Rice Notes

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University *of* California
Agriculture and Natural Resources | Cooperative Extension

In This Issue

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Weedy Rice: Survey and Season Wrap-up

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2020 Survey Update

Weedy rice was found in California on a large scale in 2016, over 8 counties, after having been only found in a few fields in one county prior to 2008. In 2020, University of California Cooperative Extension conducted a comprehensive survey. The objectives of this survey were to determine: 1) presence-absence of weedy rice, 2) to determine infestation level, and 3) to determine if there was any pattern to the distribution of weedy rice biotypes.

A survey was conducted from June thru September 2020 across eight counties (Glenn, Butte, Colusa, Sutter, Yolo, Yuba, Placer and Sacramento). Each field was surveyed on an individual basin level. Each basin was surveyed by patrolling the parameter and visually and physically inspecting. All known biotypes (1 to 7) were recorded. Once the weedy rice was identified in the basin, a rating system was used to assess the level of the infestation from 0 to 6, with 0 being the absence of weedy rice, and 6 being 25% or more of the basin infested. The rating system (Table 1) was applied to each basin.

Table 1. *Rating system utilized for visual assessments of weedy rice infestations. Basins were rated individually.*

Infestation Rating	Infestation Level per basin
0	No plants
1	<10 individual plants
2	>10 individual plants
3	Less than 5 patches of plant
4	5 or more patches
5	10-25% of basin infested
6	>25% of basin infested

Save the Date!

2022 Annual Rice Grower Meetings

Jan 24 - Richvale am / Glenn pm
Jan 25 - Colusa am / Yuba City pm
Jan 26 - Woodland am

2020 Results Summary

The total acreage of basins found infested with weedy rice was 2,237; 20.7% of the basins surveyed contained weedy rice (Table 2). Biotype 1 was most common (54.5% of the basins) followed by Biotype 2 (30.9%). No basins were found with Biotype 5 or Biotype 7 (Table 3).

The majority of infested basins (34.7%) were rated infestation level 3 (less than 5 patches of plants), or infestation level 2 (27.4%) (less than 10 individual plants) (Table 4). None of the basins were rated at the highest infestation level 6.

Table 2. *Weedy rice infestations in 2020 per County, acreage surveyed, acreage infested, and percent of acreage infested (%).*

Counties	Surveyed (ac)	Infested (ac)	Infested (%)
Butte	1823	430	23.59
Glenn	1155	388	33.59
Colusa	1226	330	26.92
Yuba	1666	415	24.91
Sutter	3318	642	19.35
Placer	305	32	10.49
San Joaquin	0	N/A[a]	N/A[a]
Sacramento	0	N/A[a]	N/A[a]
Yolo	1288	0	0.00
Total	**10781**	**2237**	**20.75**

[a] San Joaquin and Sacramento counties were not surveyed in 2020. Infested acreage is known from 2019 or previous years.

Table 3. *Weedy rice infestations (2020) per individual weedy rice biotype in acreage surveyed and percent of acreage infested (%), where total acreage was 2237 ac. No acreage was found infested with Biotypes 5 or 7.*

Biotype	(ac)	%
1	1220	54.54
2	692	30.93
3	292	13.05
4	13	0.58
5	0	0.00
6	20	0.89
7	0	0.00
Total	**2237**	**100.00**

Table 4. *Weedy rice infested acres (2020), percent of infested acres, and percent of total acres surveyed. Total infested acreage was 2237. Infestations were rated on a scale of 0 to 6.*

Infestation Level	(ac)	% of Infested Acres	% of Total Acres
0	8544	N/A	79.3
1	472	21.1	4.4
2	612	27.4	5.7
3	777	34.7	7.2
4	234	10.5	2.2
5	142	6.4	1.3
6	0	0.0	0.0
Total Uninfested	**8544**	**N/A**	**79.3**
Total Infested	**2237**	**100.0**	**20.7**

2021 Survey Update

In 2021, 39 fields were inspected for the presence of weedy rice. The total acreage inspected was 2,497 acres and the total acreage infested was 1,525 acres. The fields are in Yuba (1,506 acres), San Joaquin (985 acres), and Sutter (12.5 acres) counties.

