

SHORT COMMUNICATION**Effect of conservation agriculture practice for sugarbeet cultivation****M.S. Hossen^{1*} and S.S. Tabriz²**¹Scientific Officer, Agricultural Engineering division²Senior Scientific Officer

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Sugarbeet is mostly grown in temperate countries of the world. In 2009, sugar beets accounted for 20 percent of the world's sugar production (FAO, 2009). During the last few years India, Pakistan and Bangladesh are trying to grow sugarbeet in subtropical climate. Duration of sugarbeet growing season is only 5-6 months and its sugar recovery is also high in comparison to sugarcane. Presently government is giving much emphasis on growing sugarbeet. Agricultural machinery play an important role to reduce drudgery of farm works as well as minimize operational time and production cost. The current methods of land preparation and sowing operations are very expensive and time-consuming for crop production. Proper placement, right amount and distribution of seeds and fertilizers into the soil are necessary for good germination and crop establishment for better crop yields (Ganesh, 1999). Conservation agriculture (CA) is the combination of three major farming principles for successful crop production that are less soil disturbance, crop residue management and beneficial crop rotation. CA is a win-win approaches that reduces operational and imputes costs, while increasing yields and better utilization of natural resources. In greater sense, resources are time, energy, money, soil and water. CA allows efficient and effective utilization of resources. In CA, three operations also could be done in a single-pass operation, however, the strip tillage systems only disturbs up to 50 percent of the land leaving the rest untilled (Justice et al., 2004). The total time requirement for field preparation and planting was highest in conventional tillage (17.5 hr/ha), intermediate in minimum tillage (6.7 hr/ha) and lowest in strip tillage (5.26 hr/ha). The fuel consumption during seeding operation was 57 percent and 38 percent lower than conventional and minimum tillage, respectively (Hossain *et al.*, 2014).

Strip tillage allows for fuel savings because primary and secondary tillage operations with chisel plow, field cultivators, etc. are eliminated. Strip tillage also eliminates additional fuel inputs associated with fertilizer application and weed cultivations in conventional tillage systems. Labor costs may be reduced in association with fewer field operations (Overstreet *et al.*, 2008). The strip-tillage soil profile has slightly greater moisture content than chisel plow. Moisture content through the soil profile particularly at the lower depths under all tillage treatments was greater than the plant available water (PAW). However, the changes in soil moisture storage were much greater

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with strip-tillage and chisel plow than no-tillage from post-emergence to preharvest at 0–30 and 0–120 cm. Strip-tillage can contribute effectively to improve plant emergence, similar to chisel plowing and conserve soil moisture effectively compared with no-tillage (Mark *et. al.*, 2004). Higher production cost of crops can be reduced by means of mechanization. Maize, wheat, potato etc have successfully and effectively cultivated through conservation agriculture by CA planter. Root and estimated recoverable sucrose (ERS) yields were the same under all three tillage practices across N supply. There were no differences in N response across tillage systems. However, estimated tillage costs for ST were from 53 percent to 76 percent lower than other tillage systems tested. Sugarbeet production area under ST in the Amalgamated Sugar Company production area has increased from 0 ha in 2007 to approximately 2,800 ha in 2009 (Tarkalson *et. al.*, 2012). But sugar beet seed sowing is being performed conventionally (manually) yet now in Bangladesh. Feasibility study for sugarbeet seed cultivation by planter in Bangladesh needs to be assessed properly and in this regard, no systematic research work has so far been done in Bangladesh. Therefore, the experiment was done with a view to practicing conservation agriculture for sugar beet seed cultivation in Bangladesh.

