Agronomic impacts on rice milling quality

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Topics

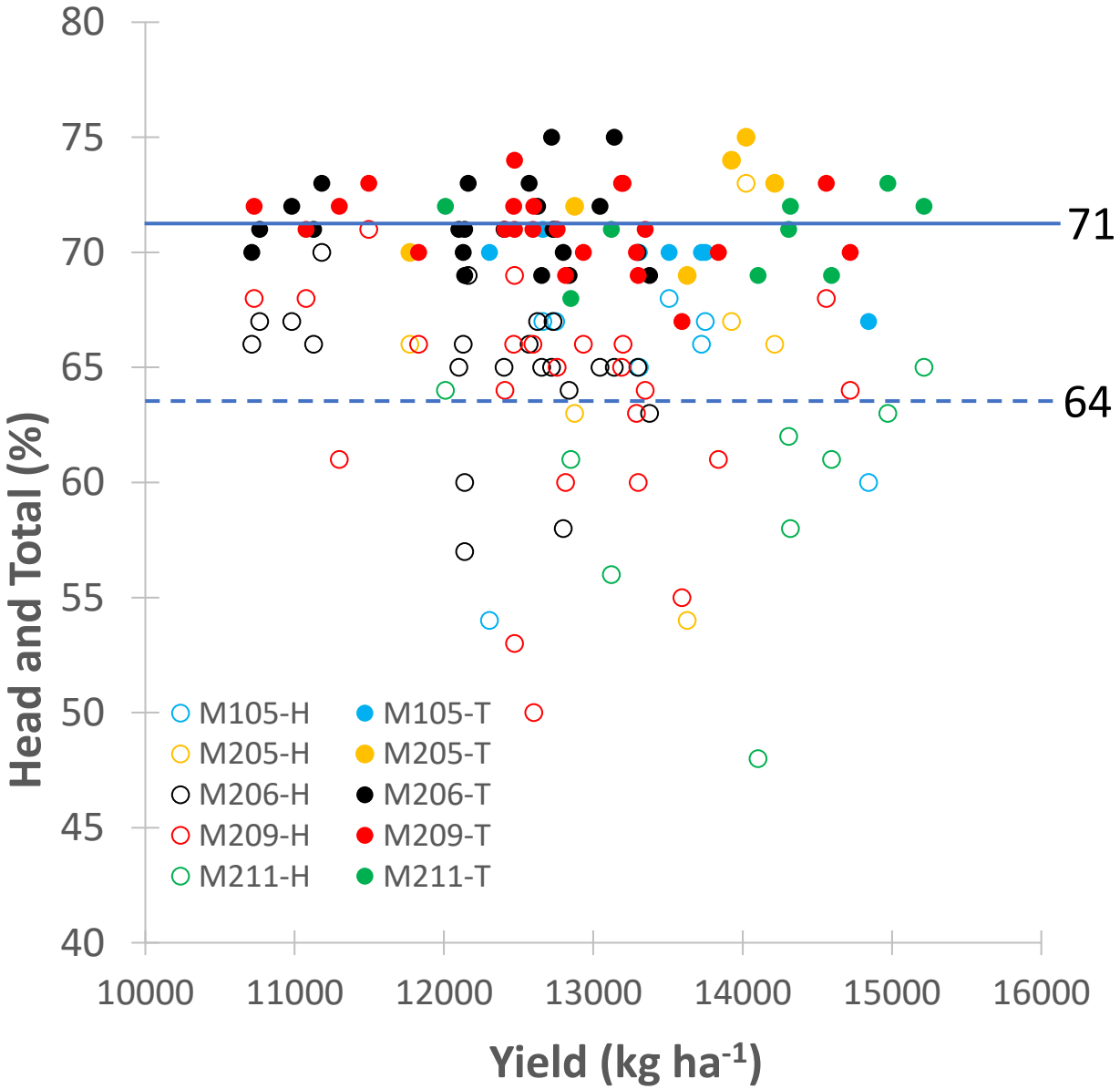
- Focus on milling quality
- Variety (Dustin covered)
- **Preparing the seedbed**
- **Planting: establishment and seed rate**
- **N management**
- **Water management and field drainage**
- **Harvesting considerations**

What’s the goal of agronomic management?

