Shipping of grains
Safety Rules

Alberto Mazzucato, Italy

Shipping of grains: safety rules

- **Context of grain transportation**

- **Grain characteristics**

- **Transportation and storage**

Context of world grain transportation

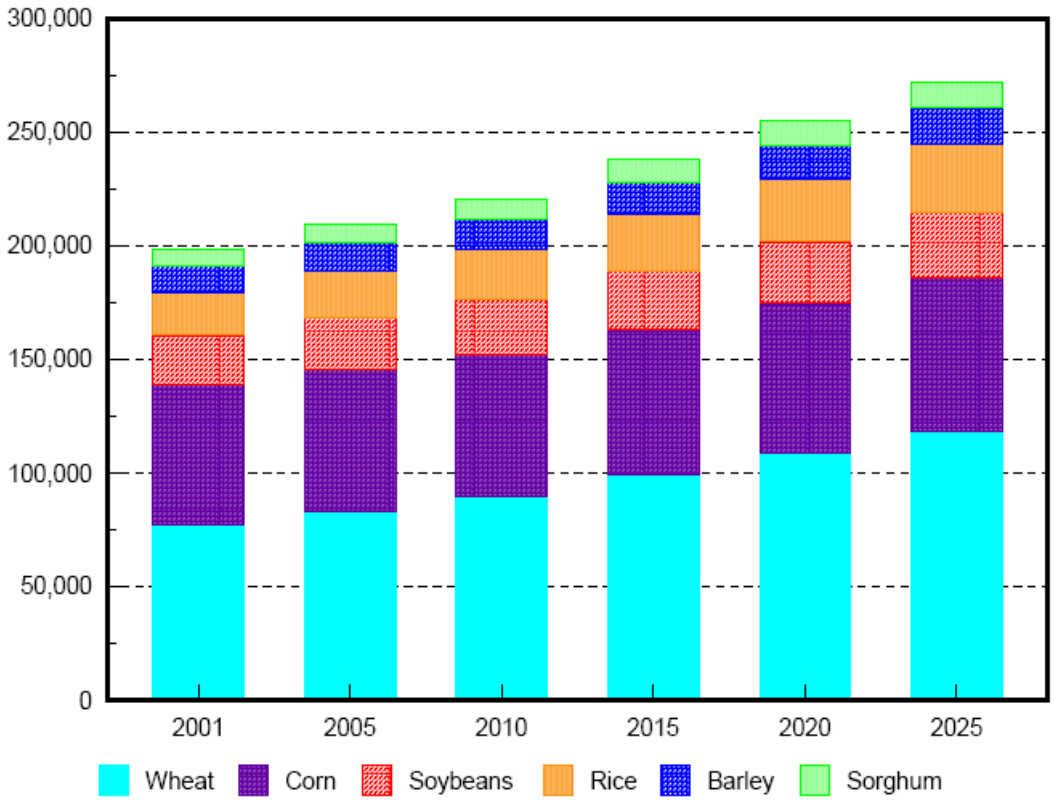
- **Brief history of world grain trade**
- ✓ **World grain market and future trends**
- ✓ **World transportation routes**

Context of world grain transportation

- ✓ **Brief history of world grain trade**
- ▶ **World grain market and future trends**
- ✓ **World transportation routes**

