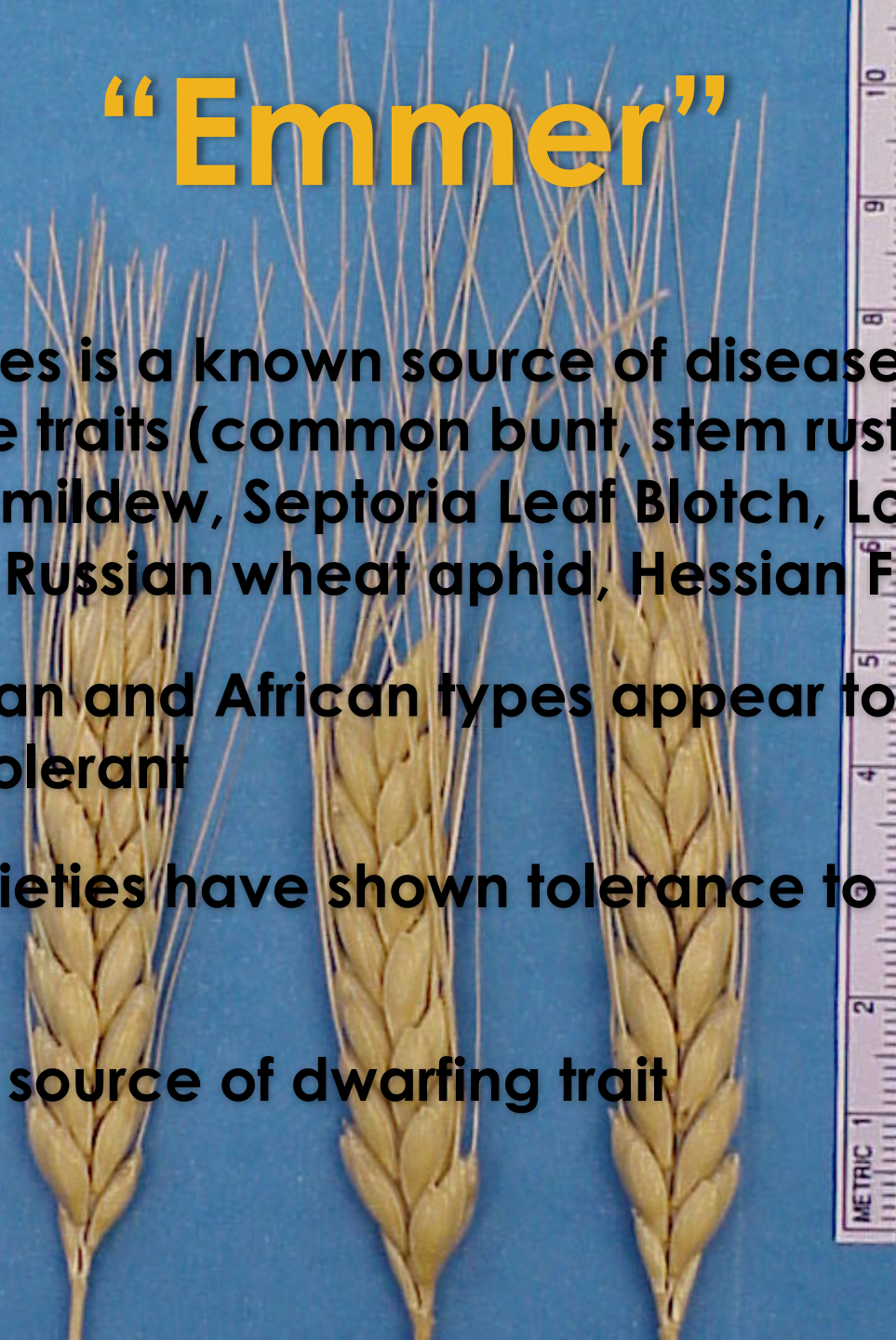






# “Emmer”

- ✿ The species is a known source of disease and pest resistance traits (common bunt, stem rust, leaf rust, powdery mildew, Septoria Leaf Blotch, Loose smut, Tan Spot, Russian wheat aphid, Hessian Fly)
- ✿ Some Asian and African types appear to be more drought tolerant
- ✿ Some varieties have shown tolerance to higher soil salinity
- ✿ Alternate source of dwarfing trait