- Broad goal: By harvest, rice that is
  - high yielding,
  - standing,
  - has as uniform a grain moisture as possible.

Milling Quality and Yield

- Milling quality not associated with yield
- High quality possible with good yields
- Head rice yield varied between variety and grain moisture



Field Preparation

- Well leveled and graded fields lead to:
  - Increased ease of flooding and draining fields
  - Uniform water depth encourages uniform crop development and grain ripening
  - Helps field drain uniformly at end of season allowing for uniform ripening.
  - Reduces weed competition
- High areas lead to weeds and may dry out earlier
- Low spots are wet longer and may delay grain drying
- New fields with cut and fill areas create variability.

Planting

- Planting date
  - Match planting schedule with harvest capacity
  - Consider effects of very early or late plantings

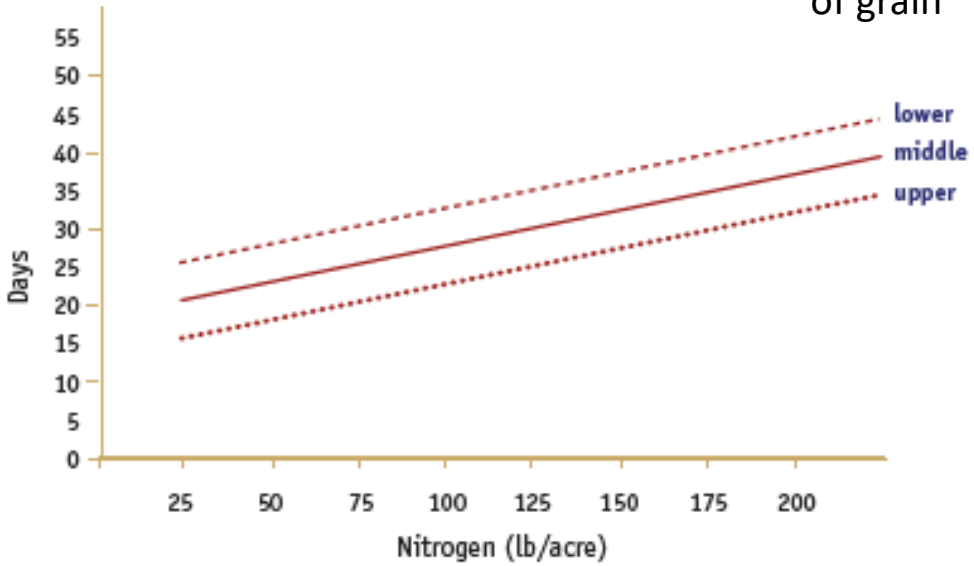
- Seeding rate and distribution
  - Optimal plant density
    - Low plant density contributes to a lot of tillering
      - Variation in panicle maturity
    - Both high and low plant density can contribute to lodging
      - Lodging reduces quality due to inability to dry down uniformly and mold development
    - Ideal-25-50 plants per ft^2. Will lead to 2-3 tillers per plant
  - Encourage uniform emergence and early development.
    - Variation in water depth affects early plant development
    - In dry seeded fields, an initial flush of water will help ensure uniformity
  - Uniform distribution of plants
    - In windy areas, use Leather's Method to ensure a uniform stand

Nitrogen management

- Nitrogen: strong influence on developmental rate and grain ripening.
  - Too much N
    - delays ripening
    - Increase incidence of diseases that affect quality (i.e. smut)
    - Increases chance of lodging
    - Stimulate later tiller production causing more immature grains at harvest.
  - Field variability in terms of N will cause variability across the field in grain ripening.
    - Field position
    - Cut/fill areas
    - Headlands
    - Cover crops
    - Variation in flooding

