Mechanization Application and Experimental study of vibrating Forest and Fruit Harvester

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Abstract. Agricultural machinery is an important material basis for the development of modern agriculture, and agricultural mechanization is an important symbol of agricultural modernization. At present, China is in a crucial period of transition from traditional agriculture to modern agriculture. Fruit picking is a seasonal and labor-intensive work, because of the aging population and rural labor force is getting less and less, in the monotonous, heavy, dangerous fruit picking operations are in urgent need of efficiency, universal. The low cost picking technology and the mechanical picking method has more advantages than the robot picking methods. Therefore, the research and development of a new generation of orchard picking machinery represented by multi-function operation machinery is of more practical significance to the development of fruit industry. The paper presents Mechanization Application and Experimental study of vibrating Forest and Fruit Harvester.

1. Introduction

In 2013, the county agricultural machinery promotion station will continue to focus on the overall goal of Chabuchar county agricultural development, with the scientific development concept to lead the agricultural machinery promotion work, around the development of modern agriculture, service the new rural work ideas. Taking “project construction as the foundation of standing station and technical service as the road to flourish station”, we should increase scientific and technological innovation and key technical popularization, widen the service field of agricultural machinery, and strive for practical results in pioneering and innovating [1].

We should make breakthroughs in key work, offer practical measures for public welfare services, and make an article in system construction. We should promote the key production links of major crops in key agriculture, as well as good economic benefits, obvious social benefits, and recycling of ecological benefits. In order to promote the healthy and orderly development of agricultural mechanization in our county, farmers need new technology and equipment of agricultural mechanization to popularize and popularize.

With the development of world economy, the increase of population and the improvement of people's life, for a long time, China's harvest is mainly by hand-picked and the ladder, the fruit picking knife and other simple tools to assist the harvest [2]. Fruit harvesting machinery in our country the study throw in the initial stage, no mature and advanced practical equipment with the Xinjiang report. The characteristics of fruit, especially red dates and other fruit scale, industrialization development, rely on the artificial harvest way cannot meet the need of red dates industrialization. And as our country red dates planting area increasing, the need of pickers will be more and more, faced with this problem, we college students should devote our for the people, especially we study the mechanical design of the college students, this piece of land in Xinjiang, the Xinjiang people think our students is the national Shihezi University The pillars of the people, the hope of the people, we have this obligation to contribute to the frontier of our little strength, so I decided to design a substitute for the red jujube harvester.

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In 2012, the idea of agricultural mechanization technology extension in Chabuchar County was as follows: combining with the adjustment of agricultural industrial structure of our county, and cooperating with the proposal of our county “to build the largest processing base of beef and mutton in the country”. To create the largest organic rice production base in the country, the largest hazelnut production and processing research base, and the largest dehydrated vegetable processing base in Yili River Valley. We will vigorously introduce new technologies and tools for agricultural machinery, firmly establish the working concept of serving agriculture, rural areas and farmers, further strengthen the construction and reform of the agricultural mechanization technology extension system itself, and strengthen the service functions [3].

We will enhance service capacity and professional quality, strengthen cooperation between production, education and research, strengthen the construction of demonstration zones for integrated mechanization technology, and speed up the promotion of forestry and fruit industry and animal husbandry on the basis of improving the level of comprehensive mechanization of grain production. Installation agriculture, characteristic agriculture, facility farming, and other advanced and applicable agricultural mechanization new technology, new machinery and tools demonstration and promotion, accelerate the transformation of scientific and technological achievements and technological innovation, actively promote the county agricultural mechanization and sound and rapid development [4]. In order to strengthen agricultural infrastructure, promote farmers' income, and promote modern agriculture and socialist new rural construction to make positive contributions.

Speeding up the development of agricultural mechanization and agricultural machinery industry will improve the level of agricultural equipment, improve agricultural production conditions, and enhance agricultural comprehensive production capacity. Stimulating rural consumption demand is of great significance [5]. In order to promote the sound and rapid development of agricultural mechanization and agricultural machinery industry, the following suggestions are put forward:

We should thoroughly implement the concept of scientific development, comprehensively implement the Law of the People’s Republic of China on the Promotion of Agricultural Mechanization, adhere to the road of agricultural mechanization with Chinese characteristics, and make great efforts to promote technological innovation. Organizational innovation and institutional innovation, efforts to promote coordinated development of agricultural machinery, agronomy, and agricultural management methods, efforts to strengthen the construction of socialized service system of agricultural machinery, and efforts to improve the innovation ability and manufacturing level of agricultural machinery industry. Further increase policy support, promote agricultural mechanization and agricultural machinery industry sound and rapid development.