# Spelt

The background of the slide features three stalks of spelt wheat standing vertically against a blue background. To the right of the stalks is a white ruler with black markings, labeled 'METRIC' and showing numbers from 1 to 15. The entire slide is framed by a yellow border with a subtle floral pattern.

- ✿ **Spelt has gluten and similar protein composition to bread wheat but reduced bread making quality.**
- ✿ **Higher lipid and unsaturated fatty acid content.**
- ✿ **Some minerals tend to be higher in spelt: Fe, Zn, Mg, P. This is especially true of the bran.**
- ✿ **Spelt has less phytic acid than bread wheat.**
- ✿ **Protein may be higher and fiber appears to be lower in spelt than in bread wheat.**



# It is not correct to oversimplify...

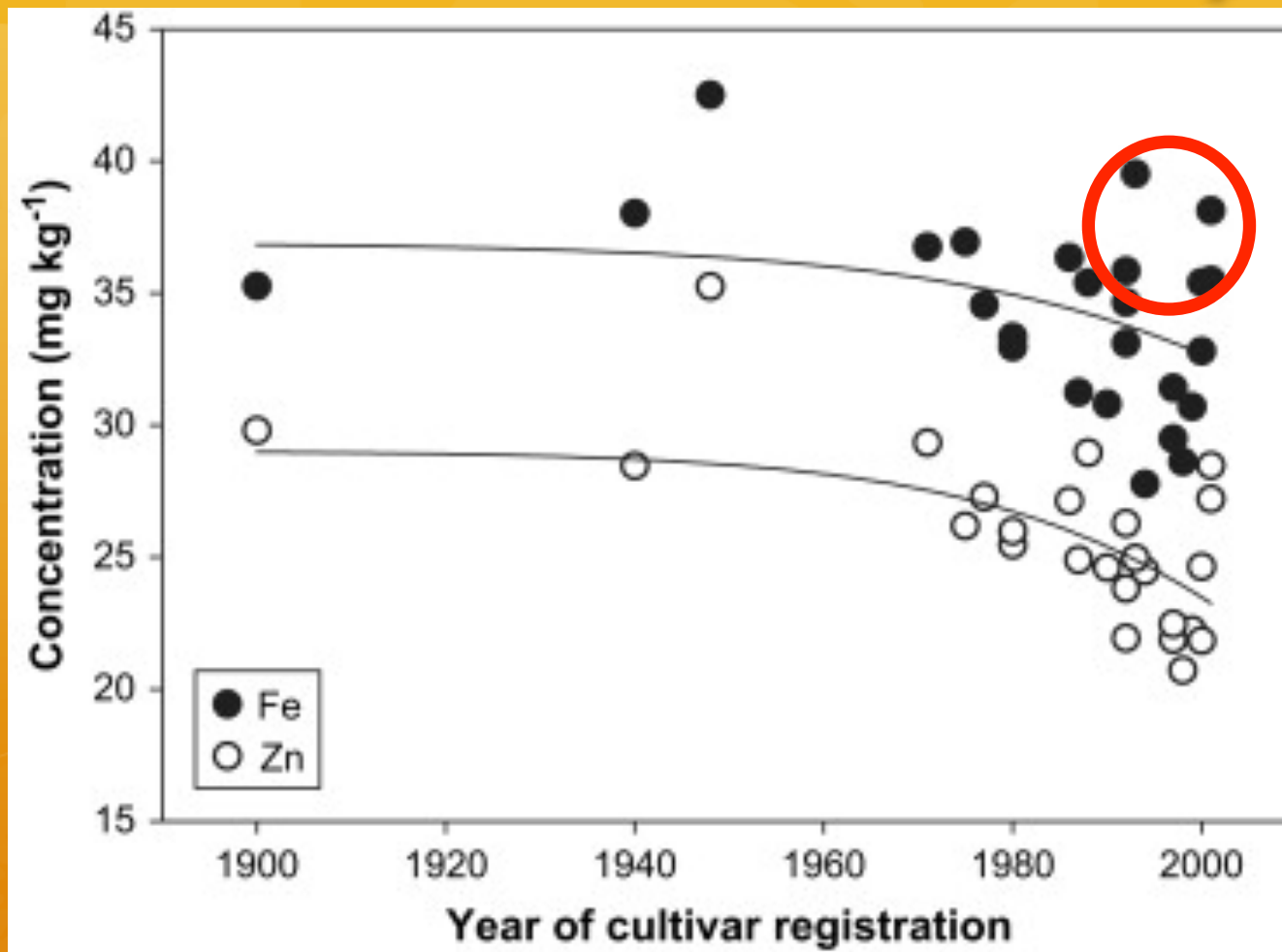


Fig. 1 in Zhao, F.J. et al. 2009. Variation in mineral micronutrient concentrations in grain of wheat lines of diverse origin. *J. Cereal Sci.* 49:290-295.

# Variety screens at Cornell University in New York





Greenmarket, OGRIN & NOFA-NY conduct consumer tastings to get the word out to bakers, chefs, processors & consumers



PASA Conference, 2012

NOFA-NY Conference, 2012



# A Shortcourse on Breadmaking

• with Locally Grown Grains •

*Two sessions available:*  
 Friday • January 18<sup>th</sup> • 8am - 5pm  
 Saturday • January 19<sup>th</sup> • 8am - 5pm

**AT WIDE AWAKE BAKERY • TRUMANSBURG, NY**

Consumers have been thrilled to discover the excellent flavor and character of breads made from wheat grown and milled in the Northeast. However, because flour made from locally grown grain is not the same as commodity flour, there can be a learning curve in working with its unique properties. Join bakers Stefan Senders and David McInnis of Wide Awake Bakery for an intensive, one-day course on baking with locally grown and milled wheat. Stefan and David will share insights