



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(6): 1778-1780
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www.thepharmajournal.com

Received: 16-03-2023

Accepted: 19-04-2023

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Study of economics of line sowing of maize by using different bullock drawn seed drills

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Abstract

Maize is the one of the highest yielding cereals and is used for food, feed and fodder. Area under maize cultivation in the country, as well as in state of Odisha is gradually increasing due to its high economic benefits from maize. The small and marginal farmers are getting lesser profit due to the use of traditional method of cultivation, use of conventional tools and machineries. Most of the unit operations in maize are generally carried out manually which is labour intensive thereby increasing the cost of cultivation. Therefore, in this study a set of improved animal powered machineries and implements were demonstrated in maize cultivation in order to study the gain in net benefits by adopting small farm mechanization. The study revealed that small and marginal maize farmers of Jajpur districts could save up to Rs 4200/- per hectare using the improved bullock drawn sowing implements and the B:C ratio has been increased up to 2.27 as compared to 1.93 in case of conventional maize farming.

Keywords: Mechanization, maize, line sowing, bullock drawn seed drill, yield

Introduction

Maize (*Zea mays* L) is one of the most versatile emerging crops having wider adaptability under varied agro-climatic conditions. Globally, maize is known as queen of cereals because it has the highest genetic yield potential among the cereals. In India, maize is the third most important food crop after rice and wheat. Maize has a huge utility as food, feed, fodder and use as snacks item. The demand of maize has been increased after introduction of sweet corn, baby corn, popcorn which have almost captured the Indian market (Sagar *et al.*, 2019) [9]. Maize is the staple food of the mountainous areas (Khan *et al.*, 2003) [7]. It is an important source of carbohydrate for human diets in developing countries and for animal feed in the developed world (Undie *et al.* 2012) [15]. Maize demand has been increasing constantly by 5% in the last decade and is expected to grow 4–6% every year for the next 20 years (Sapkota and Pokhrel, 2010) [16]. It is also the third important crop of the country after wheat and rice (GOP, 2009) [6]. It is used as a staple food for humans as a feed for livestock and as a raw material for the industry. The major problems regarding low productivity could be the traditional method of sowing (Badar and Din, 2005) [3]. Maize is growing fast due to the higher benefits from crop. The farmers are aware of the fact that maize is a high feeder crop with comparatively higher investment; still they prefer it due to higher net return. In this context, maize is most preferred diversified crop in the country and is even promoted for food security of country (Taipodia and Sukla, 2013) [13]. In India not only production and consumption of maize have been rising consistently, but also the consumption pattern of this food crop has also changed over the years (Kumar *et al.*, 2012) [8].

Maize is the most important major coarse cereals grown in the state after rice in an area of 279.61 thousand hectare with a production of 7.79 lakh metric tonnes. In Jajpur district of Odisha it is cultivated in around 1000 ha area.

Mechanization of farms helps in reduction of human drudgery besides ensuring the timeliness of operation and solving the problem of scarcity of labours during peak cropping season (Thakur *et al.*, 2016) [14]. Several initiatives have been implemented at national and state level for pushing agricultural mechanization in all leading crops. Setiawan *et al.* (2006) [11] reported that the government should encourage manufacturers of agricultural machinery locally for manufacturing agricultural machineries that is affordable by the farmers (Setiawan *et al.* 2006) [11]. Sariningpuri *et al.* (2017) [10] suggested several attempts to be taken to increase profits in corn cultivation, among others: the efficient use of agricultural machinery, professional workforce efficiency, as well as improving the work of agricultural machinery in accordance with the engine capacity. Dixit *et al.* (2017) [4] reported that a number of suitable improved

tools, implements and machinery were identified, procured/developed and evaluated by Division of Agricultural Engineering, SKUAST-K, Srinagar to bridge the existing mechanization gap for hilly regions of Jammu and Kashmir state and suggested that the results for benefit of extension workers and users. Maize can be grown according to modern and improved sowing methods, i.e. mechanical method of sowing in contrast to broadcast method of sowing (Asharfi *et al.*, 2009) [2]. Line method of sowing had improved yield and yielding components in maize (Arif *et al.*, 2001; Somroo *et al.*, 2009) [1, 12], compared to broadcast method of sowing in peak hours. Swain *et al.* 2020 [17] found that the improved practice of maize cultivation is superior to the conventional practice considering the higher labour requirement, shortage of labour during peak hours, higher drudgery and most importantly higher cost involvement.

