Corn Forage Yield and Cost of Silage Production from Use of Yard Waste as Compost

***P.E. Hildebrand, R.N. Gallaher, and R. McSorley**

ABSTRACT

Urban plant debris or urban yard waste is an increasing problem for urban areas whose sanitary landfills are overflowing with these organic materials which can be processed into yard waste compost (YWC) for beneficial application to agricultural land. The objective of this paper is to report corn *(Zea mays)* forage yield and silage production costs from application of YWC to farm land in Alachua County, Florida Two adjacent experiments received large amounts of YWC for no-tillage corn. Both experiments had control treatments with either no YWC applied or applied only the first year (1992) of the 5-yr study. Both experiments were in randomized complete block designs with five replications. In this analysis, replications and years are considered as environments. In all environments, the use of YWC increased yield and decreased cost of forage.

INTRODUCTION

Application of urban plant debris to agricultural land can improve soil properties and result in increased crop yield (Gallaher and McSorley, 1994; Gallaher and McSorley, 1995; Gallaher and McSorley, 1996; Kidder, 1993; Kluchinski et al. 1993). Urban plant debris can be applied in the fresh form (Kluchinski et al., 1993) or after it has been processed as yard waste compost (YWC) (Gallaher and McSorley, 1994; Gallaher and McSorley, 1995, McSorley and Gallaher, 1995; Kluchinski et al., 1993). While many questions remain regarding the application of urban plant debris to agricultural land, most information to date is positive. The objective of this research was to evaluate corn forage yield and cost of production from application of YWC to farm land in Alachua County, Florida.

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MATERIALS AND METHODS

Two adjacent experiments were conducted on a Bonneau fine sand for 5-yr. on the Haufler Brothers Farm, Gainesville, Florida, from 1992 to 1996. Three treatments of < 5 cm particle size, 4- to 6-mo-old YWC were as follows for experiment one: Treatment one had no YWC applied in 1992, had 120 tons/a YWC applied evenly over the soil surface for a mulch followed by a planting of in-row subsoil no-tillage corn in 1993 and again in 1994 (0-m-m). This YWC mulch was incorporated following corn *(Zea mays* L.) silage harvest each yr. No YWC was applied in 1995 or 1996. Total YWC for treatment one was 240 ton/a over the 5-yr. Treatment two was the same as for treatment one except that the YWC was incorporated prior to planting *corn* each time in 1993 and 1994 (0-i-i). Treatment three received no YWC any yr and was the control treatment (0-0-0). Adjacent to experiment one was experiment two, which used the same YWC type and source with the same three treatments as used in experiment one with the following exception. All three treatments received 120 ton/a that was incorporated in 1992 (i-m-m, i-i-i, and i-0-0). Treatments i-m-m and i-i-i received a total of 360 toda of YWC over the 3-41. Further illustration of the treatments has been reported before (Gallaher and McSorley, 1996). Corn forage yield was obtained from guarded plots each year by weighmg whole plants from each plot in the field, weighmg a subsample in the field, and weighmg subsamples for dry matter following complete drying at 70° C. Corn forage yield was adjusted to 30% dry matter to coincide with yield calculations used by the cooperating farmer in his silage marketing operation.

All inputs except YWC were the same for all treatments. Beginning in 1994 weed control included residual herbicides as well as mechanical cultivator. This provided relatively weed free conditions compared to 1992 and 1993. Further, more adapted corn hybrids were used in 1995 and 1996. These changes likely account for greater yields compared to earlier yr. Those treatments with YWC required spreading and the incorporated YWC required an extra operation. The YWC was provided free of cost for the experiment and is not costed in this analysis. Purchase and transportation costs ultimately would need to be added if this becomes standard practice in the future.

Adaptability Analysis (Hildebrand and Russell, 19%) was used to ascertain the effect of the treatments in the different environments represented by blocks and years.

RESULTS AND DISCUSSION

In 1993, rains were poor so yields overall were low, but the effects of the added YWC were dramatic (Figure 1). Yields over all environments more than doubled with the addition of YWC (either 0-i or 0-m) over no compost (0-0). Best yields were achieved with the addition of YWC both yr (1992 and 1993) as in treatments i-i and i-m. The treatment with incorporated YWC in 1992 and non-incorporated mulch (i-m) in 1993 achieved the best yields.

