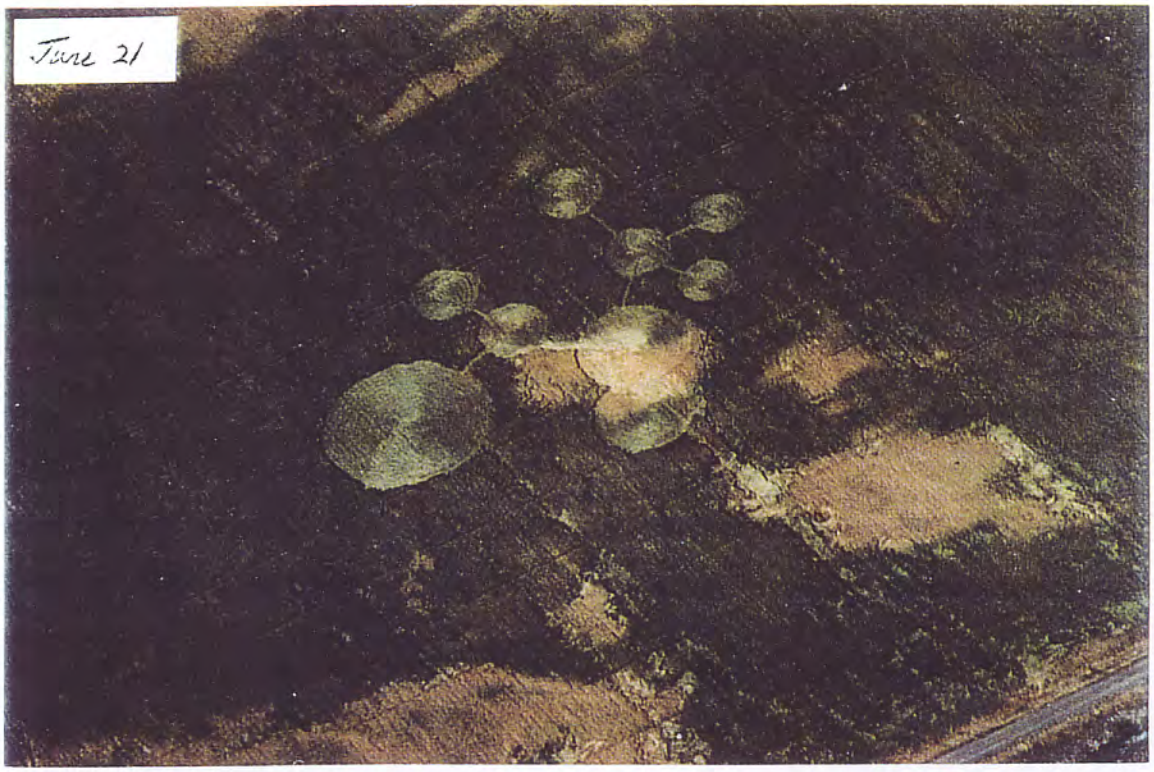
June 19, 1998
Eltopia, WA.

BLT RESEARCH TEAM INC.
PO Box 400127
Cambridge, MA 02140 (USA)
ph: 617/492-0415

LAB REPORT #105

ELTOPIA, WASHINGTON - June, 1998

Top: aerial photo taken 2 days after formation discovered; note minimal chaotic crop damage (photo: ilyes). Bottom: 3 weeks later; multiple areas of chaotically-downed crop throughout wheat-field (photo: Ardinger).



BLT Research Team
PO Box 400127
Cambridge, MA 02140
phone: 617/492-0415

June 19, 1998
Eltopio, Wash.

Lab. Report #105
January, 2000
Pinelandia Biophysical Lab.

Crop Formation: Eltopia, Washington - 1998

Lab. Code: KS-04-102
Event Location: Schaefer Farm - Eltopia, Washington
Date Formed: Night of June 18-19, 1998
Date Found: June 19, 1998
Date Sampled: July 8, 1998 and February 26, 1999
Material Sampled: Wheat plants (Steven's winter wheat) and soils on 7/8/98; soils only on 2/26/99
Sampled By: Carol Pedersen, Keith Ardinger (7/8/98); Carol Pedersen (2/26/99)
Formation Characteristics: Nine circles, ranging in diameter from 28 to 72 ft., connected by pathways (overall geometric formation approximately 200' by 270'), with extensive areas of chaotically- (non-geometrically) downed crop occurring in the days immediately following the geometric event, and prior to the fieldworkers' arrival at the site. Three circles and various chaotically-downed regions were sampled, and controls taken (see Figs. I, 2).