Shipping of grains: safety rules

Total Import Demand, 2005-2025

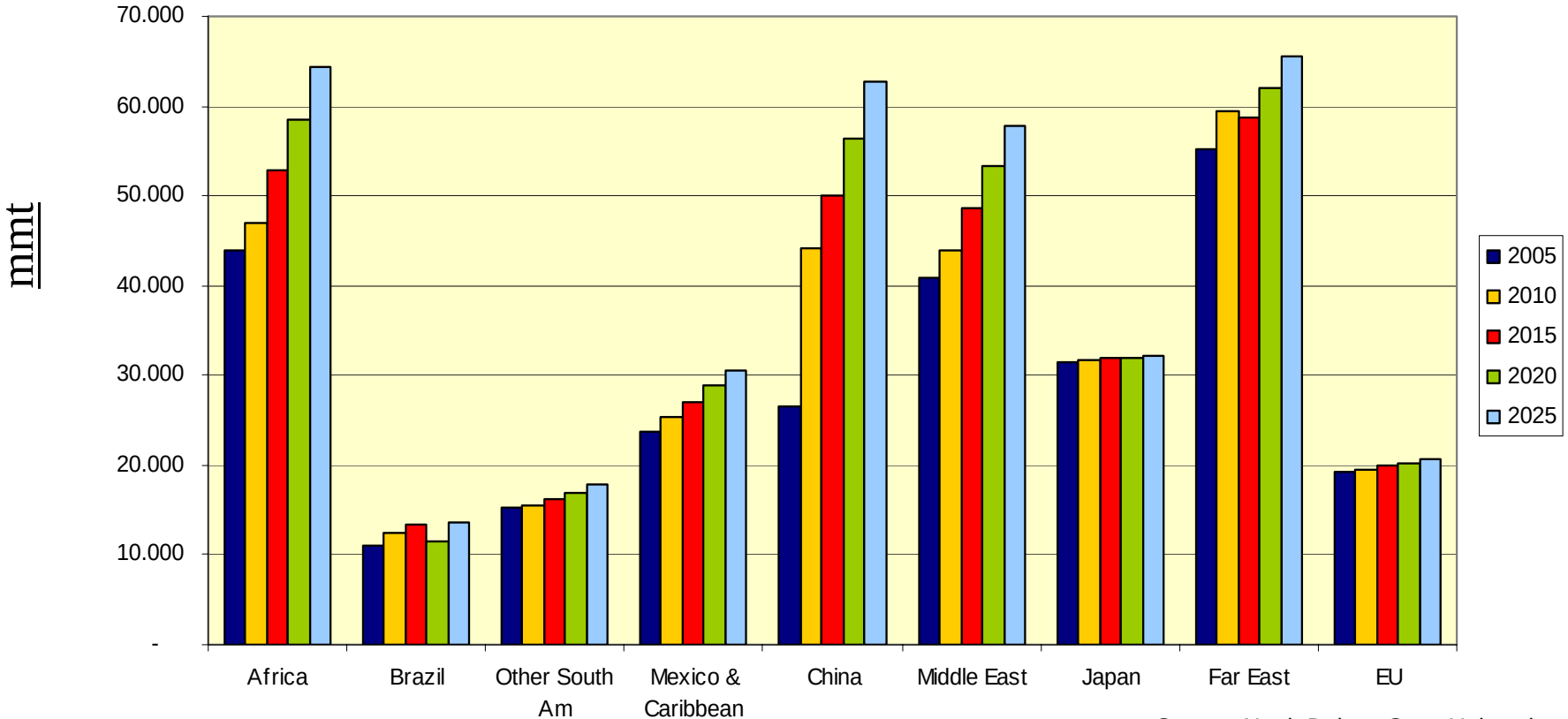


Source: North Dakota State University

Shipping of grains: safety rules

Import demand for all grains

Estimated 2005 – 2025

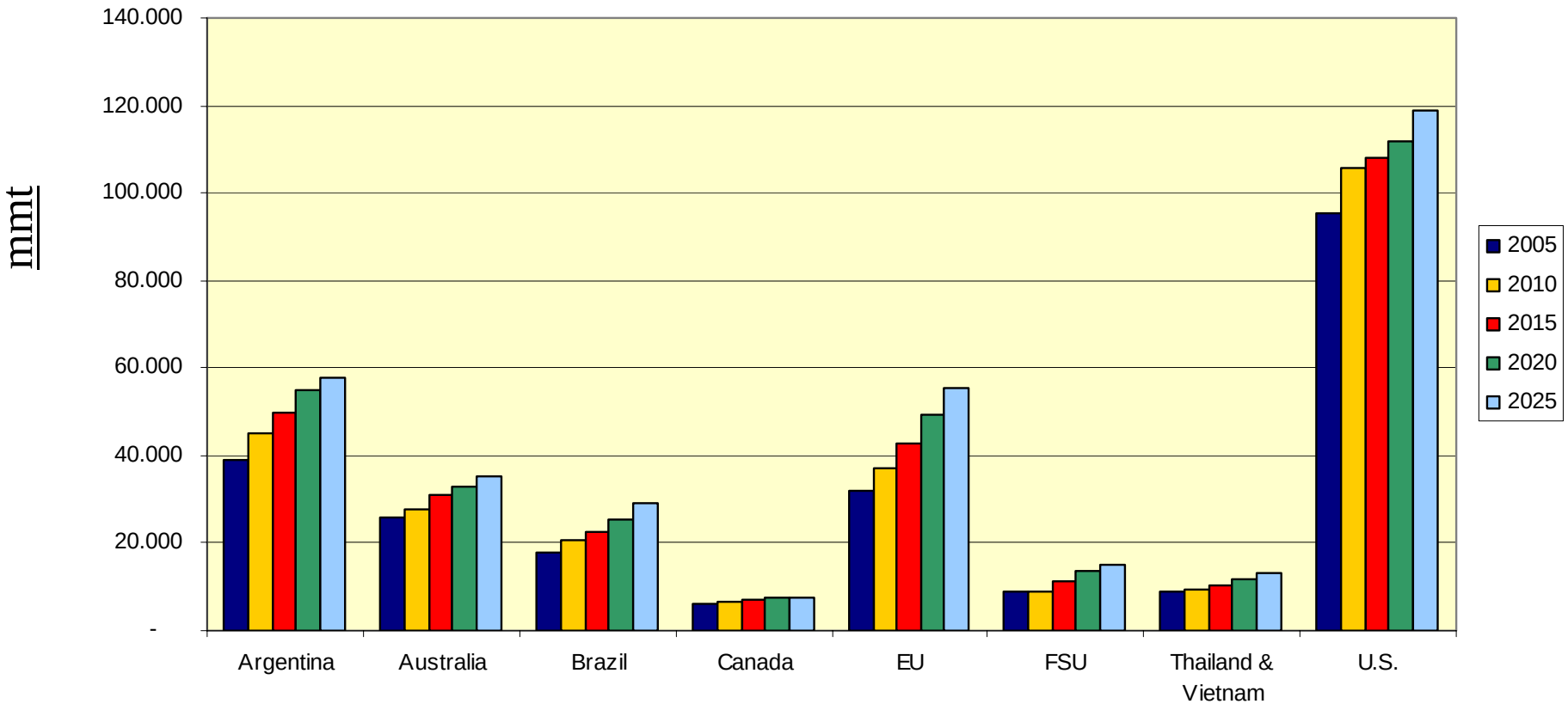


