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Integration of Agricultural Machinery and Agronomy for Mechanised Peanut Production Using the Vine for Animal Feed

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Abstract

A "three-stage" harvesting mode, "vine cutting harvesting - digging and drying - pickup and picking," was proposed to increase the use of peanut vines as animal feed and address the inability of current agronomic and agricultural machinery in China to adapt and the low levels of mechanised peanut production. The prerequisites for integrating agricultural machinery and agronomy into each important production step were provided after studying the general agronomic process of mechanised peanut production under this mode. The field measurements and testing of pickup effects, consistency of stubble height, and plant attributes were conducted. On the variation coefficient of stubble height consistency and their relevance, the effects of ridge height, ridge width, and row spacing variations were examined. The findings demonstrated that differences in ridge height and width had a significant impact, whereas differences in row spacing had no significant impact.

Keywords: Agriculture; Harvesting; Peanut; Animal feed; Agronomy

Introduction

The production and sale of peanut, a significant edible oil crop, is second only to that of soybean on a global scale. According to several studies it is crucial to the security of edible oil production globally. The United Nations' Food and Agriculture Organization (FAO) figures show that in mainland China, the planting area for peanuts in 2019 was 4.51 106 ha, with a total production of 1.76 107 t. The acreage and total yield, which accounted for 15.23% and 36.04%, respectively, of the world's peanut area and production, were rated second and first. Peanut vine is a superior feed source for animals because of the abundant crude protein, crude fat, and carbs found in fowl. As a result, research into the use of peanut vine recycling and feed has significant practical implications [1].

Ridging and plastic film mulching are widely used in the cultivation of peanuts in China because they can help preserve heat, preserve moisture, and boost yield. In 2019, more than 2.33 106 hectares of peanuts were reportedly planted in China using film mulching. According to estimates, the output of peanut vines in China in 2019 was around 1.78 107 t, and the yield of peanut vines planted with film mulching was roughly 9.17 106 t. The average peanut vine coefficient, or 0.99, for mainland China is the mass ratio of peanut pods to vines per unit area. When peanuts grown with ridges and film mulching are harvested using the conventional method, peanut vines get mixed up with the mulching film, making it difficult to use the vines as feed. Chinese farmers currently use manual, combination, and two-stage harvesting techniques to gather their peanut crop [2, 3].

Agronomic process of mechanised peanut production based on the feed utilisation of vines

Combined harvesting refers to the utilisation of a single equipment to carry out the entire operation of digging up peanuts, removing soil, picking, cleaning, and collecting fruit, among other tasks. Fresh peanuts are typically harvested using this technique. A peanut excavator is used in two-stage harvesting to spread the peanuts out on a field's surface for drying after removing the soil. After that, the fruit is picked, cleaned, and sorted using a machine designed for picking up and harvesting peanuts. This technique is mostly used to harvest peanuts for roasting the seeds and nuts and extracting the oil from them. The two harvesting techniques mentioned above do. The requirements for using the peanut vines planted with film mulching are not met by the two harvesting techniques mentioned above. Although manual harvesting can satisfy these needs, it is not appropriate for mechanising the production of peanut vines for use as feed because of its low productivity, high labour requirement, and low level of mechanisation [4, 5].

Riging and film mulching planting, field management, cutting and harvesting vines, digging and drying, and pickup combination harvesting are all steps in the mechanisation of the production of peanut vines appropriate for feed use. An integrated equipment for ridging, film mulching, seeding, and fertilising is used to accomplish peanut planting first. Ridging, mulching with film, seeding, and fertilising can all be done with various pieces of equipment. The first stage of mechanised peanut production is planting. Agronomic requirements have a direct impact on the effectiveness and quality of following industrial processes. Under film sowing and over film sowing are now the two primary mechanised peanut film mulching planting techniques used in China. In order to perform over film sowing, which entails punching holes in peanut film and sowing without releasing seedlings, the hole-forming components must be cut into the film at the sowing point [6].

There are several components involved in the mechanised production of peanuts that can yield peanut vines suitable for use as feed, and each component is intimately related to the others. To achieve organic integration of the production agronomy and operational machinery of each process, efficient and seamless development of all mechanised peanut production processes, it is necessary to take into account all aspects of peanut variety, cultivation, planting, and harvesting when considering mechanised production [7, 8].

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Discussion

The research above shows that this study can offer recommendations for the harvest of peanuts that are mulch-planted in the spring and the vines are used as a source of animal feed. It is advised that: (1) The wheel spacing of the vine harvester should be adjustable, ideally with hydraulic automated adjustment function to promote the convenience of adjustment; and (2) The pickup should be used in conjunction with the pickup to ensure the combined harvesting effect [9].

Conclusion

It is suggested to use a "three-stage" harvesting method, or "vine cutting harvesting, digging and drying, pickup and picking," to harvest peanuts grown using film mulching. Using this model, a comprehensive agronomic procedure for mechanised peanut production was suggested, and the needs for agricultural equipment and agronomic integration for each crucial stage of production were examined. Likewise, stringent guidelines for the integration of agriculture [10].

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Potential Conflicts of Interest

No conflict or competing interests in the publication of this paper.

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