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AN INVESTIGATION INTO GROUNDNUT GROWER'S ADOPTION OF MECHANIZATION IN PRODUCTION AND PROCESSING IN INDIA

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Abstract

In the agricultural sector, groundnuts are a very significant crop. In 2023–2024, there were 520 million workers. Currently, 2/3 of the workforce works in agriculture and rural areas, and 1/3 of rural households rely on agriculture. The construction, software, mechanical, and textile industries have seen a growth in employment since 2023–2024. resulting in higher salaries in the agricultural sector and a decline in the labor force. In rain-dependent regions, 80% of India's groundnuts are cultivated during the Kharif season, yielding 2380 kg/ha (2022–2023). In rain-fed locations, timely sowing and harvesting are essential for high yields. If timely operation is delayed, yields will be reduced. In India, only the preparation of the field is mechanized for peanut farming; the remainder is done using conventional techniques. Small and marginal landowners are unable to deploy machinery, which results in ineffective post-harvesting techniques, poor seed plantations, and inadequate plant protection. Gujarat, Andhra Pradesh, Tamil Nadu, and Karnataka account for over 70% of the states that produce groundnuts. India has barely reached 40% mechanization as of right now. Because small and medium-sized farmers are relocating from rural to urban areas in order to improve their financial growth, labor costs are rising. Changes in the monsoon are causing farmers in villages to lose interest in their labor. The rain-fed areas' water supplies are diminishing. Due to the high cost of agricultural machinery, small and medium-sized farmers cannot afford it.India's population is growing but its land area is shrinking as a result of defragmentation and the conversion of agricultural land into real estate. In order to boost output and productivity, lower costs, and increase planted areas. More efforts to improve the degree of mechanization and agricultural economic elements for the effective use of contemporary agricultural machinery can be inferred from the discussion above.

Keywords:Groundnut Cultivation, Farm mechanization, Agricultural equipment's, farm tools, timely operations, boosts yield, and reduce cost, More profits. Lack of plant protection,Land preparation.

Introduction

Groundnuts are an important oil seed crop in India. Since soil moisture availability is limited just after receiving rain, timely sowing is crucial for the best crop establishment for groundnuts cultivated under rainfed circumstances. Conventional field operations need a lot of labor and a lot of time, which eventually drives up cultivation costs. In dryland conditions, farmers can utilize the limited resources, conduct field operations at the right time, and overcome the labor shortage by using mechanical crop cultivation. Mechanized groundnut cultivation may soon take the place of the conventional labor-intensive way of producing groundnuts..In India, only the preparation of the field is mechanized for peanut farming; the remainder is done using conventional techniques. Small and marginal landowners are unable to deploy machinery, which results in ineffective post-harvesting techniques, poor seed plantations, and inadequate plant protection. Gujarat, Andhra Pradesh, Tamil Nadu, and Karnataka account for over 70% of the states that produce groundnuts. A small number of post-harvesting equipment are available for groundnut cultivation, but they are insufficiently effective to fully harvest,

meaning that 20% to 30% of the groundnut remains in the plant.Therefore, use mechanical method of harvesting reduce the labor cost and improve the economic growth. Labors availability is very poor during season delay in all the work in agricultural operations like plantation, weed removal, harvesting and threshing, resulted less profit to farmers and same time migration is increasing day by day in rural areas. Increase the productivity and profit mechanized for agricultural operation. The harvesting machine efficiency of 92.30%.Threshing efficiency of 82.30% and 72.30% of cleaning efficiency, this machine attached to tractor. Increase the profit and save the cost and time. The small landowner's average land is 1.3 ha. They do not have sufficient capital to expand their production. The researchers developed several technologies for groundnut operations but not reach to small scale land owners and income not increased.Groundnut growers are depend on women workers they involved all the activity like planting, weeding, harvesting, storage and marketing. If adopt the new technology increase the yield and higher income and this lead to better living standard.

Mechanization of Groundnuts In India

Accessible data shows that while tractors are used for land preparation, smaller farmers lag behind in planting and harvesting, resulting in losses; mechanization helps with timely operations, increases yield, and lowers costs, particularly in major states like Gujarat, TN, AP, and Karnataka; however, efficient machines for all stages (especially harvesting/drying) remain a challenge, requiring better adoption for efficiency.One of the most significant crops for many nations is the groundnut, which yields edible oil and protein and has 47–53% oil in its seeds. 25 - 36% protein. The average yield varies by country; for instance, South America produces 2500 kg/ha, Asia produces 1600 kg/ha, Africa produces a pathetic 800 kg/ha, and the United States generates an average of 3500 kg/ha. With an area of about 70 lakh hectares and an output of 80 to 85 lakh million tons.

