

学 位 論 文 要 旨

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題 目

Sugarcane Yield Decline and its Countermeasures
in the Nansei Islands, Japan

(南西諸島におけるサトウキビの収量低下とその対策)

The decline in sugarcane yield in the Nansei Islands can be attributed to several factors, including stagnant prices, a decrease in the number of growers, and an aging population. In recent years, the development of mechanical harvesting has further exacerbated the decline in yield.

Poor germination, seedling establishment, and drought-induced stem suppression can reduce yield, even during ratooning, and their synergistic action exacerbates the situation. Additionally, the delayed systematization of farming systems that are compatible with machine work has been a factor contributing to the decline in yield.

To address the challenges faced by sugarcane cultivation in the Nansei Islands, three cultivation technologies have been suggested as countermeasures against the decline in yield based on the findings of field experiments. Additionally, a case study of a family farm has demonstrated the potential of a mechanized integrated system, which has been successfully scaled up and maintained profitability, providing insight into a sustainable farming system. The key findings of the study are summarized below:

1. The sugarcane local adaptability test on Kumejima Island (one of the Nansei Islands) showed that (1) drought during the vigorous growth period reduced sugar yield due to a decrease in stalk weight, (2) an unstable number of millable canes occurs in ratooning of summer plants, and (3) yield per year was higher in the spring planting ratooning system, summer planting ratooning system, and summer planting system. Therefore, the study suggested increasing the yield of ratooning using heavy-stemmed cultivars with high ratooning ability and enhancing drought resistance by utilizing pathogen-free seedlings in the summer planting ratooning system.
2. The study revealed that: (1) pathogen-free seedlings can significantly increase sugarcane yield and help combat sugarcane ratoon stunting disease, and (2) simple disinfection of farming tools can effectively control the spread of the disease in original nursery and seedling farms. These results showed that implementing efficient propagation and distribution systems for pathogen-free seedlings would be beneficial.
3. One of the challenges in sugarcane cultivation is the prevalence of the sugarcane black rot fungus in Okinawa Prefecture, which can lead to poor germination and seedling growth. As a preventive method, coating seedlings with thiuram-benomyl agents has been devised, which accelerated seedling germination, increased the germination rate and seedling establishment, and promoted uniform growth.
4. The analysis of an actual case on Kumejima Island revealed the following aspects: (1) By selecting the summer planting ratooning system, farmers can distribute their workload more evenly throughout the year by eliminating winter and spring work peaks and focusing on planned work during planting and initial management. (2) Multiple benefits can be obtained from the trash by omitting subsoil breaking, stubble shave, intertillage, and earthing in ratooning. This includes weed suppression, decreased herbicide use, furrows as working roads, the extension of the workable period, and the ability to work at the appropriate time, resulting in a high and stable yield. (3) The implementation of trash mulching is an effective measure against soil runoff caused by farming practices.