Relevant Findings:

(1) **Statistically significant node-length increases were found in the plant stems in Circles #1 and #8, and in the chaotically-downed crop areas,** as compared with the 41 sets of control plants. Minimal node-length changes were found in Circle #4;

(2) **A direct relationship was found between mean stem node lengths and average level of magnetic material in the three sampled circles, and in the control plants and soils taken the farthest away from (and thus most unaffected by) the multiple geometric and chaotically-downed areas;**

(3) **Significantly increased amounts of magnetic material were found in all the soil samples and their controls,** including the additional control soils obtained on February 26, 1999 at distances up to approximately 1 mile away;

(4) **The amount of magnetic material found in the soils inside Circles #1 and #8 was greater at the southern edges of these circles, decreasing in a linear fashion toward the northern edges:** Circle #l (sampled along a N-S diameter) showed a strong linear correlation; Circle #8 (sampled along a N-NE/S-SW diameter) showed a weaker correlation. Circle #4 (also sampled along a roughly N-S diameter), but the only circle which was visually over-lapped by an adjacent circle and the only circle not found to have statistically significant node-length changes, showed no similar linear correlation;

(5) **In Circle #4, node-length changes (although minimal) in the plant stems along the roughly N-S sampling line were shown to fit the Beer-Lambert model of electromagnetic absorption;**

(6) **The evidence suggests both multiple plasma system discharges and a complex "spillover" effect in the areas outside the visibly-downed crop.**

Results and Discussion:

Three of the nine circles were sampled (Fig. l), as were some of the irregularly-downed areas in the field (see Fig. 2, where Ms. Pedersen has designated these samples as "lodging"). In all of the sample sets discussed in this report there were on average 12.6 plants per set (s.d. = 1.7). As we have found in many examined formations, the plants in irregularly-downed areas often (but not always) receive higher levels of energy than do the plants within more geometrically-downed areas and that, consequently, the physical and biochemical alterations within the plants and seeds in these sites are more pronounced than in samples taken from the geometric regions. In other words, they do not fit the definition of "lodging" (which is a term which describes simple wind or weather damage). To avoid confusion in this and future reports, the irregularly-downed crop areas will be designated as **chaotic**, rather than lodged.

In Table 1 we present the node-length data from each of the major sampling sites. The data are expressed as percent (%) change relative to the mean of all the 41 control sets.

Table 1
Mean Node Length Changes in the Eltopia Sampling Sites:
% Change Relative to Mean Level in 41 Control Sets

Sample Sets	Node Length Change	Number of Sets	Confidence Level
Circle #1	+35.1%	10	P< 0.05
Circle #4	+ 6.8%	9	N.S.
Circle #8	+26.0%	14	P< 0.05
Chaotic (L1 - L4)	+40.2%	4	P< 0.05
Chaotic (L5 - L6)	+21.6%	2	P< 0.05
Chaotic (L7 - L8)	+34.3%	2	P< 0.05
Chaotic (L9 - L11)	+20.0%	3	P< 0.05

Magnetic-Drag Tests:

Soil samples were collected at each of the plant sampling sites listed in Figs. l & 2. The levels of magnetic material found in all samples far exceeded the maximum level expected in "normal" soils (0.4 mg./g-soil); here the range of magnetic material found was from 20-70 mg/g-soil. If the average level of magnetic material found in the six most distant controls and in the three sampled circles is compared with the mean values of the node lengths (ave. N_L) we find, as shown in Fig. 3, a roughly linear relationship ($r = 0.84$), with the values from the three circles located at the upper end of the curve.

In a more detailed examination of individual sampling sites it was found that, in samples starting at the southern edge of Circle #1 and continuing across the diameter in a northerly direction, there is a clear linear relationship (Fig. 4) between the level of magnetic material found and the sampling distance from the South edge of the circle. When Circle #8 is examined in the same manner, we find a similar (Fig. 5), but much weaker, correlation; in the data from Circle #4 we find no correlation at all.

This decrease in correlation of magnetic material is in alignment with the overall energy-induced node expansion changes found in Table 1, where we can see that Circle #1 (the largest circle) exhibited the highest level of node expansion, Circle #8 (the smallest) exhibited a lesser degree, and Circle #4 (the circle over-lapped by an adjacent circle) showed only very minimal node-length alteration.

Two previously-studied crop formations[2,3] disclosed similar linear relationships between between levels of magnetic material and distance from a specific point in the formation. In those cases we found it fruitful to explore the physics of the forces acting on the magnetic particles within rotating plasma systems. For a particle within a rotating system and moving in a circular path of radius r and at a velocity v, its acceleration a is given by,

$$a = v^2/r \qquad (1)$$

and the outward directed or centrifugal force F on a particle of mass m is computed as,

$$F = mv^2/r \qquad (2)$$

The relationship between the linear velocity v and the angular velocity ω (in revolutions per second) is described by,

$$v = 2\pi r\omega \qquad (3)$$

and by substituting in equation (2) we obtain,

$$F = (4\pi^2\omega^2 m)r \qquad (4)$$

For a given vortex system ω is constant, and therefore equation (4) predicts a direct relationship between the centrifugal force exerted on a magnetic particle of mass m and its distance r from the center of the vortex system.

One of the most ubiquitous characteristics of crop formations is the documentation of compartmentalization of energies into cells or quadrants, acting totally independently of one another: the effects of the energies may change quite drastically within discreet, sharply-defined regions inside a crop formation. In this case, at the eipcenter of the vortex system the particles would, according to equation (4), receive the minimum centrigugal force and, consequently, one would predict the highest concentration of magnetic particles in this region. In Circles #I and #8 the active center of vortex rotation appears to be at, or very near, the south edge of the downed circles (because of the complexity of the energy systems the active vortex center does not always correspond to the geometric center of the downed area--and in the Eltopia case multiple "epicenters" were reported in both the geometric and chaotic areas by the field-team). Proceeding from this apparent south-edge origin, equation (4) predicts a linear decrease in energy concentration with increasing distance from the energy source. The excellent agreement between equation (4) (the hypothesized physical force) and the actual magnetic particle distributions is demonstrated in the Fig. 4 and Fig. 5 curves.