Materials and Methods

Generally, in Jajpur district it is grown year round and the used to sow the maize behind the plough. It is a labour and cost intensive and time consuming process. For reducing the labour cost and timely operation trial had been taken to mechanize the process of sowing of maize. Two treatments had been taken as first use of bullock drawn single row seed cum fertilizer drill and second bullock drawn three row seed cum fertilizer drill for sowing maize. Field experiments had been conducted in Hudisahi and Sunsilo village of Sukinda block including thirteen numbers of farmers to know the performance of the seed drills. Line sowing of maize was done in Kharif season before the onset of monsoon and it was compared with conventional method of sowing behind the plough. Three tillage operations had been conducted before sowing of maize in all the sowing methods. Maize variety Kalinga Raj (OMH 14-27) of 90-95 days duration was sown in seven fields in three different methods and the result was studied. Manual weeding was done. Farmer's traditional practice was shown in Fig.1. Sowing with bullock drawn single row seed cum fertilizer drill was shown in Fig.2 and sowing with bullock drawn three row seed cum fertilizer was shown in Fig.3. The functional parameters, plant growth parameters and yield parameters were recorded to compare the performance of both the methods of establishment of maize.



Fig 1: Sowing behind the plough



Fig 2: Sowing with bullock drawn single row seed cum fertilizer drill



Fig 3: Sowing with bullock drawn three row seed cum fertilizer

Results and Discussion

Before harvesting plant samples were collected from thirteen fields of the farmers to study the biological parameters of maize plants sown in traditional practice as sown behind the plough, by bullock drawn single row seed cum fertilizer drill and bullock drawn three row seed cum fertilizer drill. The parameters of maize establishment are given in Table 1. The biological parameters of maize in different sowing methods are given in Table 2 and comparative study of economics of maize sowing in different methods is given in Table 3.

Table 1: Parameters of maize establishment

Treatment	Av. Field capacity (ha/h)	Av. Cost of sowing (Rs/ha)	Av. Seed rate (Kg/ha)	Av. Labour requirement (mandays/ha)
Sowing behind the plough	0.028	4500	20	15
Bullock drawn Single row Seed cum fertilizer drill	0.028	2500	15	5
Bullock drawn Three row seed cum fertilizer drill	0.16	300	15	1

Table 2: Biological parameters of maize in different sowing methods

Treatment	Av. No. of plants per sq mt	Av. Plant height (cm)	Av. No. of Cobs per plant	Yield (q/ha)
Sowing behind the plough	6.57	264.3	1.1	50.3
Bullock drawn Single row Seed cum fertilizer drill	6.42	265.6	1.3	52.4
Bullock drawn Three row seed cum fertilizer drill	6.71	265.5	1.4	52.8

Table 3: Comparative study of economics of maize sowing in different methods

Sl. No.	Items	Sowing behind the plough	Single row Seed cum fertilizer drill	Three row seed cum fertilizer drill
1	Land preparation (Rs/ha)	7,500	7,500	7,500
2	Sowing (Rs/ha)	4,500	2,500	300
3	Seed (Rs/ha)	10,000	7,500	7,500
4	Fertilizer (Rs/ha)	9,000	9,000	9,000
5	Plant protection measures (Rs/ha)	2,000	2,000	2,000
6	Weeding (Rs/ha)	6,000	6,000	6,000
7	Harvesting (Rs/ha)	12,000	12,000	12,000
8	Threshing (Rs/ha)	9,000	9,000	9,000
9	Miscellaneous	2,500	2,500	2,500
10	Total cost of cultivation (Rs/ha)	62,500	58,000	55,800
11	Gross return (Rs/ha)	1,20,720	1,25,760	1,26,720
12	Net return (Rs/ha)	58,220	67,760	70,920
13	B:C ratio	1.93	2.16	2.27

Acknowledgement

Authors are thankful to Odisha University and technology, Bhubaneswar, Odisha.

Conclusion

Bullock drawn three row seed drill is economical as labour and time is saved. This method of sowing maize can save Rs 4200/- per ha for sowing of maize and yield had increased 4.97 % as compared to traditional practice of sowing. Benefit cost ratio has also increased to 2.27 from 1.93 of traditional practice. Improved mechanized method of sowing can enhance yield and reduce the labour cost. Small farmers can adopt this technology for sowing of maize.

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