Duration of grain filling

Panicle position of grain

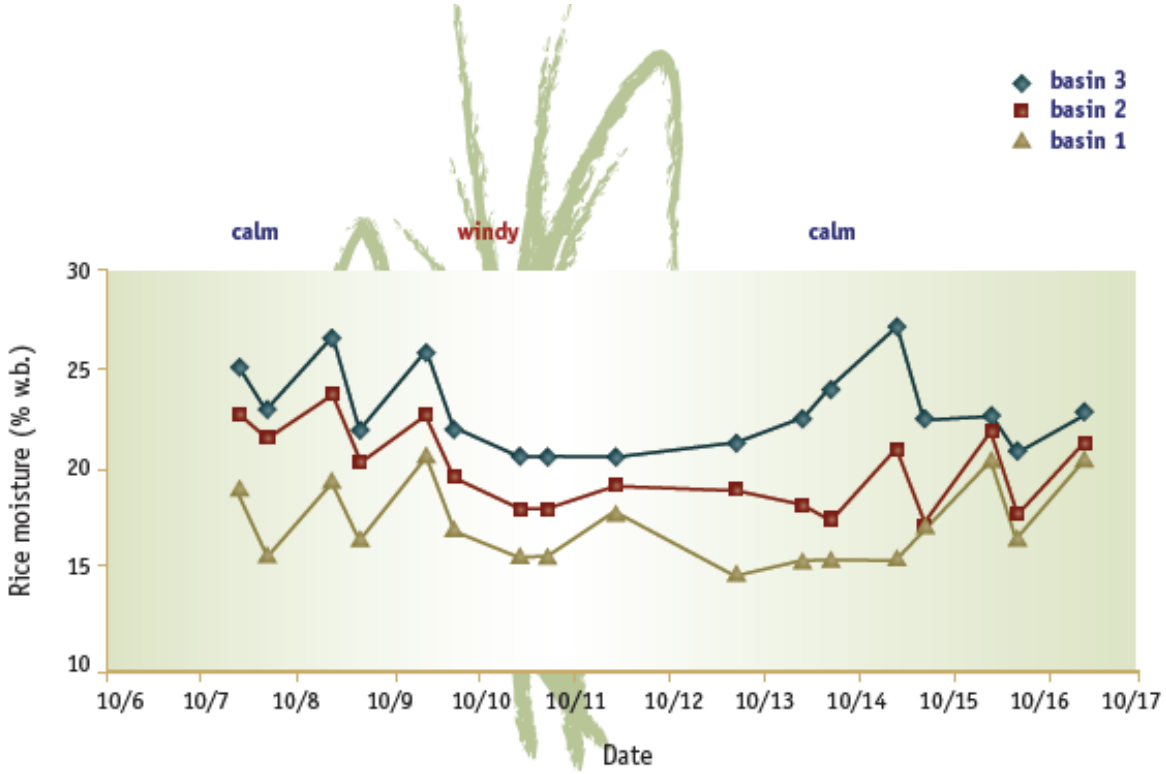


End of season water management

- Want fields to drain and dry uniformly
- Timing
  - Too late
    - Soil may be to wet to support equipment when the grain is ready to harvest
    - Increase potential to lodge
    - Potential increase in pest and disease damage
  - Too early
    - Incomplete grain filling (small or misshapen grain)
    - Loss of yield
  - Variety dependent
    - Some varieties ripen quicker
    - Reports of M-211 needing water a bit longer
  - Actual timing of the drain will be field (soil characteristics) and variety dependent

