Cropping Strategies:
Split-Pivot Systems to Reduce and Spread Immediate Water Demand

Texas High Plains, updated March 2024

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How to Use this Information

- Starting on slide 43 are common irrigation split-pivot strategies for the Texas South Plains (Lubbock region) and Texas Panhandle. These are intended as a planning aid in helping you decide how you might approach the issue.
- The strong majority of TxSP farmers the past several years have indicated they would rather do a split pivot of irrigated cotton than try to stretch limited water across the whole circle. And thus by focusing water on a half pivot they feel their management skill comes in to play vs. feeling like they have their hands tied, watering the same crop across the whole pivot.
- Are there other scenarios you are interested in, that are not in this presentation? Give me a call and let's talk about it. I am glad to help try to fit together additional strategies with different crops to see if you have a good fit of complementary cropping to minimize irrigation overlap.

Calvin L. Trostle

- “An irrigation lateral near Hereford, Texas. The field shown is now in alfalfa. Irrigation water comes from wells ranging in depth from 50 to 200 feet. An unlimited supply of water seems assured. Electric-powered and butane-powered pumps in this area usually have capacities of 1000 to 1500 gallons of water per minute. 50,000 acres of land in the county are now irrigated by this method with no measurable effect on the water level.”

12/18/1944

Contributors

- Cotton irrigation, Jim Bordovsky (retired, slides 20-26)
- Extension Agents: Kerry Siders (IPM, Hockley-Cochran-Lamb Counties); Monti Vandiver (formerly IPM, Parmer-Bailey Counties); Mark Brown (formerly Ag. agent, Lubbock County)

Sources of Label Information

& AgriLife Extension Weed Scientists

- Labels for herbicides, insecticides, fungicides, seed treatments, growth regulators, etc.—access through **http://www.cdms.net**, click 'Label Database' then 'Search' then conduct either of two searches:
  - **A)** Enter product name then choose the specific product then its label or supplemental label (most common use)
  - **B)** Click "Other Search Options" (register for a free password) to search by active ingredient (looking for a generic?), find a class of chemicals (herbicides, fungicides, insecticides) labeled for a particular crop, etc.
- Texas High Plains—Dr. Pete Dotray, Lubbock, (806) 746-6101, pdotray@ag.tamu.edu
- Central & South Texas—Dr. Paul Baumann, College Station, (979) 845-3041, pbaumann@ag.tamu.edu
- South Texas—Dr. Josh McGinty, Corpus Christi, (361) 265-9203, joshua.mcginty@ag.tamu.edu

Cropping With Less Water

- Irrigating less vs. irrigating more efficiently—Over the past 20 years what we have accomplished is most likely the latter
- Texas Seed Trade Association newsletter reporting, Feb. 9, 2012: "Due to the new requirements of measuring and reporting irrigation water use it looks plain that most growers use less water than they believed and are better stewards of the resource than is commonly believed." (HPWD staff).

Remember Some Basics

- "A shiny steel shank is often a farmer's worst enemy."

M.B., Lubbock Co.

This represents tillage and moisture loss

Three Rules for Moisture

Catch it!

Keep it!

Reap it!

- Not just for rainfall
- Applies to irrigation, too.

Do you need to re-evaluate pre-plant irrigation?

- Water use efficiency of preplant irrigation is often very low, especially when using spray mode in contrast to LEPA drag socks with furrow dikes.
  - Efficiency may be as little as 20%, especially for early spring applications
  - Wetting the entire surface of the soil greatly diminishes efficiency

Should You Be Using LEPA?

- Research documents well the advantages of increased water use efficiency
- Once the crop is established, at some point we can/should switch from spray used to establish the stand to low-set water application (especially drag hoses, also splash pads, etc.)
  - Sometimes we might need to switch back to nozzles for a period of time

Should You Be Using LEPA?

- LEPA will wet about 40% of the soil surface, and none of the foliage—more water to the root zone.
  - Less evaporation from the soil
  - Water movement into the soil at least twice as far

What About Furrow Diking?

- An "Old" technique
  - "Oh, furrow diking is so 1960s!..."
  - But less useful (and less needed) if you are using conservation tillage/no-till
- Benefits are well documented in research
- Practice may be considered a nuisance, but it is still recommended
- Benefit some years more than others
  - Up to 150 lbs./A lint, 1,000 lbs./A sorghum in best years of benefit

Irrigation Scheduling?

- Potential evapotranspiration?
  - Unfortunately the Texas AgriLife High Plains PET network was closed to the public due to lack of funding
- AquaSpy, other equipment
- Texas Alliance for Water Conservation irrigation tool, http://tawcsolutions.org/

Overestimating Irrigation Capacity

- This gets us in trouble in years that have even 'average' rainfall…
- …and we are too hopeful, too optimistic; and we delay much-needed decisions: *it's just got to rain soon!*

Implications of Forthcoming Pumping Limits

- Think now, how will you farm with a 15” limit?—This might not be an issue for you if you don’t have a lot of water anyway (or you are in an irrigation district that has not imposed limits).
- How to manage the contiguous acres provision, to get above 15”/year.
  - Should we even grow anything that requires this amount of annual irrigation?

Implications of Forthcoming Pumping Limits

- Banking your 6” of water for use in future dry years (again, if this applies to you)
- What about required water meters and reporting water use? Does that seem intrusive?
  - Most producers who have used water meters have in fact found they are using <u>less</u> water than they thought AND the meters have proved to be a useful management tool.

Minimum Irrigation GPM‡

Crop	Minimal	Good
Corn	3-4	4.5
Peanut	---	5.0
Alfalfa	5	7 to 8
Cotton	?	?
Grain Sorghum	?	?

‡Mid- to late-season gallons per minute, not in May; this Allows for decrease in pumping capacity through season.

