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Extracts from Chapin's Hand Book of Plants and Fruits.

The Analysis of the Best Pasture Lands shows that they contain from 8 to 12 per cent, of organic matter mostly vegetable; from 5 to 10 of alumina, and from 1 to 6 of lime. If but a 10th part of the grass dies annually on the soil, in a state of roots and stubble, vegetable matter must increase, in time, to a very considerable amount, while arable land cannot improve from this circumstsnce, as it is constantly turned up with vegetable remains. The leaves and roots of the grasses contain ignorant and saline matter; and dry hay, when burned, yields 8 or 10 per cent, of its weight of ash, so that, beside the vegetables left in the soil, a fine earthy powder is formed, which is the cause of the fineness of the surface of old grass fields consisting mostly of lime and silica, and differing from the clay soil originally and now below. Clay soil is also modified by the roots of grasses penetrating it, and opening a way for the rains, which carry down the clay with them. Thus changes in the character of soils constantly take place. Soils which are light contain little clay, and the grasses therefore thrive more rapidly, and a thicker sward is soon formed; but the rains wash out the clay and they do not form permanent pasture lands, as with clay soils. If the old pasture lands are ploughed up, many years will be required to effect the same condition as that before, as the lower soil is mixed up with the fine mould of the surface, and the vegetable matter disappears by rapid decomposition. At first the sowing down of natural grasses on heavy land will often disappoint expectations; and on light and loamy lands, a thick sward cannot well be expected; but in time both soils may be improved.

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Irrigation of the Soil is another mode of improving or manuring it. This is extensively practised in South America and the East, though for no other purpose generally than to moisten a dry soil. But in more northern climates, it washes out the acid and other noxious matters generated in the soil. It favorable effects are seen in peat soils, which contain much matter unfavourable to vegetation, and in subsequent drainings. The deposits also of productive organic and inorganic matter in the form of mud, in addition to the soluble matter, proves generally of great advantage to plants. They absorb from the water the salts which, as we have noticed, are so valuable in their growth Draining and burning of pure soils is also much practised. When the vegetable matter of the sod is burned the ash of the plants is left to blend with the calcined earth. The ash supplies the soil, like dressings, with inorganic matter, and the carbonaceous matter at the same time contributes to correct and improve the soil. The advantages of burned clay are not that it contains any organic matter useful as the food of plants, but that it will crumble into a friable powder; and instead of a paste like substance, it becomes communited and equally diffused, so as to give a due consistency to the soil. Thus it will render even clay soils more open and modify the texture of most others, not chemically but mechanically. Burned bricks render soils more porous, and are supposed to imbibe and condense air, which facilitates the decay of vegetable matter and aids the early growth of plants. They are thus believed to imbibe ammonia and nitric acid from the air. Charcoal has a similar effect, though the entire operation of this as well as of burned clay, is to be further and better understood by repeated experiments.

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Lime, it is well known, is extensively used in practical agriculture, and has been from the earliest period. All the varieties of its forms, as Limestones, Shells, Chalk, etc., are composed of carbonic acid and lime, and hence is carbonic of lime. But when submitted to heat the carbonic acid is driven oft and the lime remains. This is called quick lime, which, when exposed to the air, ultimately falls into powder, by absorbing carbonic acid from the air and forming thereby carbonate of lime again; or when water is thrown upon it, swells and becomes one third heavier by the combination with it of the oxygen of the water, and giving off the hydrogen with the latent heat of the water, which before kept in a fluid state. Lime is used in a mild state, as a carbonate, in marls, chalk, powdered shells, etc.; or in a caustic or quick state, as it comes from the burning or after being slacked. Marl contains from 5 to 20 per cent. of carbonate of lime in the state of a fine powder. Shell sand, found on the shores, contains also from 20 to 50 per cent of silicious sand. Some lime stones also contain considerable magnesia, and hence are called Magnesian lime stones. Most limestones contain some magnesia which is useful for plants, but if above 10 per cent. it is thought to be deleterious. The quantity of lime used in dressing and the frequency of its use should depend on the depth of the soil and the mode of culture. A large or more frequent application is necessary if the soil be wet, but when it is thin and dry a moderate coat will penetrate to the depth of 8 or 10 inches, or the ordinary extent of ploughing. A thinner dressing still is requisite on old pasture lands, the grasses living in 2 or 3 inches of soil. But in reclaiming lands, or laying them down to grass, a heavy dressing is often necesaary; and in ordinary arable culture considerable quantities are used because the soil is deeper in stiff clay soils after draining, and where there is much vegetable matter much lime may be profitably added.