2. In order to advance the mechanization of agriculture, it is a good and rapid development

Ecological fruit mechanization development has entered a new historical starting point, ecological fruit mechanization as the main in the development of modern agriculture and the main symbol, suiTable for planting machine area production needs plant type of small, single, high technology content, can not meet the requirements of the development of fruit production [6]. Low, seriously affected the development of economic crops, can rapidly promote the development of forestry planting fruit.

The design and modification of planting machine of the utility model improves the performance and efficiency of equipment, and for forestry and woodworking machinery dynamic design of other new roads, making China's machinery up to date and reach the world level, to improve the afforestation mechanization process of our country has a huge role, also has great the significance for China's forestry economic and ecological benefits. The development of forestry and fruit industry has important practical significance. Therefore, accelerating the development of mechanized transplanting technology is imperative.

“three more and three little” and “three high and three low” phenomenon, that is: more power machinery, less supporting machinery; Small machinery more, large and medium-sized machinery less; The conventional tillage and transportation machinery is more, the harvesting special machinery and the high performance machinery are few, the cultivation link mechanization level is high, the

harvest and the postpartum link mechanization level is low; High level of mechanization of grain crops, low level of mechanization of animal husbandry, characteristic agriculture, facility agriculture and forestry and fruit industry; The level of mechanization in plain areas is high and the level of mechanization in mountainous areas is low. There is still a certain gap between the overall development level of agricultural mechanization and the requirements of modern agricultural development.

(2) the system of grass-roots agricultural machinery stations is not good, and the infrastructure is simple. For many years, the “people, property and property” of the township farm machinery stations have been managed by the villages and towns, resulting in the offices of most of the township stations and the operation of service facilities. The test sites were crowded, auctioned, lost, office equipment and transportation almost nothing. There were 65 stations in the state, 34 of which had no offices. In particular, most of the agricultural machinery workers are crowded out and borrowed by the township authorities. They are not in charge of posts, are not specialized, and the technical team of agricultural machinery is showing an aging of knowledge, a lack of talent and a mismatch between the new and the old [7]. For example, the agricultural machinery management station in Beiting Town, Jimusar County, borrowed the office of the Agricultural Science Station and had only one old and two staff members, so it was impossible to manage more than 600 tractors at all.

In 2013, to do a good job of agricultural mechanization, we should continue to adhere to the general tone of seeking progress in a steady way, make new progress in solving outstanding problems such as unbalanced development, uncoordinated and unsustainable development, and strive for better and faster development of agricultural mechanization. Good and fast. The main goal is to achieve a comprehensive mechanization level of crop cultivation and harvest to reach 59.

Mechanized planting of rice and corn yield reached 33% and 45% respectively, which increased by 3% and 5% respectively compared with the same period of last year. There has been a breakthrough in mechanized production of large economic crops such as rape, sugar cane and cotton, and coordinated promotion of mechanization of forest and fruit industry, animal husbandry, fishery, facility agriculture and initial processing of agricultural products; The application level of agricultural mechanization science and technology, the degree of organization of operation, the ability of public service, the further optimization of equipment layout and structure, the stable situation of safe production, and the increase of agricultural production. Farmers' income and rural development provide strong equipment support.

Slicing machine technology abroad began in 60s to 70s has been developed, in mid 80s, most slicing machine can be processed more than 125MM large diameter single crystal, like Switzerland's Maier - Bugge Jess's bedroom in the circle cutting machine, cutting bar diameter can reach 304.8mm. in late 80s of one or two years, to the development of the slicing technology peak period, a considerable number of multifunctional automatic slicing machine have been commercialized. Thus the birth of the world famous manufacturers continued slicing machine, such as the TS series machine of Swiss AG company TSK series machine Japan TOkyo Semisu Zhu. The series of ASM, American STC Company’s STC series machine, structure slicing machine, air bearing spindle with fire rolling bearing as the support way of horizontal and vertical two. Development is now a slicer function, already quite complete, and composite There are many ways of slicing type.