Range of Planting Dates
(Lower Texas South Plains)

Crop	Early‡	Late
Grain Sorghum	4/20	7/5 (medium) 7/15 (early)
Sunflower	4/10	Tier I, July 15 Tier II, July 22
Guar	5/10?	7/1
Sesame	5/10?	7/1
Black-eyed Pea	5/10?	7/10
Sorghum/sudan	4/15	Good, by early July Late forage, ~8/1

Range of Planting Dates
(Central Texas South Plains†)

Crop	Early‡	Late
Grain Sorghum	4/25	6/30 (medium) 7/10 (early)
Sunflower	4/10	Tier I, July 10 Tier II, July 17
Guar	5/10?	7/1
Sesame	5/10?	7/1
Black-eyed Pea	5/10?	7/10
Sorghum/sudan	4/20	Good by early July; Late forage, ~8/1

†For 'Late' dates, use 5 days earlier for north/northwest South Plains, 5 days later for lower South Plains; ‡Relies on warm soils & favorable 7 to 10 day forecast.

Range of Planting Dates
(Northern Texas South Plains)

Crop	Early‡	Late
Grain Sorghum	4/30	6/25 (medium) 7/5 (early)
Sunflower	4/15	Tier I, July 5 Tier II, July 12
Guar	5/10?	7/1
Sesame	5/10?	7/1
Black-eyed Pea	5/10?	7/5
Sorghum/sudan	~4/25	Good, by early July Late forage, ~8/1

‡Relies on warm soils & favorable 7 to 10 day forecast.

Crop Water Use Patterns & Optimum Timing

- When water is limited, there are better times to get a bang for your irrigation buck?
- When do you get better potential yield response?
- If you can irrigation cotton, sorghum, sunflower say 4”, when is the best time to do it (provided you can get to that point)?

Cotton Irrigation Summary

Jim Bordovsky (retired), TX AgriLife Research, Halfway

- Cotton growth periods:
  - Vegetative (planting to very early bloom)
  - Reproductive (early bloom to just past peak bloom)
  - Maturation (after peak bloom to initial boll maturity)

Fill in Approx. Calendar Dates

- Vegetative—When does ‘early bloom’ typically occur for your fields and your varieties?
- Peak bloom—When does this occur for you, in general?

Fill in Approx. Calendar Dates

- Vegetative—When does 'early bloom' typically occur for your fields and your varieties?
  - For discussion purposes, about July 5?
- Peak bloom—When does this occur for you, in general?
  - For discussion purposes, about August 1?

Cotton Irrigation Summary

Jim Bordovsky, TX AgriLife Research, Halfway

- Declining Ogallala aquifer—availability can change dramatically during a season
- Dealing with lack of rainfall
- Shortages of water during critical growth stages
- Loss of wells due to mechanical failure
- Limited irrigation volumes imposed by regulatory mandates before the end of the growing season

Trostle Comments

- We don’t have as much water now as 10 & 20 years ago, so pre-plant irrigation is less an option
- And with less irrigation available, we are concerned if we use much of it outside of the time (early) of maximum benefit.
- Early use in many crops leads to rank, less productive growth

Cotton Irrigation Summary

Jim Bordovsky, TX AgriLife Research, Halfway

- When available water can't meet the needs of crop demand, irrigation community has generally recommended and producers have followed the practice of 'banking water' to partially fill soil profile before planting or during early plant growth

Cotton Irrigation Summary

Jim Bordovsky, TX AgriLife Research, Halfway

- While a full profile is very desirable for cotton and other crops, and pre-plant irrigation is absolutely necessary in some years, our work indicates that under potential water constraints, the strategy of filling the profile by irrigation may need to change or at least be altered.

Banking Water ≠ Germination Water

- Watering ahead of time to have a planting zone is different, and you will use spray mode to achieve this if needed.

Cotton Irrigation Summary

Jim Bordovsky, TX AgriLife Research, Halfway

- High wind, high air temp., low humidity combine to make it difficult to retain early applied water in the soil until cotton (or other crops) really need it in July and August during bloom and boll growth
- In addition, early season water applications can be lost via evaporation or excessive plant growth
- This all represents non-productive water

Cotton Irrigation Summary

Jim Bordovsky, TX AgriLife Research, Halfway

- South Plains data from wet (2010) and dry years (2011!):
- Storing water in the soil profile in excess of cotton plant's evapotranspiration during June was ineffective

- Best time to water?...

Cotton Irrigation Summary

Jim Bordovsky, TX AgriLife Research, Halfway

- Results to date:
  - Ensure adequate irrigation available in the reproductive(#) and early maturation periods of cotton development (about 7/5 to 8/15)
  - Water applications during this stage of growth resulted in > 100 lbs./A cotton fiber growth per 1" of irrigation
  - About 20 lbs./A or less cotton production per acre-inch during spring and vegetative 'water banking' irrigation application period

Other Crops & Water Use

- Corn—Peak water use about 2 weeks before to two weeks after pollen shed
- Cotton—early July to cut-out (5 NAWF), usually mid or late August
  - Do you irrigate too much after Cut-out?
- Sunflower—2 weeks before to 2 weeks after bloom (a distinct cutoff, petal drop)
- Peanut—Ensuring pegging, late water vs. early water

***Sorghum & Water Relations

- Rain (and irrigation): Catch it! Keep it! Reap it!
- It takes 6-8” of available water to get a crop of typical sorghum plants to the point of grain production (Dr. Dan Krieg, Texas Tech, deceased)
  - ~5” for low plant population dryland sorghum
- Once met, additional moisture has large effect on yield, 350-425 lbs./A per 1”

Full-Season Maturity—Grain Sorghum...

