e-ISSN:2582 - 7219

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING AND TECHNOLOGY

Volume 4, Issue 6, June 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 5.928

International Journal Of Multidisciplinary Research In Science, Engineering and Technology (IJMRSET)

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 5.928

| Volume 4, Issue 6, June 2021 |

Adoption, Development and Field Evaluation of Power Tiller Operated Equipment Suitable for Eastern Uttar Pradesh

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ABSTRACT: The matching implements such as ridger. leveler and two-row seed-drill were developed along with their hitching systems and field performance also carried out ill terms offield capacity. field efficiency, draft. fuel consumption and slippage. The use of modified lightweight polver tiller for hill agriculture gave satisfactory performance with matching implements. Most of the models of light weight power tillers being manufactured in India are provided with a rotary tiller which can be used for seed bed preparation and interculture operation in widely spaced crops like cotton, pigeon pea, sugarcane etc. However, some lightweight power tillers are also being manufactured in the country to pull ploughs, cultivators etc, which can be used for seedbed preparation in small plots on hills where terrace cultivation is practiced for crop cultivation and also by small and marginal farmers in eastern uttar Pradesh. It is essential to develop the matching implements to increase the annual use of power tiller and make it economically viable. Further, the development of matching implements would lead to timelines of operations and increase in the command area of the power tiller. Keeping these facts in view seed drill for proper placement of seed and fertilizer, ridger for making ridges and leveler for covering furrow were developed in UP. Various parameters such as machine, soil and crop parameters were considered during the field evaluation. The major parts of the seed drill consisted of main frame, seed box, flutted roller type seed metering mechanism, furrow opener, seed tub and attachment for seed rate adjustment. Considering the performance parameters, seed drill fitted with fluted feed roller type seed metering mechanism with two numbers of furrow openers was found satisfactory for use on terraces although plant to plant distance could not be maintained. Agriculture in eastern UP is distinguished from agricultural sector in the plateau areas in terms of its features and performances. The UP region is characterized by hilly terrain, plains, high rainfall, wide variations in slopes and altitude with spread out hills interspersed by fertile plains. Because of which the region is unique, affecting agriculture in various ways including mechanization of farm activities. Farm machines or equipment for the hilly regions must suit the hilly terrain and small farm sizes. Literature also revealed that machines designed for plain areas are not suitable in the hilly region due to topography and small land holdings.

I. INTRODUCTION

The weight of prime mover to be used in eastern UP must range from 100-110 kg that can be lifted by one or two men from one terrace to another . In the region, maize is the second important cereal crop after rice in terms of cultivated area. Farmers (mostly tribal) in the region still follow manual dibbling method. This method of sowing is not only time consuming, but also it involves drudgery. Some researchers have reported development and evaluation of equipment for sowing/planting of crops in hilly areas: manually operated multi-crop planter for eastern UP ,light weight power tiller operated seed drill for sowing wheat on hilly terraces light weight manual planter for planting maize in eastern UP self-propelled multicrop planter developed & evaluated at IARI, New Delhi for planting of maize and soybean in hilly areas. It was also identified some equipment such as CIAE seed drill, dibbler, manual oilseed drill and manual multicrop planter/garlic planter, suitable for sowing small to large seeds in hilly region. Although a number of planters or seed drills have been developed and evaluated, literature on power tiller operated seed drill for sowing maize in north eastern hilly region could not be found. Since power tiller is multi-purpose and becoming popular in hilly region,

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 5.928

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there was a need to explore the feasibility and adoptability of power tiller drawn seed drill to mechanize sowing operation of maize. [1] Therefore, the present study aimed to evaluate the performance of power-tiller drawn seed drill for sowing maize on terraces in. It was also identified some equipment such as CIAE seed drill, dibbler, manual oilseed drill and manual multicrop planter/garlic planter, suitable for sowing small to large seeds in hilly region. Although a number of planters or seed drills have been developed and evaluated, literature on power tiller operated seed drill for sowing maize in north eastern hilly region could not be found. Since power tiller is multi-purpose and becoming popular in hilly region, there was a need to explore the feasibility and adoptability of power tiller drawn seed drill to mechanize sowing operation of maize.[2] Therefore, the present study aimed to evaluate the performance of power-tiller drawn seed drill for sowing maize on terraces in Moreover, some equipment such as CIAE seed drill, dibbler, manual oilseed drill and manual multicrop planter/garlic planter, suitable for sowing small to large seeds in hilly region. Although a number of planters or seed drills have been developed and evaluated, literature on power tiller operated seed drill for sowing maize in north eastern hilly region could not be found. Since power tiller is multi-purpose and becoming popular in hilly region, there was a need to explore the feasibility and adoptability of power tiller drawn seed drill to mechanize sowing operation of maize. Therefore, the present study aimed to evaluate the performance of power-tiller drawn seed drill for sowing maize on terraces in eastern UP.[3]

