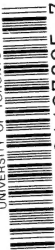


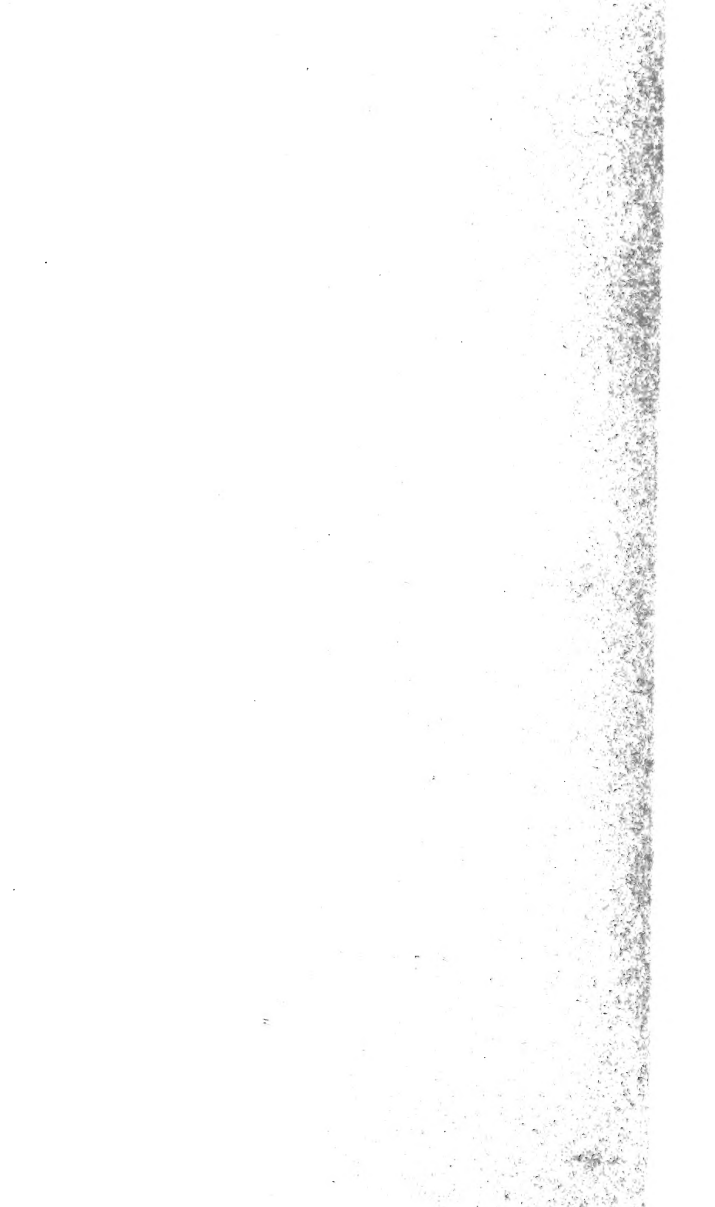
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Johnson, Outhbert William  
An essay

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AN  
**ESSAY**  
ON  
THE USES OF SALT  
FOR  
AGRICULTURAL PURPOSES;  
WITH  
INSTRUCTIONS  
FOR  
ITS EMPLOYMENT AS A MANURE, AND IN THE FEEDING OF CATTLE,  
SHEEP, &c.

With Experiments and Illustrations,

From the latest Authorities.

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BY  
CUTHBERT WILLIAM JOHNSON.

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“Salt is good; but if the salt have lost its savour, wherewith shall it be seasoned?”

“It is neither fit for the land, nor yet for the dunghill; but men cast it out.”

*St. Luke's Gospel, chap. xiv. 34, 35.*

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1820.

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TO  
THE HONOURABLE  
THE BOARD OF AGRICULTURE,  
THIS ESSAY  
UPON THE USES OF SALT,  
FOR  
AGRICULTURAL PURPOSES,  
IS  
MOST RESPECTFULLY INSCRIBED,  
BY  
THE AUTHOR



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J58



## ADVERTISEMENT.

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As the advantages arising from the use of common salt for every purpose of agriculture, are rapidly gaining public attention, I propose, in the following pages, to endeavour, upon known scientific facts and principles, to give a rational explanation of the various and important properties of common salt, for agricultural purposes; which in the numerous experiments of agriculturists, and in those at which I have personally assisted, it has most uniformly appeared to possess; being persuaded, that the want of better information, respecting the power and means by which this valuable substance can beneficially operate, has been the great impediment, to its general employment in agriculture.