Source: North Dakota State University

Shipping of grains: safety rules

All grain shipments by exporter

Estimated 2005 – 2025

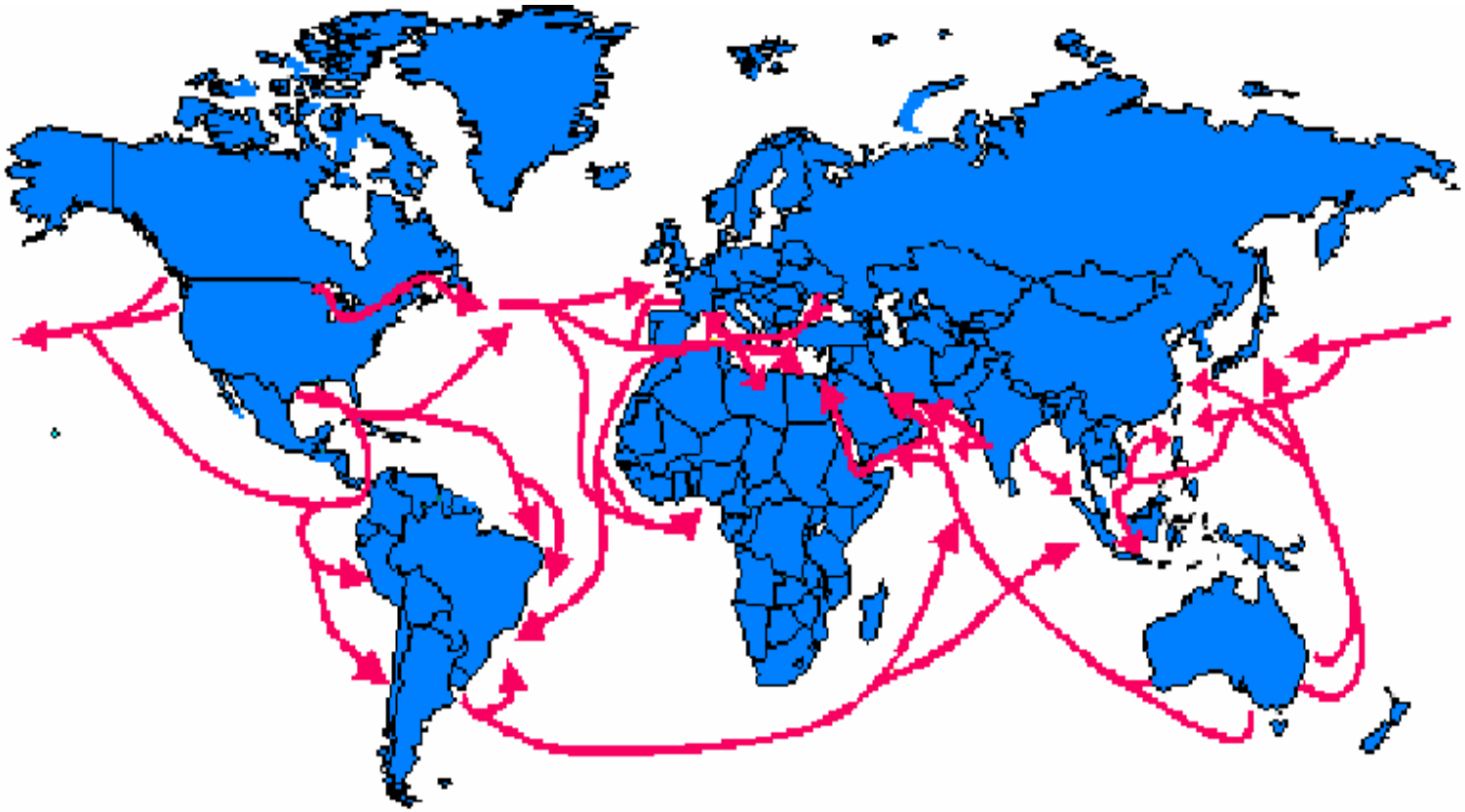


Source: North Dakota State University

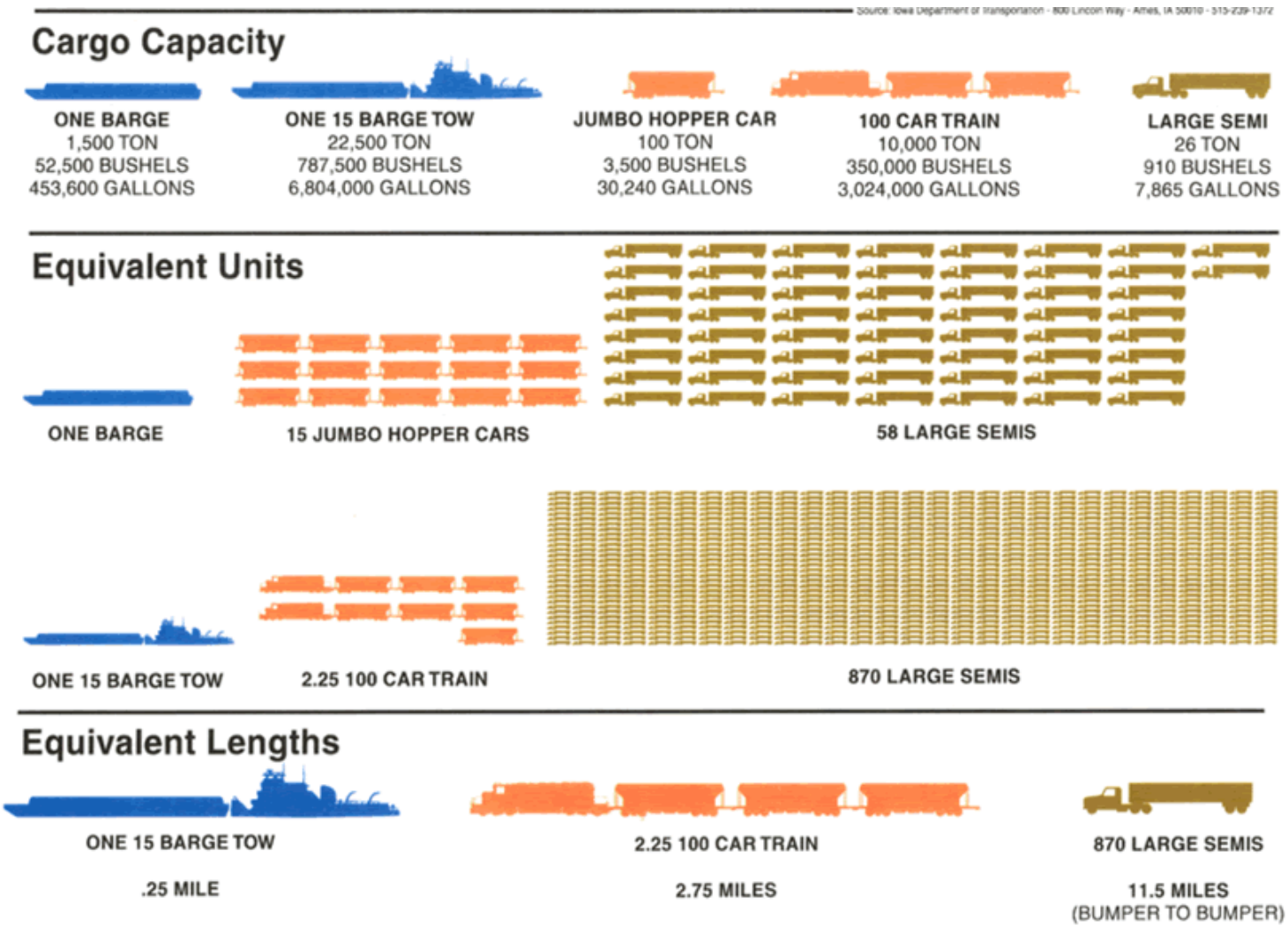
Context of world grain transportation

- ✓ **Brief history of world grain trade**
- ✓ **World grain market and future trends**
- ▶ **World transportation routes**

Major world grain routes



Cargo capacity equivalents



Shipping of grains: safety rules

- **Context of grain transportation**

- **Grain characteristics**

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Shipping of grains: safety rules

Maize

Shipping of grains: safety rules

Rice

Shipping of grains: safety rules

Wheat

Shipping of grains: safety rules

<u>Others:</u>

millets, sorghum, rye,
oats, barley, teff,
wild rice, etc.)