From the node-length data in Table 1 one might expect that the amount of magnetic material in the higher-energy, chaotically-downed areas would be greater than the levels found in the geometric circles and controls. Here just the opposite is the case: in the chaotic regions the magnetic material levels are, on the average, lower than in Circles #I, #4 and #8, and were in the same range as the control values (shown in Fig. 3). This unexpected result is explanable by comparing the magnetic material deposited inside the chaotic areas with the sampling levels immediately outside them. Data for this inside-outside comparison were available from three of the chaotic sites, and it is quite apparent (see Fig. 6) that the vortex energies within these highly turbulent areas literally propelled a significant portion of the magnetic material beyond the confines of the visibly-downed, chaotic regions. The higher the centripetal force (equation 4) within the chaotic region, the lower the amount of magnetic material inside, and the higher the amount that would be propelled outside.

In the final stages of data analyses it was realized that, if the active vortex centers are near the south edges of the sampled circles, it might be worthwhile to examine the node-length data in relation to the application of the Beer-Lambert model of electromagnetic energy absorption in crop formations. In Circles #1 and #8 no such relationship was found; however, the level of node expansion in both of these circles suggested a high level of turbulent activity (as shown by Levengood and Talbott,[1] a high level of complex energy distribution can reduce the Beer-Lambert regression correlation). However, in Circle #4 where there was considerably less applied energy (as evidenced by lower plant-stem node expansion, see Table 1) and a lower level of magnetic material in the soil (see Fig. 3), one might expect less influence from the boundary conditions which can produce significant alterations in the internal structure (and final result) of the plasma system.

Starting at the south edge of Circle #4 the node-length data are plotted in Fig. 7, according to the Beer-Lambert model. A correlation coeffiecient of r = 0.92 demonstrates excellent agreement with the theoretical model; however, it is important to note that the positive slope of this curve clearly indicates that, in Circle #4, the active vortex energy occurred at or very near the north edge of this circle. Considering the data in Fig. 7 and the results obtained from Circles #l and #8, as well as the data from the chaotic regions, it is very apparent that the entire area was subjected to multiple ion plasma vortices, with internal energies ranging from very turbulent and chaotic to much milder and more organized--thus producing the range of effects found here.

---

[1]Levengood, W.C. and Talbott, N.P. (1999) *Dispersion of energies in worldwide crop formations*, Physiologia Plantarum 105:615-624.

[2]"Crop Formation: Marion, New York, 1997," BLT Lab. Report #100, June 16, 1998.

[3]"Crop Formation: Saskatchewan, Canada, 1996," BLT Lab. Report #90, October 19, 1997.

W.C. Levengood
Pinelandia Biophysical Lab.

Nancy Talbott
Cambridge, Mass.

