requires to be dropped in early winter. His first year's cost will be as follows :—

Value at birth	$ 3 00	
Milk, whole and skimmed, during four months	5 00	
Meal, hay and oats during winter	4 50	
Pasture, first summer	1 50	
First twelve months cost		$14 00
Second winter's straw, hay and chaff	$ 5 00	
Second winter's roots—60 bushels	5 00	
Second winter's meal and bran—200 lbs.	1 75	
Second summer's grazing	3 (0	
Second year's cost		$17 75

As the proper season has arrived to begin the fattening process, the expense during the next six months will be :—

Hay and chaff	$ 5 00	
Meal and bran	12 00	
Roots	14 00	
Cost during the last six months		$31 00
The total cost will be		$62 75

The weight is 1,350 pounds live-weight, and value at 5c. per pound—$67.50—giving a direct profit of $4.75.

While reckoning the cost of grain, roots, etc., I have taken the average cost of production, as given bv the statistics of Bureau of Industries for 1887, and values are given according to the average prices received in our leading markets for ordinarily good grade animals during the past five years.

Not only does the stall-fattened steer give the greatest cash profit, but the largest amount of stall-made manure, and most valuable also, on account of the heavier feeding at the finish.

The grass-finished animal with 95c. profit, and the one fattened in the stall $4.75, give us the mean profit of the average thirty months steer as being $2.85. The cost of the former is $40.30, that of the latter $62.75, or a mean cost of $51.52½.

As it has been shown that the average steer yields a small profit, the next consideration is, how can it be increased ?

As the Emerald Islander would say, "we must begin before the beginning." Dams and sires must be so mated that the offspring will have the tendency bred in them to mature early, and lay on flesh rapidly. In other words, the first step towards increased returns, must be the production of what might be called an animated machine, which will convert the greatest amount of raw food materials into the finished products of frame, flesh and fat in the shortest period. Then the manufacturing must be constantly carried on to the full capacity, for if the food is so reduced in quantity, or lowered in quality as to check growth, lessen condition, and prevent the accumulation of flesh, the largest available profit will not result. Were we given a quantity of proper food to change into beef, knowing that an animal requires a certain amount to sustain life without any advancement in weight or condition, would it not reduce the ultimate returns to employ *ten steers* to bring about the change, if *seven or eight specially-bred ones* would accomplish the work in the same length of time ? Undoubtedly, the food saved from having two or three less structures to build and maintain, would give considerably more of the finished article—beef. A further saving would be had in less stabling, attendance, etc.

As "a penny saved is a penny gained," so is the prevention of waste in connection with stock raising necessary in all details to insure the most abundant returns ; therefore, careful breeding, judicious feeding, and so managing as to have the animal ready for the market at that season when the available markets usually yield the highest prices, are the means whereby the profit resulting from the rearing and fattening a thirty months' old steer may be greatly increased.

The Science and Practice of Stock Feeding.

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For the next few months the subject of stock feeding must necessarily occupy much of the time and attention of the successful farmer, and as the importance of this subject is often overlooked I will briefly state the latest available statistics on live stock. It has been found, by numerous experiments, that on an average, it will require twenty pounds of hay, five pounds of corn meal, and two pounds of cotton seed, or an equivalent of these, daily for one thousand pounds of live weight,—this is necessarily an average for horses, oxen, sheep, cows, and growing cattle.

At the outset I wish to say, that the science of stock feeding is the key to better practical work. It should go hand in hand with the practice, pointing out possible improvements, and showing the losses which many old methods entail. Science can never take the place of practical knowledge, but it can point out the methods which lead to success. True science and *good* practice never conflict; if theory and practice lead to opposite conclusions, either the science or the practice is wrong. A practice not based upon science may be right, or it may be wrong, just as a man may guess right or wrong, but at best such practice, whether in agriculture or engineering, contains too many elements of uncertainty.

Theory and practice must go hand in hand to arrive at the best results in the best way. This is as true in agriculture as in any other pursuit.