A power tiller drawn seed drill (HPKV Palampur Design) having three furrow openers (25 cm spacing between them) was used. Out of three, only two furrow openers were allowed to drop seeds (making it a two-row seed drill) to maintain a row spacing of 50 cm for sowing maize. The major components were main frame, seed hopper, seed metering unit, seed tube, furrow opener, power. Laboratory calibration of seed drill conducted as per BIS standard (IS: 6316-1993). Maize seed was filled in the hopper. Ground wheel was jacked up and 20 revolutions were given to the ground wheel. The seed discharged from each of the two seed tube were collected and measured separately. Ten replications were taken. Variation in seed metering and uniformity of seed delivery between two rows were also evaluated.[4]

The man-hour requirement of the seed drill was 8.33 per hectare as compared to 200 man-hours per hectare with manual dibbling method. The major loss in efficiency was due to the turns at the head land and adjustment of seed drill position before a run so that required spacing was maintained with sown rows of the previous pass. The average depth of seed placement depth was found to be 45 mm. The performance indices indicated that the power tiller operated seed drill performed satisfactorily under field conditions though plant to plant spacing could not be maintained. After 20 days of sowing, plant population of 77,000 per hectare was maintained.

II. DISCUSSION

During field operation, the machine could be comfortably manoeuvred by the operator on the terraces. No breakdown and repairs of components during the operation were observed. The cost of operation of the seed drill was estimated to be Rs. 1,751/- only per hectare of area covered against a cost of Rs. 7,500/- per hectare for manual dibbling method. The cost of sowing with the power tiller operated seed drill was substantially lower as compared to manual dibbling method followed by farmers in the eastern UP.[5]

About 74% of the beneficiaries owned the tractor, whereas rest of them availed it on hiring basis. Nearly half of the machines (52%) were matching with the tractor hp. About 61% of the machines had operator manual along with it which was supplied by the manufacturer. There was six times out of 10 when the manufacture conducted demonstration of the machine for the beneficiaries. It was observed that 75% of the machines were physically present. Amongst the machines available, 71 % machines were in 'Good running condition' and the remaining 29 % were either requires minor or major repair or unserviceable. The reasons for repair includes wear and tear of garden tille's blades, power tiller's tine, damage of sprayers nozzle and recurring problems of repair associated with self-propelled reapers. The reasons for un-serviceability are non-availability of spare parts damages due to improper handling, and manufacturing defects. As among the machines which were not physically available at the time of the visit, reasons were; sent to hiring (38 %), given to friend or relative (14 %), sent for repair (6 %) and remaining were unavailable for unknown reasons. Based on the analysis of the ways through which they got command over the use of machine, it was found that a majority of them (39.1 %) learned it from neighbours, 22.5 % learned from the demo provided by the manufacturer, 23.2 % learned based on their knowledge and rest of them learned from the manual provided along with the machine. The survey of the beneficiaries revealed that 62.4% of the machines owned by them were in good condition, 20.7% in very good condition, 12.1 % in average condition and rest of them were in poor condition. [6]

There were safety symbols on the 67.8 % of the machines. Considering overall performance of the machine, 24.8 %, 65.0 %, 5.5 % and 4.7 % of them were rated as very good, good, average and poor, respectively. It was revealed that

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 5.928

| Volume 4, Issue 6, June 2021 |

most of the farmers were sowing the seeds on very higher side. In case of wheat the seed rate was observed as 125 kg per ha against the recommended seed rate of 100 kg per ha.. The reduction in the seed rate was observed in range of 5 % to 19.8 % among the surveyed households. Thus, farmers have saved the input cost through reduction in seed rate, thereby reduction in overall cost of cultivation. - It was revealed that most of the farmers were sowing the seeds through broadcasting or bullock drawn implements. In case of paddy-soybean-wheat-maize, the seed was not placed uniformly at the recommended depth. This was causing poor rate of germination or even losses due to birds and insects. However, after the use of seed drill and multi crop planters, the overall seed Germination rate has improved in the range of 6.9 % to 28.8 % among the surveyed households. The average increase in seed germination rate was in the range of 14.1%. Thus, farmers have received better yield of crop due to proper plant population on one hand and saved the input cost through reduction in seed rate, on the other hand. It was revealed that most of the farmers were applying the fertilizers on higher side as basal dose and top dressing. After the use of seed cum fertilizer drill and fertilizer broadcaster, the consumption vis-à-vis fertilizer use efficiency has improved. At the same time cost of labour for fertilizer application has also reduced. The reduction in the fertilizer application was observed in range of 10.1% to 19.9 % among the surveyed households. The average reduction in fertilizer rate was in the range of 12.7 %. Thus, farmers have saved the input cost through reduction and efficient use of fertilizer, thereby reduction in cost of cultivation. Due to various above stated factors, the quality of farm operations has improved. The land preparation, seed and fertilizer placement, weed control, interculture operations, are performed in time bound manner. The harvesting and threshing time has considerably reduced which has reduced the incidences of crop damage due to untimely rains. All the above factors has contributed in increase of crop yields and reduction in post harvest losses. The increase in crop yield has been reported in the range of 13% to 23.6%. But on an average, 17.90 % increase in crop yields have been recorded.[7]

