

## The Art and the Science of Agriculture

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Agriculture is a strange mixture of art, biological science and economics. It began with the hunt and the end is not yet. Simple as it was in the beginning, it is growing day by day more complicated and almost every new discovery adds to its complexities and to its interest as well.

It has all come about in a perfectly natural way, no doubt, and while most of its history is buried in the past of many races, yet its broader outlines can be inferred with a fair degree of accuracy.

That the earliest man was a hunter, like his animal associates, is a fair assumption, though he was doubtless by far the most ingenious and heartless of the lot. For after having subdued the earth and turned to his advantage what he has not destroyed he seems now to have entered upon an era of self-destruction, even as his savage ancestors fought for hunting grounds. But this is not agriculture and need not concern us here.

Nature seems to have provided at least two distinctly different opportunities whereby this early man might make a living and he divided himself into groups accordingly, though why some chose this and others that is a secret of the long lost past.

Anyhow, one group chose to live by the seaside, obtaining its living from the waters, the simplest, and perhaps the surest, means of support but the least stimulating to progress.

Apparently much the larger group chose to live mainly by the hunt with some help from the lakes and rivers, and with them existence became a game of matching wits against their animal neighbors. It is among these that we shall look for the beginnings not only of agriculture but of science.

Now the timbered sections of river valleys were the favorite hunting grounds because here were the hiding places of the hunted. Even a half developed man thing must have noticed the hunting habits of the wolf, and what was more natural than that he should tame a young pup now and then and finally acquire a pack to help him trail and corner the game. So the dog, almost certainly, was the first domesticated animal.

But the hunt is not always successful, and it must have been that not infrequently hunter and dogs returned with nothing to show for the day's work but empty stomachs, gnawing hunger and possibly a fair stock of ill nature. But the women had been hunting, too, among plants that could not run away and hide.

They had discovered, here and there, certain fruits, nuts, even roots with a good taste and with qualities that could stave off hunger. It was then that woman discovered that the road to a man's heart is through his stomach and that it is good policy to "feed the brute." Nothing was more natural than to clear away competing vegetation from the neighborhood of these valuable food plants, and so it was that agriculture was born and women became the first farmers.

It was not long under these conditions until man discovered that these trees, shrubs and other valuable plants come from seeds, and following close

upon that discovery was an attempt to enlarge nature's beneficence by planting some of these seeds on the sand bars down by the river or in other vacant spaces—a second step in the development of agriculture.

Now this could not long go on without noticing that the seeds from the better plants were able to produce a superior crop and such seeds were in demand. Here was "breeding from the best," the first step in what we now call genetics and the first service of science to agriculture if not to the race. No doubt the hunter had noticed a vast difference in his dogs and soon learned also to breed from the best.

In the meantime another thing was happening. Some of the larger animals, feeding upon the taller grasses, naturally sought the open country and, being fleet of foot, were able to venture farther from shelter than the weaker and more timid woods folks. These were the cattle kind and noble hunting did they make.

But to secure these animals the man must have another helper and one that not only could outrun the cattle but was also able to carry a rider. And so the horse came into the picture, without much doubt the second domesticated animal. Here, too, difference in individuals must have been apparent and breeding from the best vastly increased not only the speed but the power and endurance of the greatest of all domesticated animals.

This meant a perambulating life, as the tribe followed the herds in their wanderings for fresh pasturage. To care for these herds the help of many men was required, and gradually, as the herds multiplied, they came into the virtual possession of masterful men with many followers. Such was Abraham of old, rich herdsmen, who often battled each other for possession of favorite pasture lands, one of the beginnings of warfare.

In the meantime something was happening back in the valleys where crops were being cultivated. Nothing could so injure that tribe as to raid their growing crops and their storehouses by enemy tribes; and here was born, on the heels of agriculture, the first organized warfare, in which personal combat became mass conflict. The only protection of a tribe thus becoming tied to a settled habitation was to organize a war party to clean up the surrounding country much as we stop a prairie fire by backfiring. That is what the Six Nations were doing just before America was discovered, when they chased their enemies up into Canada, down into the Carolinas and, to make assurance doubly sure, came out into what we now call Illinois.

So this brings us down pretty nearly to our own time except for one fact long before well known. And that was that certain materials applied to the ground would vastly increase the yield. It was probably accidental in the first place, for it was inevitable that some one would notice that where a fire had been or near the dumping place vegetation grew ranker than elsewhere.

So there grew up in Roman times a considerable knowledge of fertilizing materials. But it was crude and empirical, for as late as a hundred years ago useless, even harmful, materials were often applied, just as the phases of the moon were consulted in almost every agricultural operation.

But alchemy was turning into chemistry. What though chemistry meant then only analysis—it was a start. What though the first scientific assumption was that everything found in the crop by analysis should, in theory, be applied as a fertilizer—it was a step in the right direction.

Exactly one hundred years ago a great thing happened. One Sir John Lawes came into possession of the family estate at Rothamsted, in Herts. In the university he had become interested in the possibilities of applying scientific methods to agriculture, for those were the days when agriculture was the chief concern of English gentlemen.

Securing the services of one Henry Gilbert, afterwards Sir Henry, the two together in 1837 laid out Broadbalk field into small plots and proceeded to raise every important crop under every conceivable form of treatment.

As would be expected, they found some materials injurious, others useless and a few highly beneficial. English farmers had already learned by experience that "lime enriches the father but impoverishes the son". Lawes and Gilbert learned why. They early learned that while most crops could be grown year after year on the same ground it was impossible with legumes, a mystery not yet fully solved.

The great outstanding lesson they learned was that most crops respond to the application of combined nitrogen as to no other fertilizer. And then arose the "nitrogen mystery," a mystery because there was no known way by which such combinations were effected in nature.

As late as 1890 I read a letter from Sir John Lawes to Dr. Manly Miles, the first professor of agriculture in this country, in which Sir John said, in substance, that unless we could speedily solve this nitrogen mystery the world would positively go hungry. The only known source of combined nitrogen was the guano of a few Pacific islands which fleets of ships had by that time nearly exhausted.

And the mystery was solved, as we now know. But here is an interesting incident in that connection. On the way up from South America in 1892, I came by way of England in order to visit Rothamsted. Arriving in England, I asked the privilege of a visit and a time was set.

On the appointed day and hour Mrs. Davenport and I presented ourselves at the laboratory, expecting to be shown at once over the fields. What was our surprise to be greeted by Sir Henry Gilbert himself and to see the walls of his laboratory covered with charts. But our amazement was complete when he proceeded to repeat for us, taking a full hour of his time, the lecture he had given in Halle a few days before, showing how they had solved the nitrogen mystery. And we saw the very clover plants that were used in the experiment.

This brings us down to the present when the contributions of science to agriculture are much better known to others than to me and when the economics of farming is the chief concern.