John Burke
Pro-Seed Technologies

Fig. 1: Eltopia, WA Field-Sampling Diagram #1

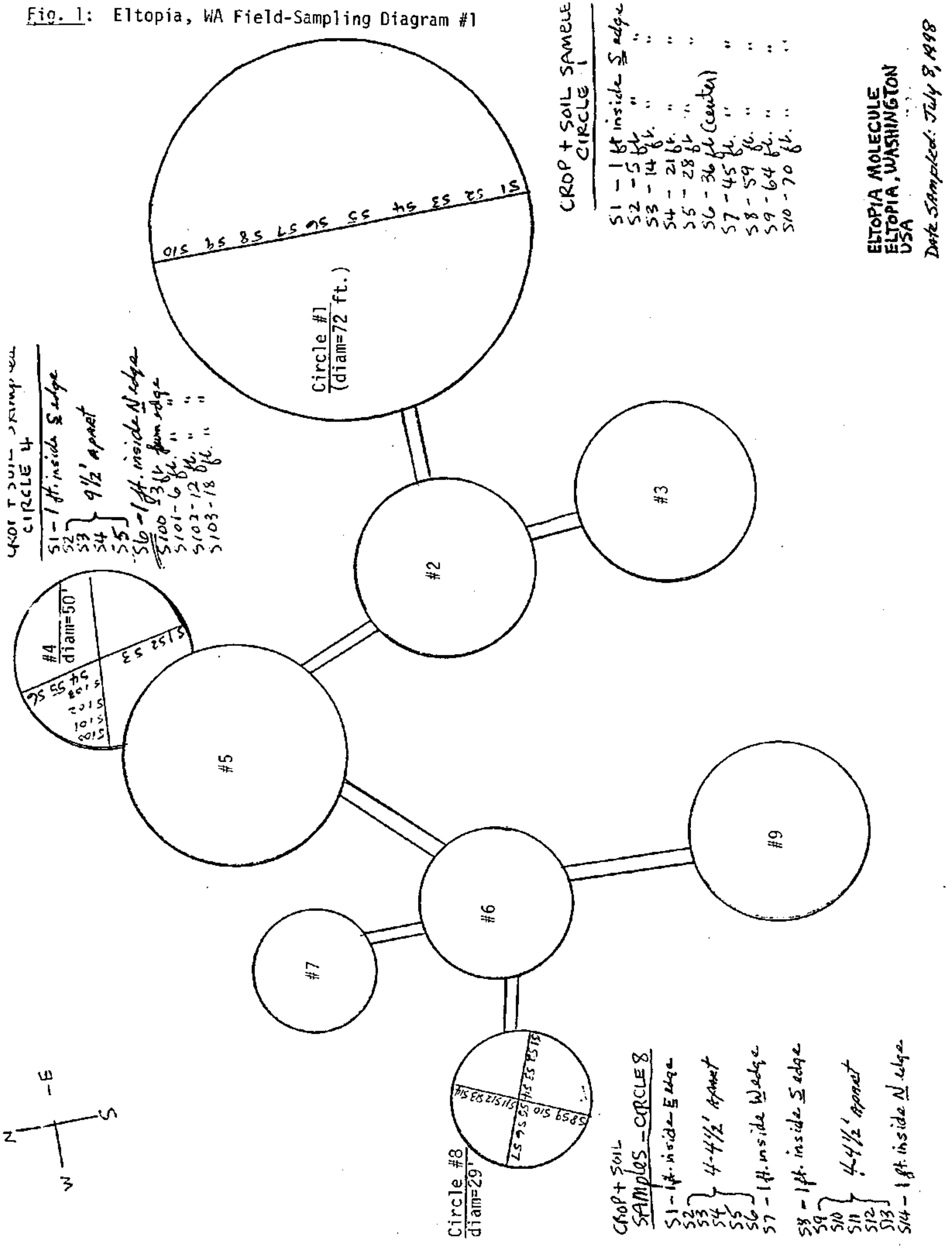