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The Productive powers of soils are mostly modified by the plants grown on them. Lands unfit for arable, may be made to produce profitable arable crops by the continued growth of wood. But there is a difference in the kind of trees thus calculated to improve the soil. The pines may not improve it at all, and the beech and sycamore may render it even less valuable than at first. Oaks render it better only after 15 or 18 years. The larch renders it still better, though in a still longer time. This improvement is the result of addition to the soil by the leaves of the trees. But the green foliage delays the decomposition of the fallen leaves by shading them from the favourable influence of the sun. Some leaves decay more readily however than others—the beech and oak, for example sooner than the pines. Those of the oak contain 5 per cent. of saline and earthy matter, while the fir tribe afford only about 2. The improvement, therefore, is in proportion to the quantity and kind of inorganic matter trees receive from the air. This determines also the kind of grasses which will be produced. Lands laid down with artificial grasses for a few years are better fitted for grain crops; but they deteriorate after this time, it is believed, if kept in these grasses. They will not improve beyond a certain extent, any more than they will with any other crops. Old and extensive commons, heaths and wastes are evidences in point. But some grass lands retain their good condition for a long period without manuring, as some rich grain-lands have for a century. Any improvement that takes place is in the formation of a dark-brown surface-soil, imbued with vegetable matter, and which becomes thicker in proportion to the time it has lain down to grass. The thickening however sooner ceases if the soil be light and sandy; if moderately heavy, the improvement continues longer, and if somewhat clayey, it may be made permanently good.

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A scale of nutrive equivalents of the most important vegetable food has been formed on the proportion of the nitrogen they contain, which is as follows:

Substances.	Equivts.
Wheat	107
Do. Flour,	100
Barley Meal,	119
Barley,	130
Indian Corn,	138
Rice.	117
White Haricots,	55
White Garden Cabbage,	810
Do. dried at 212,	83
Oats,	117
Rye,	111
Buckwheat,	108
Potatoes,	613
Do. kept 10 months,	694
Do. dried at 212,	126
Lentila	57
Turnips,	1335
Jerusalem Artichokes,	539
Carrots,	757
Do. dried at 212	95
Horse Beans,	44
Peas,	67

Thus 44 parts of horse beans, 67 of peas, or 83 of dried cabbage are equal in nitrogen to 100 parts of wheat flour, 138 of maize, or 613 of potatoes. But while these afford the most nitrogen, they are deficient in the elements (phosphate of lime and magnesia) which compose the bones, and are therefore of much less value than others is articles of food; they satisfy the appetite, but add little to the strength. All vegetable poisons contain nitrogen, and some nitrogenized articles of food contain poisonous principles, as with the sodanina of potatoes and some others of that genus; but these principles are always dissipated or modified, as we have shown, by heat.

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The Times of Gathering Crops determines also the amount of their nutriment. Thus, radishes left too long in the ground become hard and woody, and so with the stem of the young cabbage and the artichoke; and so it is, in effect, with the grasses cut for hay. There is much sugar in these, and as they grow up, this is changed into starch, first, and then into woody fibre. Therefore, the riper the plants become the less sugar and starch they contain, in proportion to size. Those parts of a plant which dissolve most easily are the most nourishing: starch and sugar are redily soluble in water. The weight of cut straw or hay is less when perfectly ripe. These should be cut, consequently, soon after they are at their greatest weight, when both the quantity is greatest and the quality is best, and the same may be said of all the corn or grain crops. The straw commonly begins to diminish three weeks previous to being fully ripe, and it becomes less nourishing after that time. But the ear of grains which is sweet and milky four weeks before it is ripe, afterwards becomes consolidated, the suger changes into starch, the milk thickens into gluten and the albumen of the flour. And when this is completed, two weeks before the ripening, the grains contain the greatest amount of starch and gluten. If grains be cut at this time, they are heavier, and they will yield the gratest amount of good flour and the least bran, as the skin of the grains always thinnest at this time. If, however, they are left longer, the grains cover themselves with a thicker skin for protection, a part of the starch is also changed into woody fiber, as in the ripening of hay, the radish, etc. All corns or grains should therefore be cut two weeks before ripening.

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On the Eye and its Diseases.—This chapter I wrote previous to joining the cavalry in which I practised, consequently I could form no competent knowledge of what variety might exist in deseases of the horse's eye in this country: I then wrote according to those which the animal is afflicted with in Europe. On showing it to a medical gentleman, he informed me that the animal in India was by no no means subject to so fatal disease as I had described it, the inflammation being merely superficial: I have however, experienced the reverse. In H.M. 25th Dragoons there are several blind horses, which I found on enquiry became so precisely in the same manner as I had described that is, by repeated inflammations, each attack leaving the eye in a weaker state, until a film succeeded, and ultimately loss of vision. I also witnessed two or three horses that became blind precisely in the same manner, and whatever relief was afforded was merely temporary: and considering