At present, the global demand for fruit processing machinery with an annual growth rate of 5.3%. The United States has the largest fruit processing equipment manufacturers, followed by Japan, the main producers of others from Germany, Italy and China, the fruit processing equipment production growth is the fastest development China countries and regions [8].

In China, the three major grain production mechanization campaigns have been launched in an all-round way and is progressing smoothly. Facility agriculture and agricultural mechanization is an important symbol of agricultural modernization, with the characteristics of high yield, high quality, high efficiency, ecology, safety and annual production. The high efficiency production and sustainable development have been realized, and the popularization of agricultural science and the level of agricultural modernization have been improved. As a modern and high input industry, facility agriculture needs higher infrastructure conditions. Facilities construction and operation and

maintenance have effectively promoted the development of rural construction, materials, machinery, chemical industry, management and other cities and town's agricultural industry and related industries, and effectively promoted the industrialization and urbanization construction. At the same time, it broadens the channels of employment in urban dependent areas and the increase of farmers' income.

The rapid development of facility agriculture is an effective guarantee for the seasonal balanced supply of agricultural products such as vegetables, meat, eggs and milk in China. Improving the life of urban and rural residents has played a very important role. However, facility agriculture is a modern and efficient agricultural technology which integrates biotechnology, engineering technology and information technology, and its technological intensity. The degree of intensification and commercialization are very high. Such characteristics make the development of facility agriculture in our country in technology, input, production; management will face many constraints, especially for a long time. Facilities agriculture has no comprehensive and coordinated management departments, nor specialized technical extension agencies, only by agriculture, forestry, livestock, agricultural machinery and other departments to carry out strip management. The development of facility agriculture in many areas is extremely unscientific and not standardized.

According to the needs of harvesting suitable tree. Selection of resistant to drought, barren tree species, such as Platycladus orientalis, Robinia pseudoacacia, Bai Kuai, Sophora japonica, Fraxinus velutina; selection of cold resistance, wind resistance, disease and insect species, such as Ailanthus altissima, Lespedeza, sea buckthorn, Amorpha fruticosa, for the development of the western regions and Beijing, Inner Mongolia such as sand, sand control engineering. The environment greening and ecological construction was based on the Shandong and surrounding provinces, have certain greening effect and ornamental value of the species, such as Acacia, five maple, horse chestnut, Koelreuteria paniculata, honeysuckle, leaves small tillers, sumac.

2, choose the economic tree rootstock seed harvesting. Create economic forest, can quickly restore the vegetation, it can quickly generate economic benefits, hand is welcomed by the farmers. Especially dry fruit is the future direction of development, so we should choose drought resistance barren, strong resistance, suitable for deep processing of fruit rootstock seeds. Rushan apricot, Jujube, hawthorn (wild hawthorn), Diospyros lotus (Actinidia), walnut, chestnut and so on.

With China's accession to the world trade organization, Chinese herbal medicine market is gradually warming up, such as to choose a certain medicinal species, such as eucommia, Ginkgo biloba, Gleditsia sinensis, Fructus Corni, medlar, Holly collected seeds.

China is a big country timber to timber resources, has been scarce. To create a large area of fast-growing, high yield forest is imperative, to select high-quality, fast-growing tree species, such as catalpa, Liriodendron, metasequoia, linden, Qing acquisition seeds.

3. How to harvest fruit seeds

The in-depth implementation of Scientific Outlook on Development, in order to change the agricultural development as the main line, to adjust and optimize the structure of agricultural equipment layout, improve operation level of agricultural mechanization is the main task of accelerating the main crops mechanization key, vigorously develop animal husbandry, fishery, agriculture, forestry and fruit industry and primary processing of agricultural mechanization.

Pay attention to local conditions, reasonable to determine the scope of subsidies, agricultural equipment increases the amount of structural adjustment and layout optimization; highlight the key, to the advantage of the main agricultural areas, the weak link of the key, the farmer specialized cooperative organization tilt, improve the quality and level of development of agricultural mechanization; attach great importance to overall planning, coordination and promotion in the hilly and mountainous area, agricultural and pastoral areas and areas of blood development; pay attention to fuyoufujiang, vigorously promote the application of advanced, mature technology, safety, energy saving and environmental protection, service in place of the machine, to promote agricultural industrial structure.

