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### AGRICULTURE.

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ACTION OF LIME.

Chemical investigation has led to the idea that one of the effects of lime, when applied to the soil, consists in its rendering soluble certain mineral substances which are essential to the growth and perfection of vegetation. Granite, trap, and slate contain potash, which is liberated by caustic lime. There is good reason to believe that this action of lime is of great importance, and that in many instances it is one of the principal causes of the increased productiveness which the application of this substance imparts to the soil. The following remarks from a valuable paper by Professor Johnston, serve eminently to illustrate this subject, and will be read with profit:—

The decaying vegetable matter in the stems, roots, and leaves of plants; which form the so-called humus of the soil, contain a large proportion of the inorganic matter which was necessary to their existence in the living state. As they decompose, this inorganic matter is liberated. By promoting this decomposition, therefore, lime sets free this mineral matter, and provides at once abundant organic and inorganic food to the growing plant. The result of the action of lime is no less important in reference to its fertilising quality than that by which it causes the production of those numerous changes in the purely organic matter of the soil to which I have already adverted.

If the vegetable matter decay rapidly, it will supply in abundance all the materials, both organic and inorganic, which new races of plants require to form their entire substances. If it be in an inert state, and decompose slowly, the food it contains remains locked up, and comparatively useless to vegetation. In quickening the decay of this inert or slowly decomposing matter, it is easy to see, therefore, how lime should render the land more fertile, and should do so more sensibly where vegetable matter is more abundant.

The mineral and rocky fragments in the soil are acted upon in a similar manner.

Among the early constituents of soils, there often exists fragments of feldspar and other minerals, derived from the granitic and trap rocks, as well as portions of the stony and other beds from which the soils have been formed, and which as they crumble down, yield more and more of those inorganic substances on which plants live.

The decomposition of these minerals and rocks proceed more or less rapidly under the conjoined action of the oxygen, the carbonic acid, and the moisture of the atmosphere. But the presence of lime promotes this decomposition, and the consequent liberation of the inorganic substances which the rocks contain.

The silicates of potash and soda are among the most important compounds which these minerals and rocky fragments contain. These silicates, after being heated to redness with quick-lime, readily yield a portion of their potash or soda to water poured upon the mixture. The same result follows, but more slowly, when, without being heated, and silicates and the lime are mixed together into a paste with water, and left for a length of time at the ordinary temperature of the atmosphere. It is reasonable therefore, to suppose, that in the soil of our fields a similar decomposition will slowly take place, when quick-lime is mixed with it. It will take place also, though still more slowly, when lime is added to it in the form of carbonate.

By some, the liberation of potash and soda in this way is supposed to be the most important action exercised by lime in rendering the land more productive. With this extreme opinion I do not agree, though it must be conceded, I think, that in numerous instances, a certain amount of benefit must follow from the chemical action it is thus fitted to exercise.

I have spoken of lime as liberating the inorganic constituents of the decaying matter of the soils. The stalks of the grasses, and the straw of our corn-bearing plants also contain silicates of potash and soda, which lime sets free in hastening the decomposition of the vegetable matter of which they form a part. Besides liberating, it further decomposes these silicates, as it does those of mine-

erals in the soil, and sets their potash and soda free to perform those important functions they are known to exercise in reference to the growth of plants. I am inclined to consider this part of the action of lime as of nearly equal importance to vegetation in many instances, with that which it exercises upon the mineral silicates.

While the potash of soda is set free in a soluble state, the lime unites with a portion of silica, forming a silicate of lime of which traces are to be met with in nearly all soils. This silicate, again, is slowly decomposed by the agency of the carbonic acid of the atmosphere and of the soils, as I have already explained when speaking of this compound as one of the causes of the known fertility of soils formed from the decay of trap rocks.

Potash and soda exist sometimes in considerable quantity, in our stiff clay soils, in combination with the silica and alumina, of which they chiefly consist. From their extreme tenacity, the air is in a great measure excluded from these soils, and hence chemical decomposition proceeds in them very slowly. The addition of lime alters their physical character, and by making them more open, admits the air, and thus promotes its decomposing action upon them. But it acts chemically also, in the same way as it does upon the silicates already spoken of, and thus compels them to give up more freely to the roots of plants those mineral substances by which their growth is to be made more luxuriant.

**ACTION OF LIME ON SALTS OF IRON, MAGNESIA AND ALUMINA.**—Salts of Iron.—Lime, either in the mild or in the caustic state, possesses the property of decomposing the sulphate and other saline compounds of iron, which especially abound in moorish and peathy soils, and in many localities so saturate the subsoil, as to make it destructive to the roots of plants. Sprengel mentions a case in which the first year's clover always grew well, while in the second year it always died away. This, upon examination, was found to be owing to the ferruginous nature of the subsoil, which caused the death of the plants as soon as the roots began to enter into it.

When land is rendered unproductive by the presence of salts of iron, a dressing with lime will bring the land into a wholesome state without other aid than those of the drain and the subsoil plow. If sulphate of iron be the cause of the evil the lime will combine with the acid and form gypsum (sulphate of lime), while the first oxide of iron which is set free will, by exposure to the air, be converted into the second or red oxide, in which state this metal is no longer hurtful to vegetation.

