Chapter

4

Rice Stand Establishment

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Stand establishment is the first step to a successful rice crop. Factors that influence stand establishment include cultivar, seedling vigor, seeding method, seeding date, soil properties, seeding rate, seed treatments, environment and geographic location. Later management decisions are affected by stand density and uniformity. The goal of stand establishment is to obtain a uniform stand of healthy rice seedlings. Uniformity of emergence is important for accuracy of the DD50 program, pesticide application timing, drain timing for straighthead prevention, milling yield, irrigation termination, yield and harvest.

Seeding Rate

Seeding rates vary depending on cultivar, due to differences in seed size and/or weight. The RICESEED program is available to assist growers in determining the correct seeding rate for different seeding dates and methods, soils, seedbed conditions and cultivars. This program is available at local county Extension offices or may be accessed online from the Cooperative Extension Service web site at http://riceseed.uaex.edu/.

Table 4-1 provides a list of seed weights and seeding rates needed to obtain the different number of seeds per square foot for commonly grown cultivars. Under most conditions where rice is drill-seeded, 30 seeds per square foot are adequate to obtain the optimum stand density of 10 to 20 plants per square foot for conventional varieties (or 6 to 13 seedlings per 7.5-inch drill row foot). For hybrids, 10 to 15 seeds per square foot is needed to obtain optimum stand density of 6 to 10 plants per square foot (or 4 to 6 seedlings per 7.5-inch drill row foot). Stand densities above the optimum density increase disease, plant height and lodging.

Table 4-1. Seeding rates for different seeds per square foot based on seed weight.

Cultivar	Seed Weight†	Seeds/lb	Number of Seed/Sq. Ft.							
			10	12	14	25	30	35	40	45
			Seeding Rate, lbs/A							
CL111	23.09	19,662	--	--	--	55	66	78	89	100
CL151	24.13	18,813	--	--	--	58	69	81	93	104
CL153	24.01	18,909	--	--	--	58	69	81	92	104
CL163	25.11	18,079	--	--	--	60	72	84	96	108
CL172	23.31	19,481	--	--	--	56	67	78	89	101
CL272	25.32	17,932	--	--	--	61	73	85	97	109
Diamond	24.58	18,470	--	--	--	59	71	83	94	106
Jazzman-2	22.37	20,295	--	--	--	54	64	75	86	97
Jupiter	26.52	17,119	--	--	--	64	76	89	102	115
LaKast	25.46	17,832	--	--	--	61	73	85	98	110
Mermentau	21.58	21,038	--	--	--	--	--	--	--	--

† Grams per 1,000 grains or milligrams per seed.

(Continued)

Table 4-1. Seeding rates for different seeds per square foot based on seed weight. (cont.)

Cultivar	Seed Weight†	Seeds/lb	Number of Seed/Sq. Ft.							
			10	12	14	25	30	35	40	45
			Seeding Rate, lbs/A							
RT 7311 CL	23.54	19,286	23	27	32	--	--	--	--	--
RT CL XL729	22.82	19,895	22	26	31	--	--	--	--	--
RT CL XL745	23.46	19,352	23	27	32	--	--	--	--	--
RT XL XP756	23.49	19,327	23	27	32	--	--	--	--	--
RT Gemini 214 CL	21.89	20,740	21	25	29	--	--	--	--	--
RT XL723	22.84	19,877	22	26	31	--	--	--	--	--
RT XL753	23.89	19,004	23	28	32	--	--	--	--	--
RT XP754	23.49	19,327	23	27	32	--	--	--	--	--
RT XL760	22.88	19,843	22	26	31	--	--	--	--	--
Roy J	22.74	19,965	--	--	--	55	65	76	87	98
Taggart	25.90	17,529	--	--	--	62	75	87	99	112
Thad	25.29	17,952	--	--	--	61	73	85	97	109
Titan	27.24	16,667	--	--	--	65	78	91	105	118
Wells	25.98	17,475	--	--	--	62	75	87	100	112

† Grams per 1,000 grains or milligrams per seed.

Below optimum stand densities are capable of producing high yields provided that plant distribution is uniform, weeds are controlled and additional nitrogen is applied to increase tillering. Most cultivars compensate for low seedling population by increasing tillering and the number of grains per panicle. Seeding rates should be increased by 10 percent for no-till seedbeds and early seeding; 20 percent for broadcast seeding, poor seedbed condition or clay soils; and 30 percent for water-seeding. In fields with a history of severe infestations of grape colaspis larvae (lespedeza worm) or fields with chronic infestations, seeding rates should be increased to help compensate or use a recommended seed treatment insecticide.