2021 Samples Collected

We had lots of calls in 2021, but the vast majority were not weedy rice (not red pericarp, non-shattering). Many were off-types or varietal contaminants. Preliminary findings are: one previously-infested ranch in Yuba County with Type 5, three new ranches infested in Glenn County (2 with Type 5, and 1 with Type 1), and one previously-infested ranch in Butte County with two new biotypes (Type 2 and Type 3).

We encourage growers and PCA's to please continue calling us with suspected infestations, as the smaller the infestation, the easier it is to control it.

Call your Farm Advisor: Michelle Leinfelder-Miles (San Joaquin County), Luis Espino (Butte and Glenn Counties), and Whitney Brim-DeForest (Sutter, Yuba, Placer, and Sacramento Counties). For Colusa and Yolo Counties, please call either Whitney or Luis.

Managing rice straw when winter flood water is uncertain

Bruce Linquist, UCCE Rice Specialist

In most years, California rice farmers manage their winter straw by flooding a field where the rice straw has either been chopped or chopped and incorporated. In these cases, the flood water helps to ensure good decomposition.

Incorporating straw after harvest — photo courtesy UC Cooperative Extension

This year, however, is different. Many growers are faced with having no water to flood their fields over the winter. Good straw decomposition is important as it will impact nitrogen management decisions the following year.

It may also affect the survival of stem rot and aggregate sheath spot sclerotia, the fungus resting structures, in the soil. Too much straw will tie up nitrogen fertilizer early in the season and will also serve as a host for stem rot and aggregate sheath spot. So, what are the options besides burning?

Options

First, removing straw is an option. Driving around, I have seen a lot of straw bailing going on. Bailing rice straw removes about half of the rice straw.

This is a good start, but it would still be nice to make sure the rest of it gets decomposed by following the suggestions in the second option.

The second option is to do the best possible to make sure rice straw decomposes without winter flooding. Simply chopping the rice straw and leaving it on the surface will likely not do the trick – especially if there is not much rain over the winter.

It is really important to make sure there is good soil-water-straw contact to ensure good decomposition. For this to occur you need to incorporate your rice straw. Studies were conducted here in California in the late 1990s which compared burning, bailing, incorporation and rolling of rice straw.

They found that incorporating rice straw resulted in the greatest amount of straw decomposition and the least straw remaining the following spring. This result was seen in both fields that were flooded and those that were not.

When the fields are not flooded, rainfall can provide water for good decomposition.

2021 Rice Seed Report

Timothy Blank, CA Crop Improvement Association

Statistics:

Due to the drought, rice acres in California saw a substantial decline to a total of ~405,000 acres, a 21% decline from 2020 and the smallest since 1992. The seed program saw a 9% decline, falling from all time highs in 2019 (30,663 acres) and 2020 (30,655 acres), to 27,989 acres applied in 2021. Excluding ‘Field Inspection Only’ (fields transitioning varieties) and rejected acres, 24,559 acres were approved for seed in 2021. M-206 remains the #1 Calrose variety in terms of acres applied, constituting 30% of the acres applied. The 5 Rice Experiment Station varieties that are marketed under the Calrose brand make up 79% of the total rice seed acres applied. These 5 Calrose varieties and their acres applied are M-206 (8,483), M-209 (5,447), M-105 (3,094), M-211 (2,827), and M-210 (2,338).

Activity:

The training of two new inspectors took place on 8/5, and rice inspections commenced on 8/9 with a total of 4 rice inspectors. Early inspection of fields in the QA program were prioritized due to higher lodging potential and these received their first inspection by 8/17.

Scouting fields for presence of red rice was emphasized and inspectors’ eyes were trained in commercial fields known to have red rice. A total of 939 acres were rejected due to presence of red rice. Fewer than 200 red rice plants were observed across 10 applications, and biotypes observed were Types 1, 2, 5, 6, & 7. Below is table showing a breakdown of red rice (RR) observations by inspection program (Certified seed and Quality Assurance).

