

The Ancient Grains Einkorn, Emmer, Spelt, & Heritage Wheat

Agronomics

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MISCELLANEOUS

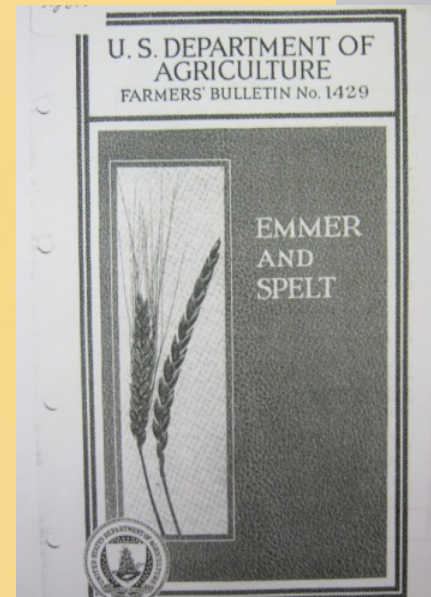
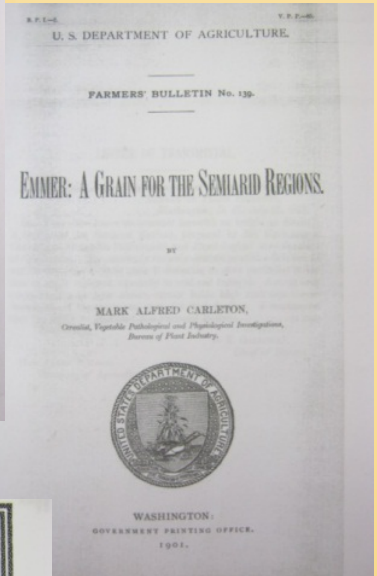
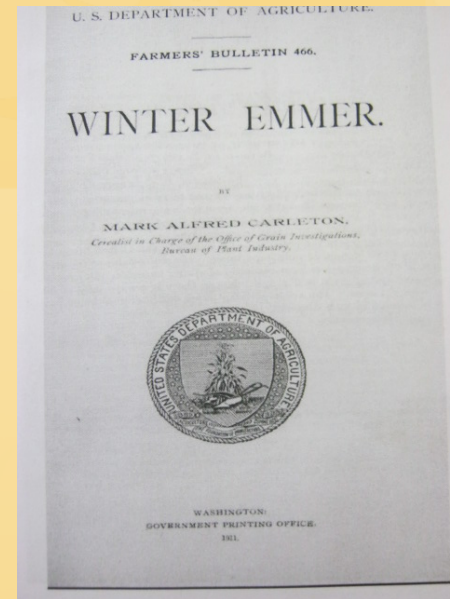
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UDSA publications

- ❁ Ancient grains have history in US and northern plains states
- ❁ Immigrant farmers bring landraces
- ❁ USDA brings emmer seed from Russia
- ❁ Dakotas identified as good growing areas



Climate vs wheat type

from Monica Spillman
Whole Grain Connection



Mediterranean climate & low rainfall areas:

☼ white common, durum, pollard, turanicum, emmer

- Continental climate, cold winter:

☼ hard red common (long season), spelt

- Continental climate, intensely cold winter:

☼ hard red common (short season), spelt,

☼ possibly durum, turanicum, & emmer

- Coastal moderated, humid summer:

☼ soft red common, spelt (dry summer: soft white)

Ancient & Heritage wheat



Ancient wheat



Thrashes with hull intact



Einkorn, emmer, and spelt = order of appearance



Winter or spring types, mainly spring



5000-12,000 years old



Heritage wheat



Free thrashing



Winter or spring types



Modern varieties, can be from 30-150 years old



Pre 1950's may be most common definition



Limited supply of seed for all types

Ancient Grain Seed

emmer, einkorn, & spelt

- ❁ Seed sources and varieties limited
 - ❁ Einkorn in particular
- ❁ Little variety improvement or breeding effort has occurred
 - ❁ Emmer, 1 variety MSU
 - ❁ Spelt, 2 spring varieties AC, CDC, few private winter varieties, 1 variety MSU
- ❁ Main source of seed are landraces
 - ❁ Farmer saved seed
 - ❁ GRIN





