Effect of Moisture Conservation Techniques on Growth and Yield of Sugarcane in Drought Prone Areas of Bangladesh

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ABSTRACT

The experiment was conducted during 2015-2016 cropping season at Bangladesh Sugarcrop Research Institute farm, Ishurdi (AEZ 11) and Regional Sugarcrop Research Station farm, Thakurgoan (AEZ 1) with a view to find out the effect of moisture conservation techniques on growth and yield of sugarcane. The experiment was laid out in a factorial design with three replications. The experiment was conducted with the following treatments viz., Factor A: Irrigation: I_1: 3 Irrigation (Live irrigation + 2 irrigation during drought) and I_2: 4 Irrigation (Live irrigation + 3 irrigation during drought). Factor B: Moisture conservation Practice: M_1: Farm Yard Manure @ 10 t ha^{-1}, M_2: Sugarcane Trash mulching during drought period, M_3: Wheat trash mulching during drought period, M_4: Black polythene mulch during drought period, M_5: Transparent polythene mulch during drought period. Results revealed that at both the locations all the growth parameters and yield of cane responded significantly due to different treatment combinations. The highest number of tillers, millable cane, Pol percent cane and yield of cane were found in treatment I_1M_2 where two irrigations during drought along with sugarcane trash mulch was applied. At both the sites the highest values of soil moisture were also recorded in same treatment (I_1M_2). The highest Marginal Benefit Cost Ration (MBCR) was also obtained in treatment I_1M_2 at both the sites. Two irrigations during drought along with sugarcane trash mulch may be recommended for sugarcane cultivation for higher yield, monetary return and moisture conservation.

Key words: Effect, moisture, growth, yield, sugarcane, drought

INTRODUCTION

Water is most limiting natural resource in arid and semi-arid region. This inadequate and uneven distribution of rainfall during the growth span of crop, it is needed essential to supply water to the plants through irrigation. As water is becoming costly input in agriculture production, optimization of this input on scientific basis with modern concept is essential. In areas where limited water supplies are available, suitable method of irrigation coupled with moisture conservation plays an important role in increasing the water use efficiency and crop productivity. The major water losses take places in the nature are due to evaporation, transpiration and percolation of water. Among these percolation losses can be avoided to some extent by applying required depth of water to the plants.

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Transpiration losses are hard to control where as evaporation losses can be easily minimized by using mulching approach. Mulching is considered a comprehensive approach to reduce water loss and water use from soil surface. The Extension Department of Colorado State University reported that mulches can cut off water use by 25 to 50% on surface soil. Any material spread on the surface of soil to protect it from raindrops, solar radiation and evaporation could serve the purpose of mulch. Mulches are used to cover surface of soil nearby crop plants to develop eco-friendly and favorable conditions for maintenance of growth. They significantly affect the soil electrical conductivity, organic matter, nitrogen, phosphorus, potassium content (Khurshid *et al.*, 2006, Pakdel *et al.*, 2013), slower evaporation and reduce water requirement of cop plants (Chawla, 2006; Liu *et al.*, 2009; Collin, 2006; Concord, 2009). Mulching improves soil moisture status and structure of soil (Muhammad *et al.*, 2009), decreases salinity, controls weeds and soil erosion (Concord, 2009; Bu *et al.*, 2002; Kumar and Lal, 2012).

