THE GREEN MANURE AND SOUR SOIL MYTH

Little or No Evidence to Show That Green Crops Plowed Under Sour Soils—Cutting Off the Moisture Is Far More Likely the Cause of Any Trouble That May Occur

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THE Southern farmer has been offered many suggestions as to what crops he can profitably grow to take the place of cotton, but one very profitable one seems to have been overlooked. This one is now too little grown, and there is no likelihood of there being any over-production in the future, and it has the additional advantage that all that can be raised can be profitably used where produced. This valuable crop is home-grown nitrogen to be used in improving our depleted soils. Possibly the fact that an acre of cowpeas or similar crop of legumes can take from the air from 50 to 150 pounds of nitrogen annually is so well known that no one has cared to mention it; yet it is a way by which a farmer can make an acre of land take from the air $10 to $30 worth of fertility.

An Exploded Theory

THE use of green manures for soil improvement is about as old as is agriculture. Their use has been the main factor in keeping the soils of Europe in their high state of productivity after centuries of cultivation. Americans, and particularly those in the southeastern states, have failed to avail themselves of this method of soil improvement. The failure to do so is not due to the lack of suitable crops nor because there has been no need for growing soil-improving plants, but seems to be due to a rather groundless fear that these green manures will "sour" the land. That this fear is widespread throughout the cotton states is not to be denied, but it is about as hard to find any foundation for it as for the belief in "hollow tail." It is true that the majority of text books on agriculture emphasize the possibility of making the soil acid by plowing under green crops, but it is very hard to find the man who started the report. After diligent search through the literature published in the past 30 years, the writer has reached the conclusion that it originated from the making of a false analogy, that of comparing a soil with a silo. The reasoning seemed to have been that because clover when put in a pit silo became acid the same thing would occur if the clover were plowed under. The vast difference between this method of food preservation and the common process of decay was lost sight of. In the silo there is almost a complete exclusion of air, while in the freshly plowed soil it is abundant.

There are no data to show that incorporating green cover crops with the soil has increased its acidity, and no chemist has reported finding more acid in a green manured soil than in an adjoining soil without the green manure. A great many farmers claim that they have obtained poor yields following the turning of a green crop, and that the low yield was due to souring the land; but poor crops have followed deep plowing and shallow plowing, heavy fertilization and light fertilization, etc. Did the soil sour in these instances? It is highly probable that other and more rational explanations could be found for all poor yields assigned to "sour" soils due to turning under green crops.

There are a number of reasons that argue against the probability of green manures making soils sour, but before any discussion of these, consider the composition of green cowpeas and see if it is probable that an acid soil would result from their decay. Henry's "Feeds and Feeding" gives the composition of green cowpeas as, water 83.6 per cent, ash 1.7 per cent, protein 2.4 per cent, crude fiber 4.8 per cent, nitrogen-free extract 7.1 per cent, and fat 0.4 per cent. As soon as the plants are wrapped in moist soil the process of decay begins, and will continue till the disintegration of the plant constituents is complete. Chemist and bacteriologist agree that when protein is decomposed, in presence of air, ammonia is formed. This ammonia would immediately neutralize any acids formed. McBeth, Scales, and Smith United States Department of Agriculture, found that none of the soil organisms could decompose crude fiber or cellulose so as to produce an acid from it. Under certain conditions acids can be formed from nitrogen-free extracts, and it is possible that some acids, such as lactic, propionic and butyric, are formed in the process of decay in the soil; but all of these acids are excellent food materials for soil fungi, and the acids would be destroyed as fast as produced. At the Georgia Experiment Station we have added as much as 1 per cent of lactic acid to soil and have found that it disappeared within a week, and that in two weeks the nitrifying bacteria were working as if nothing had ever happened.

Nothing in Cowpeas That Is Not in Stable Manure

ONE of the leading arguments used by popular writers against the use of green manures is that they stop nitrification. There is no experimental evidence to support this theory, but to the contrary the Georgia Experiment Station has found that when cowpea vines were added to soil at rate of 50 tons per acre nitrification went on faster than it did before, or faster than it did in soils receiving a liberal application of ammonia sulphate (Georgia Experiment Station Bulletin No. 103, page 9). Since the amount of green material used here was four to five times greater than the farmer will ever have occasion to turn under, it is clear that he need not have any worries about a stoppage of nitrification in field practice. These experiments, conducted at a temperature of 80 to 85 degrees, also answer the contention that hot weather leads to souring.

Why the farmer is willing to use all the cow manure that he can get and objects to green manures is hard to understand, after a comparison of the composition of the two has been made. Their relative composition is:

	Water	Ash	Protein	Crude Fiber	Nitrogen Free Extract	Fat
Green cowpeas	83.6	1.7	2.4	4.8	7.1	0.4
Cow manure	81.8	2.39	4.04	3.57	8.21	0.49

There is nothing in the cowpeas to produce acid that is not in the manure; then why should the cowpeas be feared and the manure praised as a soil improver? Director Thorne, of the Ohio Station, (Farm Manures page 210) says:

"It is probable that experiences similar to the above (the reference is to a corn failure following plowing under rye late in a dry season, discussed on page 209) have given rise to the idea that the turning under of green material may 'sour' the soil. Such a green crop might amount to 10 or 15 tons to the acre, or less than such an application of manure as many farmers apply; it probably would not decompose in soil any more rapidly than would manure, nor give rise to products containing any greater acidity. It would seem, therefore that the occasional unfavorable effect observed from the turning under of green manures should be ascribed to previous exhaustion of the water supply, and not to any excessive production of deleterious acids."

If this were not enough to convince the most skeptical, there remains the experience of the farmers of Italy who have been turning under clovers

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