Fig. 2: Eltopia, WA Field-Sampling Diagram #2

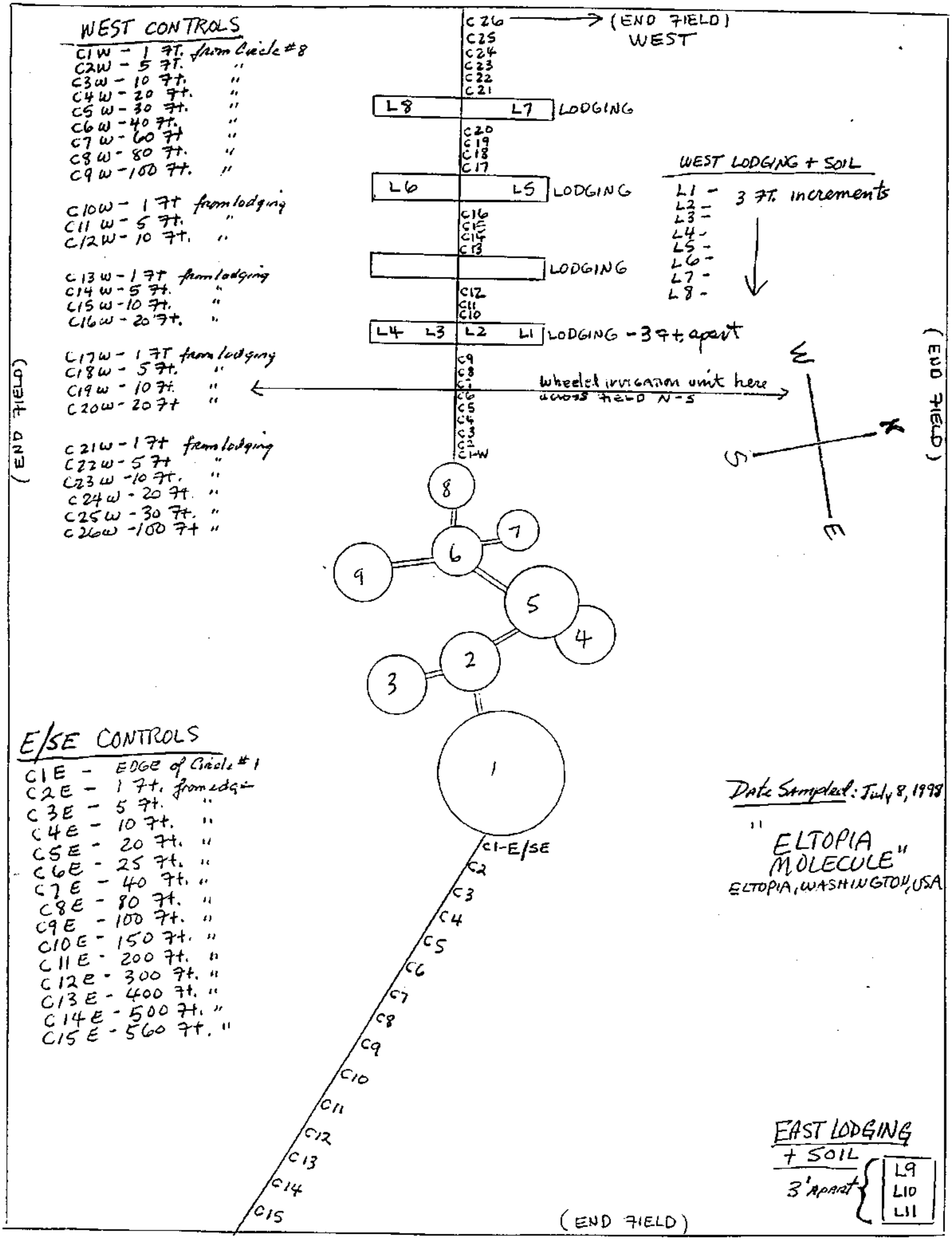
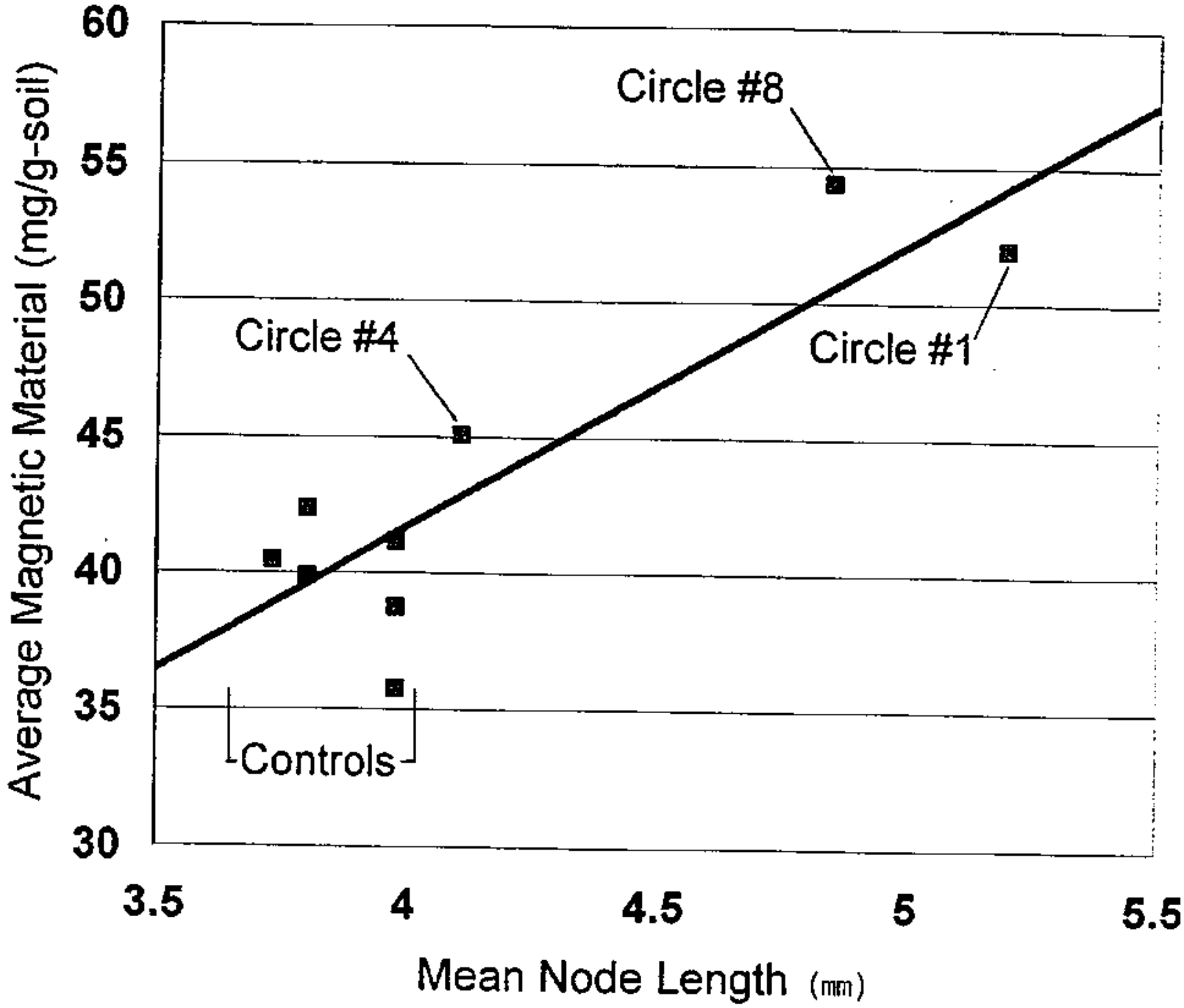