Yields generally increased each year of the experiment owing to improved weed control and improved, more adapted cultivars, but the effect of the treatments remained consistent (Figure 2). The best yield consistently was i-m-m-0-0, closely followed by i-i-i-0-0. Any YWC was better than none, but the effect of the YWC incorporated only in 1992 (i-0-0-0-0) disappeared in the best environment by 1996.

Preliminary cost estimates were taken from Hewitt (1997). Costs that did not vary among treatments were estimated at $160/a. Excluding cost of YWC and its transport, treatment costs are estimated at $10 for the control, S25.60 for the incorporated treatments and $7.30 for the mulch treatments. Based on these estimates, the YWC treatments reduced cost of silage production by at least half in 1993 (Figure 3). The two treatments with mulch in that dry year (i-m and 0-m) were the lowest cost, largely because there is no cost of incorporation prior to planting. Again, because of improved practices each year, costs continued to decline as the environment for producing the corn improved (Figure 4). If the cost of YWC and its transport to the field is as much as $2/ton, then the advantages of the YWC essentially disappear (Figure 5), and costs would exceed the price of the silage at the pit, $35/tan.

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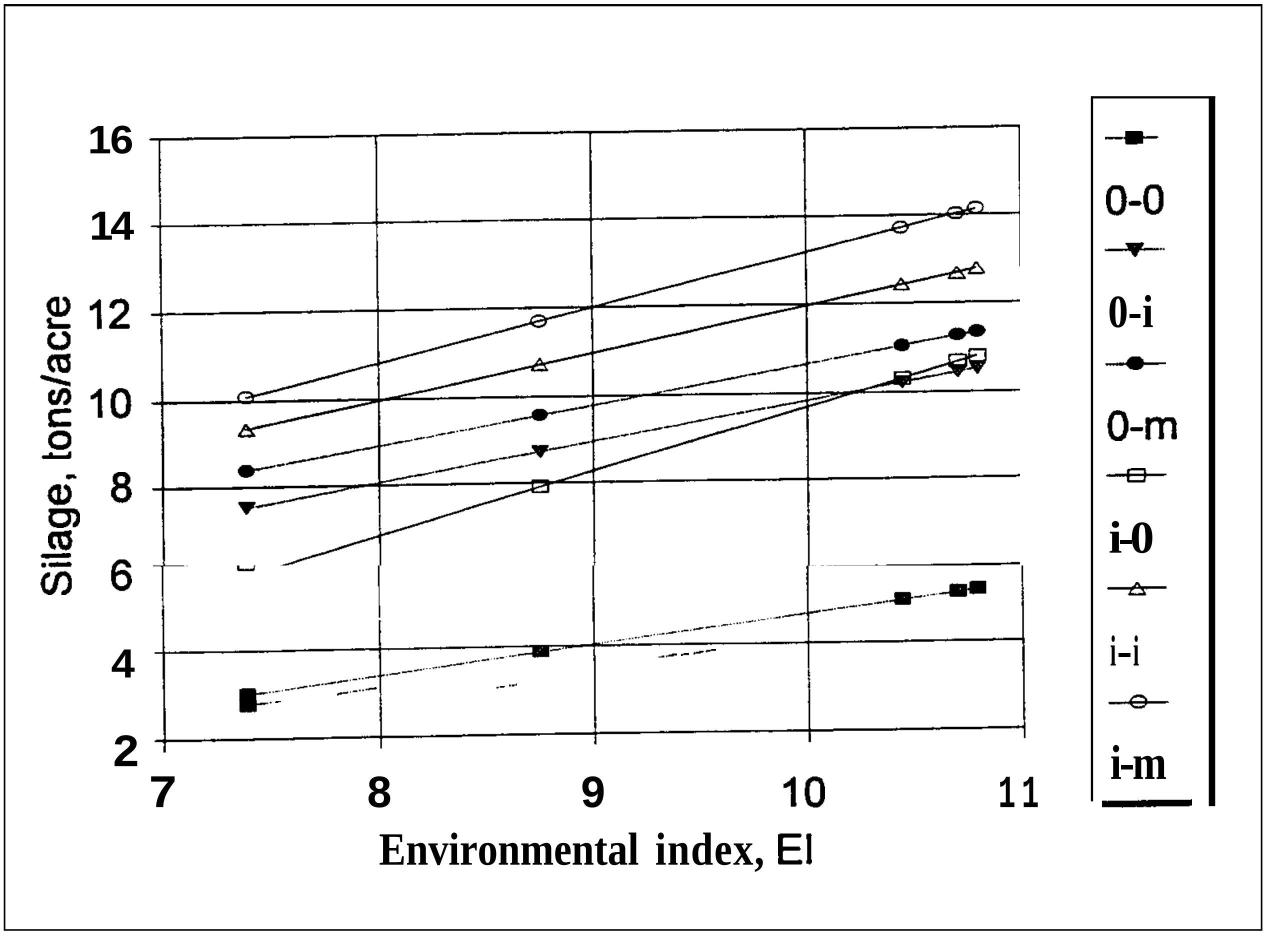