India is the second-largest producer after China. More than 75 countries purchase peanuts from India. The summer, Rabi, and Kharif seasons are when this crop grows, peaking between June and October. About 70% of groundnuts are grown in areas with little or no rainfall because of the low and average yield in Asia and Africa. Inadequate watering during flowering and irregular mansion significantly reduce the yield. Although groundnut oil has several applications, its primary use is in cooking. Soap, fuel, cosmetics, shaving cream, leather dressings, furniture cream, and lubricants are just a few of the preparations that use it. Additionally, groundnut oil is used to make Vanaspati ghee and fatty acids. Additionally, it serves as a preservation medium for pickles, chutney, and other delicacies.Many medicated ointments, plasters, syrups, and medicated emulsions are made with groundnut oil. It is also used to make a variety of meals, including butter, milk, chutney, candy and chocolate, Laddu, barfi (Chukii), and groundnut pack.

Review of Literature

Sudhakar,et.al., (2010). According to research findings on root development, groundnuts can grow roots up to 2.1 meters in a system with a good root environment. Therefore, the field needs to be prepared as deeply as possible to create a suitable environment for root growth. This helps with in-situ moisture conservation in addition to promoting improved root growth. In a similar vein, research on the impact of primary tillage (MB plough and rotovator) on groundnut growth parameters showed a 16.5 percent improvement in production above farmers' practices.

Ramana, C. (2015). When groundnut cultivators and rotovators are employed for preparatory cultivation, the depth of cut and soil disturbance will improve exposure to nutrients and moisture, making it easier to increase productivity.

Comparison of Two Methods of Harvesting Like Traditional Method And Mechanized Method

Karnataka's production of 856 kg/ha is extremely low when compared to other states; Tamil Nadu's output is 2452 kg/ha, while India's average is 2852 kg/ha. There are two methods for harvesting: mechanically and conventionally. The traditional method is used to hand extract and turn over groundnuts. The standard harvesting procedure includes digging, hoisting, windrowing, stocking, and threshing. It usually takes 12 to 14 laborers per hectare of land to harvest groundnuts in a single day. Harvesting groundnuts by hand can be difficult when the crop has grown too long and the soil has hardened. In this instance, additional work is needed and a hand hoe or blade harrow is utilized. In terms of ergonomics, harvesting groundnuts is a repetitive operation that results in changes in heart rate, blood pressure, and body temperature while the pods are being collected in the field. Increased joint pain is experienced by harvesting participants. Therefore, the development of a machine to address this problem will reduce fatigue and workload in the agriculture industry. Metropolitan populations are growing while rural populations are declining daily, not only in India but in other nations as well. We must give rural communities with the tools they need to supply metropolitan populations with food and vegetables. Therefore, using more sophisticated technology in agricultural fields will boost output and provide effective tools and techniques for producing groundnuts.

Mould Board Plough

It is helpful for turning and pulverizing fields up to 45 cm in length. When compared to a Bullock drawn country plow or cultivator, the MB plough is 300% more efficient since it penetrates the soil by suction in its structure. The tool works effectively in non-sticky, stone-free soils. Two-way reversible mold board ploughs with a hydraulic shift lever are available to prevent undulations in the field.

Disc Plough

In stony stumpy soils, where MB plough cannot be administered Disc plough can be successfully administered. This plough has got rolling plough bottom, hence it is useful for any type of soils and plough enters in to the soil due to self weight of the implement. If required, dead weights can be added to the implement for more depth up to 45cm even in dry soils. The rolling discs orientation like disc angle and tilt angle be changed for getting better quality soil tilt.

Sub Soiler

In order to manage the bottom layers of soil strata and help mix new soil with old dirt on top layers, a subsoilier cuts soil strata down to a depth of 40–75 cm on the field, produces vertical cuts, and is applied once every three years. However, because drainage is limited, subsoiling (vertical tillage) also produces a vertical depression for rainwater to enter the field and for excess water to move laterally. Rainwater entering deep layers through vertical cuts will moisten the soil under the surface and remain intact (as a reservoir) without evaporating. Moisture beneath the surface layers protects the crop and helps it survive long dry spell.

Seed Treatment Equipment

The Sathi Bullock Drawn Groundnut Planter was created at the Agricultural Research Station, ANGRAU, Ananthapur, to automate the sowing process. For seed placement in the row, it has a trough-style seed metering system. This maintains a seed-to-seed gap of 10 cm in a row at a depth of 4–5 cm and covers four rows at a time with a row-to-row distance of 30 cm. It is possible to sustain the suggested seed rate of 100 kg/ha. By altering the row-to-row spacing and disc in the seed metering system, it may also be applied to other crops such as Bengal gram, castor, and red gram by changing the row to row spacing and disc in seed metering mechanism. The field capacity is in between 1.5 to 2 ha/day. The capacity of hopper is 8 kg for groundnut.

