COST-EFFECTIVE SOLUTIONS OF FUEL SAVING QUESTIONS.

Cockshull, K. 1986. *The Grower* (British). 106(18). Oct., 1986.

This is a description of energy work at Littlehampton, England. Cockshull points out that energy saving is not simply a question of choosing the measure that saves the most energy for a given capital outlay or that seems to have the shortest pay-back period. Gains from energy savings have to be offset not only against the costs of adapting the measure but also against those of any loss in crop yield or quality that accompany it.

The most common change that follows energy saving measures is a reduction in the amount of light reaching the crop. The following alternative cladding materials are tabulated below:

Cover	Calculated energy saving (%)	Measured light transmission
Single glass	0	100
Low-emissivity glass	10-20	90
Double glass	34	87
Double polycarbonate	38	79
Double acrylic	42	89
Triple acrylic	55	80

As the proportion of energy saved increases, so the amount of light transmitted decreases, with the exception of double acrylic. The effects of light loss are more difficult to predict.

With cucumber, Holland investigators have shown, on the average, an 8% reduction in fruit yield for every 10% loss in light. The situation is much less clear with tomato. One of the investigations is to be undertaken at Littlehampton. But, preliminary results in England and Holland indicate that yield and light are correlated in the tomato.

There is also a decided effect on humidity. The tighter the greenhouse, the higher the humidity and relative humidities can reach excessively high levels. Crop responses to relative humidities above 85% are not well understood. One effect of high humidity is to reduce transpiration by the leaves, which then reduces water movement through the plant. This, in turn, affects distribution of mineral elements like calcium, which are normally transported in the transpiration stream. If the young, actively growing tissue does not obtain enough of these elements, growth may be restricted. There is evidence for this:

Humidity treatments Day:night	Calcium deficiency on scale of 0 to 3 Feb. 6	Fruit yield at June 24 Kg m^{-2}
Low:low	0.1	13.11
High:low	0.1	12.36
Low:high	0.4	11.96
High:high	1.6	10.60

These experiments were at Naaldwijk where tomato leaves developed calcium deficiency when grown at continuously high humidities. Fruit yield can also be seriously depressed.

Editor's Note: Measurements of radiation under various covers now in use commercially in Colorado are being carried out, as time permits, winter, 1986-87. This may give us an idea of transmission characteristics under Colorado conditions. This work is supported by the Kenneth Post Foundation. Also note the summary in the following abstract from Norway. Colorado State University is well equipped to investigate these factors, especially with the new technique of acoustic emission analysis. Unfortunately, funding for this type of work is non-existent.

Mortensen, L.M. 1986. Effect of relative humidity on growth and flowering of some greenhouse plants. Sci. Hort. 29:301-307.

Young plants of 10 different greenhouse species were grown from 24 to 100 days at 55-60, 70-75 or 90-95% relative humidity (RH) in growth rooms. The dry weight increased significantly by increasing RH from the lowest to the highest level in *Begonia* x *hiemalis* (47%), *Saintpaulia ionantha* (17-36%), *Euphorbia pulcherrima* (31%), *Chrysanthemum* x *morifolium* (31%), *Nephrolepis exaltata* (68%) and *Lycopersicon esculentum* (20%). The dry weight of *Campanula isophylla, Rosa, Cucumis sativa,* and *Lactuca sativa* was not affected by RH, while *Soleirolia soleirolii* was negatively affected. The fresh weights of *Cucumis* and *Lactuca,* however, increased with RH in spite of there being no effects on the dry weights. Shoot length increased very considerably by raising the RH in most of the species. The number of leaves was increased by RH in some of the species while not in others. Number of flowers and flower buds significantly increased with RH in *Saintpaulia,* and time to flowering was reduced with RH in *Saintpaulia, Begonia,* and *Campanula.*

Editor's Note: The editor saw some of the plants when he visited the agricultural school in Oslo two years ago. In fact, I have a picture which shows distinct increases in plant size as relative humidity was increased. Unfortunately, good understanding of the effects of humidity on growth is going to require a shift from the use of relative humidity values to actual calculations of internal plant water stress and vapor pressure differences between leaf and air. Colorado's climate is highly unique, and we need to know these things for our economic return.

FORT COLLINS GREENHOUSE CLIMATOLOGICAL SUMMARY FOR FOUR WEEKS, BEGINNING JANUARY 1, 1987 (See Bulletin 426 for details.)

	Week beginning							
	Jan. 4		Jan. 11		Jan. 18		Jan. 25	
	Day	Night	Day	Night	Day	Night	Day	Night
Average outside temperature (°F)	38	30	32	22	28	20	48	39
Maximum outside temperature (°F)	56	44	50	46	48	42	66	55
Minimum outside temperature (°F)	28	15	3	−5	7	−4	26	16
Degree-days of heating	189	210	231	301	259	315	119	182
Average hours in the period	8	16	8	16	15	9	9	15
Accumulated total solar radiation (MJ/sq.m.)	38	1	56	—	58	—	61	—
Average relative humidity (%)	54	69	54	67	53	64	30	43
Maximum relative humidity (%)	97	100	92	91	89	96	58	77
Minimum relative humidity (%)	12	24	13	35	32	32	10	16
*Average absolute vapor pressure (mb)	4	4	4	3	3	2	1	4
Average wind speed (mph)	3	1	1	1	—*	4	4	—*
Maximum wind speed (mph)	28	20	11	11	—	40	37	—
Average CO_2 concentration (Pascal)	27	—	28	—	29	—	27	—
Maximum CO_2 concentration (Pascal)	46	—	44	—	38	—	41	—
Accumulated gas consumption (cu.ft./sq.ft.)	39	100	38	104	43	97	18	70

*Inoperable

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