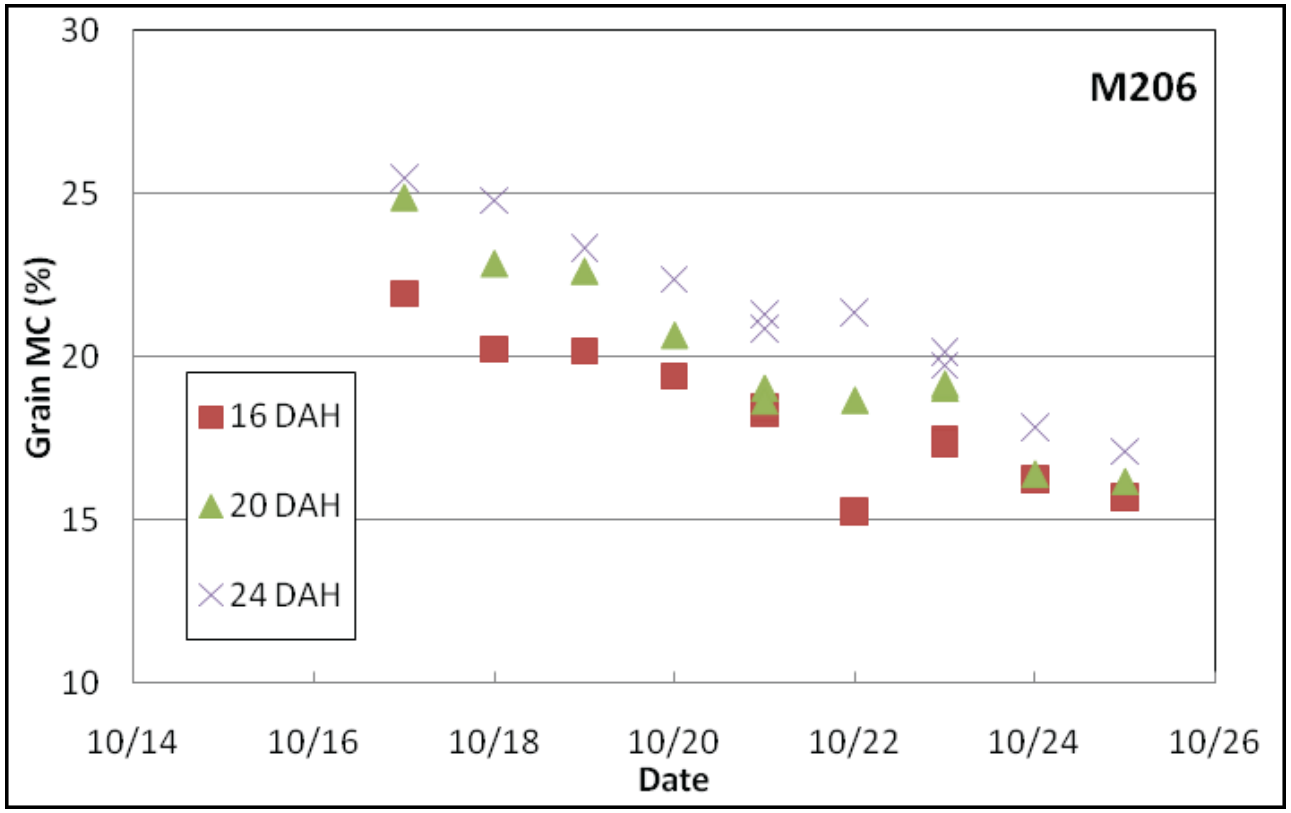
Manage water to reduce field variability

- Depending on how water drains from a field (or how a field dries out), there can be a lot of variability.
- Grain moisture in field to left varied across check by over 10% across basins
- Understanding field conditions can help reduce this variability.
- In field ditches or multiple drains