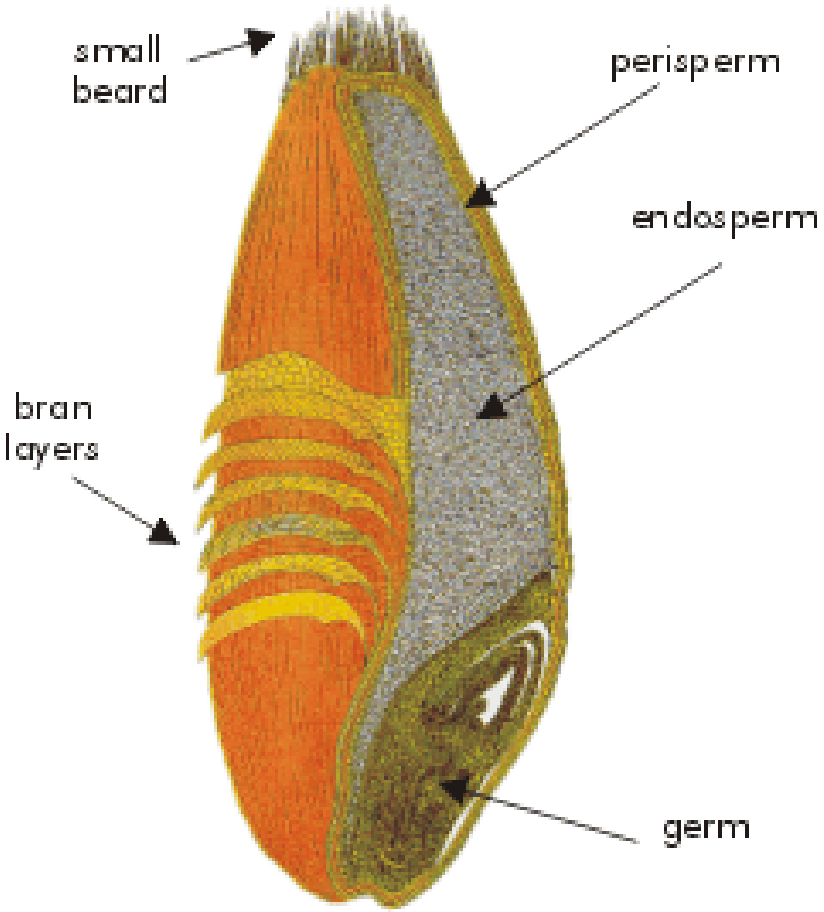
Shipping of grains: safety rules

Grain characteristics

- ***structures***
- ***chemical composition***
- ***biological activity***

Shipping of grains: safety rules

Caryopsis



Shipping of grains: safety rules

Grain characteristics

- ***structures***
- ***chemical composition***
- ***biological activity***

Shipping of grains: safety rules

Constituents	Rye, wheat	Rice	Corn
Carbohydrates	68 - 69	up to 80	70
Protein	11 - 12	5 - 7	10.5
Fat	2	approx. 1	4.5
Raw fibre	2	0.3	2.5
Ash	1.5 - 2	0.5	1.5
Water	13 - 15	> 14	11.5