Fig. 3: Relationship between average levels of magnetic material in soils (mg/g-soil) and node-length increase (mm) in plant stems (KS-04-102).

Circles #1, 4 and 8 are the geometric areas sampled; the controls shown here are those most distant from (and thus most unaffected by) both the geometric and chaotically-downed crop areas.

A rough linear relationship (r = 0.84) is obtained, with the circles showing the greatest node-length change also showing the greatest amounts of magnetic material in their soils.

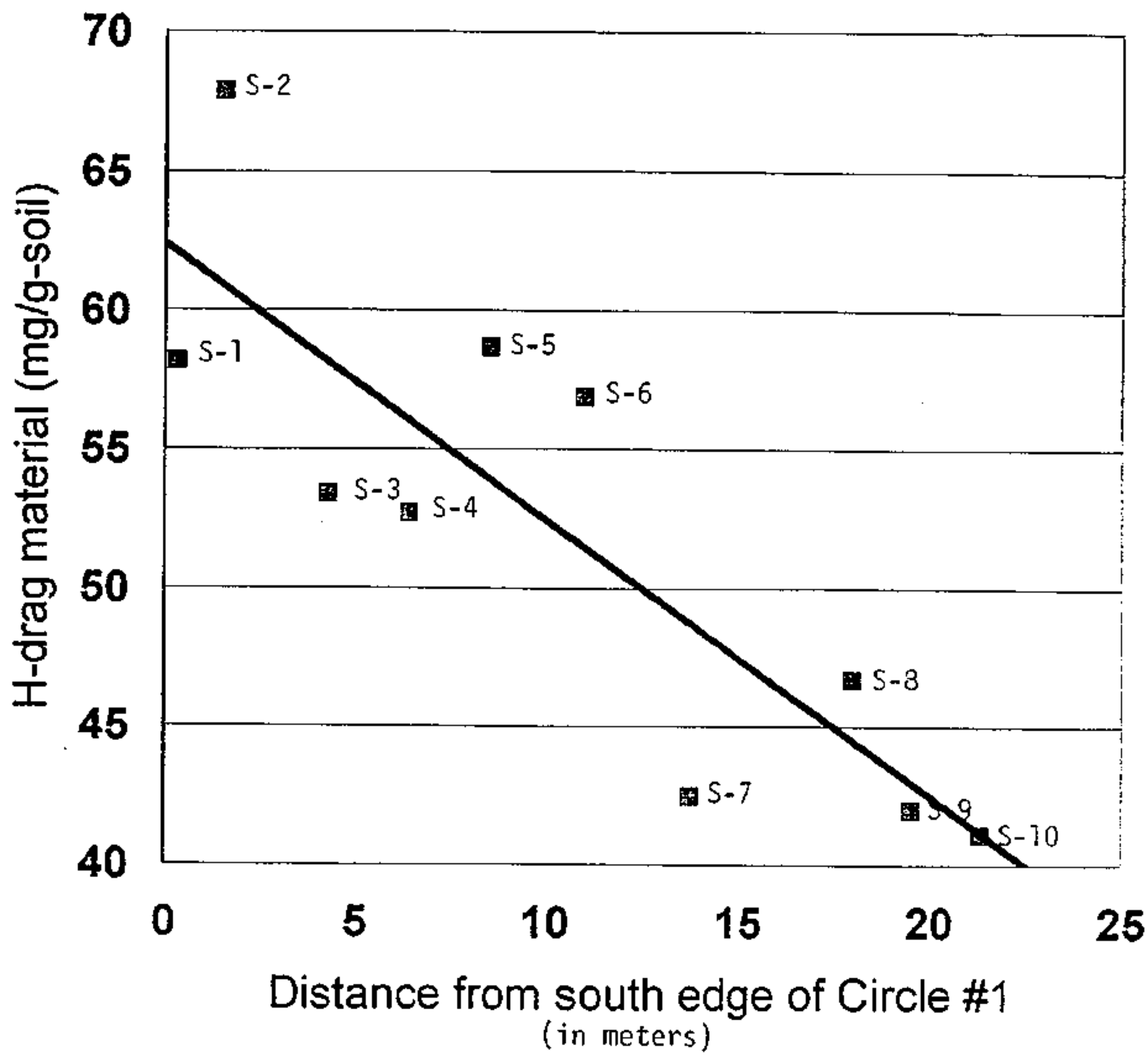


R-square = 0.753 # pts = 9

$$y = -0.00875 + 10.4x$$

Fig. 4: Linear distribution of magnetic material found in the soils along the North-South Diameter of Circle #1 (KS-04-102).

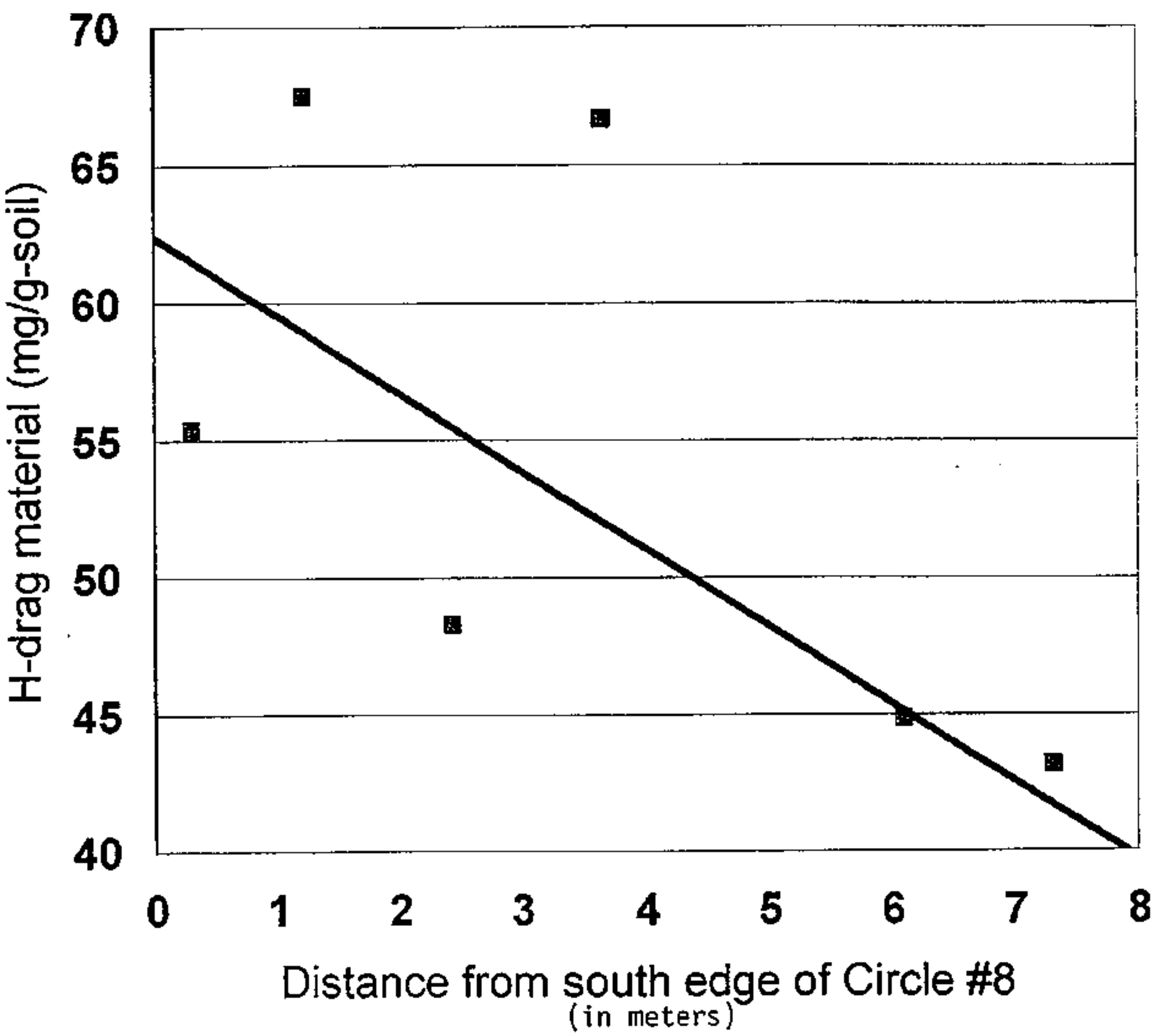
(Distance has been converted to meters, at 3.28 ft./meter.)



