Delta Rice Production – Challenges and Opportunities

The Delta region of California is located at the confluence of the Sacramento and San Joaquin rivers. The Delta spans approximately 738,000 acres, where over 400,000 acres are in agricultural production. While the region is defined by its waterways, the Delta is also unique for its fertile soils which range from mineral to organic. The mineral soils are the result of alluvial deposits from waterways. The organic soils formed from decomposed plant matter. Delta soils were reclaimed in the mid- to late-1800's when levees were constructed to contain water within channels, allowing Delta "islands" to be farmed.

Over time, some areas of the Delta with organic soils have experienced carbon oxidation, resulting in land subsidence. Land subsidence threatens levee stability, water quality, and water distribution within the Delta and to other parts of California. Keeping soils flooded mitigates soil carbon loss and land subsidence, but most crops cannot grow under flooded conditions. Rice is one exception because of its unique cellular structure that allows gas diffusion through the plant, even under flooded conditions. Research has demonstrated that the flooded conditions of rice cultivation can greatly reduce, if not stop, carbon oxidation and land subsidence in the Delta.

The predominant rice-growing region in California is the Sacramento Valley, but rice acreage in the Delta is growing, and yields are comparable with statewide averages (Table 1). Rice establishment practices differ between the Sacramento Valley and the Delta due to varying environmental conditions, like soils and climate. In the Sacramento Valley, rice is grown on mineral soils with a high clay content. In the Delta, rice is grown on soils with a high organic matter content (approximately 20-40%) and low bulk density (i.e. mass per unit of volume, approximately 0.5-0.8 g/cm^3). Sacramento Valley fields are planted by flying soaked seed onto flooded fields (i.e. water-seeding). This planting practice presents challenges in the Delta because the lightweight, organic soil can go into suspension and then bury the seed when it settles, resulting in a reduced stand. Additionally, winds can affect crop establishment in a water-seeded system by preventing root anchoring into the soil or by dislodging seedlings. To overcome these challenges, Delta rice is drill-seeded into moist soil, as growers would plant wheat (Fig. 1).

Table 1. Delta and statewide rice acreage and yield (as hundredweight per acre, cwt/ac).

California Rice Production						
	2022	2021	2020	2019	2018	2017
SJC* Acreage	8930	7070	4990	4360	3620	3060
Proportion of statewide acreage in the Delta	N/A	2%	1%	0.9%	0.7%	0.7%
Average SJC* Yield (cwt/ac)	101	95	88	81	86	82
Average Statewide Yield (cwt/ac)	N/A	92	89	86	88	86

**Rice acreage and yield according to the San Joaquin County (SJC) Agricultural Commissioner's Crop Reports. Rice acreage in SJC is primarily in the Delta region. Delta acreage in other counties is not included in these statistics. At the time of publishing, 2022 CDFA statewide data were not yet available (N/A).*

The San Francisco Bay is a strong influence on weather patterns in the Delta. Cool tempera-

tures affect how fast the crop develops and may delay flowering and harvest, which can impact yield (Fig. 2). Also, cold nighttime temperatures between panicle initiation (i.e. when the grain head begins to form at the base of the stem) and flowering can result in blanking. Blanking is a term used to describe when individual grains do not fill, which lowers yield. Nighttime temperatures peak in late-July, and a nighttime temperature less than 58°F (depending on variety) is considered cold for rice grain development. To overcome the cool conditions, Delta growers plant early in the season (April or May) so that panicle development and flowering occur ahead of nighttime temperatures decreasing. Growers also plant very-early and early maturing varieties, which mature roughly 15 days ahead of intermediate and late-maturing varieties in the Delta region. Variety options are limited but may expand with continued variety selection for cold tolerance.

Figure 1. Delta rice is drill-seeded, in contrast to the water-seeding done in the Sacramento Valley.

Windy conditions in the Delta can interfere with pesticide applications since pesticides cannot be sprayed when winds are high. Delta growers adapt to these challenges by making applications before dawn, when winds are calm.

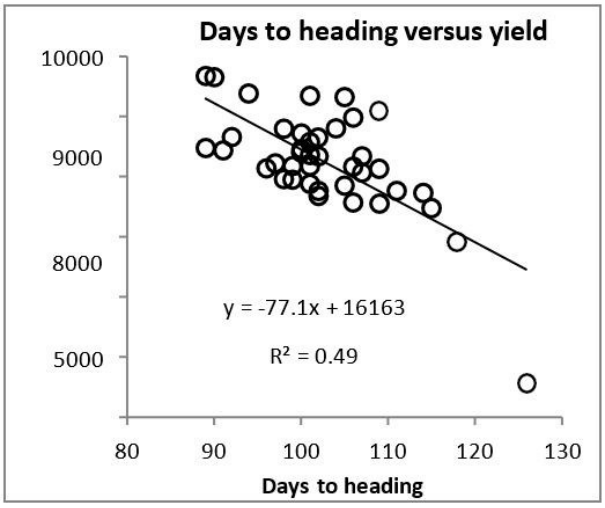

Figure 2. Relationship between days to 50% heading and grain yield. Data are from the Delta variety trial (2010-2014).

For more on this topic:

- ✓ CA Department of Food and Agriculture. CA Agricultural Production Statistics. https://www.cdfa.ca.gov/Statistics/.
- ✓ Deverel, S. J., Dore, S., and Schmutte, C. 2020. Solutions for subsidence in the California Delta, USA, an extreme example of organic-soil drainage gone awry, Proc. IAHS, 382, 837–842, https://doi.org/10.5194/piahs-382-837-2020.
- ✓ San Joaquin County Agricultural Commissioner. Annual Crop Report. https://www.sjgov.org/department/agcomm/general-info/crop-reports.

Agronomy Research and Information Center

http://agric.ucdavis.edu/

UC CE University of California Cooperative Extension

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