From a perusal of the various modern authorities, which I have quoted, as much as possible in their own words, the agriculturist will commence his experiments, without fear of loss; and from the ancient authors he will learn, that the use of salt in agriculture, must not be classed among those transient novelties, daily presented to the notice of the agricultural world.

From being satisfied of the truth of the accounts of researches handed down to us, and from the great mass of evidence offered before their Committee, in April, 1817, Parliament have now liberally removed every obstacle, consistent with the safety of the revenue, which prevented a fair trial of its uses, for the various purposes of agriculture. And the Honourable Board of Agriculture, have offered a gold medal, or 50*£*. for the best experiments upon salt, as a manure. And another medal or premium, for the best experiments, on its application, for assisting in the feeding or fattening of cattle; these prizes are to be decided in March, 1820, and the Honourable Board, have renewed their premium for March, 1821. The Highland Society of Scotland, have also offered, for the best experiments upon the same subjects, premiums of 30 guineas, or plate of the same value, to be decided in November, 1820.

Convinced of the valuable and important uses, to which common salt may be applied, for agricultural purposes, I hope, that more useful publications will soon appear, than I am enabled to offer, to influence the serious attention of the agriculturist; and the distressed state of the agricultural interest, will contribute to promote attention to every rational means of improvement: and thus we may observe, that the recurrence of unfavourable seasons, are events, not unproductive of universal good, they excite enquiry, vigilance, and precaution, which by requiring

new expedients, give increase of employment, both to the farmer and labourer; and by rewarding judicious expenditure, promotes agricultural arts and agricultural life, of all modes of life, the best, being the most conducive to health, to virtue, and to enjoyment; such events, therefore, must not be considered as unaccompanied with benefits. I believe, that in those countries, where the soil is most fruitful, and the seasons the most regular, there the condition of the cultivators of the soil is most depressed, uncertainty, therefore, of favourable seasons has its use, even to those who complain of it most.

Seasons of scarcity, therefore, are not without important advantages; they call forth new exertions, they set contrivance and ingenuity at work, they give birth to improvements in agriculture and economy, they promote the investigation and management of public, as well as private resources, and they contribute to the happiness of mankind.

GREAT TOTHAM, BY WITHAM, ESSEX,

*Feb. 8, 1820.*

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## INTRODUCTION.



THE earliest testimony of the employment of salt as a manure to land, that I am acquainted with, is that which I have quoted from the scriptures, as recorded by St. Luke. Its good properties as a nutritive substance, when given with the food of cattle, seems to have been well understood at a still earlier period.

Virgil, who wrote about 30 years before Christ, bears testimony to its good properties:

- “ At cui lactis amor, cýtisum, lotosque fréquentes
- “ Ipse manu salsasque ferat præsepibus herbas.
- “ Hinc et amant fluvios magis, et magis ubera tendunt
- “ Et salis occultum referunt in lacte saporem.”

*Georgics, Lib. III. ver. 394.*

- “ If milk be thy design; with plenteous hand
- “ Bring clover grass, and from the marshy land
- “ Salt herbage for the fodd'ring rack provide,
- “ To fill their bags, and swell the milky tide:
- “ These raise their thirst, and to the taste restore
- “ The savour of the salt, on which they fed before.”

*Dryden's Virgil.*

Pliny, who wrote his Natural History, A. D. 50, observes, “ Pecudes armentaque et jumenta sale maxime sollicitantur ad pastum, multo largiore lacte, multoque gratiore, etiam in caseo dote.”—*Lib. xxxi. cap. 7.*

“ Herds of cattle being covetous of a salt pasture, give a great deal more milk; and the same is much more agreeable in the making of cheese, than where there is no such saline ground.

And still speaking of the uses of salt for cattle, he says, “ Pecórum quoque scabiem et boum illitus tollit, deturque lingendus.”—*Lib. xxxi. cap. 9.*

“ A washing of the sheep and oxen (with salt) takes away the scab. It is also given to them to be licked.”