The drain and the subsoil plow are useful auxiliaries to the time in lessening the injurious effects of the compounds of iron, because they allow the rains to descend and gradually to wash away the noxious matter which has accumulated in the under soil—because they permit the descending water to carry with it portions of the lime in a state of solution, and thus spread its good effects through the whole soil—and because they admit successive supplies of air as deep as the bottom of the drains, by which, while the action of the lime is promoted, these other good effects also are produced which the oxygen of the atmosphere can alone accomplish. In fact, it has an outlet for the surface water be thus provided beneath, by which the lime may be enabled to descend, and the rains to wash away slowly the noxious substances from the subsoil, even the addition of a copious dose of lime will only produce a temporary improvement.

**Salts of Magnesia and Alumina.**—Lime decomposes also the sulphates of magnesia and alumina, both of which, but especially the former, are occasionally found in the soil in large proportions, and being very soluble salts, are liable to be taken up by the roots in such quantities as to be hurtful to growing plants. With the sulphuric acid of these salts the lime forms gypsum, as it does with the acid of sulphate of iron when this salt is present in a soil to which it is added; besides removing the evil effects of these very soluble sulphates, therefore, it exercises the beneficial action which gypsum is known to exhibit upon many of our cultivated crops.

Alumina has the property of combining readily with any vegetable acids and in the clay soils exercises a constant influence—though more feeble in degree than that of lime—in persuading organic matter to those forms of decay in which acid compounds are more abundantly produced. Hence, clay soils almost always contain a portion of alumina in combination with organic matter. These organic compounds decomposed by lime, and by the more energetic action of this substance, their constituents are sooner made available to the wants of the new races of plants.

### PROTESTANT CORNER.

#### DESIGNS OF THE POPE.

A private letter received in Paris from Gaeta, written by a distinguished personage, not a Frenchman, mentions that the Cardinal Secretary of State had communicated to the Ambassadors of the four powers composing the Conference at Gaeta, the plan of government the Pope had devised for the administration of his affairs in his dominions. His Holiness concedes to his subjects the most extensive municipal franchises. In each district there is to be a municipality, the members of which are to be elected by the inhabitants, the electoral right being granted to almost every male individual in the district. The Pope only reserves to himself the choice of Mayors and Deputy Mayors, who are to be selected from among the members of the municipal bodies.

His Holiness also proposed the establishment in each province of a provincial council, the members of which are to be elected by the landed proprietors and merchants, and whose powers will pretty much resemble those of the Grand Juries in England and the councils-general in France. In cases of emergency, the Presidents of these councils will have to appoint, from among themselves a committee charged with the administration of the province, until matters shall have recovered their normal condition. In addition to these, a State Consulta, composed of one delegate from each province, and as many other delegates as the Pope may please to appoint, is to meet at Rome.—This body will be consulted on all the affairs of the State, but is not to have a deliberate vote. A Council of State, on the plan and with the attributes of that of France, is also to be instituted.

#### POPERY TOTTERING.

I find the Church of Christ in Scripture; but I cannot find the Roman Catholic Church there—except in prophetic denunciatory anticipation. Here, indeed, I find her.—There is not a single peculiar dogma of that church which Christ and his apostles have not foreseen; and for which they have not prepared a disclaimer and a rebuke. *Not one!* She has been the chief custodian of the Book of Life? She has; and to a strange account has she perverted the trust with which, along with other churches, she was invested. It was committed to her to be diffused. She has endeavored to keep it to herself. She has sealed it; locked it up. To other hands than hers are we indebted for its multiplying and its spread—jealous of which, as hostile to her schemes of overleaping ambition, she has prohibited it; she has burned it; she has branded it with a lie, denying its all-sufficiency—the all-sufficiency of Omnipotence and Omnipotence! Ponder the condition of mankind, wheresoever you can trace the footsteps of her sway. The earth is parched and rotten with arid ignorance, through lack of the living waters, which the Duty has amply provided, but which man has withheld or diverted. She languishes though she knows not for what. Knowledge, worldly knowledge—now approaches her meridian fast! Before the half of the nineteenth century is well complete, human art and science have achieved things which smile at the exploits of a thousand preceding years. Distance is almost annihilated; wind and current are defied; lightning, at the will of man, plays in all the gradations of its power—becomes his messenger, with wing of fire, while the sun enacts his limner and draughtsman; torture is disarmed of her throes; the simplest agents displace the most ample and boastful; man inquires, not what I can do, but what can I not do;—and yet is the ocean of human passions upturned from its profoundest depths, and rolls and foams, destructively on every side.—Nations at war with themselves, one with another, looking for war! One overcast heaven and one troubled earth! The clearing up and the calming—how are they to come, and when? They that humbly await the answer, and with faith—the only faith—scriptural faith—for the faith of tradition—can alone await it, without trembling.—*Eberdan Knowles' Rock of Rome.*

**THE STATUE OF ANGELS.**—Bishop Purcell, of Cincinnati, has received the first of a pair of kneeling angels, to adorn his cathedral, sculptured under the direction of Powers, in Italy. Some one asked the bishop if this statue was not of uncommon size, it being the kneeling figure of a person six feet in height. In answer he gave the history of his commission to Powers. He had directed it to be made of the natural size. Powers, in reply, requested something more definite, alleging that he "had never seen an angel." The bishop referred to Revelations xxi. 17, for his measurements. This was conclusive, and was the gauge as to size and proportions of the object and.