The recommended seeding rate of 30 seeds per square foot for conventional varieties is a reduction from previous recommendations. Recent studies suggest that seeding rates may be reduced by 25 percent from older recommendations and still obtain optimum yields (Table 4-2). Seeding rates as low as 67.5 pounds per acre (1.5 bushels/acre) result in grain yields and milling yields similar to those obtained with higher seeding rates. Reduced seeding rates lower the potential for sheath blight and the amount of fungicide needed on varieties such as CL151 and CL161 by reducing the risk of excessive plant populations.

Table 4-2. Influence of seeding rate on grain yields of four rice varieties averaged across five locations in 2015 and 2016.

Seed Rate	Grain Yield			
	CL172	Diamond	LaKast	Roy J
lbs/acre	bu/A			
20	142	165	159	153
40	154	175	173	164
60	162	177	175	167
80	160	183	175	169
100	162	183	181	170

Source: Hardke unpublished data.

Management Key

Use the RICESEED program to calculate optimum seeding rates for specific fields to avoid excessive plant populations. Proper calibration of drills is an important step in obtaining optimum seeding rates.

Recommended drill row widths for rice are between 4 and 10 inches. Limited research data suggests that under most conditions row widths between 4 and 10 inches can produce similar yields. However, as row width increases, the importance of uniform stand density also increases. Several studies show a trend for higher grain yields with narrower drill row spacing, thus a drill row spacing of 6 to 8 inches is ideal (Table 4-3). However, other practical considerations should be made regarding row spacing. For example, wider row spacing is desirable on clay soils where clods may become lodged between the coulters on narrow row drills. Seeding rates do not need to be adjusted for differences in drill row widths in the 4- to 10-inch range. Table 4-4 provides the number of seed per row foot for 6- to 10-inch drill row spacing and seeding rates for drill calibration.

Table 4-3. **Influence of row spacing on grain yields of three rice varieties at three locations during 2004.**

Cultivar	Grain Yield					
	RREC†		SEREC		Lake Hogue	
	7"	10"	7"	10"	7"	10"
	bu/A					
Banks	190	170	173	162	169	160
Cybonnet	169	150	128	125	175	166
Francis	206	180	160	154	213	193

† RREC = Rice Research and Extension Center, Stuttgart; SEREC = Southeast Research and Extension Center, Rohwer; and Lake Hogue = Poinsett County.

Source: Frizzell et al., 2006. p. 270-275. *B.R. Wells Rice Res. Studies 2005.* Ark. Agr. Exp. Sta. Res. Ser. 540.

Table 4-4. **Seed spacing for calibration drills.**

Seeds/ Sq. Ft.	Seed Per Row Foot for Different Row Spacings				
	6"	7"	8"	9"	10"
20	10	12	13	15	17
30	15	17	20	23	25
40	20	23	27	30	33
50	25	29	33	38	42
60	30	35	40	45	50
70	35	41	47	53	58
80	40	45	54	60	68

Seed Treatments

Seed treatments are often considered "insurance" and include fungicides, fertilizers, growth regulators and insecticides (when available). Although most seed treatments are generally inexpensive, they are not always recommended. The decision to use seed treatments should be based on planting date, tillage/planting method, cultivar, soil texture, disease problems and field history. Most seed treatments are for use only by commercial seed treaters, although a few are available as planter box treatments.

Fungicide seed treatments (Table 4-5) are generally recommended for early planting, clay soils, reduced tillage (especially no-till) or on fields that have a

Table 4-5. **Fungicide seed treatment products and disease control spectrum for rice†.**

Disease	Fungicide	Active Ingredient	FRAC Code	Rate/cwt Seed	Comments
Pythium diseases	Allegiance FL	metalaxyl	4	0.75 - 1.5 fl oz	Apply with commercial seed-treating equipment.
	Apron XL	mefenoxam	4	0.32 - 0.64 fl oz	Apply with commercial seed-treating equipment. Use higher rates for early planting or other severe disease situations.
Rhizoctonia seedling diseases, general seed rots	RTU-Vitavax-Thiram	carboxin + thiram	7 + M3	6.8 fl oz	Apply with commercial seed-treating equipment or use as a pour-on hopper-box treatment.
	Vitavax 200	carboxin + thiram	7 + M3	4 fl oz	Apply with commercial seed-treating equipment.
	Maxim 4 FS	fludioxonil	12	0.08 - 0.16 fl oz	Apply with commercial seed-treating equipment. Use higher rates for severe disease situations.