The experiment was conducted at BSRI Farm during 2015-2016. Machine was calibrated at agricultural engineering workshop before operation. This experiment was conducted at Bangladesh Sugarcrop Research Institute (BSRI) farm with a view to practicing conservation agriculture for sugarbeet cultivation. Seeds were planted with three different tillage methods (Strip tillage, Bed planting and Conventional method). A versatile multi-crop planter was used as bed planter and strip tillage. The experiment was laid out at RCBD design with three replications where plot size of the experiments was 6m×6m. There were three treatments such as trip tillage, bed planting and conventional method of beet plantation. Seeds were placed manually after 20 cm and 60cm row distance. Forward speed of the machine, width of the machine, total distance travels, time required for single row, total time required for plantation, fuel consumption data was taken during plantation. Four numbers of irrigations were applied including live irrigation. Nitro (Insecticide) was applied six times till harvest of sugarbeet for controlling pest. Weed was managed by conventional method of daily basis labour. Fertilizer (Urea-226 kg/ha, Mop-225 kg/ha, TSP-100 kg/ha, Gypsum-100 kg/ha, ZnSo₄-10 kg/ha, Boron-7 kg/ha) was applied according to the fertilizer recommendation guide of sugarbeet, BSRI. On the other hand time required for single row, total time required for plantation of beet by conventional method were also collected. Effective field capacity and theoretical field capacity were calculated for both methods. Germination data of different planting method were taken and different intercultural operations were done. After harvest, beet weight and brix (percent) for each plot of different planting method were collected. Data was analysed carefully at BSRI laboratory.

Two years result clearly showed that there was no significant difference in yield and brix with different plantation method. The maximum yield was 75.5 t/ha in conventional method and brix was highest, 16.9 at strip tillage method (table 1). It showed from figure 1 that the germination percent and millable sugar beet was highest for conservation agricultural method. For Strip tillage and bed planting it was 70.67 and 70.33 respectively. On the other hand Conservational Agriculture was a water saving technique. Rahman and Islam (2008) observed that 37 Percent water usage can be saved in CA as compared to the conventional tillage system without sacrificing grain yield during the dry season. It reduced labour and fuel cost by means of total production cost. The field capacity and fuel consumption of the bed planter operation were 0.14 ha/hr and

1.4 l/hr, respectively. The bed planting system reduced irrigation water application time by 40 percent compared to conventional flood irrigation. (Haque *et. al.*, 2013). Estimated tillage costs for strip were from 53 percent to 76 percent lower than conventional tillage systems tested. (Tarkalson *et. al.*, 2012)

Table 1. Effect of different planting method on yields and brix

Treatment	Yield (t/ha)		Brix (percent)	
	2015	2016	2015	2016
Strip	70.2	74.35	16.9	16.2
Bed	70.2	73.75	16.27	15.81
Conventional	71.8	75.50	16.73	15.73

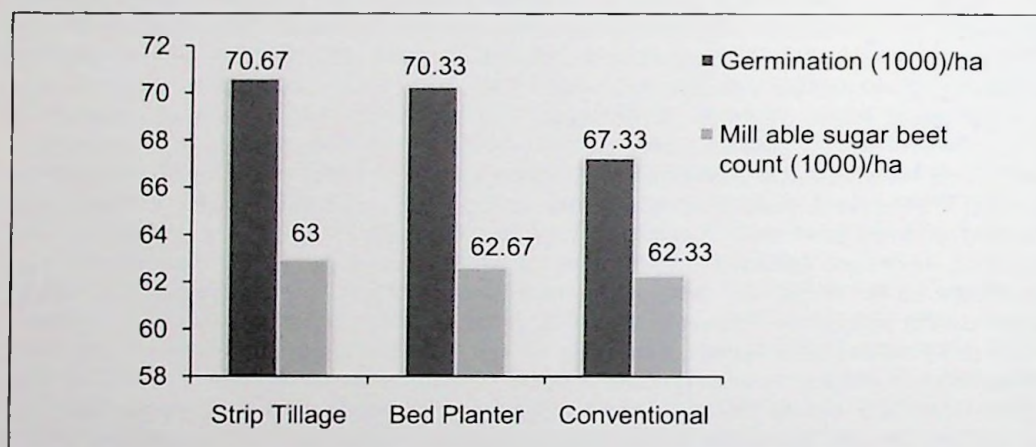


Figure 1. Germination percent and Millable beet for different tillage method

It was found that there was no significant yield different between CA and conventional method. On the basis of fuel consumption cost and labour cost CA was much lower than the conventional practice. So it can be concluded that without compromise with yield, total production cost of sugar beet plantation can reduce by means of conservation Agriculture.

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