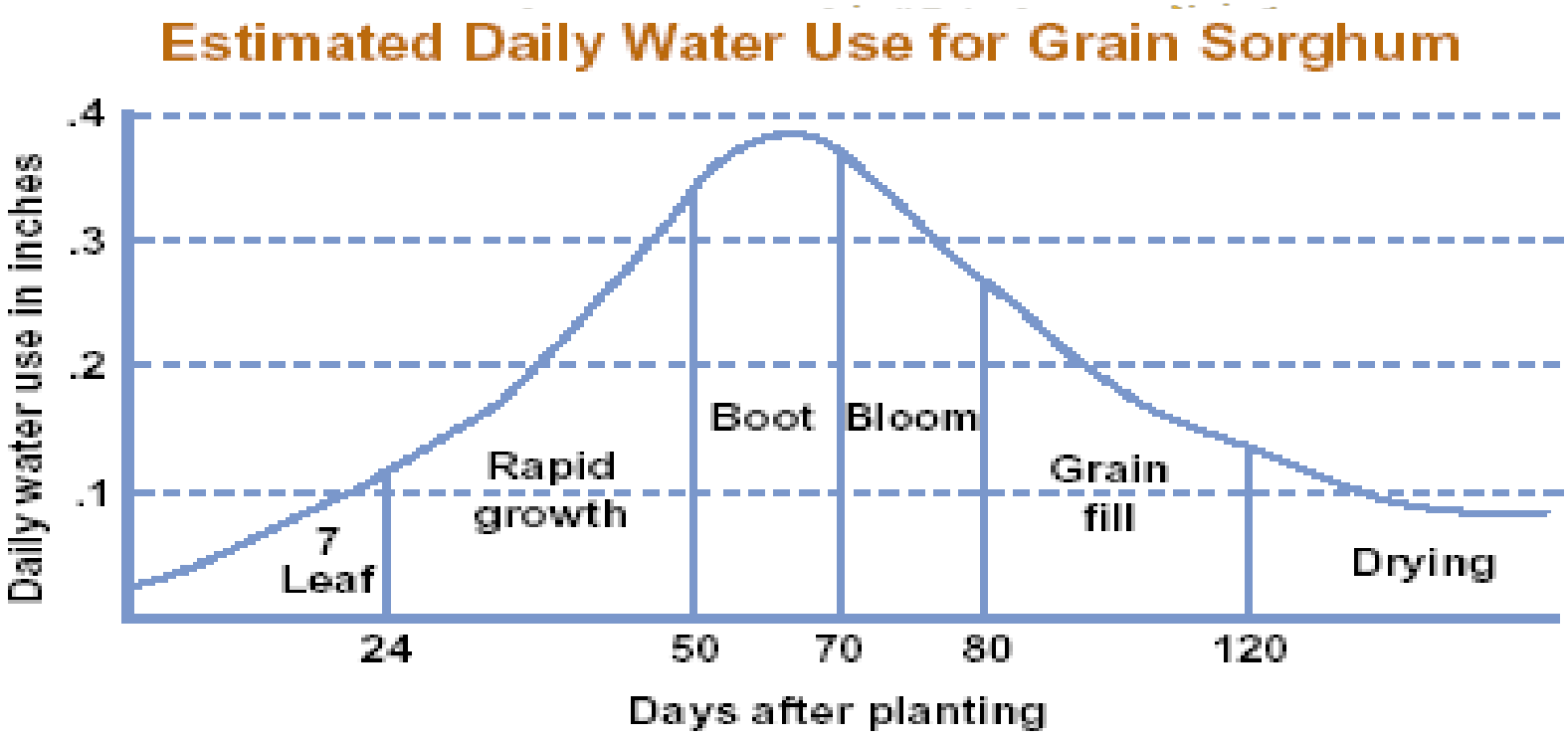


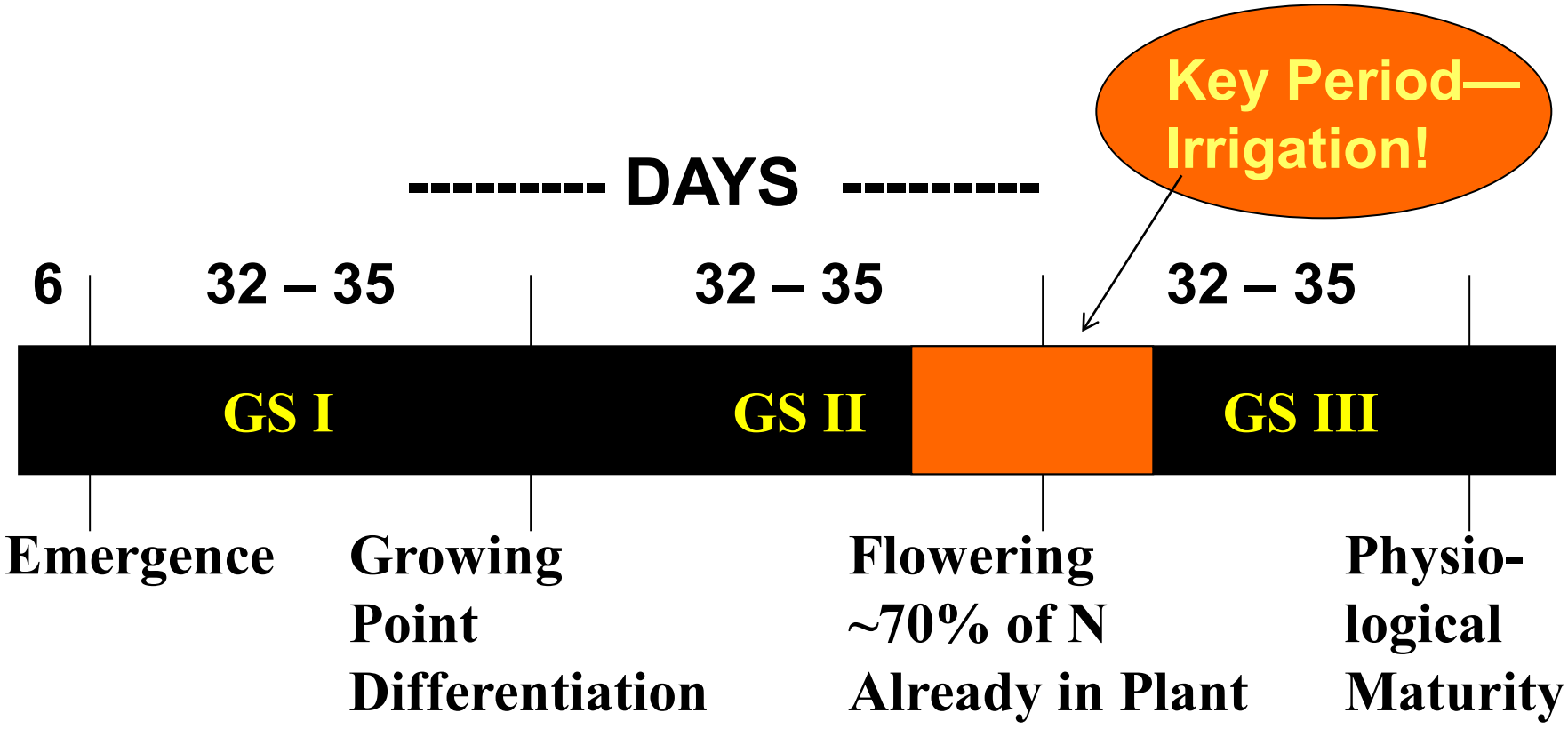
Figure 1. Water needs for sorghum rise sharply at the rapid growth stage, peak during the boot stage and then drop off afterward.