The illustrious Lord Bacon, who died A. D. 1626, in his *Natural History*, declares, that “ the best manure next to marl, is sea sand, which no doubt obtaineth a special virtue by the salt water.”

Sir Hugh Platt, who published his *Jewel House of Art and Nature*, in 1653, states, that it “ is salt which makes all seeds to flourish and grow; and that no dung which is laid on barren ground, would any way enrich the same, if it were not for the salt in it.”

“ A gentleman sowed a bushel of salt upon a small patch of barren ground, at Clapham; which to my day,” says Sir Hugh, “ remains more fresh and green, and full of swarth, than all the rest of the field about it.”

The use of salt in this country, for agricultural purposes, was prior to the time of Lord Bacon; as in his *Natural History*, he expressly mentions the benefits derived from watering beet radish and other herbs, with a solution of salt in water.

Frederick Hoffman, Professor of Physic in the University of Halle, who died in 1742, observes, “ In Hungaria, Polonia, Russia, Transylvania, Borussia, necnon Græcia, salis fossilia frusta animantibus objiciuntur ut ejus usus internam corruptionem et morbum arceat.” In Hungary, Poland, Russia, Transylvania, Borussia, and also in Greece, they give small pieces of fossil or rock salt to their animals, and the use of it keeps away internal corruption and diseases. *De fontib. salsis malensibus, &c. cap. 7.*

This salt, says Dr. Brownrigg, in an *Essay*, published in 1748, “ is dispersed over all nature, it fertilizes the soil, it arises in vegetables, and from them is conveyed into animals; so that it may well be esteemed the universal condiment of nature, friendly and beneficent to all creatures endowed with life, whether it be vegetative or animal: when properly used as a manure, it affords ample nourishment to corn and other vegetables, and renders kingdoms rich and fertile, where it happens to abound in the soil.”

The Rev. Dr. Shaw, observes, that “the soil in Barbary is generally impregnated with common salt and nitre, and that the waters of most of the rivers and lakes have there a salt taste;” and to this grand and inexhaustible fund of salts, he very judiciously attributes the great fertility for which that country hath always been remarkable, and still continues to be so, without any other manuring, but the burning in some few places of the stubble.

In the year 1773, when the late learned Dr. Watson, Bishop of Landaff, published his *Essays*, the demand for this manure had become very great, as he states, that at one town only, Northwich, in Cheshire, the farmers purchased 3000 tons of salt annually, for this purpose; although it was then subjected to a duty of 13s. 4d. per ton, imposed in 1768—wheat was then as low as 45s. per quarter. The duty being evaded, stricter regulations were adopted to enforce its collection, by an act passed in 1783; but these regulations proving ineffectual, the liberty of using it was repealed by another act, passed in 1785; from which period, this refuse salt has, in the presence of the exciseman, been regularly thrown into the river.

The late John Hollingshead, esq. of Chorley, in Lancashire, who during a long course of years, was a distinguished advocate for the use of salt as a manure, from many years experience of its good properties, and who unsuccessfully endeavoured to get the prohibitions to its use removed; observes, in a pamphlet published by him, in 1802, “nothing in nature is so powerful as salt to meliorate and drain strong and stiff soils, and also to give moisture to dry ground; it is also a certain destruction to weeds and insects, besides its efficacy in corn and fallow land, its excellent qualities in giving luxuriance and salubrity to grass lands, are peculiarly worthy the attention of the grazier and breeder of cattle.”

“There is no substance yet known, said the late Dr. Anderson, which is so much relished by the whole order of graminivorous animals, as salt. The wild creatures of the desert are so fond of it, that wherever they discover a bank of earth impregnated with a small portion of salt, they come to it regularly ever after to lick the saline earth. It is also admitted, by all who have tried the

experiment, that salt, given with the food of domestic animals, (except fowls\*,) tends very much to promote their health and accelerate their fattening; and although some persons who have been at a loss to account for the manner in which this stimulant could act as a nutritive substance, have affected to disregard the fact; yet no one has been able to bring the slightest shew of evidence to invalidate the strong proofs which have been adduced in support of it. It is not therefore an extraordinary argument, to assert, that by a proper use of common salt, the same quantity of forage might on many occasions, be made to go twice as far as it could have done in feeding animals, had the salt been withheld from them. If so, then we have here laid open to our view an easy mode of augmenting the produce of our fields, to an amazing extent; for if the same quantity of forage can be made to go not twice as far, but only one twentieth part farther than it now does, it would be the same thing as adding one twentieth part to the aggregate produce of meat for beasts, throughout the whole kingdom."