Grain dry down

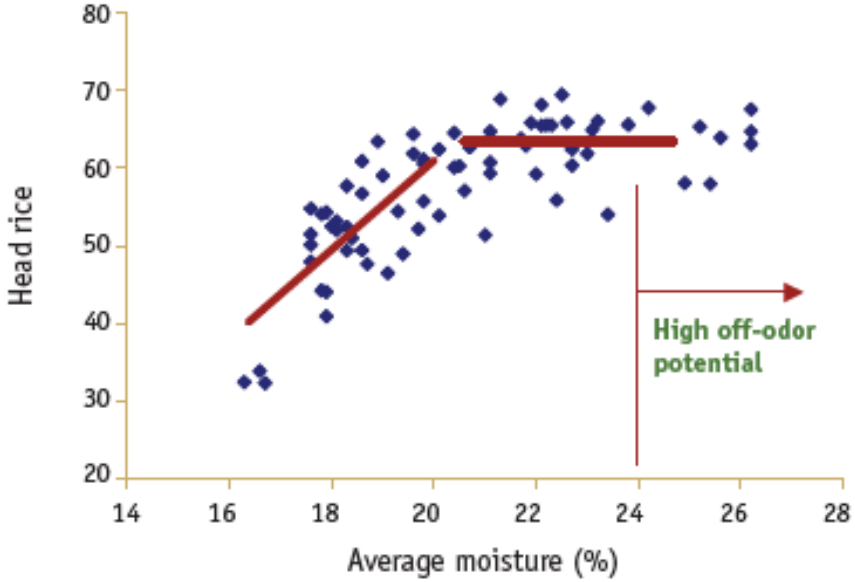
- Early drain initiates drying faster and may lead to lower yields
- Rate of dry down is similar
- Actual rate will depend on year.
- In case to the left, drop 6% required about 1 week.



Harvesting at the right time

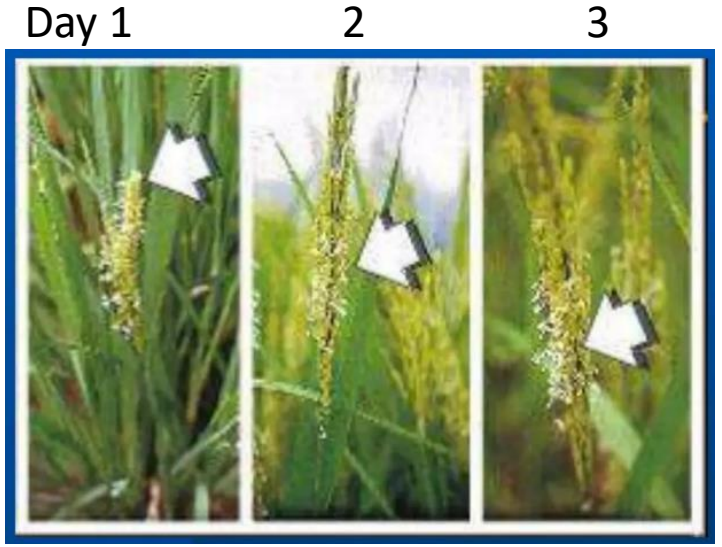
- Want to harvest at optimal moisture
  - Too high: odor and high drying costs
  - Too low: low head rice
  - Varies by variety
    - Generally for medium grains 18-21% is optimal
    - Below this head rice can drop quickly for certain varieties (i.e. M-209 and M-211)
- Optimal grain moisture is when grain <u>first</u> reaches desired moisture
- Challenges

Figure 4.1. Rice quality of California medium grain rice in truckload lots at a drying facility. *Source:* Mutters and Thompson 2004.