† Specific product labels should be consulted for use rates and precautions. Some products may be mixed to broaden the spectrum of seed protection. The highest labeled rates should be used for very early planting or other situations where seed germination and emergence may be delayed by environmental conditions. The effectiveness of most products is relatively short-lived under field conditions, providing about 2 to 3 weeks of seed protection at most.

(Table continued)

Table 4-5. **Fungicide seed treatment products and disease control spectrum for rice†. (cont.)**

Disease	Fungicide	Active Ingredient	FRAC Code	Rate/cwt Seed	Comments
Pythium, Rhizoctonia, general seed rots	Vitavax 200 + Allegiance FL	carboxin + thiram + metalaxyl	7 + M3 + 4	4 fl oz + 0.375 fl oz	Apply with commercial seed-treating equipment.
	Apron XL LS + Maxim 4 FS	mefenoxam + fludioxonil	4 + 12	0.32 - 0.64 fl oz + 0.08 - 0.16 fl oz	Apply with commercial seed-treating equipment. Use higher rates for early planting or severe disease situations.
	Dynasty	azoxystrobin	11	0.153 - 1.53 fl oz	Commercial seed treaters only. Usually sold with Apron XL and Maxim on rice to improve seedling disease control. To reduce seedborne blast, data suggests rates of Dynasty above 0.75 fl oz per cwt. The use of a seed treatment fungicide to minimize seedborne blast does not mean complete control of the disease later in the season and the field should still be scouted for blast disease and managed with deeper flood and foliar fungicides. CruiserMaxx Rice may be used for a wider range of ai's.
	Trilex 2000	trifloxystrobin + metalaxyl	11 + 4	1 - 2 oz	See label.
	EverGol Energy	prothioconazole + penflufen + metalaxyl	3 + 7 + 4	1 oz	Commercial seed treatment only.
	CruiserMaxx Rice	thiamethoxam + azoxystrobin + fludioxonil + mefenoxam	--- + 11 + 12 + 4	7 fl oz	

† Specific product labels should be consulted for use rates and precautions. Some products may be mixed to broaden the spectrum of seed protection. The highest labeled rates should be used for very early planting or other situations where seed germination and emergence may be delayed by environmental conditions. The effectiveness of most products is relatively short-lived under field conditions, providing about 2 to 3 weeks of seed protection at most.

history of poor seedling emergence and seedling disease. Under the right conditions, fungicide seed treatments can result in a 10 to 20 percent stand increase over untreated seed. However, there may not be a yield increase since rice can compensate for thin, uniform stands by increased tillering. Fungicide seed treatments do not speed the rate of emergence like growth regulator treatments, nor do they control kernel or false smut. The use of fungicide-treated seed also does not guarantee that seedling disease will not impact stand density, especially three to four weeks after planting. Most fungicide seed treatments are specific for certain groups of fungi that may cause stand loss. Refer to MP154, *Plant Disease Control Products Handbook* (www.uaex.edu/publications/mp-154.aspx), for the latest information on fungicide seed treatments.

Recommended growth regulator seed treatments are currently limited to gibberellic acid (or GA3) products which include Release® and GibGro®. Seed treatments containing GA3 do not prevent seedling disease and are not recommended for water-seeded rice. The use of GA3 is highly recommended for semi-dwarf rice cultivars, cultivars having poor seedling vigor, on clay soils, reduced tillage situations and early seeding dates. Use of GA3 treated seed may increase uniformity of emergence, minimize the effects of deep seed placement and speed up germination and emergence and has been well researched since 1988. Growth regulator seed treatments may be used in combination with other types of seed treatments, but always check the product labels for mixing instructions and precautions prior to use. When treated with GA3, rice seedlings may appear tall and yellow shortly after emergence. Seedlings normally outgrow these symptoms within one or two weeks after emergence. If a stand failure occurs and a residual herbicide has been used, check the herbicide and GA3 product labels for replanting restrictions/recommendations with GA3-treated seed. For example, the Prowl herbicide label recommends that GA3-treated seed not be used to replant fields that have been treated with Prowl.