There are various materials which are being used for mulches; these include plastic sheets/films, sawdust, sugarcane trash, rice straw, wheat straw, plant residues, poultry litter, paper pellets, polyethylene sheet and city garbage, etc. Sugarcane is one of the most important sugar crop of Bangladesh and mostly grown in the north-west region (drought prone) of the country. To exploit the production potential of sugarcane, it is an urgent need to provide irrigation water coupled with mulch. Use of organic manure in crop production improves soil water holding capacity (Vengadaramana *et al.*, 2012). Percentage increase in soil moisture in sugarcane trash mulch, wheat straw mulch, soybean straw mulch and interculturing operation over control (no mulch) was 28.19%, 17.81%, 12.26% and 7.54%, respectively (Chavan *et al.*, 2009). Worldwide, the increase usage of polyethylene mulch is due to its benefits when applied in the field, i.e. increases soil temperature, especially in early spring, reduces weed problems, enhances moisture conservation, increases crop yields and leads to more efficient use of soil nutrients (Kwabiah, 2004; Ban *et al.*, 2009; Mamkagh, 2009; Berihun, 2011; Bhatt *et al.*, 2011; Hatami *et al.*, 2012; Kumar and Lal, 2012). In view of the above circumstances the research program has been undertaken to find out the suitable moisture conservation techniques for sugarcane production in drought prone areas.

MATERIALS AND METHODS

The experiment was conducted during 2015-2016 cropping season at Bangladesh Sugarcrop Research Institute (BSRI) farm, Ishurdi (AEZ 11) and Regional Sugarcrop Research Station (RSRS) farm, Thakurgoan (AEZ 1) with a view to find out the effect of moisture conservation techniques on growth and yield of sugarcane. The experiment was laid out in a factorial design with three replications. The experiment was conducted with the following treatments viz., Factor A: Irrigation: I_1: 2 irrigation during drought and I_2: 3 irrigation during drought. Factor B: Moisture conservation practice: M_1: Farm Yard Manure @ 10 t ha^{-1}, M_2: Sugarcane Trash mulching during drought period, M_3: Wheat trash mulching during drought period, M_4: Black polythene mulch during drought period, M_5: Transparent polythene mulch during drought period. The plot size of the experiment was 8m x 6m. Two budded sets of sugarcane variety Isd 39 was used in the experiment as planting material. Sugarcane sets were planted following end to end method and maintaining row to row

distance of 1 m. Soil sampling was carried out with soil auger before one days of irrigation at 15 cm depths from each plot for moisture determination. Soil moisture was determined using the following formula:

$$\text{Soil moisture (\%)} = \frac{\text{Wet weight - Oven dry weight}}{\text{Oven dry weight}} \times 100$$

Sugarcane trash and wheat trash was applied @ 6 t ha^{-1} as mulch after plantation. Polyethylene sheet was applied between two rows of sugarcane as mulch after plantation. The sides of the polyethylene sheet were covered with soils to retaining soil moisture. Necessary intercultural operations were done throughout the cropping season for proper growth and development of the crop. Collected data were compiled and tabulated in proper form and were subjected to statistical analysis by using the computer package Statistix 10 program for Windows Version. Computation was done by the use of Microsoft Excel 2003 program.

RESULTS AND DISCUSSION

Results presented in Table 1 showed that at Ishurdi site growth parameters and pol percent cane responded significantly where as yield of cane was statistically insignificant due to different irrigation level. Highest number of tiller (198.85 $x10^3$ ha^{-1}), millable cane (79.54$x10^3$ ha^{-1}) and Pol percent cane (14.96%) was recorded in irrigation I_1 where 2 irrigation during drought was applied. Though the yield of cane recorded in irrigation I_1 (81.79 t ha^{-1}) was higher than I_2 (Three irrigation during drought) (80.77 t ha^{-1}) but statistically similar. These results corroborate with the findings of Hanafy *et al.* (2008) who found higher yield of cane with 85% water requirement of sugarcane. It was revealed that all the growth parameters, pol percent cane and yield of cane differed significantly due to moisture conservation techniques.