R-square = 0.721 # pts = 10

$y = 62.4 + -0.995x$

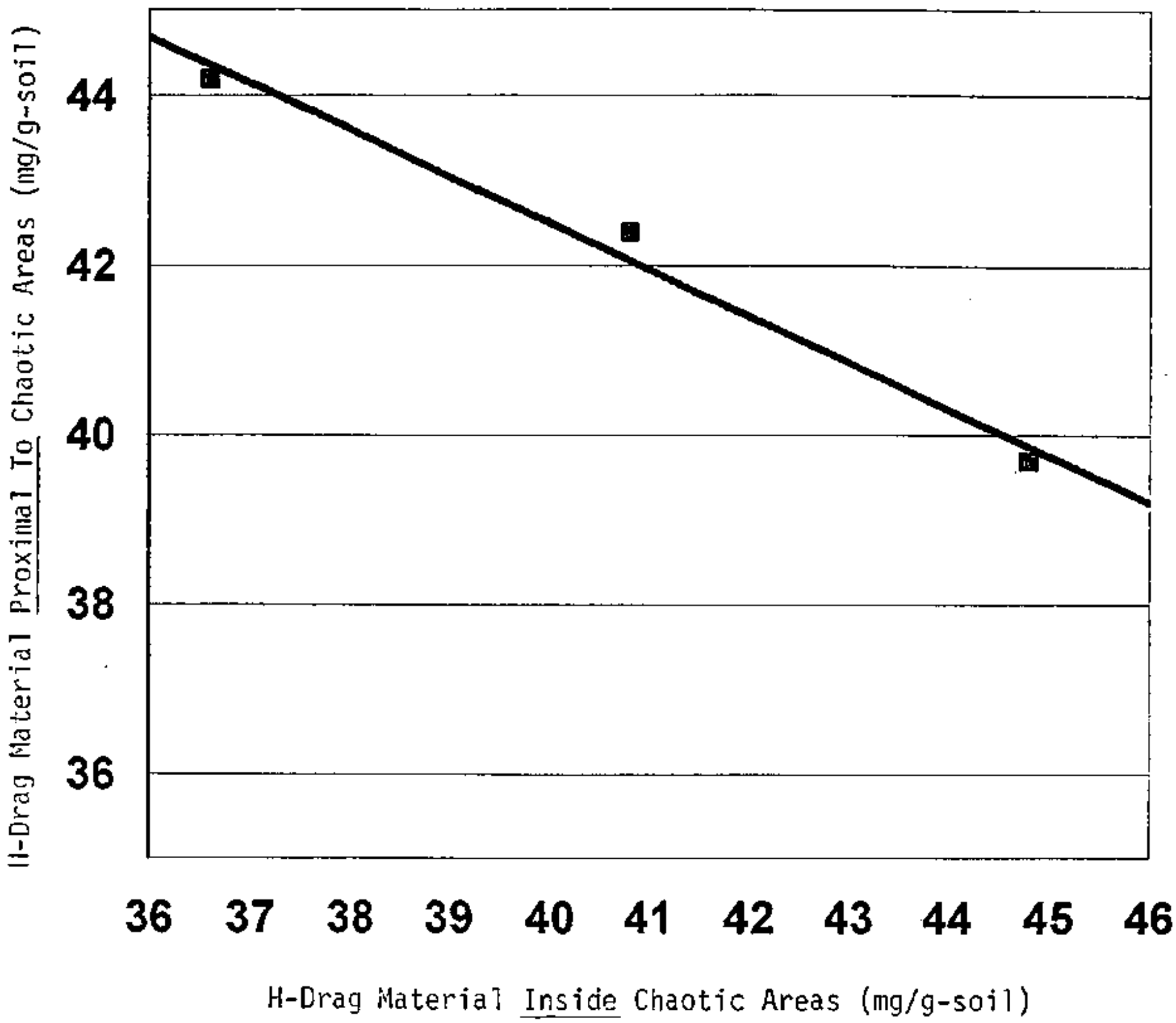
Fig. 5: Rough linear distribution of magnetic material found in soils along the North-Northeast/South-Southwest diameter of Circle #8 (KS-04-102). Amounts of magnetic material found in soils along the mostly East/West diameter were totally random in distribution. Two data points overlap. (Distance has been converted to meters, at 3.28 ft./meter.)



