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How Florida Agriculture can aid the Brewing and Distilling Industries

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Abstract:
Florida is one of the top agricultural producers within the southeastern United States as well as having the fourth largest brewing economy in the country. With new product labeling legislation and industry desires, the demand for locally produced ingredients is at an all-time high. Additionally, low-input, small grain production such as malting barley could provide Florida farmers with a more sustainable and less ecologically impactful rotation crop that is also economically profitable within their agricultural production. For these reasons, this project aims to explore the agricultural feasibility of cultivating malting quality barley in the state of Florida, the economic implications for both the producers and consumers of the agricultural product, as well as cropping models for sustainable agricultural implementation of barley production within the state of Florida.

Study Overview:
The study examined cultivation conditions for barley grown in the state of Florida. Planting date and varietal trials were examined in this study. Ten (eight 2-row and two six-row) barley varietals were chosen to be studied; CDC Copeland, LCS Genie, LCS Odyssey, LCS Opera, ND Conlon, ND Genesis, ND Pinnacle , NDSU-2nd353529, UM Rasmusson, and UM Robust. The varietals were planted in a randomized order in strips of 50 ft x 3 ft with a 10 in space between strips. This was then repeated four more time to make up the five replicates per planting date.

To study the variable of planting date, this planting regime was repeated through the late fall/early winter, two weeks apart from one another starting 1 November 2021 and ending 23 December 2021. Harvesting was conducted over two days in early May 2022.

This study was conducted at the UF/IFAS North Florida Research and Education Center-Suwannee Valley in Live Oak, FL. The test plots were under irrigation and treated with 115 lbs. per acre of nitrogen, 115 lbs. per acre of potassium, and 32 lbs. per acre of phosphorous were used and applied over three applications. Insect, weed and disease control was also implemented such as the use of fungicides for control of net blotch (*Pyrenophora teres*) and loose smut (*Ustilago nuda*).

This study was investigated by a multidepartmental team from the Agronomy, Horticultural Science, Food Science & Human Nutrition, and Agricultural & Biological Engineering departments of the Institute of Food and Agricultural Sciences at the University of Florida.

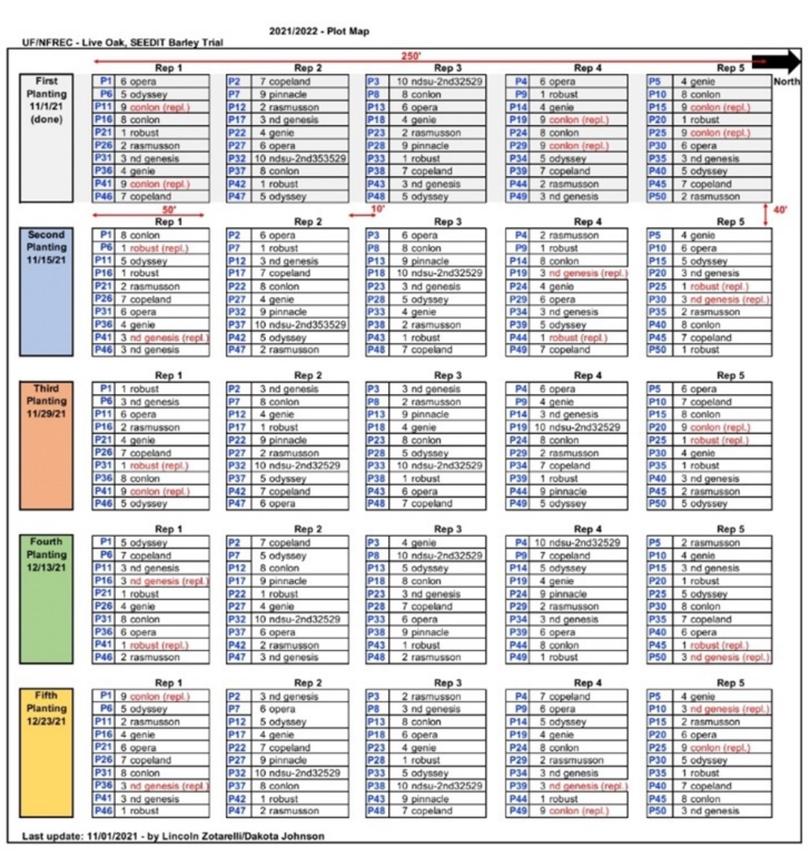

Image 1 – The diagram above is a representation of the field planting trials of barley planted at the UF/IFAS NFREC. The columns represent the replication and the large colored rows represent the different planting dates. The smaller rows are representations of the randomized strips of the individual barley varietals.

Images 2-3 – Above are photographs taken at the field site in Live Oak, FL, showing the field conditions as well as the experimental setup. The long strips are the individual barley varietal trials and north-south blocks are replicates within the same planting date, and the east-west blocks are the different planting dates.