Highest number of tiller (229.51 x 10^3 ha^{-1}), millable cane (91.80 x 10^3 ha^{-1}), Pol (%) cane (15.64 %) and yield of cane (87.93 t ha^{-1}) were found in treatment M_2 where sugarcane trash was applied as mulch. Which supports the findings of Suma and Savitha (2015) who reported increased sugarcane yield with trash mulching. These might be possible due to higher moisture conservation, low weed infestation and better nutrient availability due to trash mulching which may lead proper growth and higher yield of sugarcane. Interaction between Irrigation and Moisture conservation techniques showed that all the growth parameters and yield of cane responded significantly due to different treatment combinations. The highest number of tiller (236.63 x 10^3 ha^{-1}), millable cane (94.65 x 10^3 ha^{-1}), Pol percent cane (15.68%) and yield of cane (88.54 t ha^{-1}) were found in interaction of I_1M_2 (236.63 x 10^3 ha^{-1}) where two irrigation during drought along with sugarcane trash mulch was applied.

Table 1. Effect of irrigation and moisture conservation technique on growth and yield parameters of sugarcane at Ishurdi site, 2015-2016

Irrigation	No. of Tiller ($x10^3$ ha^{-1})	No. of Millable Cane ($x10^3$ ha^{-1})	Pol (%) Cane	Yield (t ha^{-1})
I_1	198.85 a	79.54 a	14.96 a	81.79
I_2	190.19 b	76.08 b	14.60 b	80.77
LSD (0.05)	2.49	0.99	0.23	NS
Moisture Conservation Practice				
M_1	190.75 c	76.30 c	14.59 b	84.02 b
M_2	229.51 a	91.80 a	15.64 a	87.93 a
M_3	197.18 b	78.87 b	14.43 b	79.30 c
M_4	189.10 c	75.64 c	14.53 b	75.49 d
M_5	166.06 d	66.42 d	14.70 b	79.65 c
LSD (0.05)	3.94	1.58	0.36	3.09
Interaction (Irrigation x Moisture)				
I_1 M_1	197.13 c	78.85 c	15.00 bc	82.16 cde
I_1 M_2	236.63 a	94.65 a	15.68 a	88.54 a
I_1 M_3	196.18 c	78.47 c	14.41 d	79.93 def
I_1 M_4	197.65 c	79.06 c	14.47 d	75.04 g
I_1 M_5	166.67 e	66.67 e	15.23 ab	83.27 bcd
I_2 M_1	184.38 d	73.75 d	14.19 d	85.88 abc
I_2 M_2	222.39 b	88.96 b	15.60 a	87.32 ab
I_2 M_3	198.18 c	79.27 c	14.45 d	78.66 efg
I_2 M_4	180.55 d	72.22 d	14.58 cd	75.94 fg
I_2 M_5	165.44 e	66.18 e	14.18 d	76.03 fg
CV (%)	1.67	1.67	1.99	3.13
LSD (0.05)	5.57	2.23	0.50	4.36

Figure(s) having common letter(s) in a colum did not differ significantly at 5% level of significance by DMRT.

These results was at par with the findings of Shrivastava *et al.* (1994) who found that reduced irrigation (drip) plus sugarcane trash mulch (STM) was the best combination for higher fruit yield of tomato.

Initial and post harvest nutrient status of soil at Ishurdi was presented in Table 2. It was found that pH, OC, N, P, K and S content of post harvest soils slightly changed than that of initial soil nutrient status due to different treatment combinations.

Table 2. Initial and post harvest nutrient status of soil at Ishurdi

Treatment	pH	OC%	N%	P (ppm)	K (meq%)	S (ppm)
Initial soil	7.40	0.71	0.085	13.0	0.28	11.0
Post harvest Soil						
I_1M_1	7.35	0.76	0.070	13.0	0.26	10.0
I_1M_2	7.30	0.80	0.080	14.0	0.28	11.0
I_1M_3	7.35	0.78	0.080	14.0	0.29	12.0
I_1M_4	7.40	0.72	0.080	14.0	0.29	12.0
I_1M_5	7.41	0.71	0.080	14.0	0.28	11.5
I_2M_1	7.35	0.72	0.080	15.0	0.26	12.0
I_2M_2	7.30	0.79	0.075	15.0	0.29	12.0
I_2M_3	7.40	0.76	0.070	14.0	0.28	11.0
I_2M_4	7.45	0.72	0.080	15.0	0.26	11.5
I_2M_5	7.45	0.71	0.080	14.0	0.28	12.0
Critical level value	-	-	0.12	10.0	0.12	10.0