and techniques that stem from their collaboration with local farmers and a new milling enterprise, Farmer Ground Flour. The course will include a practice-based session in the wood-fired bakery working with flours from the local mill, a round-table discussion of best practices in baking with “challenging” flours, and an introduction to baking with the ancient grains einkorn, emmer, and spelt (led by June Russell of Greenmarket) to create tasty, distinctive breads and pasta. Issues such as cost and sourcing of locally grown grains and flours will be covered. Plus, Stefan and David will share their experiences with their community-supported-baking or Breadshare.

This course is for artisan bakers, home bakers, students, farmers—all those interested in experimenting with locally grown grain. Space is limited: we have room for 12 participants per session. Cost for the course is \$100, which includes breakfast and lunch, a handout on best baking practices, and samples of flour made from locally grown wheat and ancient grains. A limited number of scholarships are available for students and for farmers who are interested in developing on-farm bakeries.

To register, or for more info, contact Elizabeth Dyck at OGRIN ([edyck@ogrin.org](mailto:edyck@ogrin.org), 607 895 6913). To apply for a scholarship, which will pay half the tuition cost, students and farmers should write a paragraph on their involvement with locally grown grain and how the course will help them with future endeavors and send to [edyck@ogrin.org](mailto:edyck@ogrin.org) or OGRIN, 1124 County Rd, Bainbridge, NY.

Wide Awake Bakery is located at 4361 Buck Hill Road South, Trumansburg, NY 14886, about 10 miles west of Ithaca, NY. You can learn more about the bakery at [wideawakebakery.com](http://wideawakebakery.com)

Shortcourse offered by  
 Greenmarket  
 and OGRIN, including  
 emmer, einkorn and spelt