Fig. 1. Corn silage yield related to environmental index based on replications as influenced by yard waste compost treatment, 1993. *0* is no compost, *i* is incorporated compost and *m* is mulched compost.

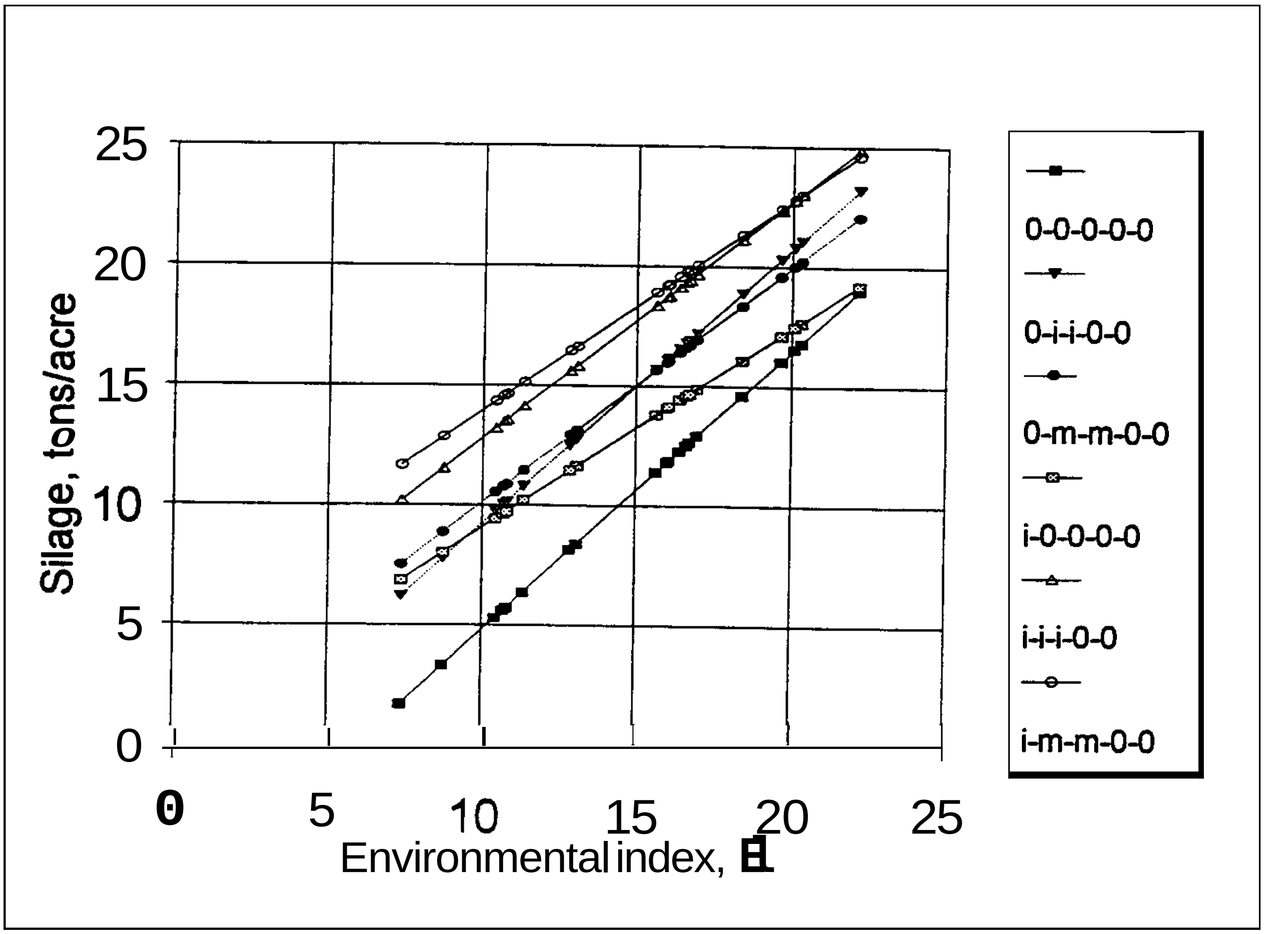

Fig. 2. Corn silage yield related to environmental index based on replications and years, as influenced by yard waste compost treatment, 1993-1996. ***0*** **is no compost,** ***i*** **is incorporated compost and** ***m*** **is mulched compost.**