It was found from Figure 1 that at Ishurdi site in the month of March, April, May and June the highest value of soil moisture was recorded in treatment I_1M_2 where two irrigation during drought along with sugarcane trash mulching was applied. Which supports the findings of Mathew and Varughese (2008) who reported reduced irrigation with sugarcane trash mulching gave the higher moisture levels in soils. Second highest soil moisture content was also found in treatment I_2M_2 (three irrigation during drought along with sugarcane trash mulching) in those months.

Economics of irrigation and soil moisture conservation

It was found from Table 3 that at Isurdi the highest variable cost (Tk. 84674 ha^{-1}) of sugarcane production was recorded in treatment I_2M_4 (Three irrigation + Black polyethylene mulch) and the lowest (Tk. 58969 ha^{-1}) was from I_1M_3 (Two irrigation + wheat trash mulch). The highest gross return (Tk. 332114 ha^{-1}) was recorded in treatment I_1M_2 (two irrigation + sugarcane trash mulch) and the lowest (Tk. 281475 ha^{-1}) was from I_1M_4 (Two irrigation + Black polyethylene mulch).

The highest net return (Tk. 270145 ha^{-1}) was recorded in treatment I_1M_2 (two irrigation + sugarcane trash mulch) and the lowest (Tk. 200177 ha^{-1}) was from I_2M_4 (Three irrigation + Black polyethylene mulch). The highest Marginal Benefit Cost Ratio (MBCR) (4.36) was also recorded in treatment I_1M_2 (4.36) and the lowest (Tk. 200177 ha^{-1}) was from I_2M_4 (2.36).