Full Irrigation-Grain Sorghum

- Maximum yields at 3.5 to 4.5 gpm/A
  - Corn comparison would be ~5.0-6.0 gpm/A
- LEPA or low-set nozzles increase water efficiency
- Critical irrigations at mid-vegetative stage, boot, heading, flowering, grain fill

Development of Sorghum

Medium Maturity Grain Sorghum, 17 leaves



Spikelets & Potential Seed Number Set from GPD +10 Days for Each Head

Limited Irrigation Sorghum

- Highest return usually occurs if sorghum is irrigated at boot stage (provided you can get to that point)
- Avoid moisture stress during the mid-vegetative stage (30-35 days after planting, i.e., growing point differentiation)

Growing point of grain sorghum; the head is now developing, determining the number of spikelets and seeds per spikelet. (These are important components of yield potential.)

Similar to grain sorghum, growing point differentiation in wheat leads to small head down in stem—spikelet number and seeds per spikelet pretty much already determined. If grazing and then going to grain then cattle should have been off about 7-10 days prior.

9,600 lbs./A, Hale Co.

- 24” of water (irrig./rain) for grain yield
  - Add in 7” to get the crop to the point of grain yield (31” total)
- A more realistic goal: 6,000 lbs./A with medium or medium-long maturity
- 15” of water for grain yield
  - Add in 6” to reach point of grain yield (21”)
  - 3” soil water, 6” rain, 12” irrigation

Irrigation Termination & Harvest

- Termination of irrigation: near soft dough, if good soil moisture is still present
- Physiological maturity is at black layer (~10-12 days after soft dough)
- Seed moisture at black layer is ~25-35%
- Harvest below 20% moisture with drying required
- Market price based on 14% grain moisture to avoid dockage (may depend on delivery point)

Split Pivot Scenarios 1

- Pairing two irrigated crops
- What strategies can you consider?
- One crop is your main focus, the other may be managed in such a way that it ‘goes dryland’ if needed.

Split Pivot Scenarios 2

- The widest separation of crop irrigation needs for two crops is your summer crop + winter wheat.

- The further north in the Texas High Plains and into Kansas, then wheat may become the most realistic (or only) option for splitting irrigation between two crops.

Partial Circles of Cotton?

- Numerous farmers with limited irrigation find this appealing
- Not the same cotton yield on ½ the acres—that ignores rainfall
- But management skill to grow great cotton on ½ circle comes into play vs. having your hands tied trying to scrape by irrigating the same crop on 120 acres

Cotton/Sorghum, Split Pivot

- Two-crop/two planting date/split pivot scenarios
  - Early cotton, late June sorghum
  - Early sorghum, delayed cotton
  - Early sorghum, late sorghum same pivot
- The goal is to minimize or even eliminate the overlap of peak irrigation
  - Much if not most of the time you are only watering a half circle
- Check with Extension (Trostle) for an explanation of possible scenarios for your farm

Cotton/Sorghum, Split Pivot

- Farmer consideration--splitting pivot with different crops requiring water at different times to reduce total irrigated acres at one time
- Which crop has main emphasis?
  - Cotton production, give it all you can?
  - Sorghum—you signed a pounds contract?—you have to spread your crop loss/low yield risk to ensure delivery of pounds of grain

Shifts in Projected Dates

- A specific planting date for either cotton or grain sorghum does not mean cut-out or flowering will occur on a certain day or within a few days
- Heat unit accumulation drives physiological growth—it is potentially driven faster by heat
  - The same hybrid planted in late April will probably take 5-7 days longer to reach half bloom vs. plantings in June
  - But grain filling and maturation will likely then be quicker for the early planted grain sorghum

Shifts in Projected Dates

- Early cool fall temps. can greatly slow growth
- It is not worth sickly or slow emergence on cotton or sorghum if it means you need to wait 5 days to early plant
  - The potential damage in a start in cold conditions is a greater risk than if irrigation or heat during flowering hit crop later
  - If temperatures are reasonable is there a major cold front in the next 5-7 days?