Management Key

Use gibberellic acid (GA3) seed treatments when the following conditions exist:

- Semi-dwarf rice cultivars
- Cultivars with poor seedling vigor
- Rice planted on clay soils
- Reduced tillage rice production
- Early-planted rice

The use of fertilizer (i.e., Zn) seed treatments is addressed in later chapters that concern fertilization practices. Check with your local county Extension office for the most recent recommendations for use of new seed treatment products.

Insecticide seed treatments (Table 4-6) are recommended for fields with a history of grape colaspis or rice water weevil or soil types most commonly associated with these insects (silt loam for grape colaspis). Even in the absence of insect pressure, insecticide seed treatments have generally been observed to increase seedling emergence and early season vigor and can sometimes increase yield. Refer to MP144, *Insecticide Recommendations for Arkansas* (www.uaex.edu/publications/pdf/mp144/mp144.pdf) for the latest information on insecticide seed treatments.

Seeding Date and Soil Temperatures

The daily maximum, mean and minimum soil temperatures measured at a 4-inch depth at three University of Arkansas Division of Agriculture Experiment Stations are provided in Table 4-7. Rice should be seeded in a seedbed that is conducive to good seed-to-soil contact when the daily average soil

Table 4-6. Insecticide seed treatment products and insect control spectrum for rice†.

Insecticide	Active Ingredient	Rate/cwt seed	Comments
Dermacor X-100	chlorantraniliprole	1.5 - 6.0 fl oz (see label)	Control of rice water weevil larvae. Suppression only of grape colaspis larvae. See label.
NipsIt INSIDE 5 FS	clothianidin	1.92 fl oz	Control of rice water weevil and grape colaspis larvae. Use only on dry-seeded rice. DO NOT spray crop with another neonicotinoids insecticide after using NipsIt INSIDE. DO NOT use near fish or crawfish farms.
CruiserMaxx Rice	thiamethoxam	7.0 fl oz	Control of rice water weevil and grape colaspis larvae. DO NOT plant or sow Cruiser-treated seed by aerial application. Cruiser is NOT labeled for use in water-seeded rice. DO NOT use treated fields for aquaculture of edible fish or crustaceans. DO NOT exceed 120 lbs seed per acre.
This information was current as of August 1, 2018, and applies only to Arkansas and may not be appropriate for other states or locations. The listing of any product in this publication does not imply endorsement of that product or discrimination against any other product by the University of Arkansas Division of Agriculture. *Every effort was made to ensure accuracy, but the user of any crop protection product must read and follow the most current label on the product -* ***The Label is the Law.*** For further assistance, contact the local Cooperative Extension Service office.			

† Specific product labels should be consulted for use rates and precautions. Some products may be mixed to broaden the spectrum of seed protection. The highest labeled rates should be used for very early planting or other situations where seed germination and emergence may be delayed by environmental conditions. The effectiveness of most products is relatively short-lived under field conditions, providing about 2 to 3 weeks of seed protection at most.

temperature at the 4-inch depth is above 60°F. Soil temperature measurements taken from Rohwer, Stuttgart and Keiser indicate that the average soil temperature at a 4-inch depth reaches 60°F about April 8, 11 and 16, respectively. Assuming adequate moisture for germination, rice emergence should occur within approximately 8, 14 and 20 days after seeding when 4-inch soil temperatures average 70°, 65° and 60°F, respectively (based on data from seeding date studies).

Management Key

Seeding when the average soil temperature at the 4-inch depth is above 60°F enhances uniform emergence and reduction in potential for seedling diseases.

When rice is planted early, more time is required for germination, emergence and development to the 5-leaf stage. For example, in the 2015 Rice DD50 Research and Development Studies, 20 rice cultivars seeded on April 3 required an average of 11 days from seeding to emergence and an additional 36 days to reach the 5-leaf stage for flooding (Table 4-8). In comparison, rice planted June 3 only required 7 days for emergence and an additional 16 days to reach the 5-leaf growth stage. The extended time between planting and flooding at the 5-leaf growth stage may increase production costs associated with flushing and weed control.