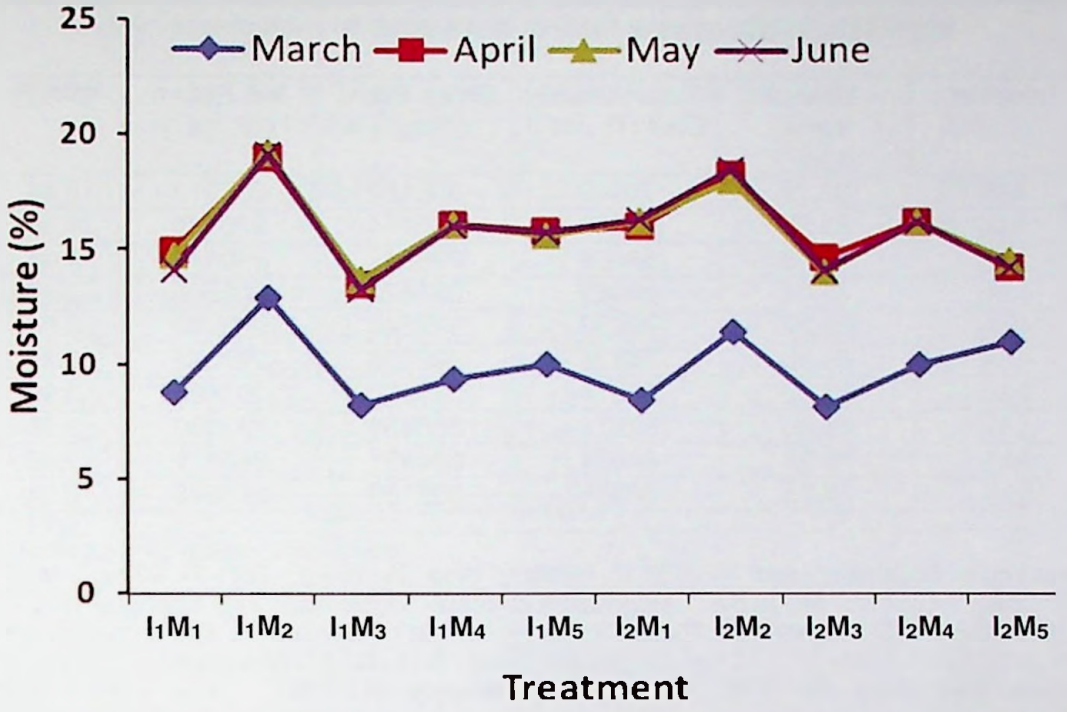

Figure 1. Soil moisture (%) in different month due to moisture conservation techniques at Ishurdi

I_1: 3 Irrigation (Live irrigation + 2 irrigation during drought), I_2: 4 Irrigation (Live irrigation + 3 irrigation during drought)

M_1: Farm Yard Manure @ 10 t ha^{-1}, M_2: Sugarcane Trash mulching during drought period, M_3: Wheat trash mulching during drought period, M_4: Black polythene mulch during drought period, M_5: Transparent polythene mulch during drought period

Table 3. Economics of irrigation and moisture conservation technique on sugarcane production at Ishurdi, 2015-2016

Treatment	Yield of cane (t ha^{-1})	Total variable Cost (Tk. ha^{-1})	Gross Return (Tk.ha^{-1})	Net Return (Tk. ha^{-1})	MBCR
I_1M_1	82.16	70969	308182	237213	3.34
I_1M_2	88.54	61969	332114	270145	4.36
I_1M_3	79.93	58969	299817	240848	4.08
I_1M_4	75.04	80969	281475	200506	2.48
I_1M_5	83.27	72637	312346	239709	3.30
I_2M_1	85.88	74674	322136	247462	3.31
I_2M_2	87.32	65674	327537	261863	3.99
I_2M_3	78.66	62674	295054	232380	3.70
I_2M_4	75.94	84674	284851	200177	2.36
I_2M_5	76.03	76341	285189	208848	2.74

Input cost: Sugarcane seed- Tk. 3751 t^{-1}, Fertilizer: Urea- Tk. 16 Kg^{-1}, TSP- Tk. 22 Kg^{-1}, MoP- Tk. 15 Kg^{-1}, Gypsum- Tk. 10 Kg^{-1}, Magnesium Sulphate- Tk. 35 Kg^{-1}, Zinc Sulphate- Tk. 140 Kg^{-1}, Furadan 5 G- Tk. 160 Kg^{-1}, Regent 3 GR- Tk. 180 Kg^{-1}, Bavistin- Tk. 250 Kg^{-1}, Irrigation- Tk. 3705 $time^{-1}$. FYM- Tk. 1.50 Kg^{-1}, Sugarcane Trash- Tk. 1.00 Kg^{-1}, Wheat trash- Tk. 0.50 Kg^{-1}, Black Polyethylene - Tk. 15 M^{-1}, Transparent Polyethylene- Tk. 10 M^{-1}.

Output cost: Sugarcane-Tk. 3751 t^{-1}.

Results presented in Table 4 showed that at Thakurgoan site among growth parameters millable cane and yield of cane responded significantly due to irrigation. The highest number of millable cane and yield of cane was found in irrigation I_1 (88.69 x 10^3 ha^{-1} and 93.48 t ha^{-1}, respectively) where two irrigation during drought was applied. Whereas, due to different moisture conservation practice number of tiller, millable cane and yield of cane differed significantly among treatments. The highest number of tiller (161.56 x 10^3 ha^{-1}), millable cane (93.71 x 10^3 ha^{-1}) and yield of cane (99.03 tha^{-1}) were recorded in treatment M_2 where sugarcane trash was applied as mulch. Interaction effect showed that all the growth parameters and yield of cane differed significantly due to interaction between irrigation and moisture conservation techniques. The highest number of tiller (169.51 x 10^3 ha^{-1}), millable cane (94.72 x 10^3 ha^{-1}), Brix percent (20.79%) and yield of cane (99.03 tha^{-1}) were recorded in interaction of I_1M_2 where two irrigation during drought along with sugarcane trash was used as mulch. The effect of interaction I_1M_2 was superior to all other interactions regarding growth parameters and yield of cane. These results was also at par with the findings of Shrivastava *et al.* (1994) who found that reduced irrigation (drip) plus sugarcane trash mulch (STM) was the best combination for higher fruit yield of tomato.