Soil Temperatures & Fall Cool

- Crops that can extend the production season and spread irrigation needs by planting early in cooler soils or matures better under cool and even frost conditions, can expand the window of opportunities for split-pivot irrigation scenarios
  - Early planting in cool soils: corn, sunflower (50°F minimum; cotton & grain sorghum, 62-65°F minimum)
  - Mature in cool/frost conditions: sunflower (28°F)
- Want to expand cropping season or minimize overlap irrigation more than these scenarios?
  PLANT WHEAT

Scurry/Howard/Dawson/Lynn/Terry
Early Cotton, Late GS

- Half pivot with cotton, planted ~May 5
  - Peak water use early July to mid-August
  - Physiological cut out (5 NAWF) by ~August 10?
  - Greatly reduce irrigation ~Aug. 20 if soil moisture is available, A&M data suggests little additional irrigation benefit esp. if some rain is received
- Consider medium maturity sorghum, ~4,500 lbs./A yield goal (6-8" irrigation)
  - Flower about September 5
  - Back up 65-67 days (from 9/5)—plant ~July 1

Scurry/Howard/Dawson/Lynn/Terry
Early Cotton, Late GS

- Result: cotton is up to 3 weeks past cutout prior to sorghum flowering (~Sept. 5), and lower moisture requirement
- Sorghum enters peak water demand ~7 days after cotton cut out when cotton irrigation is greatly reduced
  - Sorghum maturity near October 10-15 with added potential of Sept. rainfall assisting yield
- Concentrate water to cotton early with 1-2 possible key waterings to sorghum prior to flowering (panicle differentiation, early boot)

Scurry/Howard/Dawson/Lynn/Terry
Early GS, Delayed Cotton

- Half pivot with medium-early sorghum, planted ~April 25
  - Medium-early hybrid, flower by June 25-30—peak water use is declining as cotton water needs rise rapidly
  - Maturity about first week of August with mid/late-August harvest
- Cotton planting delayed to May 15th
  - Physiological cut out ~Aug. 20th
  - Little overlap in peak irrigation needs
  - How strong is your water?

Split Pivot Sorghum—2 Plantings

Dawson/Lynn/Terry Co., Medium Maturity

Timing	Planting Date	Flower-ing	Maturity	Maximum Water Use
Early	April 25	July 1-5	Aug. 5-10	6/15 to 7/10
Late	June 30	Sept. 5	Oct. 10-15	8/20 to 9/15

Hockley/Lubbock/Crosby/Floyd/Hale
Early Cotton, Late GS

- Half pivot with cotton, planted ~May 5
  - Peak water use early July to mid-late August
  - Physiological cut out (5 NAWF) around Aug. 15?
  - Reduce irrigation ~Aug. 25 if moisture is available, A&M data suggests little additional irrigation benefit esp. if some rain is received
- Consider medium-early maturity sorghum, ~4,500 lbs./A yield goal (6-8" irrigation)
  - "Schedule" flowering about September 1
  - Back up 60-62 days (from 9/1)—plant ~7/1

Hockley/Lubbock/Crosby/Floyd/Hale
Early Cotton, Late GS

- Result: cotton is up to 2 weeks past cutout and higher moisture requirement prior to sorghum flowering (~Sept. 1)
- Sorghum enters peak water demand about time of cotton cut out but before end of cotton irrigation
  - Sorghum maturity near October 5-10 with added potential of Sept. rainfall assisting yield
- Concentrate water to cotton early with 1-2 possible key waterings to sorghum prior to flowering (panicle differentiation, early boot)

Hockley/Lubbock/Crosby/Floyd/Hale
Early GS, Delayed Cotton

- Half pivot with medium-early sorghum, planted ~April 25 (watch soil temps. if cool)
  - Medium-early hybrid, flower by ~July 1—peak water use is declining as cotton water needs rise rapidly
  - Maturity about August 5th & harvest begins ~Aug. 20
- Cotton planting delayed to May 15
  - Physiological cut out ~Aug. 25th
  - Little overlap in peak irrigation needs
  - How strong is your water?

Split Pivot Sorghum—2 Plantings

Hockley/LBB/Crosby/Floyd/Hale, Medium Maturity

Timing	Planting Date	Flower-ing	Maturity	Maximum Water Use
Early	4/25-5/1	6/30-7/7	Aug. 5-15	6/20 to 7/15
Late	June 25	~Sept. 1	~Oct. 5-10	8/15 to 9/10

Parmer/Castro/Bailey/Lamb/Cochran

Early Cotton, Late G.S.

- This is harder to separate irrigation of the two crops than to the south and east
- Half pivot cotton, planted ~May 10
  - Plant cotton earlier if you safely can due to soil temp.
  - Peak water use early July to late August
  - Cut out (5 NAWF) about August 20-25th?
- Consider medium-early maturity sorghum, ~5,000 lbs./A yield goal (6-8 irrigation)
  - "Schedule" flowering by ~Sept. 1st
  - Back up 60-62 days (from 9/1)—plant by June 30th (the cut-off for a medium-early maturity)

Parmer/Castro/Bailey/Lamb/Cochran

Sorghum/Cotton

- Result: cotton is about 1 week past cutout before sorghum flowering (~Sept. 1)
- Cotton cutout about 0-7 days after peak sorghum water demand begins
  - Sorghum maturity near October 5-10 (this is close to early frosts) with potential of Sept. rainfall assisting yield
- Concentrate water to cotton early with 2 possible key waterings to sorghum prior to flowering (panicle differentiation, boot)

Parmer/Castro/Bailey/Lamb/Cochran
Early G.S. vs. May 10 Cotton

- More separation in water use than late sorghum?
- Half pivot with sorghum, planted ~May 1
  - Medium-early hybrid, flower by ~July 4
  - Peak sorghum water demand reduces after July 10
- Can't advocate delaying cotton
- Half pivot cotton, planted ~May 10
  - Peak water use early July to late August
  - Cut out (5 NAWF) about August 20-25th?