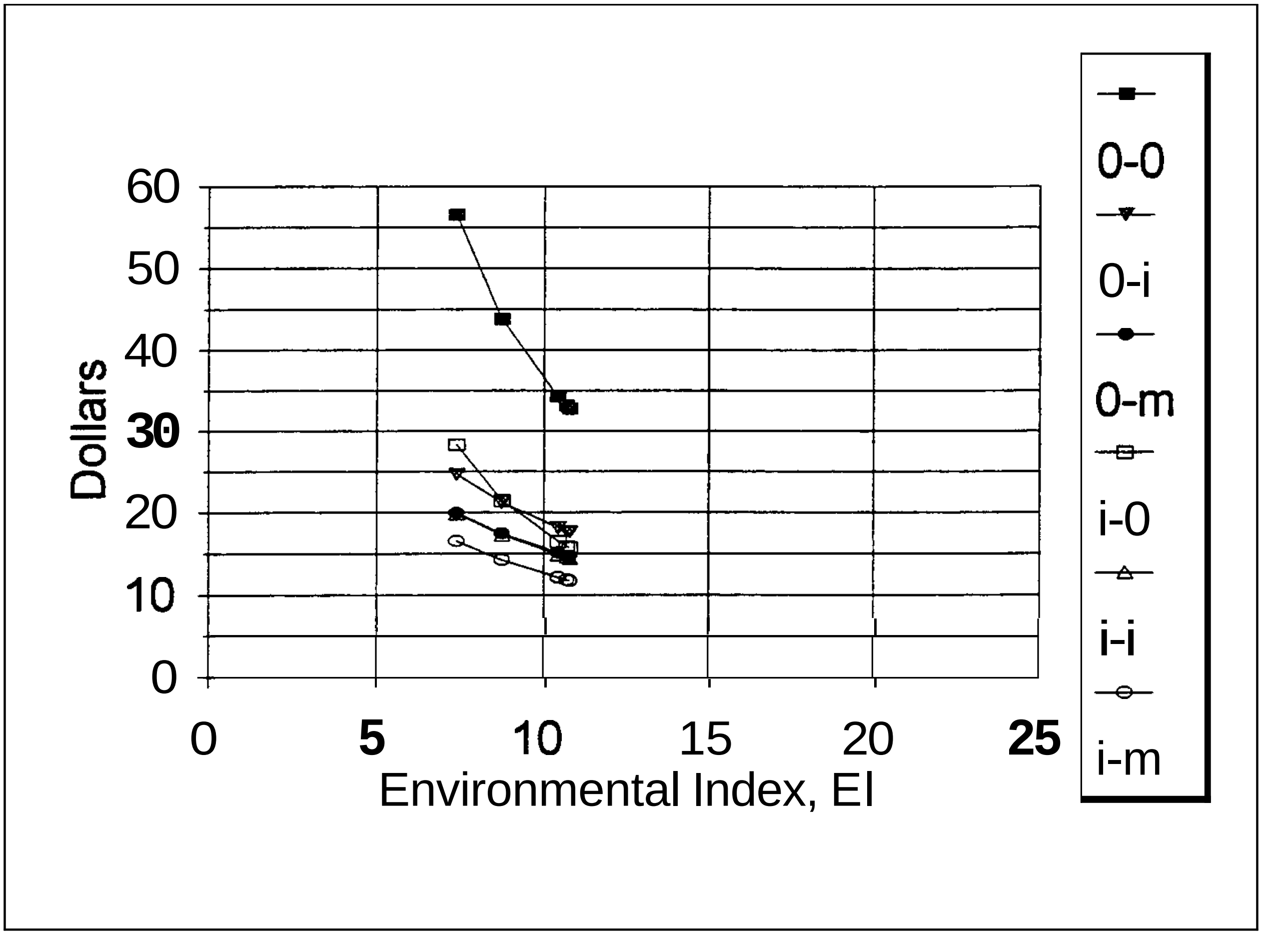

Fig. 3. Cost/ton of corn silage related to environmental index based on replications, as influenced by yard waste compost treatment, 1993. *0* is no compost, *i* is incorporated compost and *m* is mulched compost.