The adjustment and technology progress; pay attention to the sun operation, to strengthen supervision, to further promote the subsidy policy implementation process fair and open, solid and effective regulatory measures; to give full play to the role of market mechanism, and effectively protect the autonomy of farmers choose to purchase agricultural machinery; pay attention to play the guiding role of subsidy policy, mobilize the enthusiasm of farmers to purchase and use of agricultural machinery, to promote agricultural mechanization the rapid and healthy development, to promote the stability of agriculture and increase farmers' income and rural prosperity and contribute to the stability.

Red jujube is widely planted in China, and its planting area and yield account for 99% of the world. Red jujube contains rich rutin, cyclic adenosine monophosphate, which can prevent and treat cardiovascular and cerebrovascular diseases [9]. Xinjiang is located in the hinterland of Eurasia, drought and little rain, long sunshine, its economic value and medicinal value is very high, which can inhibit the growth of cancer cells and promote the transformation of cancer cells into normal cells. It can inhibit the growth of cancer cells and promote the transformation of cancer cells into normal cells. Rich in light and heat resources, large diurnal temperature difference, suitable for good cultivation quality and high yield of red jujube.

With the adjustment of agricultural structure in Xinjiang, the planting area of forestry fruit industry expands rapidly, among which the growing area of red jujube is the fastest, which brings huge economic benefits to farmers, but the mechanization level of forest and fruit industry is low at present. At present, jujube harvesting mainly depends on labor, labor intensity, low efficiency, high cost, and the harvest season and other cash crops such as cotton coincides with the harvest period, resulting in difficulties for employees, can not harvest timely. With the development of scale and industrialization of red jujube, it is no longer possible to meet the demand of industrial production of red jujube by relying on artificial harvest. It is an inevitable trend to realize mechanized harvest of red jujube.

In accordance with the “State Council on deepening reform and strengthening grassroots agricultural extension system opinions require to strengthen grassroots agricultural extension institutions construction, to ensure that agricultural extension organization and team stability, explore actively to meet the requirements of the new situation of agricultural extension mode, and gradually establish and improve the grassroots public welfare agricultural extension agencies as the leading agricultural machinery service organization, business cooperation as the main body, large agricultural machinery, agricultural scientific research, education and production, circulation enterprises to participate in the division of labor, services in place, full of vitality, the diversification of grass-roots agricultural technology promotion service system. Good agricultural extension mechanism and regional innovation pilot work station construction, promote the innovation of grassroots agricultural extension system reform and mechanism, and strive to improve the promotion of agricultural mechanization technical ability.

At present, our country still has not very rich patterns of jujube harvesters, and the technology is not very mature, most of them are holding the trunk of the robot into vibration, so that the fruit falls off, and some use the wind to blow the branches. The fruit was blown off by strong wind, taking the first red jujube harvester “4YS-24 red jujube harvester”, which was developed successfully by the Mechanical equipment Research Institute of Xinjiang Academy of Agricultural Reclamation, as an example. It is the vibration that causes the fruit to fall off. The field demonstration of jujube harvesting machine has aroused the great interest of the majority of fruit farmers. The harvester is designed with hydraulic transmission and control technology of vibration manipulator and inverted umbrella-shaped fruit holder. Set. It can collect 50 jujube trees per hour by using the jujube harvester, the net picking rate is 91.5%, and the efficiency is increased about 10 times. For the bingtuan 60,000 hectares red jujube growers harvest jujube to provide technical and equipment support, it is understood that this jujube harvester cost about 20,000 yuan, very popular with the majority of the people. If we can develop a better and cheaper jujube harvester, it will open up a better world for us.