Parmer/Castro/Bailey/Lamb

Early Corn, Late Grain Sorghum

- Half pivot 108- to 115-day relative maturity corn, planted ~April 15
  - Compare heat unit requirements for specific hybrids
  - Peak water use ~V10 and especially from silking to past milk (through ~July 20); maintain good soil water to near ½ starch line
  - Don't cut the corn short…
- Consider medium maturity sorghum, ~5,000 lbs./A yield goal (6-8" of irrigation)
  - "Schedule" flowering by no later than Sept. 1
  - Back up 65-67 days (from 9/1)—plant by June 20-25th (the suggested cut-off for a medium-early maturity hybrid in this area is 6/25)

Parmer/Castro/Bailey/Lamb

Early Corn, Late Grain Sorghum

- Result: half circle of corn is essentially fully irrigated, but for grain sorghum
  - One watering to establish stand (late June)
  - Before corn is finished, a possible second water ~4-5 weeks after planting in advance of growing point differentiation (increase spikelet & seeds per spikelet)
- Grain sorghum maturity by ~Oct. 7 (this is close to early freezes, and about 2 weeks of the average first 32°F) with potential of Sept. rainfall assisting yield
  - Modest population for grain sorghum to better prepare the crop to wait until after corn irrigation is completed
  - To reduce fall temp & maturity concern, plant a medium-early about the same time

Parmer/Castro/Bailey/Lamb
Early Grain Sorghum, Early June Corn Silage

- Half pivot ~110-day relative maturity corn, planted ~June 1 (figure ~100 days to silage harvest, with irrigation needed to just before chopping, or 97 days)
  - Compare heat units requirements for specific hybrids
  - Peak water use begins ~V10 (~July 7; some irrigation at this time is likely stored for later use when ET demand is high and/or little rainfall received) and especially from before tassel/silking to past milk (through ~Sept. 7); irrigation terminates after starch begins to move down, but stop ~3 days sooner than ½ starch to enable field to dry to support harvest & hauling equipment, use available water remaining in the soil
- Consider medium-early maturity sorghum, ~4,000 lbs./A yield goal (3-5" of irrigation) if rainfall is typical (otherwise all water to corn starting in mid-June?)
  - Have to plant early, based on soil temperatures (avg. year, ~May 5?)
  - Modest population for grain sorghum to prepare for minimal irrigation in a dry year when water goes to corn
  - Project forward ~63 days from May 5 to half bloom (July 7)

Parmer/Castro/Bailey/Lamb
Early Grain Sorghum, Early June Corn Silage

- Result: half circle of silage corn is fully irrigated, but for grain sorghum…
  - One watering to establish stand (early May), a second to enhance growing point differentiation (early June, near when corn is planted); from this point forward until about July 1 corn water need is relatively low, but you may wish to store some water for later use in corn; so sorghum could be watered perhaps on two week intervals (mid-June; July 1; e.g. 2” more?) in early and late boot stage, but last watering may occur before flowering as corn moves into peak water use. If you are keeping up with irrigation requirements with corn, you might be able to water the sorghum a final time after flowering in early grain fill (mid-July)
  - Modest population for grain sorghum to better prepare the crop to wait until after corn irrigation is completed
  - GS physiological maturity another 35-40 days after flowering (Aug. 11-16).

Split Pivot Sorghum—2 Plantings

Parmer/Castro/Bailey/Lamb/Cochran, Medium-Early Maturity

Timing	Planting Date	Flower-ing	Maturity	Maximum Water Use
Early	May 1	July 1-5	Aug. 5-10	6/20 to 7/10
Late	June 25	Aug. 25	Oct. 1-5	8/10 to 9/1

Early Corn & Cotton

Moore-Sherman Counties (This is better…)

- Half pivot ~110-day relative maturity corn, planted ~April 15
  - Compare heat units requirements for specific hybrids
  - Peak water use begins ~V10 (June 1) and especially either side of silking (July 1) to past milk stage (and higher water requirement through ~July 25); maturity ~Aug. 5; maintain good soil water to near ½ starch line
  - Don't cut the corn short…
  - Can shorten corn maturity (100 day?), but give up some yield potential
- Cotton, planted May 10
  - Cut-out, 5 nodes above white flower (5 NAWF), ~Aug. 25
  - Elevated irrigation requirement begins in early July to ~Sept. 5 (about 10 days past cut-out)
  - Cotton experiences delay in desired irrigation 2-3 weeks due to major July 1-20 irrigation of corn (could shorten corn maturity)

Cotton & Late Corn

Moore-Sherman Counties (Not very good)

- Cotton, planted May 5-10
  - Cut-out, 5 nodes above white flower (5 NAWF), ~Aug. 25
  - Elevated irrigation requirement begins in early July to ~Sept. 5 (about 10 days past cut-out)
- Half pivot ~100-day relative maturity corn, planted ~June 20
  - Peak water use begins ~V10 (August 5) and especially either side of silking (August 25) to past milk (water requirement through ~Sept. 20); maturity ~Oct. 1-5
  - Can shorten corn maturity (90-95 day?, plant June 27), but give up some yield potential
  - Major overlap of peak irrigation requirements, especially if you don't further shorten corn maturity; **Early corn & cotton scenario better spreads water use** (the season is expanded by the difference of corn vs. cotton planting dates, 25 days)