Specific beginning and ending seeding dates were once suggested, by cultivar, for the geographic regions of south, central and north Arkansas. However, seeding date studies conducted during the past 10 years suggest these cultivar selection guidelines were not appropriate for late seeding. Depending on environmental conditions, cultivars with longer growing seasons may produce higher yields than very short-season cultivars when seeded late. Cultivar selection decisions for late-planted rice should be made based on cultivar performance in

Table 4-7. **Minimum, maximum and mean undisturbed soil temperatures at a 4-inch depth for selected dates at three locations in Arkansas.**

Location	Rohwer, SEREC†			Stuttgart, RREC‡			Keiser, NEREC†		
Latitude	33.45 N			34.49 N			35.68 N		
Soil Texture	Perry Clay			DeWitt Silt Loam			Sharkey Clay		
Daily Temp.	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Date	4 inch undisturbed soil temperature, °F								
March 15	50	57	54	46	56	51	44	54	49
April 1	53	52	57	49	62	55	46	55	51
April 15	60	69	64	56	69	63	55	64	59
May 1	63	74	69	59	71	65	58	69	64
May 15	69	75	72	66	79	72	64	81	73
May 31	69	78	74	69	78	73	70	74	72

†Temperatures are the six-year average from 1990 to 1995.
‡Temperatures are the nine-year average from 1990 to 1998.

Table 4-8. **General seeding, seedling emergence, and flooding date information for the DD50 seeding date study in 2015 at the Rice Research and Extension Center near Stuttgart, AR.**

	Planting Date					
Parameter	March 21	April 5	April 18	May 2	May 19	June 15
Emergence date	April 2	April 16	May 3	May 15	May 31	June 27
Flood date	May 11	May 16	June 2	June 13	June 29	July 19
Days from seeding to emergence	12	11	15	13	12	12
Days from seeding to flooding	51	41	45	42	41	34
Days from emergence to flooding	39	30	30	29	29	22

Source: Castaneda et al., 2017. *B.R. Wells Rice Res. Studies 2018.* Ark. Agr. Exp. Sta. Res. Ser.

seeding date studies. Results from annual seeding date studies are published each year in *Rice Information Sheets* that summarize cultivar yield performance among different locations and seeding dates.

Management Key

Rice planted within the early window (Table 4-10, Table 4-10) performs better than rice planted in later windows; however, there may be increased stand establishment risks in some fields planted at the earliest dates due to cool, wet soil conditions.

Table 4-9. Yields for studies conducted in Stuttgart comparing seed treatments across multiple planting dates.

Planting Date	Seed Treatment			
	Fungicide Only	Cruiser-Maxx	NipsIt INSIDE	Dermacor X-100
	Bu/A			
Early April	170	190	189	185
Mid-April	155	162	159	163
Early May	172	175	171	172
Mid-May	161	172	163	164
Early June	156	165	163	163
Mid-June	167	168	172	173

† CruiserMaxx, NipsIt INSIDE and Dermacor X-100 all received the same fungicides as the fungicide-only treatment.

Source: Lorenz and Hardke, unpublished data.

Insecticide seed treatment studies were conducted at the Rice Research and Extension Center (RREC) to evaluate the benefits of insecticide seed treatments across a range of planting dates (Table 4-9). Results suggest that insecticide seed treatments provide a yield benefit to growers across the range of planting dates common in Arkansas. Specific growing season conditions and insect pressure will influence results in a given season.

Seeding date studies conducted at the Rice Research and Extension Center (RREC), located near Stuttgart, Arkansas, were analyzed to predict the optimum seeding dates for central Arkansas (Table 4-10). The optimum seeding date range was defined as "seeding dates producing 95 to 100 percent yield potential." Results suggest that the optimum time period for drill-seeded rice in most years, based solely on grain yields, in central Arkansas is March 23 to May 20 (Table 4-10). Growers must be cautioned that "risk factors" increase for very early seeding dates. These risk factors include, but are not limited to, stand reduction or failure, seedling stress and increased production costs. Management may overcome many of these risks and must be weighed against the potential benefits of early planting. For this reason, it is recommended that the optimum time for seeding rice be based on grain yield potential and management factors. Therefore, the estimated optimum seeding dates listed in Table 4-11, based on yield and management, are suggested for grower use. Relative yield, as affected by seeding date, is presented in Table 4-10 and should be used to make decisions concerning the profitability of late-seeded rice compared to alternate crops.

Table 4-10. Predicted relative yield potential for drill-seeded rice in central Arkansas by seeding date.

Relative Yield Potential	Actual Yield Potential†	Seeding Date Range††	
%	bu/A	Begin	Cut-off
95.0-100.0‡	166-175	March 23	May 20
90.0-94.9	158-165	May 21	June 1
85.0-89.9	149-157	June 2	June 11
80.0-84.9	140-148	June 11	June 18
70.0-79.9	123-139	June 19	June 30

† Actual yield potential is based on a 100% relative grain yield of 175 bu/A at 12% moisture.