Table 4. Effect of irrigation and moisture conservation technique on growth and yield parameters of sugarcane at Thakurgoan site, 2015-2016

Irrigation	No. of Tiller ($x 10^3$ ha^{-1})	No. of Millable Cane ($x 10^3$ ha^{-1})	Brix (%) Cane	Yield (t ha^{-1})
I_1	145.54	88.69 a	20.35	93.48 a
I_2	144.76	80.87 b	20.32	89.83 b
LSD (0.05)	NS	1.77	NS	1.45
Moisture Conservation Practice				
M_1	151.74 b	82.81 b	20.18	90.31 bc
M_2	161.56 a	93.71 a	20.63	97.33 a
M_3	141.63 c	83.23 b	20.33	88.33 c
M_4	133.70 e	82.29 b	20.26	91.40 b
M_5	137.14 d	81.87 b	20.28	90.90 b
LSD (0.05)	2.63	2.80	NS	2.29
Interaction (Irrigation x Moisture)				
I_1 M_1	151.80 b	88.54 bc	20.03 b	92.81 bc
I_1 M_2	169.51 a	94.72 a	20.79 a	99.03 a
I_1 M_3	139.30 d	91.88 ab	20.21 ab	92.71 bc
I_1 M_4	128.02 f	83.33 d	20.29 ab	90.41 cde
I_1 M_5	139.06 d	85.00 cd	20.43 ab	92.43 bcd
I_2 M_1	151.67 b	77.08 fg	20.35 ab	87.81 e
I_2 M_2	153.61 b	92.71 a	20.46 ab	95.63 b
I_2 M_3	143.96 c	74.58 g	20.44 ab	83.96 f
I_2 M_4	139.38 d	81.25 de	20.23 ab	92.40 bcd
I_2 M_5	135.21 e	78.75 ef	20.13 ab	89.38 de
CV (%)	1.49	2.72	1.94	2.06
LSD (0.05)	3.71	3.95	0.68	3.23

Figure(s) having common letter(s) in a colum did not differ significantly at 5% level of significance by DMRT.

Initial and post harvest nutrient status of soil at Thakurgoan were presented in Table 5. It was found that pH, OC, N, P , K and S content of post harvest soils slightly changed than that of initial soil nutrient status due to different treatment combinations.

Table 5. Initial and post harvest nutrient status of soil at Thakurgoan

Treatment	pH	OC%	N%	P (ppm)	K (meq%)	S (ppm)
Initial soil	5.40	1.08	0.11	29.0	0.14	26.0
Post harvest Soil						
I_1M_1	5.35	1.03	0.10	25.0	0.12	23.0
I_1M_2	5.30	1.05	0.10	26.0	0.13	24.0
I_1M_3	5.30	1.07	0.11	25.0	0.14	24.5
I_1M_4	5.45	1.07	0.11	25.0	0.14	24.0
I_1M_5	5.40	1.05	0.10	24.5	0.13	23.0
I_2M_1	5.43	1.05	0.10	24.0	0.12	23.5
I_2M_2	5.35	1.10	0.12	28.0	0.13	25.0
I_2M_3	5.40	1.10	0.12	28.0	0.13	25.0
I_2M_4	5.45	1.08	0.10	25.5	0.12	23.5
I_2M_5	5.38	1.08	0.10	26.0	0.12	24.0
Critical level value	-	-	0.10	7.0	0.08	8.0

It was found from Figure 2 that at Thakurgoan site in the month of March, April, May and June the highest value of soil moisture was recorded in treatment I_1M_2 where two irrigation during drought along with sugarcane trash mulching was applied. Second highest soil moisture content was found in treatment I_2M_2 (three irrigation during drought along with sugarcane trash mulching) in those months.