Program	Applied acres (includes ‘Inspection Only’)	Approved acres	Rejected w/ RR	% Rejected of Applied acres	# Apps	# Apps w/ RR	% of Apps w/ RR
Certified	26,881	23,720	670	**2.5%**	355	7	**2.0%**
Q.A.	1,108	839	269	**24.3%**	29	3	**10.3%**
Total	27,989	24,559	939	**3.4%**	384	10	**2.6%**

With the anticipated full registration of oxyfluorfen for rice in CA in 2023, the first Foundation class seed production of a ROXY variety (19Y4000) was inspected and passed in 2021. Oxyfluorfen resistant rice will be an important tool in combating common weeds and red rice. At the Rice Experiment Station this year, the effectiveness of oxyfluorfen against non-ROXY rice was demonstrated by mixing Koshihikari seed in some of the herbicide trial plots.

As in the past, Timothy Blank (lead rice inspector) inspected all the Quality Assurance production due to the intricacies of the varieties and the program. Inspections in the certified seed program were divided by region among the four inspectors. Seed field inspections were completed in late September.

Rice is the #2 crop in the CCIA program by acreage and the least fluctuating major seed crop over the years. Through self-regulation, California's rice industry is unique compared to other rice growing regions in that it has adopted requirements that the planting seed be inspected by an approved third-party to meet industry standards. The CCIA remains committed to providing the rice industry with this vital service.

2021 Delta Rice Recap

Michelle Leinfelder-Miles, Delta Farm Advisor

In 2021, rice acreage in the Delta, south of the Yolo Bypass, was roughly 6,600 acres. Most of the Delta acreage is in San Joaquin County, with a few hundred acres in Sacramento County. Delta rice acreage has been steadily increasing over the last several years (Table 1). Most of the acreage was planted with variety M-206, but I have heard that a small amount of M-105 was also planted.

The season was influenced by the severely dry winter that preceded it. Delta rice is entirely drill-seeded (Figure 1). The fine, organic soils present challenges for water-seeding; namely, soil particles go into suspension and then bury the seed too deeply, resulting in poor germination. Growers who were planted by mid-April were generally able to plant to moisture. These growers were starting to harvest by late September and early October and beat the late-October rains.

Table 1. Rice acreage and yield according to the San Joaquin County Agricultural Commissioner's crop reports. County rice production is predominantly (if not entirely) in the Delta region. The 2021 acreage estimate includes a few hundred acres in the Sacramento County Delta.

San Joaquin County Rice					
	2021	2020	2019	2018	2017
Acreage	6600 (est.)	4990	4360	3620	3060
Average Yield (cwt/ac)	Not available	87	81	86	82

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

Pest pressure was not especially high across the region in 2021, but I consulted with growers and consultants on a handful of pests. Watergrass, barnyardgrass, and sprangletop can be problematic weeds. These are generally controlled by a spray program applied by ground pre-flood, when the rice has 3-4 leaves. Windy conditions can compromise optimal timing for herbicide applications, and this year was no exception. Typically, a second application is not made, but some growers contemplated it this year for escaped grasses. Over the last two years, I have conducted trials to evaluate the efficacy of a new product, Loyant (florpyrauxifen-benzyl; Corteva Agriscience), on these grasses in the Delta drill-seeded system. This year, we evaluated product efficacy on nutsedge, and those results will be forthcoming.

I have been trapping armyworms in the Delta since 2016, and like in the Sacramento Valley, armyworm populations were very low this year. Some growers indicated needing to treat some of their acreage, particularly where rice was neighbored by riparian or wetland vegetation, but other growers did not treat. Annual trap counts for the Delta are available on my website.

Last year, we started observing stem rot (Sclerotium) on some farms but not until late in the season when the fields were drained. We developed post-harvest straw management programs, which appear to have mitigated the problem but not eliminated it. Next year, we will monitor for the disease early in the year, and a fungicide application may be necessary on some farms. There is a tendency for stem rot to be more severe on low potassium soils, and most Delta soils are naturally low in potassium.