Early Corn, Late Grain Sorghum

Moore-Sherman Counties—Good spread of water use

- Half pivot ~110-day relative maturity corn, planted ~April 15
  - Compare heat units requirements for specific hybrids
  - Peak water use begins ~V10 (June 1) and especially either side of silking (July 1) to past milk stage (and higher water requirement through ~July 25); maturity ~Aug. 5; maintain good soil water to near ½ starch line
- Consider medium-early maturity sorghum, ~4,500 lbs./A yield goal (~6" irrigation)
  - "Schedule" flowering by ~Aug. 25th
  - Back up 60-62 days (from 8/25)—plant by June 25th (the cut-off for a medium-early maturity in the northern Texas Panhandle)
  - By the time the growing point starts differentiating at 30-35 days after planting and a timely irrigation is desired, the corn is essentially done with irrigation
  - Remaining irrigation resources can be dedicated to sorghum, including highest water requirements in boot stage

Early Corn, Late Grain Sorghum

Moore-Sherman Counties—Good Spread of Water Use

- Result: half circle of corn is essentially fully irrigated, but for grain sorghum
  - One watering to establish stand (late June)
  - By about the time corn is finished, only then is sorghum coming in to significant water requirements (starting 30-40 days after planting), leading up to boot stage
- Grain sorghum maturity by ~Oct. 5 (this is close to early freezes) with potential of late August & September rainfall assisting yield
  - Modest population for grain sorghum to better prepare the crop to wait until after corn irrigation is completed
- **This scenario works well.** Could tweak planting dates (later corn, earlier sorghum) or corn hybrid longer and/or sorghum hybrid up to a medium (plant June 20) if desired.

Split Pivot Corn—2 Planting Dates

Northern Texas Panhandle

Early Planting, 110-day Maturity/Late Planting 100-Day Maturity

Planting Timing	Planting Date	Silking	Maturity	Maximum Water Use
Early	April 15	~July 1	~Aug. 5	6/15 to 7/15
Late	June 20	Aug. 25	Oct. 1-5	8/10 to 9/10

- Critical irrigation for corn is at its peak requirement from about 2 weeks before pollen shed and silking to 2 weeks after.
- This scenario does a good job of minimizing overlap of peak water requirements though both crops require lower irrigation levels late July-early August.

Sunflower Irrig. on Split Pivot

- Farmer consideration: splitting pivot with different crops requiring water at different times—or very limited but timely irrigation to the ‘complementary crop, e.g. sunflower or grain sorghum, to reduce total irrigated acres at one time
- Which crop has main emphasis?
  - Cotton production, give it all you can?
  - Corn—you signed a pounds contract?
  - Sunflower—widest range of planting dates & flexibility in a summer annual

Peanut/Sorghum Scenario

Gaines/Yoakum/Terry Counties

- Half pivot with Runner or Virginia peanuts and grain sorghum
  - You can not diminish water to peanuts!
  - Peak peanut water use early July to early/mid September
  - Recommended crop rotation min. 1 year peanut in 3
  - Preferable to let each of sorghum and peanut rotate with cotton but not each other
  - This might represent ‘delayed planting’ (the last peanuts you plant, perhaps May 10)
  - Spanish and Valencia peanut would enable you to delay planting further if desired which could give you another 10 days in early July to water grain sorghum
- Consider medium-early maturity sorghum, 4,000 lbs./A yield goal (8” irrigation with good deep soil moisture?), and planting late April if soil temps are up
  - Flower by end of June, peak water use decline early July—if you water at all (choose lower seed drop)
  - Some sorghum water sharing with peanut needed

Peanut/Sorghum (Gaines, Terry Cos.)

- Result: sorghum is at or past flowering (~June 30) before peanut enters peak water demand; peak water demand for still about another two weeks
- Concentrate water to peanut after July 1 with only 1 possible additional watering to sorghum, esp. if soil water for peanut is already banked
  - Sorghum maturity by ~August 5-10

Peanut/Sorghum Scenario

- Dilemma for early sorghum and runner peanut:

- You are watering the sorghum at the possible expense of peanut unless rainfall is good
- Hold water off sorghum (other than establishment) until you have profile moisture for peanut (irrigation goes to peanut ground or rainfall received to take care of this)
  - At no time would you want to re-direct moisture to sorghum if profile moisture in peanut needs to be replaced.

Possible Early Peanut/Late Sorghum

- ~May 1 Valencia peanut maturing in 127-130 days to digging
  - Must dig to avoid loss of large pods
  - Most remaining irrigation could go to sorghum by about Sept. 1
  - Valencia emerges better than other market types under cool conditions so you could likely push the planting date forward 7-10 days, but then the bulk of the crop matures in more heat (-)
- Consider <u>medium-early</u> maturity sorghum
  - “Schedule” flowering about September 10 (lower South Plains) or Sept. 5 in western or central South Plains
  - Back up 60-62 days (from 9/10 or 9/5)—plant by end of first week of July in Gaines Co., (7/10 cut-off for medium-early hybrid); in Terry-Yoakum Cos. plant by July 4 (7/5 cut-off for medium-early hybrid)

Other Peanut Options

- Sunflower can better spread the water use by planting two weeks sooner or up to 10 days later than grain sorghum
- To optimize irrigation use in peanuts, wheat is the best rotation, and the stubble should be key for protection of seeding cotton or peanut the next year. The grass rotation is excellent for both.
  - *This has been common in Gaines Co. for years*

Sunflower Irrig. on Split Pivot

- Two-crop/two planting date/split pivot scenarios
  - Early cotton, late June/early July sunflower
  - Early sunflower, delayed cotton
  - Corn & Sunflower
  - Sunflower offers more flexibility than grain sorghum
- The goal is to minimize or even eliminate the overlap of peak irrigation
  - Much if not most of the time you are only watering a half circle
- Check with Extension (Trostle) for an explanation of possible scenarios for your farm