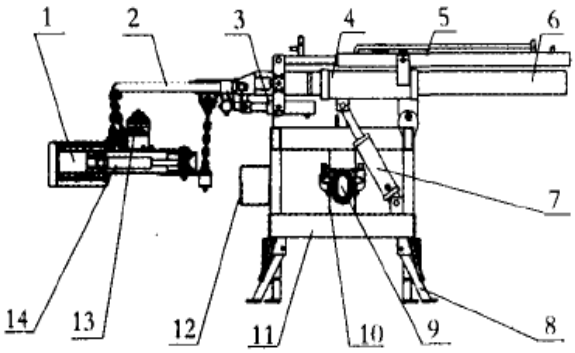

Fig. 1. The arm of the jujube harvester is operated under hydraulic control

In the U.S food industry , vegetables and fruits account for the largest share of food machinery , while the United States imports food processing machinery from Germany , Mexico , Canada and China . In Russia, machinery manufacturing is far from the needs of industries such as agricultural processing and food production. It is understood that Russian fruit processing machinery has a market capacity of $ 2 billion to $ 4 billion a year, but Russian manufacturers have only 20 per cent of their share , and these manufacturers are primarily producing semi - automated equipment , and are currently not capable of meeting the overall needs of the Russian food production processing industry . In Asia, the Vietnam market is increasing demand for a set of processing equipment such as food machinery, such as food slicer, especially in fruit processing equipment . Vietnam produces rich tropical fruits with annual output of more than 3.8 million tons, but the fruit processing technology is backward, leading to the export of fresh fruit.

Although our country has made great progress, but compared with the developed countries, there is still a big gap, there is a low level of science and technology, low facilities [10]. As an important content of facility cultivation, mechanization technology has been popularized and applied to a certain extent. At the same time, the majority of farmers also put forward a more urgent demand for the application of machinery in facility agricultural production. The application of multi-functional small-scale agricultural machinery and seed processing machinery is the core content of mechanization technology of facility agricultural engineering. Mainly include seed processing, deep tillage, sowing, planting, trench, ridge, tillage, and weeding and other work links. Can effectively ensure that the inside corner of the shed can be ploughed to the maximum extent to meet the needs of the shed operation.

The slicer technology in China started in the early years , and the slicer of our country is widely used in the fields of vegetables , traditional Chinese medicines , frozen meat and the like , in which the application of potatoes is the most significant , and the main modes of the slicer in China are as follows : 1 . The linear reciprocating slicer has simple structure and low cost, so it can be applied to situations where the working requirements are low and the efficiency is low. 2. The disk rotary slicing machine has simple structure and high production benefit, so it is widely used in various occasions. 3. The water gun type slicing machine, the water gun type water consumption is large, can only cut out the straight piece, so its application is not quite extensive. The circular slicing machine has high working efficiency, but it is complicated in structure and difficult to design, so it can be applied to the professional field with high working efficiency.

4. Mechanization Application and Experimental study of vibrating Forest and Fruit Harvester

At present, we see the fruit picking machinery are mostly single, but the price is a little expensive, in my fruit picking machine, I not only can be used for picking fruit can also be fruit pruning on fruit trees, so virtually farmers buy it is no longer a single harvester, but to fruit trees the management of machinery two units, a price of two sets of results, this is Why not? Thing, my vibration picking fruit machine consists of a frame structure, Fruit Shake device and a hydraulic control system, with 29.4kW (40 horsepower) hitch tractor.

The domestic market is now the slicer type rotary cutting machine, vibration cutting machine, vertical microtome, frozen meat slicer, Chinese herbal medicine slicing machine, wood cutting machine, slicer and so on.

Research and development section in China has 30 years of history, in recent years the development of slicing machine is very rapidly, but compared with the developed countries there is still a distance, development of slicing machine have not been applied in large area, although now have slicing machine manufacturers a lot, but slice machine in our country is still at a low level of development.

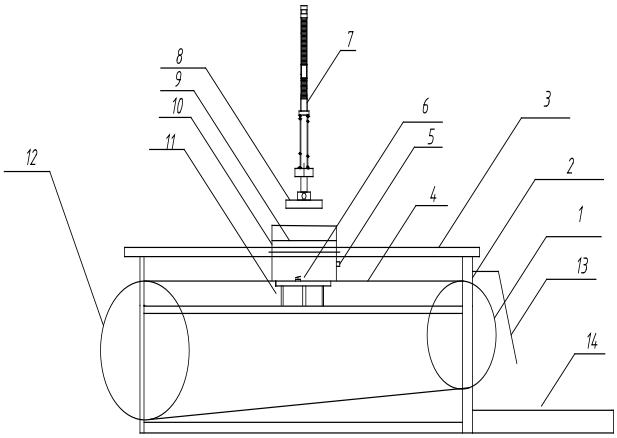

Fig. 2 Membership function diagram of system input and output

(2) it is beneficial to environmental protection

I design the rotary cutting type Apple slicing machine is mainly composed of the motor by V with reduced speed and passed to the flat band power, so that the flat belt rotation, the blade of apple peeling. By rack and spring makes the blade cut up in a box of apple, the replacement of the material box immediately and, pressing material cutting. See figure 3.