III. RESULTS

The success of any custom hiring centre depends upon the skilled man power and the facilities for the repair and maintenance available so that the down time is minimum. About 58.1 % centres have informed that sufficient facilities were available in the nearby towns/cities, while 34.5 % centres reported that it was easily manageable. However, 7.4 % complained that it took longer down time to put back the machinery in working condition. The in-depth analysis of those 7.4 % complainant revealed that they lacked experience and technical man-power. The qualification of entrepreneurs are under matric to graduate and backstopping facility has been mainly extended to them by respective State Farm Machinery Training and Testing Stations or in some cases KVKs. These centers are providing the hiring services within a radius of 10 to 20 km from the village where they are established. The source of publicity or advertisement regarding availability of equipments is through agriculture department but major source of publicity is meeting during religious functions or through friends and relatives. In general, the CHC or FMBs have employed 2 to 3 person including one driver, one helper and one center in-charge. The CHCs and FMBs are mainly carrying-out the field operations like land leveling, ploughing, seeding, harvesting and threshing. The equipments available includes tractor, laser land leveler, rotavator, cultivator, paddy transplanter, seed drill, and thresher. Since tractor trolley is not included in the list of approved implements, the entrepreneurs purchase the same at their own. The supplied farm implements and equipments are as per the choice of entrepreneurs, which are compatible with the power tillers or tractors.[8] The region specific farm equipments include paddy transplanter, maize Sheller, multi-crop planter, groundnut decorticator, potato digger, sugarcane crusher etc. As the survey data reveals, the manufacturers arrange demonstration of machines in the field and provide on-the-site servicing facility for tractor and power tillers during the guarantee period. In general farmers expressed satisfaction over the quality of services provided by the CHCs, as their equipments are new, better quality and operators are well experienced. It is also revealed that entrepreneurs of CHCs and FMBs are having their own farm lands, many of them give first priority for their own work . But overall the centers have extended their services to solve the problem of Farm power availability in remote and untouched areas. The private banks are front runner in approval of bank loan for establishing CHCs and FMBs as their field staff provide efficient on site services.[9] The entrepreneurs from many states have expressed concern about the high rate of interest i.e. 14% per annum being charged by the banks. Some of the banks also mortgage land of the entrepreneurs as a security. The financing institutions need to make bank financing more borrowers friendly as agriculture is a priority sector.[10]

IV. CONCLUSION

The team of monitoring and evaluation of WAPCOS discussed with Agriculture officers, NGOs and farmers in the study area, during the evaluation. It is found that the main agriculture machineries required to boost up the productivity of crops and minimize the cost of production are Rotavator, Power weeder, Laser guided land leveler, Tractor mounted sprayer, Happy seeder, Seed-cum fertilizer drill, Rice transplanter, Multicrop thresher & Combine.[11] The demand for

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 5.928

| Volume 4, Issue 6, June 2021 |

these implements are growing fast. They should be provide to marginal and small farmers on Custom hire basis, because the cost of these machinery is very high. As per the opinion of farmers rotavator are being considered better than the conventional tillage equipments. This equipment has saved considerable amount of fuel and accomplished both tillage as well as soil pulverization.[12] The farmers of the study area informed that due to higher cost of manual paddy transplanting, mechanized transplanting is the basic need in paddy growing areas. Zero till seed drill is preferred by farmers of Indo-gangetic plain particularly in eastern Uttar Pradesh for rice-wheat cropping system due to limited time available for sowing of wheat after rice harvesting. In case of harvesting and threshing, the level of mechanization is more than 50% for wheat and rice and less than 10% for other crops. The operation wise farm mechanization of seeding, plant protection and harvesting are top priority for the farmers in study areas for cereals and horticultural crops. But mechanization of these operations is not up to the level of farmers expectations. Farmers need complete mechanization package for crops given below in the table for optimizing the crop production through timely farm operations in a cost effective manner.[13]

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Impact Factor: 5.928

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