Major types of cereals composition

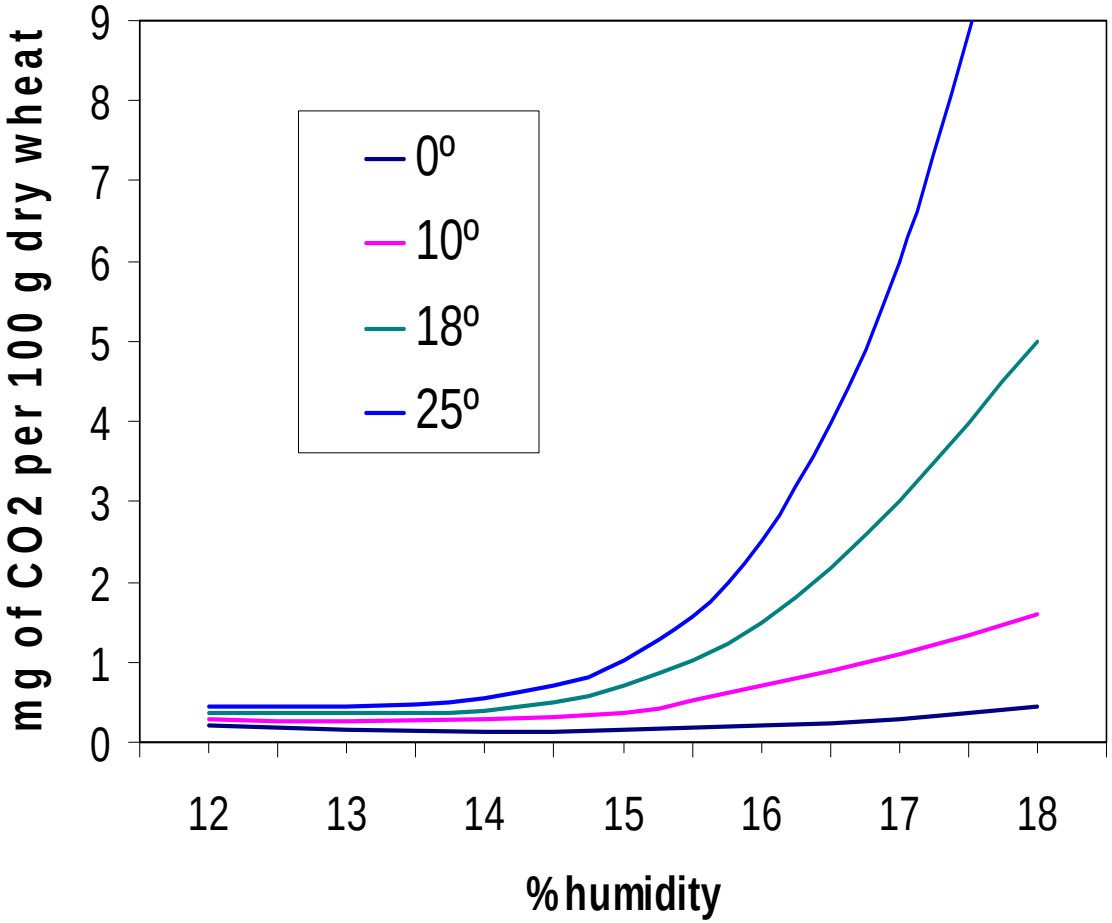
Chemical composition in %

Shipping of grains: safety rules

Grain characteristics

- ***structures***
- ***chemical composition***
- ***biological activity***

Shipping of grains: safety rules



Respiration intensity of wheat

Shipping of grains: safety rules

Grain characteristics

- ***structures***
- ***chemical composition***
- ***biological activity***

Shipping of grains: safety rules

- **Context of grain transportation**
- **Grain characteristics**
- **Transportation and storage**
  - ***risks and damages***
  - ***salvage and loss prevention***

Shipping of grains: safety rules

Steps in grain transportation

1. **Uploading at charge port**
2. **In transit at sea**
3. **Unloading at discharge port**
4. **Port storage**