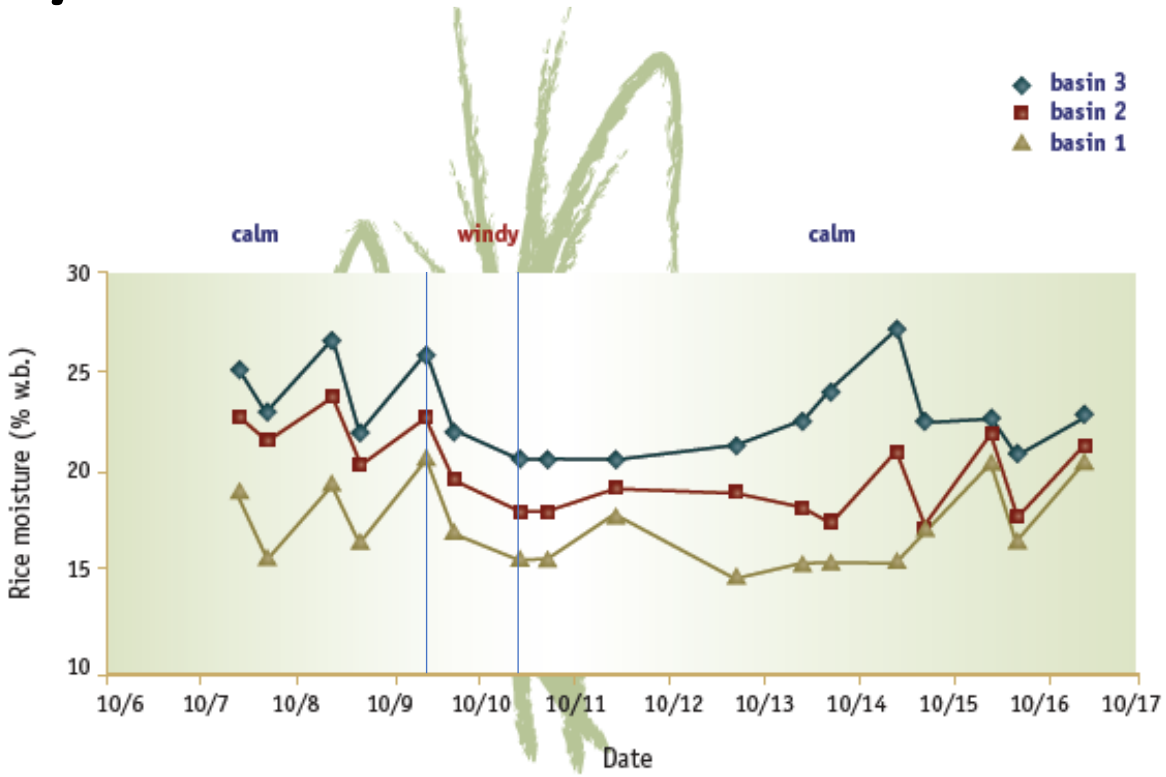
Grain moisture varies on a panicle

- On a given panicle grains develop at different times
- A single plant has a number of panicles. The primary panicle is first to develop and the others follow
  - On a given plant with multiple tillers, flowering takes place over a period of 7 days
- Given this, grains mature at different times.
- Grain moisture is the average of a wide range of moisture contents from grain all over a plant and field.
  - While good management reduces variation, there will always be some



Environmental affects on grain moisture and head rice yield

- Want to harvest when grain <u>first</u> reaches optimal moisture
- Ideal: weather conditions that uniformly dry the rice down at a constant rate
- Reality: weather patterns cause large variations in how grains dry down
  - Dry north winds cause rapid reduction in moisture.
    - Drop a couple percentage points in one day.
  - Cool nights with dew rehydrate grains
    - <u>cause fissuring in the grain</u>



Using desiccants to accelerate dry down

- Desiccants may be necessary if it is rice can not drop to proper moisture content for harvest.
  - Low temperature, rain
- Sodium chlorate is a registered desiccant
- Used rarely and not much research in CA
- General guidelines from the southern US for long grains
  - Do not apply when rice is above 25% moisture due to reducing milling quality
  - Do not apply earlier than 35-40 days after heading
  - Apply only on acres that can be harvested within 3-5 days after application
    - Want to prevent rehydration
  - Does not affect seed germination if used on seed field and within the above stated guidelines.

Summary

- Broad goal: By harvest, rice that is
  - high yielding,
  - standing,
  - has as uniform a grain moisture as possible.
- Agronomic practices to achieve this start at field preparation and go right through to deciding when to harvest.
- Agronomic practices should strive to achieve uniformity across a field
  - Water
  - Plant distribution
  - Fertility
  - Soil moisture during drying


Thankyou