Seed Cum Fertilizer Drill (Gujarat model)

This seed cum fertilizer is provided with seed and fertilizer boxes along with seed metering mechanism (trough feed) and mounted on 9 tynes cultivator (Rigid and spring tyned optional based on soil type). The depth control system was provided to maintain uniform depth through two guage wheels. The row spacing of the sowing can be adjusted as per the season/requirement. The covering device is placed behind the implement to close the furrows immediately after sowing (with rear plank). Similarly the same seed drill can be used for any type of seed sowing for which seed metering scoop wheels need to be changed. Fertilizer drilling qualities also can be monitored by changing sliding door at the bottom of fertilizer box and beginning of the fertilizer spout.

Tractor Drawn Anantha Groundnut Seed Cum Fertidrill

Tractor drawn groundnut seed cum ferti drill –row tractor operated groundnut seed drill with row to row spacing of 30 cm fir timely sowing with mechanical advantage and intercropping fertilizer facility is provided. This is provided with a hopper and seed metering mechanism as the main components. The hopper is divided into boxes each can accommodate 5 kg of seed (total 40 kg). The inclined plate seed metering mechanism gives correct seed to seed distance of 10 cm in a row and maintains the recommended seed rate of 100 kg/ha with optimum plant population of 33 per square meter area. Placement of seed is at proper depth of 4-5 cm. the seed damage is negligible and the field capacity is 6 to 7 ha/day and facilitates coverage of large area before the soil moisture is dried up.

Boom Sprayer

It consists of a pump, one plastic or fiber glass made tank of 400 litres capacity, control valves, relief valve and a spray boom fitted with nozzles. The pump is operated by the PTO shaft of the tractor at the high pressure of around 20-55 kg/cm2 . The complete sprayer is mounted on 3-point linkage of the tractor. The boom may be of flexible hose pipe on which nozzles are mounted to meet crop row spacing. The bottom is fixed with a rigid beam by clamps. Inlet liquid supply to boom is provided at two points for even distribution of liquid. Hole are provided on the frame to lower or raise the beam to adjust the height of spray. This boom has 13-15 triple action nozzles and can cover 7-8 m width. Two small width pneumatic tyres of 8.3”X28” size need to be fitted to the rear axle of the tractor to run in between rows of the crop instead of normal size tyres to prevent trampling of plants.

Manufacturing process in a Groundnut Decortication :

As the groundnut seed is contained in pode pod is harvested by pulling or lifting the plant manually or by using a hoe as the mechanization system. The pods are stripped from the haulms, dried stored and processed. Shelling is a fundamental step in groundnut processing as it allows the kernels and hull to be used as well as other post harvesting technologies to take place such as oil extraction or in hull briquetting. Shelling can generally be done by hand or machine. Hand shelling is the process in which the pod is pressed between the thumb and first finger so that the kernel is released. It is the most predominantly used method in India’s small holder agriculture while hand shelling keeps the rate of kernel breakage low, it is labour intensive, energy requirement is high and leads to “sore thumb syndrome” when large quantities are handled.Then, under the blowing force of peanut shelling machine's rotating fan, the light peanut shells would be blown out of the machine, while peanut kernels would be separated by the vibrating screen to achieve the purpose of cleaning.

A good percentage of the farmers of this crop crack the pods using fingers and stones or by beating out the seeds with paddles and sticks. This is time wasting, boring and energy sapping. Other producers and marketers of this economically important crop who procure decorticating machines from overseas do

this with tears because the stresses and costs involved in importation is enormous. Some imported large-scale plants are increasingly replacing small groundnut processing units, but due to high foreign exchange rate, the cost of such imported machines is clearly out of reach of poor farmers in India. Developing an affordable groundnut decorticator to ease the labour associated with shelling and reduces operational cost and time would enable the high potentials of the crop to be harnessed optimally.

Conclusion

India has barely reached 40% mechanization as of right now. Because small and medium-sized farmers are relocating from rural to urban areas in order to improve their financial growth, labor costs are rising. Changes in the monsoon are causing farmers in villages to lose interest in their labor. The rain-fed areas' water supplies are diminishing. Due to the high cost of agricultural machinery, small and medium-sized farmers cannot afford it. India's population is growing but its land area is shrinking as a result of defragmentation and the conversion of agricultural land into real estate. In order to boost output and productivity, lower costs, and increase planted areas. More efforts to improve the degree of mechanization and agricultural economic elements for the effective use of contemporary agricultural machinery can be inferred from the discussion above. Create more affordable equipment in the future to accommodate medium-sized and marginal farms. It is clear from the discussion above that there is a lot of potential for using automated technology in the agricultural sector for groundnut growing and harvesting. The people will be able to remain in rural areas and make a living as a result of the increased production and returns.

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