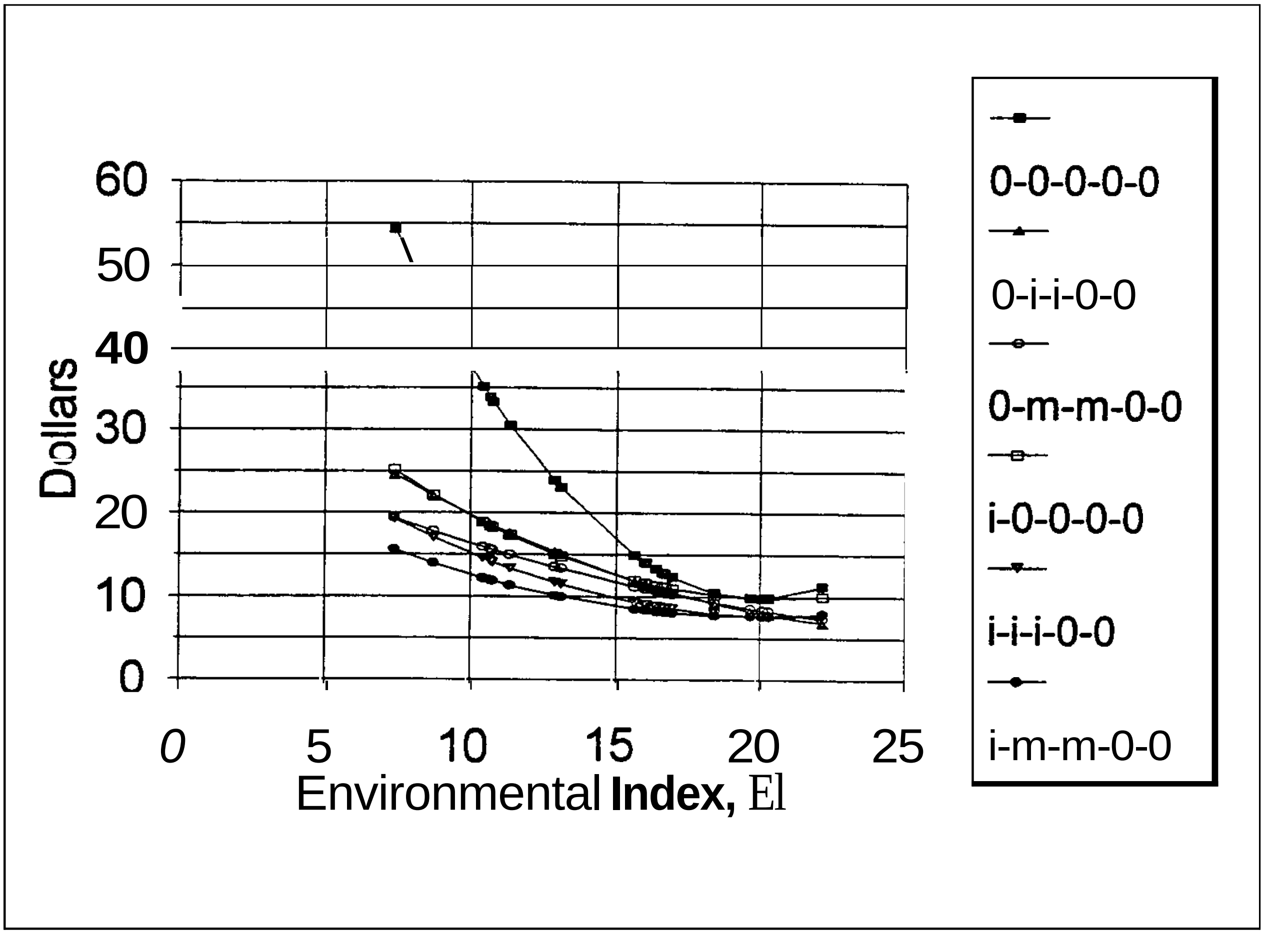

Fig. 4. Cost/ton of corn silage related to environmental index based on replications and years, as influenced by yard waste compost treatment, 1993-1996. 0 is no compost, *i* is incorporated compost and *m* is mulched compost.

