

## RESEARCH PROGRESS IN MECHANIZED PLANTING AND HARVESTING TECHNOLOGY AND EQUIPMENT FOR PINEAPPLE

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Pineapple is an important southern subtropical fruit in China with important processing and fresh food values. Since pineapple planting agronomy mainly adopts uniform rows and dense planting in China, which triggers the problem that machines are unable to work on the ground, resulting in pineapple planting, field management, harvesting and other key links relying on manual labor to complete. In order to realize the mechanization of pineapple field production, two agronomic models were constructed, which were the flat strip cropping of queen pineapple and double row cropping with large and wide ridges of Tainong pineapple, based on the integration of agro-machinery and agronomy. In the mechanized pineapple planting process, the chain-clamp planting method was used to study the chain-clamp planting mechanism applicable to the flat strip planting mode, and the combination of the rotary cup seedling delivery and the hole-inserted duckbill planting method was adopted to design the hole-inserted duckbill planting mechanism applicable to the double-row mode of large-width ridge planting. To clarify the planting mechanism of pineapple seedlings under the conditions of flat cropping and ridge cropping, the kinematics and dynamics of pineapple seedlings in the process of seedling delivery and seedling transplanting were analyzed by using virtual simulation technology and high-speed photography technology. Through design of the seed box, depth limiting mechanism, the transmission mechanism and other components, the 2ZB-4L type four rows of flat crop pineapple transplanter and 2ZB-130 type ridge crop two rows of pineapple transplanter were developed. The field test results of the machines showed that the overall planting pass rate was more than 92%, and the planting efficiency was about 0.08 ha/h. In the pineapple mechanized harvesting link, the double-winged symmetrically arranged conveyor belt with fruit collection mechanism was designed by the cross-row operation and the conveyor belt conveying method. The high clearance self-propelled transfer platform, which was based on the height of pineapple plants at the appropriate picking period, was designed to form a fast fruit collection and transfer method for pineapple by utilizing the high clearance self-propelled method. Two structural forms of upland gap pineapple harvesting trucks, included type 4B-200 and type 4B-135, were developed to the different technical parameters of the two agronomic models. The field test results showed that the fruit carrying capacity was more than 2t, the harvesting efficiency was more than 3t/h, the fruits and seedlings were not hurt during the operation process. This study built a mechanized production technology model for pineapple planting and harvesting through the establishment of a pineapple planting agronomic model suitable for mechanized operation, exploring the mechanized planting and harvesting technology of flat crop and ridge crop, and developing pineapple planting machines and harvesting vehicles. The pineapple field key production link machine on the ground, which was difficult and no machine available, was solved. It was of great significance in alleviating labor shortage, improving productivity, reducing production costs and the labor intensity, transforming and upgrading the pineapple industry, and helping to revitalize the countryside.

**Keywords:** Pineapple, Mechanization, Planter, Harvesting vehicle, Agronomy