For a few years, we have been monitoring some ranches where we have identified weedy rice. On one farm that had a light infestation, it appears that the grower has eliminated weedy rice with in-season rogueing, post-harvest management that included straw chopping but no incorporation, and winter flooding. These appear to be important practices, especially with light infestations, and in particular until a herbicide is approved for spot-spraying. We also advise that growers pay attention to equipment sanitation – harvesting weedy rice fields last (if possible) and thoroughly cleaning out equipment after harvesting fields with weedy rice.

Cooler temperatures in the Delta, compared to the Sacramento Valley, make the Delta a challenging place to grow rice. Growers are limited to using only very-early and early maturing varieties. In 2021, we revived the UCCE variety trial in the Delta location, which will help in the identification and advancement of cold-tolerant varieties. Low night time temperatures can cause blanking, which results in empty grains. We expect blanking to occur when the developing pollen grains are exposed to nighttime temperatures at or below 55^{o} F for several hours. I am aware of a late-planted ranch that may have experienced some blanking due to cooler temperatures at the time of panicle development, but blanking should not be a problem for the majority of fields which were planted by mid-April.

Overall, 2021 was a successful year for Delta rice growers. Thank you to all my colleagues in the industry, and especially to my trial cooperators.

Arthropod and Disease Update

Luis Espino, UCCE Rice Advisor

Overall, the 2021 season did not have a lot of arthropod problems. The slow flood at planting may have provided good conditions for tadpole shrimp to be an issue, but the cooler temperatures during planting helped slow down the shrimp. A trial I conducted this year showed that rice seedlings are susceptible to shrimp injury only until the first true leave is visible, even if plants are still underwater. Seedling injury was severe when TPS were present during germination and reduced stand up to 99% and yields up to 65%. Once seedlings had a first true leave, they were well anchored and were not harmed by the shrimp.

Armyworm populations were the lowest since 2015. It seems this was a regional trend, with areas north of California experiencing a similar armyworm population decline. In our traps, the number of moths we were catching weekly was lower than what we had been getting for the past three years (figure 1). Using trap data and worm population estimates from field searches, we have determined that peak worm density occurs a week or two after moth numbers peak in the traps. This gives us some good information about the timing when fields need to be monitored closely.

Regarding diseases, 2021 was also a year of low pressure. I did not see any blast in the Valley, however, I did hear from some PCAs and growers that had seen very low levels. I inspected a few M-210 fields where blast had been suspected in the past. M-210 is blast resistant, therefore blast should not develop to epidemic levels on this variety. Given the year we had, I did not find any blast in these fields. Similarly, kernel smut was not a problem. In 2018 kernel smut became a considerable problem in the northern part of the Valley but levels have remained low since then.

One disease that I have heard some growers had issues with was stem rot. The disease can go unnoticed until drain time, when plants lodge and then dry very quickly, resulting in blanking. Many trials I have conducted have shown that azoxystrobin (the active ingredient in Quadris) can reduce the disease severity significantly when applied at very early heading. However, if the field does not have a history of stem rot, it can be difficult to determine if a treatment is needed.

A common question about the management of stem rot is the difference in susceptibility among varieties. This year I conducted a trial that compared fungicide treated and untreated plots of several common varieties. The results indicate that very early varieties like S-102 and CM-101 show higher severity, and later varieties like M-209 and M-211 show less; however, the effect on yield was similar for all varieties (on average, 4% yield reduction). The results of this trial are still being analyzed, so I hope to provide more updates during our winter meetings in January.