Drive through the flat belt and finish cutting, slicing process; at the same time using rack and spring element can press makes press good, in the end cut quickly exit and replace the material box; as for blade, the rivet into the flat belt, the material box is fixed on the frame of the guide rail, with rotation flat belt movement, the blade also follow the movement, at the same time, on a flat belt is installed on the 8 blade, cutting speed is set to 1m/s, the cutting thickness is 3mm, the slice quality at the same time, the cutting efficiency is relatively good.

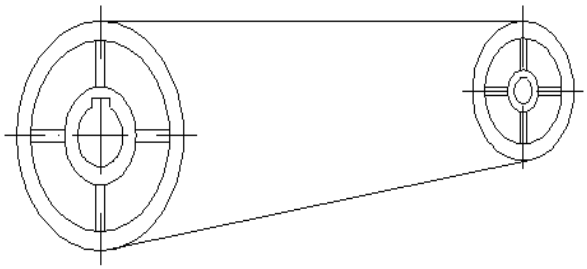

Fig. 3 Hydraulic control system is a control system based on hydraulic control and energy transfer components

Intensify the construction of demonstration areas. According to the characteristics of fruit and grain, animal husbandry, etc. comprehensive mechanization technical demonstration base construction requirements, make full use of their advantages in resources, focus on technology integration, project integration, combination of agricultural machinery and agronomy, seriously organize the implementation of demonstration base construction, speed up the food, fruit, animal husbandry, the application of advanced agricultural facilities the key link of the construction of demonstration base of new technologies and new equipment supporting the integration and demonstration, focus on rice production, animal husbandry, forestry, agricultural facilities mechanization demonstration area construction, actively explore agricultural science and technology demonstration area construction mode and long-term mechanism.

Fruit picking machinery is mainly based on the mechanical vibration of the principle of fruit fall, that is, by the manipulator (vibration head) grasp the trunk, through the vibration. The vibration comes from the eccentric mechanism. The main working process of the jujube harvester is to control the operation of five hydraulic cylinders by operating the hydraulic control valve. The tongs vibration head of the fruit tree shaking device is first clamped on the trunk, then the power is transferred from the tractor power output shaft PTO to the clamp vibration head through the hydraulic control circuit. The eccentricity vibration mechanism of the vibration head is driven by the hydraulic motor, which makes the vibration of the vibration head. The mechanical vibration produced by the vibration head is transferred to the fruit tree, and the fruit branch is subjected to the forced vibration. It also vibrates at a certain frequency and amplitude, so that the fruit on the fruit branch is accelerated by some form of vibration. The accelerating object is subjected to the action of inertial force. When the inertial force is greater than the binding force between the fruit and the branch, the fruit will fall.

5. Summary

Transplanting mechanization is system engineering, the research on the mechanical transplanting of the whole system, in the implementation process, have a significant impact in factories and facilities. So to study the design of the new tree planting machine variety, mechanization, speed, ecology. This design is for horticulture mechanization in planting links and the equipment of the design.

The fruit industry of mechanization of mechanical equipment is to use advanced and applicable in all aspects of fruit production of fruit production, to improve production conditions, to achieve fruit planting, pruning, fertilization, irrigation, harvesting mechanization, process integration, improve fruit production technical level, economic benefit and ecological benefit, so as to promote red dates the production to the development of standardization and industrialization of direction. In the process of planting, due to differences in topography, soil conditions and saplings itself, there is random error tree movement, effect of planting quality. The task focuses on seedling feeding, seedling feeding, ditching, ridging, covering soil, repression, analyze main factors affecting plant spacing and upright seedlings and planting process.

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