The two factors with which we have to deal in stock feeding are *plants* and *animals*, and we will briefly consider the principles of their growth and composition. *Plants and animals are mutually dependent* for their existence. Without *plants, animals* would perish, and without *animals, plants* would in time die for lack of an atmosphere suited to their wants.

PLANT GROWTH.

When a kernel of corn is planted under favorable circumstances it produces a stalk and ear that may weigh five pounds. It is evident that the little kernel, weighing but a small fraction of an ounce, could not have furnished all the material from which the stalk was produced, and the soil and atmosphere must have made up the deficiency.

The leaves of the growing plant absorb from the atmosphere a gas, known as carbonic acid gas ; the roots take up water, in which potash, iron, sulphur, lime, phosphoric acid, and magnesia, are dissolved, and the roots and leaves both take up nitrogen in combination with other elements. Within the plant these simple substances are combined in wonderful ways, forming many compounds having unlike properties; for example, the carbonic acid taken in through the leaves, and the water taken up by the roots, furnish the elements from which starch, sugar, oil, vegetable acids, mucilage, gum, etc., are produced. By the addition of nitrogen and sulphur a class of compounds are produced which resemble the white of eggs. Wheat gluten is an example of this class. One of the chief characteristics of plants is this power of taking the elements contained in the soil and air, and from a few, forming an almost endless variety of substances having the most diverse properties. Sugar and acids, starch and oil, strychnine and quinine, are a few of the many. This power is not found in animals. Not a grain of starch was ever produced from the elements of carbonic acid and water, except by plants; animals are dependent upon plants for their food. During the growth of plants they are constantly taking in carbonic acid, using a part of it in the production of starch, sugar, etc., and giving off oxygen ; the result of this is to use up the carbonic acid of the atmosphere and overcharge it with oxygen ; animals, however, produce just the opposite effect ; they take in and use oxygen and give off carbonic acid. This is the one thing that keeps nature's books balanced.

A plant put under a tight jar would in time so far use up the carbonic acid as to die from lack of food ; a mouse under another jar would use up the oxygen and increase the carbonic acid until suffocated ; the two if put under the same jar would keep the air right for both. The oxygen given off by the plant would supply the mouse while the carbonic acid exhaled by the mouse would furnish just the kind of food necessary for the plant.

FOOD.

A *food* may be *complete* that is capable of furnishing all that an animal requires, as grass, or it may be *incomplete* or not capable of sustaining life, when fed alone, e. g., starch, sugar, oil, etc. These are just as much food, however, as grass.

In the machine shop the mechanic learns the peculiarities of different machines by taking them apart and noting their construction. In the laboratory the chemist learns the characteristics of various plants and fodders by taking them apart, so to speak, but instead of the vise he uses the crucible, in place of the monkey wrench he uses various acids, alkalies, etc., to tear apart the plant and separate it into the constituents of which it is made up ; instead of the accurate rule measuring to the $\frac{1}{10000}$ part of an inch he uses delicate balances, which weigh to the $\frac{1}{283502}$ part of an ounce. The object of both the mechanic and the chemist is to get a knowledge of the internal structure which simple inspection cannot give. If plants were made up of but one kind of material there would be no need of chemical analysis. But such is not the case. If we press out the juice of a stalk of corn and evaporate it we get *sugar ;* if the dried kernels are ground into a paste, with water, and then washed and manipulated in certain ways a large per cent of *starch* is obtained. If another sample of this corn meal is boiled with ether and the ether poured off into a clean dish and evaporated there will be found a clear yellowish oil, *or fat*, which the ether dissolved out of the corn. If wheat dough is washed until the starch is removed, a tough, sticky mass is left, this is known as *gluten*. These four substances represent the most important constituents found in fodders.

The chemical composition of fodders and feeding stuffs is determined and expressed in the following way : *Water* exists in all plants, the amount is determined by weighing a sample of the given substance and then drying it at 212°, until it ceases to lose weight, the loss is water, the part which remains is called *water free substance* and is made up of : 1st, *albuminoids* or substance resembling albumen or the white of eggs, wheat gluten or "wheat gum," already alluded to being the most familiar illustration of this class. The albuminoids contain not far from