Emmer





Speltz



Ancient Grain Agronomics

What we know

- ✿ Production practices & management recommendations similar to wheat
 - ✿ Yields (in hull) similar to wheat
 - ✿ Plant lodging can be an issue
 - ✿ Pest problems
 - ✿ Weed, disease, & insect
 - ✿ Management
 - ✿ Variety choice
 - ✿ Seeding date
 - ✿ Planting rate
 - ✿ Fertility

Objective 1: Germplasm

- ✿ Evaluate germplasm of ancient, heritage, and modern wheat
 - ✿ All research sites and multiple on-farm sites
 - ✿ Variety trials, observation screening, seed increase
 - ✿ Multiple sources of seed
 - ✿ Initially started with 224 vt's and landraces
 - ✿ National Small Grains Collection (GRIN), organic seedsman and farming groups, universities, state seed foundations, farmers
 - ✿ Additional lines being accessed throughout project
 - ✿ Over 500 lines to date

❁ Emmer landrace seed
increases



Emmer Variety Trials



Emmer Variety Trial-Cathay



Emmer Variety Trial-Robison

2012 Einkorn & Emmer Seed Increases



Objective 1: Germplasm

- ❁ Adaptability to organic systems
 - ❁ Yield, maturity, pest resistance, vigor, height, lodging
- ❁ Desirable grain and baking characteristics
 - ❁ Hulling, protein, test weight, quality
- ❁ Select and increase lines that fit criteria
 - ❁ Research trials
 - ❁ Field scale production



❁ NPSAS FBC seed increase

❁ Emmer

❁ 117 accessions

❁ Einkorn

❁ 97 accessions

❁ Spelt

❁ 67 accessions

❁ Evaluate and increase
accessions to field scale

❁ 100-2012

❁ 10-2013

❁ 3-2014

❁ 1 in 2015

seed increase scenario

year **plant** **harvest**

2012	1 gm 4 ft row	100 gms
2013	100 gms .003 ac	2500 gms
2014	5.5 lbs (2500 gms) .05 ac	100 lbs
2015	100 lbs 1 ac	2000 lbs
2016	Possible to plant 10-20 ac	

❁ NPSAS FBC wheat/einkorn projects

❁ Einkorn

❁ TM23

❁ Modern wheat

❁ Dylan

❁ Heritage wheat

❁ Mida

❁ Ceres



Objective 2: Management

- ❁ Develop management recommendations for heritage wheat, emmer and einkorn
 - ❁ N fertility management
 - ❁ Heritage winter wheat and emmer
 - ❁ Planting date
 - ❁ Heritage winter wheat, emmer, & einkorn
 - ❁ Planting rate
 - ❁ Heritage winter wheat, emmer & einkorn
- ❁ Trials conducted at research sites and on-farm

Emmer seeding rate



2012 organic specialty grain trial NDSU:CREC

Spring spelt, einkorn &
emmer on June 26

Planted April 18

Harvested July 30

Previous crop potatoes

Above average yields



Emmer, einkorn & wheat trials

July 19, 2011

- ❁ May 5 planting date
- ❁ Previous crop = cover crop



ND Common-Emmer Farmer-Led Development/ Increase

2002,2003,2004	.0025 ac each year (1/4 lb)	1 farm, small plot increase (3.5 lbs)
2005	.1 ac (10lbs)	2 farms, strip increase (140lbs)
2006	2 ac (140 lbs)	1 grower (1400 lbs)
2007	18 ac (1400 lbs)	1 grower (16,000 lbs)
2008	144 ac	2 growers (1975 lbs/ac avg)

2008 ND Common emmer field

Lewis Seibold, Cathay



Emmer Seed



Active People:

**Gil Stallknecht, advisor
retired MSU researcher**



Lentz farm



Rene Featherstone



Bluebird farm



Sam & Brooke Lucy



Heritage Wheat Conservancy



Eli Rogosa



Purity Foods



Market spelt products



Einkorn.com



Market einkorn products and may contract production



Jovial



Importing & marketing einkorn from Italy

Plant breeding

✿ Hal Lafaver

✿ Private spelt breeder

✿ Pierre Hucl

✿ University Saskatchewan breeder

✿ Dr. Karl-Josef Mueller

✿ German einkorn breeder

Saskatchewan spring emmer, einkorn and spelt wheat breeding initiative

Objectives:

- ❁ Develop a spring spelt variety with stem rust resistance similar to current common spring wheat classes grown in Saskatchewan.
- ❁ Develop a high lutein einkorn variety with competitive agronomic performance equal to the long-term agronomic einkorn check.
- ❁ Develop a food-type emmer wheat variety which is shorter-strawed but equal in yield to the feed quality variety 'Vernal'.

Laboratory deawner



Commercial deawner



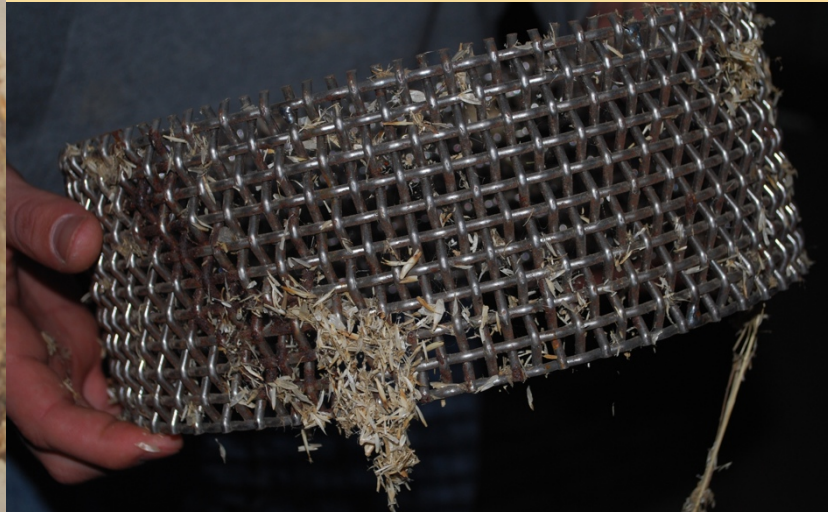
Have you heard of this company?



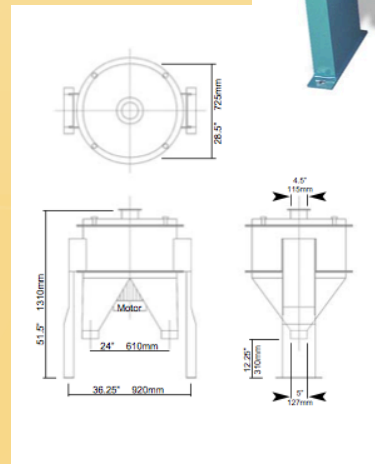
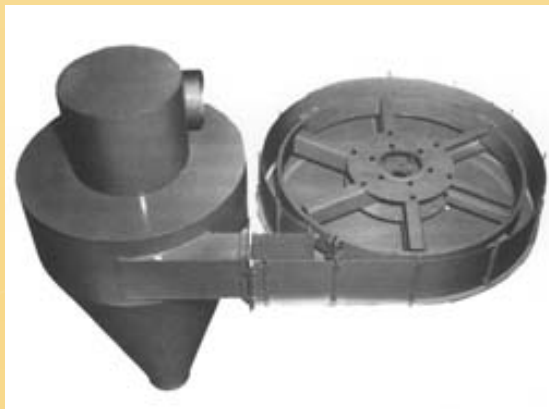
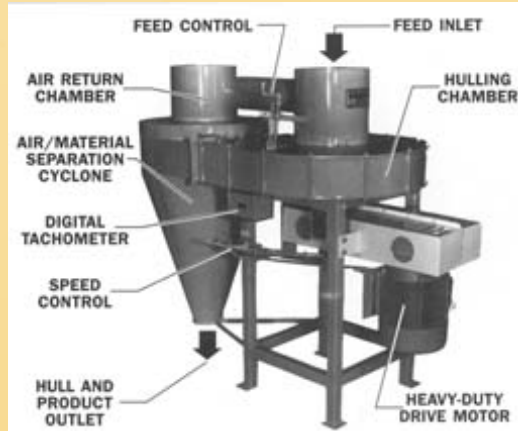
Dehulling