Central/Lower TX South Plains
Early Cotton, Late Sunflower

- Half pivot with cotton, planted ~May 5
  - Peak water use early July to mid-August
  - Physiological cut out (5 NAWF) by ~August 10-15?
  - Significantly reduce irrigation ~Aug. 25 if soil moisture is available, Texas AgriLife data suggests much reduced irrigation benefit esp. if modest rain is received
- Sunflower @ 1,500 lbs./A yield goal,
  - "Schedule" flowering about September 10-15
  - Back up 55-60 days (from 9/10)—plant ~July 10

Central/Lower TX South Plains
Early Cotton, Late Sunflower

- Result: cotton is now at reduced moisture requirement and 3 weeks or more past cutout prior to sunflower bloom (~Sept. 10)
- Sunflower enters peak water demand 1-2 weeks after cotton cut out when cotton irrigation is significantly reduced
  - Sunflower maturity near October 15 (two weeks before average first freeze) with added potential of Sept. rainfall assisting yield
- Concentrate water to cotton early with 1-2 possible key waterings to sunflower prior to flowering (esp. buds ~0.5-1.0”)

Central/Lower TX South Plains
Early Sunflower, Delayed Cotton

- Half pivot with sunflower, planted ~April 15
  - Flower in ~60 days by June 15—peak water need lasts about two more weeks to ~July 1 (petal drop)
  - Maturity about July 20 & harvest begins in early August
  - This crop is essentially finished before cotton requires peak water in early July
- Cotton planting delayed to May 15th (or the last irrigated cotton you plant)
  - Physiological cut out ~Aug. 20-25th
  - Little overlap in peak irrigation needs
  - How strong is your water?

Grain Sorghum & Sunflower

- Split pivot scenarios with sunflower and grain sorghum are highly flexible as sunflower has a very wide range of planting dates and is less affected by cool fall weather
  - Suggested sunflower planting, lower South Plains, April 10-July 15
  - Northwest South Plains, April 20-July 10

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- This scenario does a good job of minimizing overlap of peak water requirements though both crops require lower irrigation levels late July-early August.

More Flexibility, Less Risk if Main Crop is Planted First

- If you plant your "companion" crop early, you could regret watering it too much if the year turns out dry
- If companion crop is planted later, you are in the driver's seat on your decision making—you can keep the water on the primary crop 100% if needed.
  - If sorghum, a seeding rate that can get by if minimally watered

Factors in Decision Making

- The role or 'attractiveness' of certain crop insurance products
- Ag loans & financing—Net return dollars are the bottom line, but sometimes the loan process may be tilted toward cotton and other high dollar/high cost crops

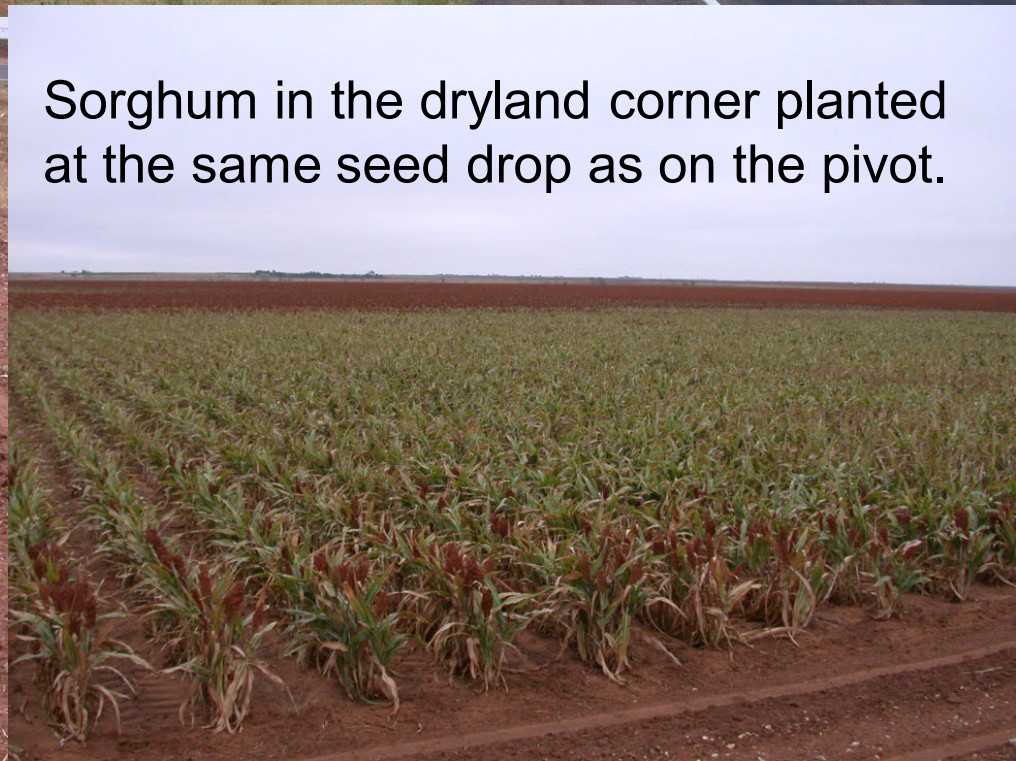
Moving Forward—Less Water

- Technology
- Superior hybrids and varieties—can you slightly reduce maturity and preserve yield?
- Irrigation timing
- NOT irrigating and using water for higher value situation

Sorghum Mistakes

Below: Sorghum on the edge of the field demonstrates the value of more area—and more moisture per plant achieves yield.

Sorghum planted at too high seeding rate on the right, has not headed out.



Sorghum in the dryland corner planted at the same seed drop as on the pivot.

http://lubbock.tamu.edu/programs/disciplines/irrigation-water/