Determination Of Optimum Plant Populations For Clearfield® Rice Varieties Using Conventional And Fall-Stale Seedbed Tillage

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During the 20th century, the only method to suppress red rice in commercial rice production was the use of some variation of water seeding. After the release of Clearfield® rice varieties for commercial rice production in 2002, water seeding was no longer the only management practice that could be used for red rice control. Red rice could now be controlled with the use of imidazolinone (Clearfield®) herbicides, and a shift toward more drill-seeded acres began to occur. With each passing season, rice producers became more comfortable using a grain drill to plant rice and using the Clearfield® herbicide program. Today, drill seeding is the predominant seeding method of rice in Louisiana. Clearfield® technology does have a price though, and all rice farmers are aware of the cost difference between rice seed with and without the Clearfield® trait. In fact, as producers have gotten more comfortable with drill seeding and using the Clearfield® herbicide program over the last decade, seeding rates used by many producers have gotten lower and lower with each passing year. So much so that today, in an effort to save money, many producers are drill seeding using seeding rates lower than the official LSU official recommendations, many times with great success. Currently, the LSU AgCenter recommends 60 to 90 pounds per acre for drill-seeded rice with a target plant population of 10 to 15 plants per square foot. This research was conducted to determine if seeding rate recommendations can be adjusted without compromising yield and profitability.

Several trials were initiated in 2010 in an effort to define the optimum seeding rates and target plant populations for almost all currently available Clearfield® rice varieties. Separate trials were used to evaluate 'CL111,' 'CL131,' 'CL151,' 'CL142,' 'CL181,' and 'CL261.' Treatments include nine seeding rates (5, 10, 15, 20, 25, 30, 35, 40, and 45 seed per square foot (approximately 10 to 110 pounds of seed per acre depending on variety) and two tillage systems (conventional tillage vs. fall-stale seedbed). Seed was treated with gibberellic acid, mancozeb (ethelene bisdithiocarbamate), and Dermacor X100. Seed for each plot was counted with a seed counter on a seed per plot basis. Rice was drill seeded to soil moisture (½ inch) using an Almaco no-till grain drill. Plant populations were determined 2 weeks after emergence. Agronomic data obtained included days to 50% heading, plant height at maturity, grain yield, number of panicles, filled and unfilled grain per panicle, 1000 grain weight, and milling.

Plant population at 2 weeks after emergence was not significantly affected by any of the tillage 2- or 3-way interactions with variety and/or seeding rate, suggesting that when seedbed conditions are not limiting (moisture, weed pressure, seeding depth, etc.) seedling emergence and survival should be equivalent between conventional and stale seedbed tillage systems. A variety by seeding rate interaction was significant ($P \leq 0.001$) for seedling plant population. All varieties had a linear relationship between seeding rate and plant population. Varieties CL111, CL142, CL181, and CL261 responded similarly, with 48, 53, 53, and 55% of the planted seed resulting in a seedling 2 weeks after emergence, respectively. Varieties CL131 and CL151 had lower % seedlings established with 42 and 31% of the planted seed resulting in seedlings 2 weeks after emergence, respectively. Grain yield varied with variety and seeding rate (Table 1). In general, grain yield increased from the 5 to 10 seed/ft2 seeding rates for all varieties. Yields began to stabilize at or above 10 seed/ft2, depending on variety (Table 1). When pooled over seeding rate and tillage, grain yield was highest for CL151 (11,079 lb/A) followed by CL111 (10,307 lb/A), CL131 (9,817 lb/A), CL142 (9,473 lb/A), CL181 (8,866 lb/A) and CL261 (8,731 lb/A). The relationship between relative (%) grain yield and plant population was evaluated using regression analysis (Fig. 1). Approximately 12% of relative rice grain yield could be explained by plant population alone ($P < 0.001$). Furthermore, 95% of relative rice grain yield was achieved with a plant population of 6 plants/ft2. Maximum yield was obtained with plant population of 19 plants/ft2. This data suggests that plant populations between 6 and 9 plants/ft2, which are less than current LSU AgCenter recommendations (10 – 15 plant/ft2), are capable of achieving acceptable yields when the stand is even and managed intensively. Ratoon and yield component data are currently pending and will be shared at the meeting. Δ

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Seed rate	CL111	CL131	CL151	CL142	CL181	CL261
(seed/ft^2)	lb/A					
5	9729	8995	10187	8313	7734	8231
10	10221	9780	11183	9283	8594	8916
15	10409	9882	11119	9166	8839	8801
20	10398	10014	11186	9614	9082	9006
25	10512	9545	11144	9853	9316	8747
30	10315	9836	11259	9288	8920	8593
35	10530	9991	11066	10007	8797	8785
40	10321	9990	11400	9709	9299	8747
45	10326	9919	11168	10024	9214	8750
LSD	432	321	431	593	656	364

Table 1. Mean rice grain yield for each Clearfield variety and seeding rate, pooled over tillage system.

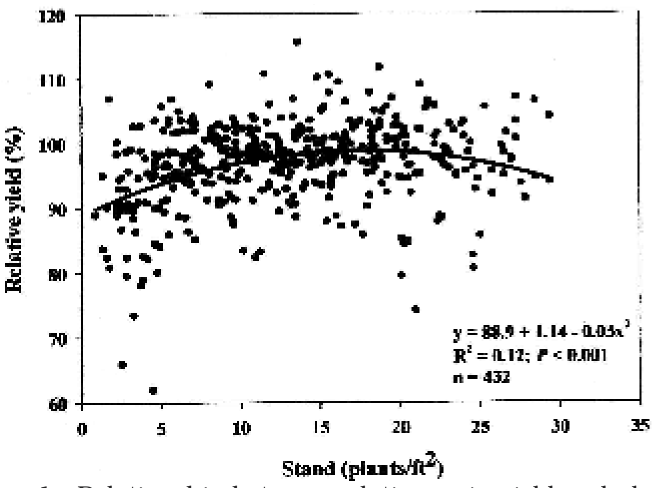

Figure 1. Relationship between relative grain yield and plant population for all rice varieties, pooled over tillage system.