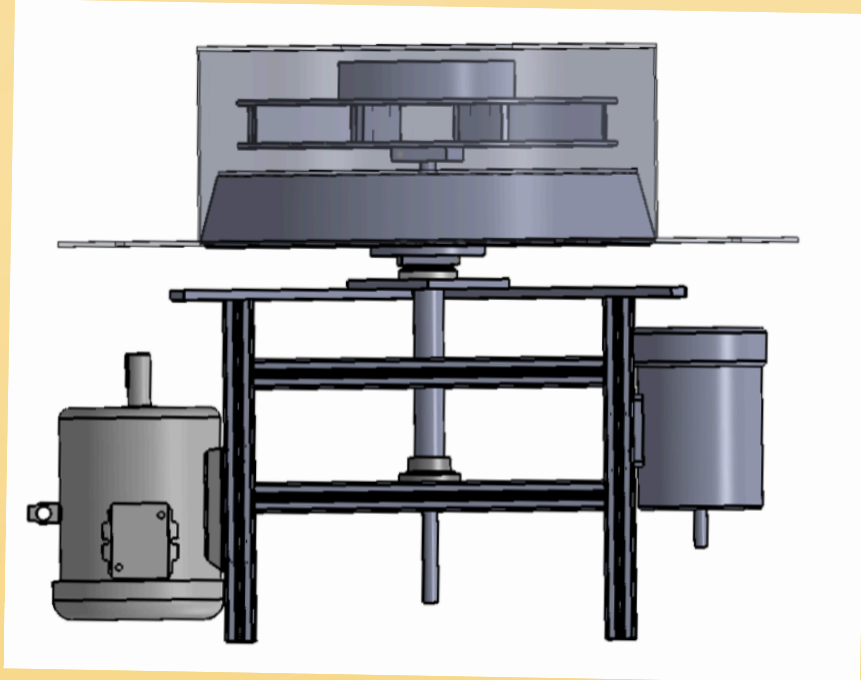
HORN Dehuller – friction



Impact Dehullers



Dehuller design project



De-hull emmer and einkorn

Process at least 120 kg/hr

Operate with minimal supervision

Minimal maintenance and adjustment during operation

Adjustable for variability in grain size (dependent on growing conditions)

Cost less than \$10K.



Results of crossing Black Winter Emmer with Khorosan in the F₂ generation

Thanks to “Mid-Atlantic Plant Research Center” in Maryland

Summary points

- ✿ The ancient wheats represent different species and subspecies which have great genetic diversity for important traits.
- ✿ While there are overall differences among species in nutrition and baking quality, the qualities of any one variety from among these species cannot be determined without testing
- ✿ There is huge market potential for these grains, but a definite need for education, promotion and product development.
- ✿ Seed evaluation & increase of adapted lines along with cultivar development needed for future crop expansion.
- ✿ Management practices need to be refined.
- ✿ Affordable small scale dehulling capacity remains an issue in producing ancient grains and new options are still in the R&D stages.

For more information on ancient grains and the Value-Added Grain Project

Websites

 www.ogrin.org

 [www.grownyc.org/greenmarket/topics/
regionalgrain](http://www.grownyc.org/greenmarket/topics/regionalgrain)

 [www.ag.ndsu.edu/CarringtonREC/agronomy-1/
copy_of_crop-index](http://www.ag.ndsu.edu/CarringtonREC/agronomy-1/copy_of_crop-index)

Thank You!