‡ Considered optimum seeding date based on potential grain yield and does not consider other management risks or milling yield potential.

†† Seeding date and relative yield potential are based on a quadratic relationship described by the equation % relative yield = $22.4 + 1.33x - 0.006x^2$ (where x = Julian date or day number of year, where April 20 = day 110).

Source: Slaton et al. 1991.

Table 4-11. General suggested optimum and recommended seeding dates for south, central and north Arkansas geographic areas based on yield potential and management considerations.

Geographic Region	Optimum†		Recommended Absolute‡	
	Begin	Cut-off	Begin	Cut-off
South	March 28	May 20	March 20	June 15
Central	April 1	May 15	March 25	June 10
North	April 10	May 10	April 1	June 5

† Seeding during the optimum time frame does not guarantee high yields or suggest that crop failure cannot occur when rice is seeded during these times.

‡ Recommended absolute does NOT mean that a successful rice crop cannot be grown if seeded outside of the dates listed. Success may be evaluated and/or interpreted using various parameters (i.e., cropping systems, management, cash flow, field reclamation, etc.) and may differ among specific cultivars.

Specific cultivar recommendations for late-seeded rice (June seeding dates) should be made on yield performance in seeding date studies, seed availability and planned seeding date. Of the available cultivars that have been tested in seeding date studies, Diamond, Jupiter, Titan and Wells are recommended for late planting. The hybrids developed by RiceTec, Inc. also perform well when planted late. Contact your local county Extension agent or refer to the Cooperative Extension Service web page for the latest planting date study yield information.

If the estimated date of 50 percent heading is after September 10 to 20, rice should not be planted since cool temperatures and possible frost may significantly reduce grain yield and quality. The DD50 program, available at the county Extension office or online at https://dd50.uaex.edu/, can be used to estimate heading dates for different cultivars. A range of dates for the occurrence of freezing temperatures in several geographic regions is provided in Table 4-12. Table 4-13 lists the predicted dates for CL153, Diamond and RT XP753, emerged on April 1, May 1 and June 1, to reach 50 percent heading in northeast (Clay County), central (Prairie County) and southeast (Chicot County) Arkansas. Finally, seeding date may influence certain diseases. Therefore, disease susceptibility must be considered when selecting a cultivar for early or late seeding. For example, earlier seeded rice is less likely to suffer severe damage from blast, smuts or bacterial panicle blight diseases but may have increased sheath blight problems compared to late-seeded rice.

Tillage and Post-Seeding Management

In Arkansas, the most common method of seeding rice is direct, dry seeding using a drill, airplane or airflow truck. Broadcast seeding is most commonly used on clay soils or in wet years when speed of planting is important. Dry, broadcast-seeded rice is covered either by a final tillage operation or by flushing after levees are pulled. Dry seeding is practiced on about 94 percent of the Arkansas rice acreage. The remaining 6 percent is water-seeded rice.

The use of reduced tillage practices has increased in rice production over the past ten years. Reduced

Table 4-12. Expected freeze dates for several eastern Arkansas locations.

City - County	Last Date in Spring with Temp. < 32°F†	First Date in Fall with Temp < 32°F†
Corning - Clay‡	April 4 to April 17	October 11 to October 25
Augusta - Woodruff††	March 29 to April 14	October 19 to November 2
Pine Bluff - Jefferson‡	March 20 to April 3	October 26 to November 9
Crossett - Ashley‡	April 4 to April 16	October 22 to November 2

† Freeze dates were obtained from county soil surveys and are the dates for which temperatures below 32°F first or last occur in one to five out of every ten years.
‡ Time period from 1951 to 1974.
†† Time period from 1951 to 1990.

Table 4-13. Expected 50% heading dates of CL153, Diamond and RT XP753 rice cultivars in southeast, central and northeast Arkansas for three emergence dates.