Shipping of grains: safety rules

In transit at sea

Port storage

- ***risks and damages***
- ***salvage and loss prevention***

Damp sorgum

Agglomerated and moulded

Normal and fermented

Shipping of grains: safety rules

Uploading at charge port

Unloading at discharge port

- ***risks and damages***
- ***loss prevention***

Shipping of grains: safety rules

In transit at sea

Port storage

- ***risks and damages***
- ***salvage and loss prevention***

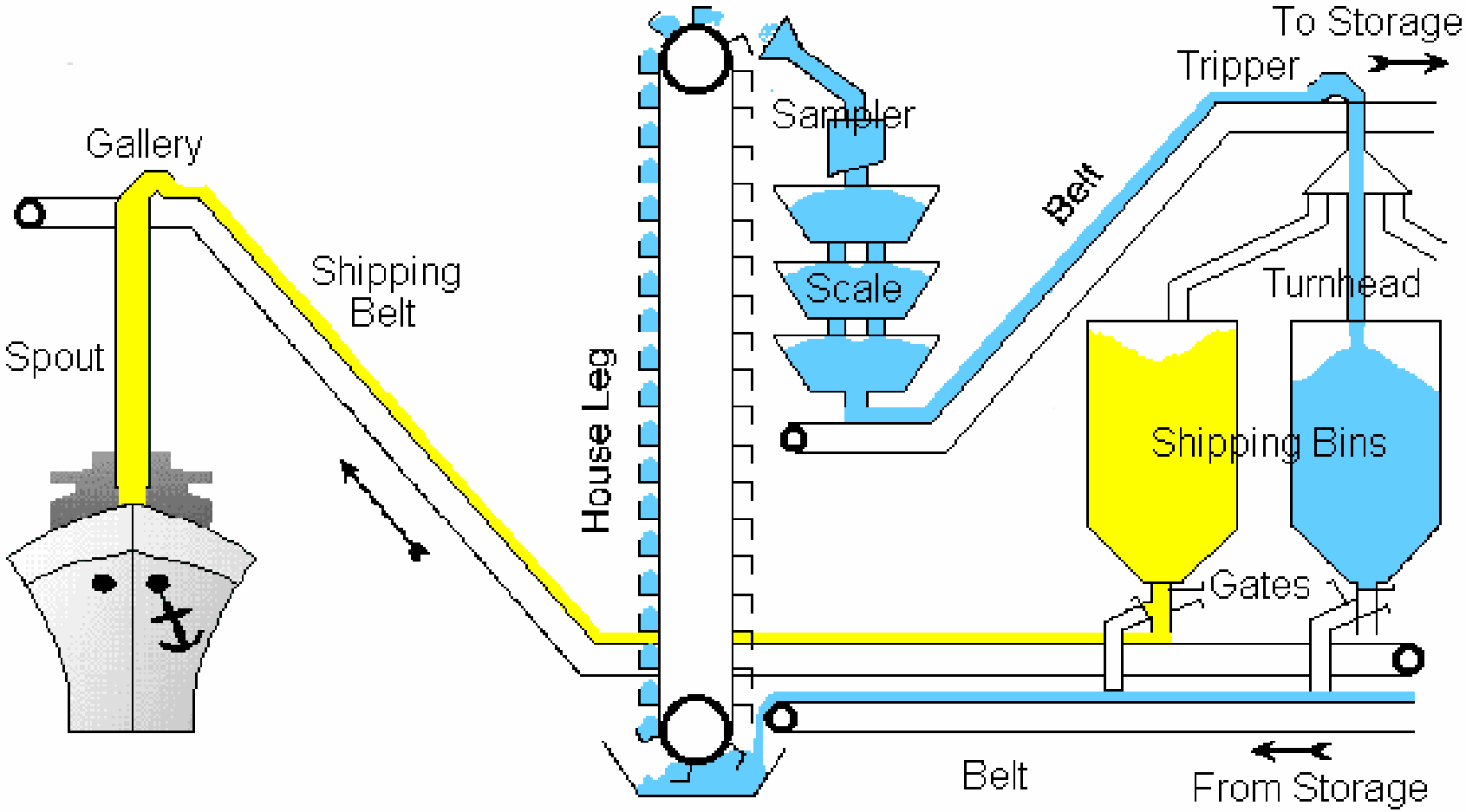
Shipping of grains: safety rules

Uploading at charge port

Unloading at discharged port

- ***risks and damages***
- ***salvage and loss prevention***

Ship loader in a typical layout

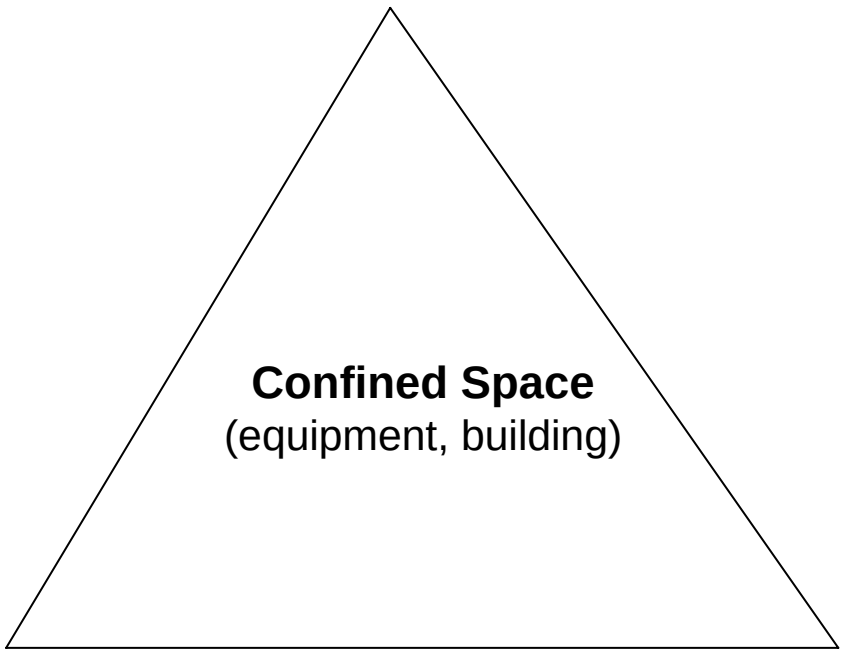


Unloading

Dust during unload

Dust explosion properties

Fuel (grain dust)



Oxygen

Ignition Source

Wichita, Kansas, 8 june 1998

Shipping of grains: safety rules

Uploading at charge port

Unloading at discharge port

- ***risks and damages***
- ***loss prevention***

Conclusions

A world without grains would be unthinkable

Can you imagine a transport of grain without Insurance cover ?