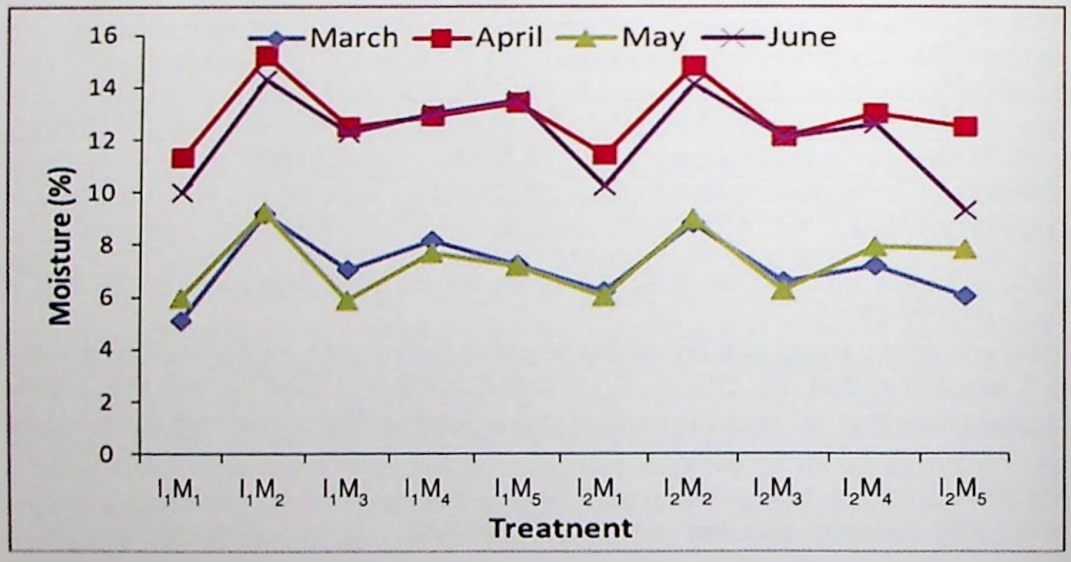

Figure 2. Soil moisture (%) in different month due to moisture conservation techniques at Thakurgoan

I_1: 3 Irrigation (Live irrigation + 2 irrigation during drought), I_2: 4 Irrigation (Live irrigation + 3 irrigation during drought)
M_1: Farm Yard Manure @ 10 t ha^{-1}, M_2: Sugarcane Trash mulching during drought period, M_3: Wheat trash mulching during drought period, M_4: Black polythene mulch during drought period, M_5: Transparent polythene mulch during drought period

Economics of irrigation and soil moisture conservation

It was found from Table 6 that at Thakurgoan the highest variable cost (Tk. 84674 ha^{-1}) of sugarcane production was recorded in treatment I_2M_4 (Three irrigation + Black polyethylene mulch) and the lowest (Tk. 58969 ha^{-1}) was from I_1M_3 (Two irrigation + wheat trash mulch). The highest gross return (Tk. 371462 ha^{-1}) was recorded in treatment I_1M_2 (two irrigation + sugarcane trash mulch) and the lowest (Tk. 314934 ha^{-1}) was from I_2M_3 (three irrigation + Wheat trash mulch). The highest net return (Tk. 309493 ha^{-1}) was recorded in treatment I_1M_2 (two irrigation + sugarcane trash mulch) and the lowest (Tk. 252260 ha^{-1}) was from I_2M_3 (three irrigation + wheat trash mulch). The highest Marginal Benefit Cost Ratio (MBCR) was also recorded in treatment I_1M_2 (4.99) and the lowest (Tk. 200177 ha^{-1}) was from I_2M_4 (3.09).