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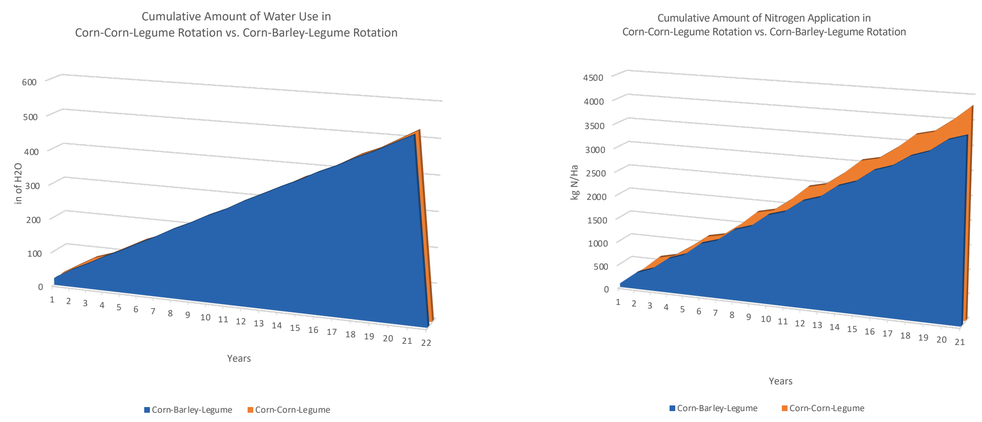
Results:
The barley crop was harvested via mechanical harvester over two days in early May 2022. Reported below is the average yield of the different varietals across the entire planting season. A timing effect was found in the trial. All varietals saw an increase in yield when planted after 15 November 2021. When the yields from the earlier planting dates are disregarded, yields from most of the trial varietals fall at or just below the national yield averages [1]. The best preforming varietals in terms of yield were the 2-row varietals of ND Genesis and NDSU-2nd353529 and the best performing 6-row varietal was UM Rasmusson based on the 2021-2022 season's data. Malting quality of the barley is currently being examined. This field trial is to be repeated in the upcoming season.

Barley Varietal	Average Seasonal Yield (bu/acre)
CDC Copeland	20.70
LCS Genie	29.29
LCS Odyssey	30.19
LCS Opera	31.40
ND Conlon	26.32
ND Genesis	34.31
ND Pinnacle	24.41
NDSU-2nd353529	36.79
*UM Rasmusson	34.40
*UM Robust	31.46

Table 1 – The above table outlines the average yields across from the entire 2021-22 planting season. Yields were significantly lower from the earlier planting dates which drove down the overall yield averages. Varietals denoted with '*' are 6-row varietals.

Discussion:
The results from this field trial are just the foundation work for the potential development for barley production in the state of Florida. Barley is being explored as a crop in Florida for many reasons. To start, Florida has large brewing and distilling industries which are constantly looking for local ingredients to use [2]. Additionally, due to the unique environmental conditions found in Florida such as permeable, sandy soils, Florida should look to more sustainable, low-input crops [3], which barley is [4]. Also, due to some additional environmental impacts, Florida's traditional agricultural systems are currently in flux [5], and barley could potentially be an alternative crop to fill that gap. And finally, barley could potentially fit within the current cereal cropping system in Florida as a rotational crop [6]. For example, based on field trials, in order to support the brewing industry in Florida with barley malt, as it currently stands, 17,250 acres, or 14% of the land currently being utilized for cereal production in the state of Florida [7], would be needed to produce barley. Given all of this, it is quite feasible for commercial barley production to be implemented in Florida.

Below are the results from a 21 year cropping simulation (11 years of historical modeling used for calibration of a 10 year projection model) performed using Decision Support System for Agrotechnology Transfer (DSSAT). The cropping systems modeled were a corn-corn-legume and a corn-barley-legume system for the UF/IFAS NFREC. The simulation is meant to understand resource use and management in relation to crop productivity. Results from this simulation show that by intensifying the agricultural system with a corn-barley-legume cropping system, resource use actually goes down on an accumulating level despite the intensification of the system.



Graphs 1-2 – The above graphs show the cumulative resource results from the DSSAT simulation of a corn-corn-legume cropping system vs. a corn-barley-legume system. Overall, they corn-barley-legume system requires less resource inputs and thus over the years the cumulative resources used in that system is less despite intensifying the overall agricultural system.

References:

1. Barrett, C.E., Zotarelli, L., Willis, S.M., Capasso, J.M., Carter, E.T., Broughton, D., Athearn, K.R., MacIntosh, A., Halbritter, A.N., Smith, M.T. and Korus, K.A., 2021. Exploring Opportunities for Malting Barley Production in Florida: HS1420, 9/2021. EDIS, 2021(5).
2. Pearson, B.J., 2013. Florida Edible Garden Plants: Hops (Humulus lupulus): ENH1227/EP488, 10/2013. EDIS, 2013(10).
3. Redfield, G.W., 2000. Ecological research for aquatic science and environmental restoration in south Florida. Ecological Applications, 10(4), pp.990-1005.
4. Macak, M.; ŽÁK, Š.; Birkas, M.; Slamka, P., The influence of an ecological and a low input system on yield and yield components of spring barley. Cereal research communications 2008, 36, 1343-1346.
5. Alvarez, S., Rohrig, E., Solís, D. and Thomas, M.H., 2016. Citrus greening disease (Huanglongbing) in Florida: Economic impact, management and the potential for biological control. Agricultural Research, 5(2), pp.109-118.
6. Hoogenboom, G., Tsuji, G.Y., Pickering, N.B., Curry, R.B., Jones, J.W., Singh, U. and Godwin, D.C., 1995. Decision support system to study climate change impacts on crop production. Climate change and agriculture: Analysis of potential international impacts, 59, pp.51-75.
7. USDA. State Agricultural Overview – Florida. 2021.