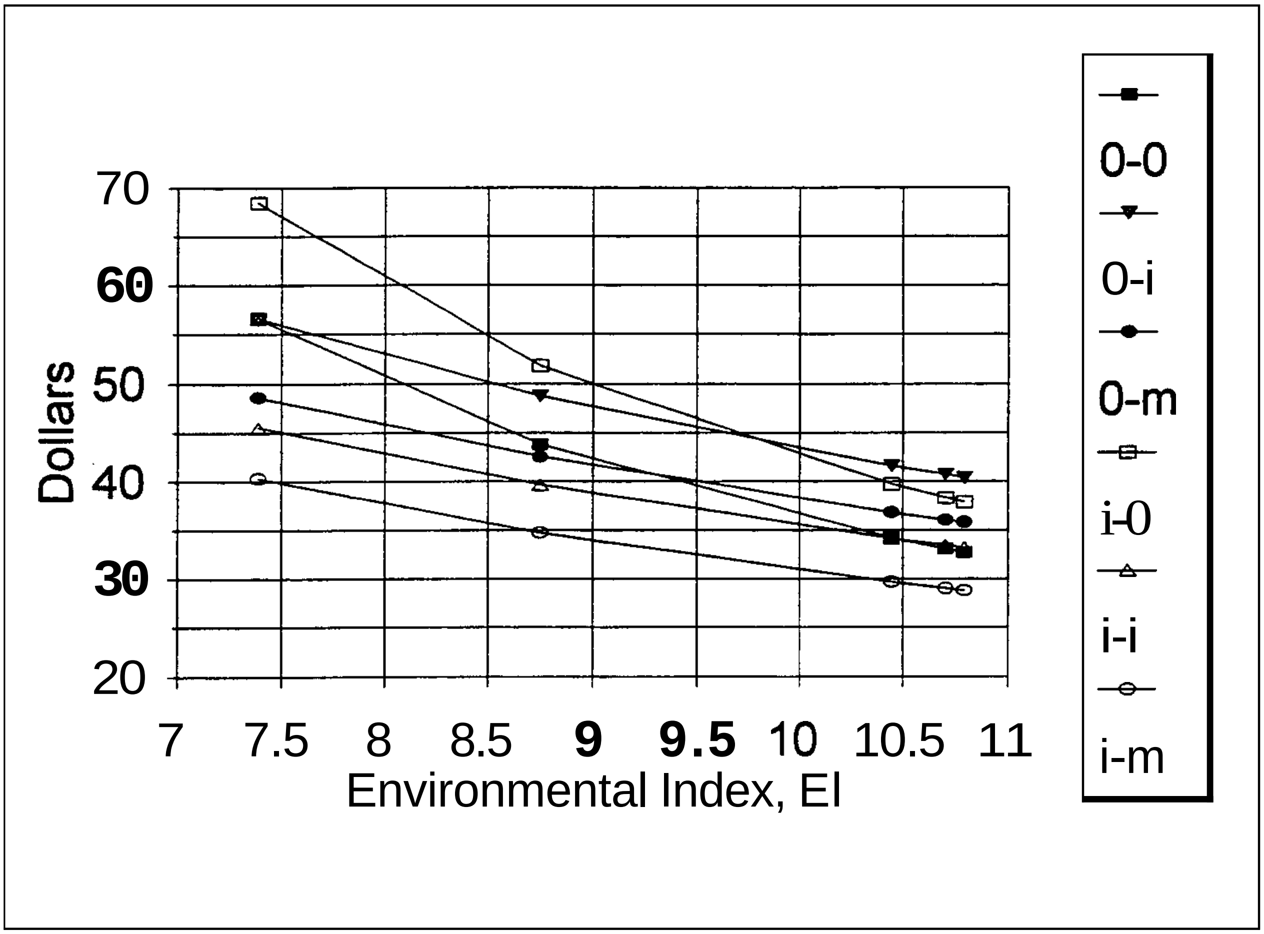

Fig. 5. Cost/ton of corn silage related to environmental index based on replications, as influenced by yard waste compost treatment with compost priced at $2/ton, 1993. 0 is no compost, i is incorporated compost and m is mulched compost.