Table 6. Economics of irrigation and moisture conservation technique on sugarcane production at Thakurgoan, 2015-2016

Treatment	Yield of cane (t ha^{-1})	Total variable Cost (Tk.ha^{-1})	Gross Return (Tk.ha^{-1})	Net Return (Tk. ha^{-1})	MBCR
I_1M_1	92.81	70969	348130	277161	3.91
I_1M_2	99.03	61969	371462	309493	4.99
I_1M_3	92.71	58969	347755	288786	4.89
I_1M_4	90.41	80969	339128	258159	3.19
I_1M_5	92.43	72637	346705	274068	3.77
I_2M_1	87.81	74674	329375	254701	3.41
I_2M_2	95.63	65674	358708	293034	4.46
I_2M_3	83.96	62674	314934	252260	4.02
I_2M_4	92.40	84674	346592	261918	3.09
I_2M_5	89.38	76341	335264	258923	3.39

Input cost: Sugarcane seed- Tk. 3751 t^{-1}, Fertilizer: Urea- Tk. 16 Kg^{-1}, TSP- Tk. 22 Kg^{-1}, MoP- Tk. 15 Kg^{-1}, Gypsum- Tk. 10 Kg^{-1}, Magnesium Sulphate- Tk. 35 Kg^{-1}, Zinc Sulphate- Tk. 140 Kg^{-1}, Furadan 5 G- Tk. 160 Kg^{-1}, Regent 3 GR- Tk. 180 Kg^{-1}, Bavistin- Tk. 250 Kg^{-1}, Irrigation- Tk. 3705 $time^{-1}$. FYM- Tk. 1.50 Kg^{-1}, Sugarcane Trash- Tk. 1.00 Kg^{-1}, Wheat trash- Tk. 0.50 Kg^{-1}, Black Polyethylene - Tk. 15 M^{-1}, Transparent Polyethylene- Tk. 10 M^{-1}.

Output cost: Sugarcane-Tk. 3751 t^{-1}.

From the above discussion it may be concluded that at Ishurdi site growth parameters and pol percent cane responded significantly whereas yield of cane was statistically insignificant due to different irrigation level. Highest number of tiller, millable cane and Pol percent cane was recorded in irrigation I_1 where 2 irrigation during drought was applied. All the growth parameters, pol percent cane and yield of cane differed significantly due to moisture conservation techniques. Highest number of tiller, millable cane, Pol (%) cane and yield of cane were found in treatment M_2 where sugarcane trash was applied as mulch. Interaction between Irrigation and Moisture conservation techniques showed that all the growth parameters and yield of cane responded significantly due to different treatment combinations. The highest number of tiller (236.63 x 10^3 ha^{-1}), millable cane (94.65 x 10^3 ha^{-1}), Pol percent cane (15.68 %) and yield of cane (88.54 t ha^{-1}) were found in interaction of I_1M_2 (236.63 x 10^3 ha^{-1}) where two irrigation during drought along with sugarcane trash mulch was applied. At Thakurgoan site among growth parameters millable cane and yield of cane responded significantly due to irrigation. The highest number of millable cane and yield of cane was found in irrigation I_1 where two irrigation during drought was applied. Whereas, due to different moisture conservation practice number of tiller, millable cane and yield of cane differed significantly among treatments. The highest number of tiller, millable cane and yield of cane were recorded in treatment M_2 where sugarcane trash was applied as mulch. Interaction effect of Irrigation and Moisture conservation techniques at Thakurgoan showed similar trend as Ishurdi site. At both the sites the highest values of soil moisture were also recorded in treatment I_1M_2. The highest MBCR of 4.36 and 4.99 were also obtained in treatment I_1M_2 at Ishurdi and Thakurgaon, respectively.

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