R-square = 0.386 # pts = 7

$y = 62.4 + -2.83x$

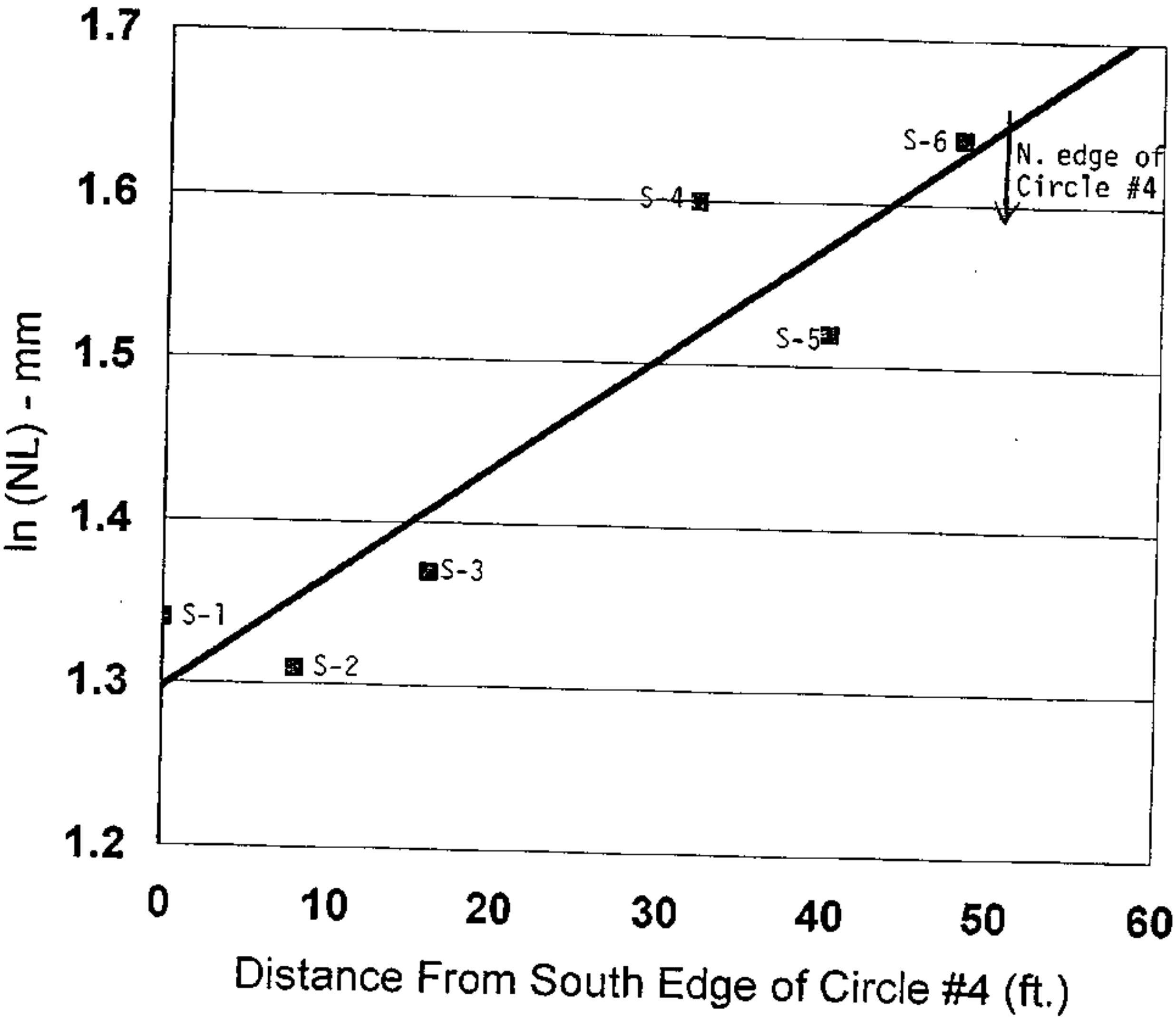
Fig. 6: Magnetic material found in soils inside and immediately outside the three sampled chaotically-downed areas West of the geometric formation (KS-04-102). The energy responsible (centripetal force) for the increased magnetic particle concentrations outside the visibly-downed crop areas is different from that responsible for the "spillover" effect observed in the plants in some crop circle events.



R-square = 0.983   # pts = 3

y = 64.4 + -0.548x

Fig. 7: Application of Beer-Lambert model of energy absorption, as evidenced by node-length increase in plant stems as a function of sampling distance in Circle #4 (correlation coefficient of r = 0.92). The increased node lengths near the North edge clearly suggest that, here, the active vortex energy was at, or very near, the North edge of the circle.



R-square = 0.853 # pts = 6

$y = 1.3 + 0.00692x$