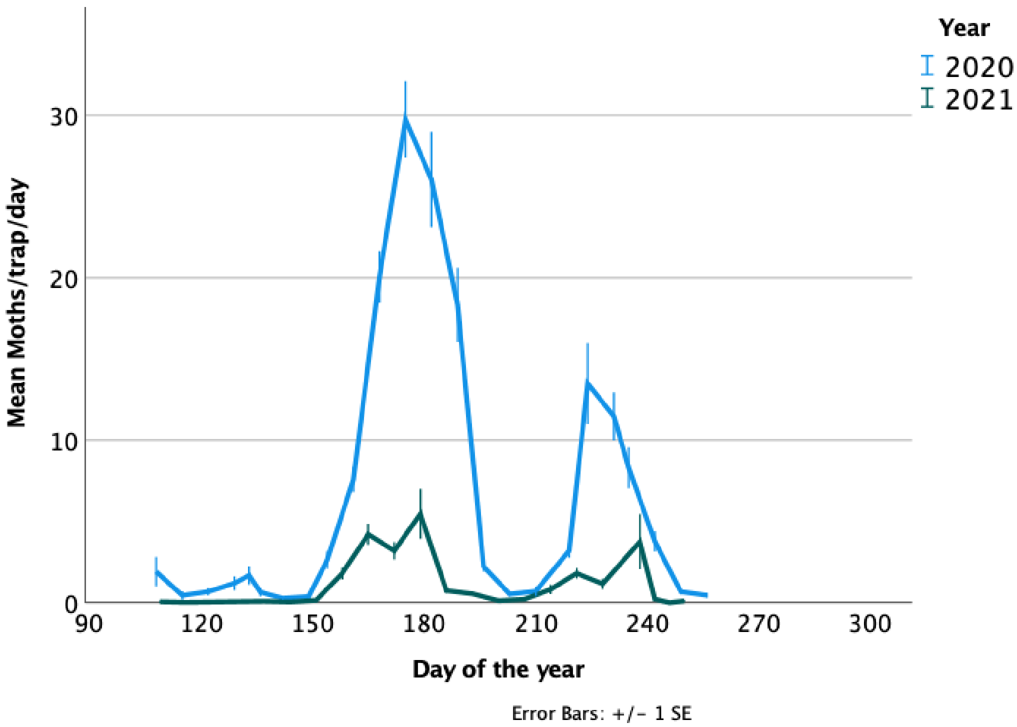

Figure 1. Average number of moths caught per day in armyworm pheromone traps in 15 rice fields across the Sacramento Valley. Day 150 = May 30, 180 = June 29, 210 = July 29, 240 = August 28.

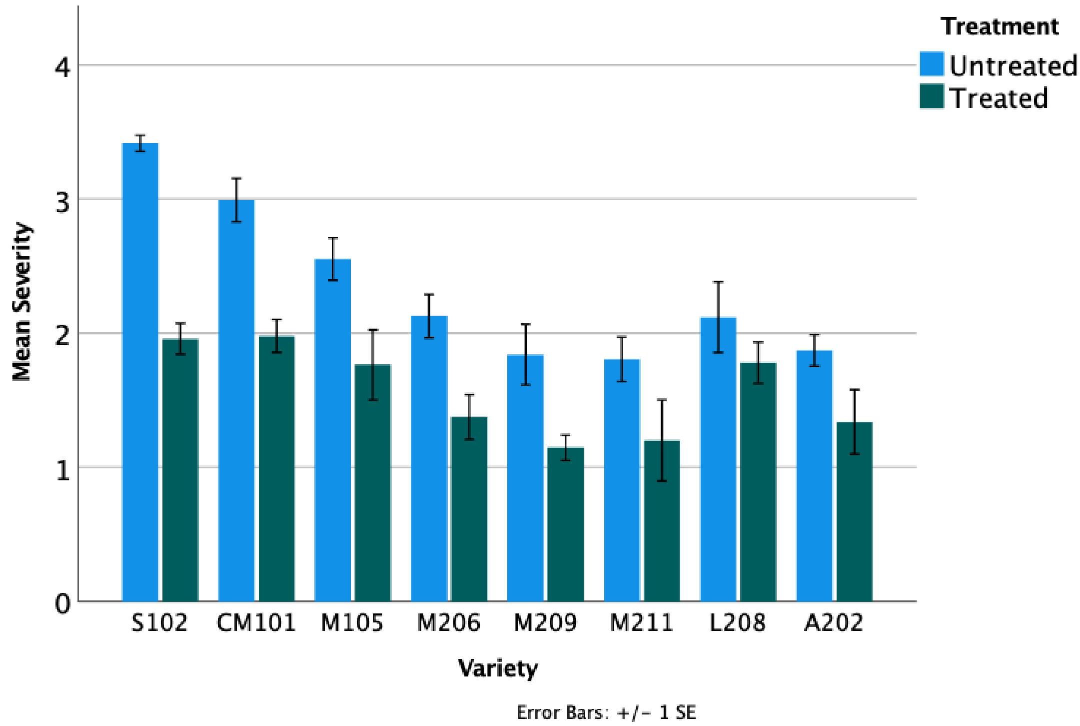

Figure 2. Average stem rot severity of fungicide treated and untreated rice varieties. The severity scale goes from 0 (no symptoms) to 4 (tiller rotted through).