		Predicted 50% Heading Date†		
Emergence Date	Cultivar	Chicot County	Prairie County	Clay County
April 1	CL153	July 6	July 15	July 19
	Diamond	July 6	July 16	July 20
	RT XP753	July 1	July 10	July 15
May 1	CL153	July 16	July 23	July 23
	Diamond	July 16	July 23	July 23
	RT XP753	July 11	July 18	July 18
June 1	CL153	August 8	August 13	August 13
	Diamond	August 9	August 14	August 14
	RT XP753	August 4	August 8	August 8

†Predictions are for 50% heading using the 30-year weather temperature means. Add 35 days for estimates of 20% grain moisture.

tillage practices may be more appropriately divided into two groups including stale seedbed (soil is tilled and floated in fall or late winter) or true no-till (rice is planted in previous crop stubble). A level seedbed free of potholes and excessive stubble or trash is desired, regardless of tillage and seeding method. A land plane or float is commonly used two times in conventional tillage operations to help eliminate small depressions and high spots in fields. Tillage practices implemented in conventional tilled fields may include a disk, field cultivator, roller and a land plane or float.

Management Key

Establish a smooth field surface that provides a good seedbed, drainage and water control.

Tillage requirements differ among soil textures, previous crop and field condition after previous crop harvest. An excellent seedbed can be prepared on most sandy and silt loam soils with minimal tillage. Tillage on clay soils usually produces a cloddy seedbed that does not provide good seed-to-soil contact. Stale seedbed or no-till seeding usually improves seed-to-soil contact on clay soils. The use of a roller before or behind the drill often improves seed-to-soil contact and speeds emergence by compacting the soil. This is best illustrated by field observations seen each spring where rice first emerges in truck or tractor tire tracks. Research has shown that rolling behind drilled or broadcast-seeded rice can increase stand population (Table 4-14).

Table 4-14. Influence of rolling behind drill on final rice stand density on a Perry clay soil at the Southeast Branch Experiment Station, located near Rohwer, Arkansas.

Cultivar	Rolled†	Non-rolled†
	Seedlings/ft^2	
Bond	21	17
Lemont	21	16

† Seeding rate was 40 seed/ft^2 for each cultivar.

Generally, levees should be surveyed on 0.2 foot vertical intervals for proper water management. However, if a field is very flat and a single levee may contain more than 10 acres, levees should be marked on 0.1 foot intervals to facilitate flooding. Rice fields having considerable slope may require that levees be surveyed on 0.3 to 0.4 foot intervals to reduce the number of levees. Levees may be surveyed and marked before or after seeding. Surveying levees in minimum tillage and no-till systems during the fall, winter or early spring spreads out labor requirements that are typically encountered following planting operations. Levee formation may be completed with two to eight passes with a levee disk, depending on soil texture. A couple of hours for drying may be required between levee disk passes for clay soils. On clay soils using reduced tillage practices, a levee base may be pulled after surveying in fall, winter or early spring to minimize water seepage losses.

Levee “squeezers” have been widely adopted and provide some benefits over a conventional levee disk. Barrow ditches are typically not as deep, resulting in better growth and production of rice in the barrow ditches. Levees are typically seeded on the final one to two passes with a levee disk that has a broadcast seeder. A levee gate should be installed in each levee by pushing out a section of soil in the direction of water flow. The ability to manage water is essential for all rice crop management practices. Construction of levees and gate installation should be performed as soon after planting as possible to enable flushing or flooding and to aid in stand establishment or pest management practices. Additional information on irrigation of rice will be covered in Chapter 10, Water Management.

Management Key

An accurate levee survey is critical to being able to manage water effectively and efficiently later in the season.

Rice harvest must be considered in planting and cultivar selection to ensure that rice matures over a range of dates and allows for timely harvest. Rice that is planted during a three-week period in April may mature and be ready for harvest at the same time. Rice can be planted much quicker than it can be harvested. Therefore, spread out planting dates to help spread out harvest.

Table 4-15 lists the estimated dates of 20 percent grain moisture for five cultivars that differ in maturity.

Table 4-15. **Influence of emergence date on predicted dates for 20% grain moisture for five cultivars using 30-year weather norms for Stuttgart, Arkansas.**

	Rice Emergence Date				
Cultivar	**April 1**	**April 15**	**May 1**	**May 15**	**June 1**
	Predicted Date for 20% Grain Moisture†				
CL153	August 14	August 15	August 22	September 2	September 15
Diamond	August 15	August 15	August 23	September 2	September 15
RT XP753	August 9	August 10	August 17	August 28	September 10
Jupiter	August 20	August 21	August 28	September 8	September 21
Titan	August 16	August 17	August 24	September 4	September 17

† Approximate date of 50% heading can be estimated by subtracting 35 days from listed date for CL153, Diamond, and RT XP753 or 45 days for Jupiter and Titan.

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