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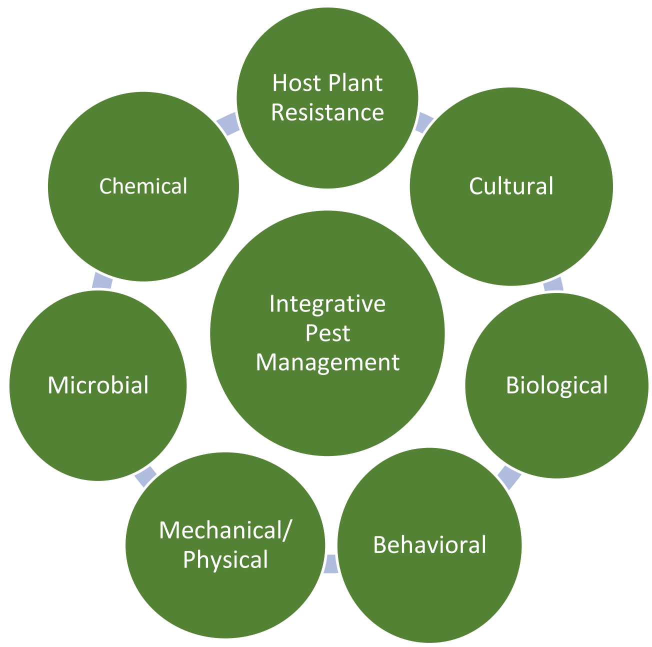
Open Membership for the California Rice Integrated Pest Management (IPM) Work Group



Conceptual model by Surendra, D. (2019). The new IPM paradigm for the modern ages and the growing world. https://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=29940

What is the California Rice IPM Work Group? A key instrument for involving industry representatives and stakeholders in defining IPM research priorities and supporting the participation of community members in extension efforts.

The mission of the IPM Rice Working Group is to review existing recommendations for management of pests in rice; review recent research and extension efforts; identify and share successes and failures; and help shape priorities in research, education, extension, and regulation.

The IPM Work Group aims to:

- Understand and solve major pest management issues impacting rice production.
- Develop priorities for project funding, focused on IPM in the future.
- Communicate realistic approaches and findings to grower communities and populations.
- Strive for approaches and opportunities which will bring people together to achieve common IPM goals.

At the first meeting in 2021, the IPM Rice Work Group focused on Crop Rotation as an integrated pest management tool. Future meetings may cover other topics of interest to the work group or industry.

Background. The California rice industry has a long history of being proactive and adapting to new production challenges and environmental concerns. Yet, pest management challenges continue to escalate and scarce data on IPM options for California rice systems exist. Crop rotation is one IPM practice that shows potential to control pest and disease pressures while providing other benefits (Figure 1), however little data exists to support growers in making informed management options concerning crop rotations. At the same time, crop rotations may not be an option for many growers in Sacramento Valley, due to several environmental and economic constraints, and alternative IPM practices need to be explored. To address these issues, farmers, researchers, extension professionals, and other key industry personnel need to be involved in future research and priority-setting efforts.

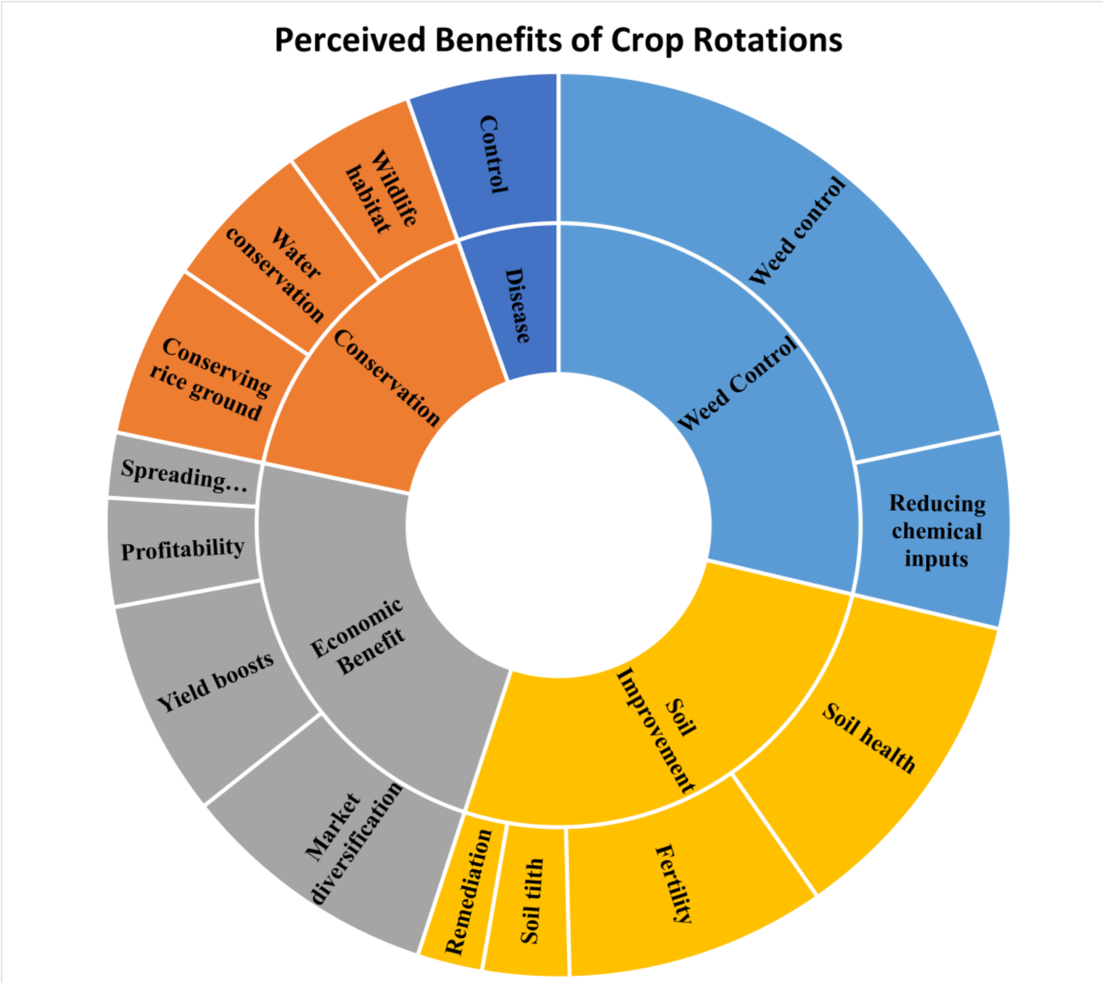


Figure 1: Findings from baseline interviews for perceived barriers to adoption by rice growers. Complete findings from this study can be found in the 2020 Rice Research Board Annual Report. General categories are represented by different colors and the relative size of each category corresponds with the number of times that category was discussed out of total responses.

Current and Future Research Interests: An inaugural IPM work group meeting was held July 7, 2021, to prioritize future research interests:

- Economics of long-term and short-term rotation options.
- Effects of different crop rotations on soil health, soil microbiome, rice yields, and input use.
- Cover crop management on different soils, options and impacts on crop health.
- Review and re-share past research findings on drill seeding and dry seeding.
- Exploring how weed species and pest populations shift when implementing different IPM management practices.
- Alternative irrigation methods, alternative fall management practices and their impact on pests and disease.

For further information and to participate in future meetings:

UCCE Rice Team at ipmriceworkgroup@ucanr.edu

Membership for the IPM workgroup will remain open to people in the rice industry.