The attention of the public has very lately been drawn to consider the impolicy of the prohibition to the use of refuse salt, for agricultural purposes, through the exertions of several distinguished persons. The late excellent Sir Thomas Bernard, published two most useful works, a Letter to Mr. Vansittart, in 1816, and the Case of the Salt Duties, in 1817. Two pamphlets have also appeared from the pen of Samuel Parkes, esq. a distinguished chemical writer: Thoughts on the Laws relating to Salt, in 1817, and a Letter to the Farmers and Graziers of Great Britain, to explain the advantages of using Salt in the various Branches of Agriculture, in 1819.

A Letter to Mr. Vansittart appeared in 1816, from William Horne, esq. merchant of Liverpool; this gentleman has lately been elected a member of the Board of Agriculture, in testimony of respect for his exertions to obtain a repeal of those prohibitions and other impediments to a free use of salt in agriculture.

Lord Erskine, in his *Armata*, published in 1816, observes, in

\* Sir John Sinclair is of opinion, that salt is good for fowls.



reference to this subject, "Lime, which has caused to start into life the most inert and sterile parts of Great Britain, is just nothing as a manure, when compared with salt; which differs from it, besides, in two remarkable qualities, decisive of its superior value."

"Lime, and, I believe, all other known composts, are powerful according to the quantities in which they are used; whereas salt to be useful, must be sparingly applied, it *corrupts* vegetable substances, when mixed with them in small quantities; but preserves them when it predominates in a mass; it is needless, therefore, to add, that independently of its comparative lightness, the expence both of such a manure and its carriage would be much less than any other. Yet you rob the mother of your people of this food, which indulgent nature has cast into her lap, sufficient, as you will see hereafter, to feed all her children, even if their numbers were doubled."

Through the exertions of these and other patriotic noblemen and gentlemen, the attention of several members of the legislature was drawn to a consideration of the subject; and by two clauses in an Act, which passed in 1816, the farmer was allowed to use rock salt for his cattle, upon payment of a duty of 10£. per ton, and entering into security by signing a bond, &c. and by another clause, he was allowed to use ashes steeped in brine, free from duty or bond.

In April, 1817, various evidence was adduced through the exertions of some of the gentlemen I have mentioned, before the Honourable the Board of Trade, and in the course of the evidence given by Lord Kenyon, he observed, "By the information which I have been able to collect, I am induced to consider salt, when sparingly applied, as an admirable manure, especially for fallows and arable land."

In the session of 1817, John Calcraft, esq. then member for Rochester, moved for a committee to enquire into the subject; but owing to the advanced period of the session, the motion was negatived by a very small majority. Upon a motion by the same gentleman, early in the session of 1818, a committee was ap-

pointed, and from the great mass of evidence given before them, and printed by order of the House, I have liberally selected what I have thought most useful for public information. From the recommendation of this committee, a Bill was immediately passed to allow the use of rock salt for cattle, upon payment of a duty of 5£. per ton.

This Bill, having, as stated by the committee, been very hastily passed, owing to the advanced period of the session; early in the session of 1819, another Bill was introduced, under which, the farmer can now obtain refuse salt for manure, if mixed with one-fourth of ashes or soot, free from duty or bond.

The legislature, having thus been influenced to restore to the country the use of salt, for agricultural purposes, on terms which have strongly excited the attention of agriculturists, my purpose is to endeavour to render its nature and properties and uses better understood by every farmer, who otherwise may be content to wait until influenced by the greater prosperity of his neighbour, before he would adopt any new system of cultivation; unless he obtains some satisfactory knowledge of the certain nature and value of what is offered for his service.

AN  
ESSAY  
ON  
The Uses of Salt  
FOR  
AGRICULTURAL PURPOSES.



**CHLORIDE** of sodium, or common salt, is a substance possessing such various and valuable properties, that few years elapse without some new discovery, either for extending its use, or for applying it to new purposes: it is composed, according to the analysis of Sir Humphrey Davy, and Dr. Marcet, of chlorine  $59\frac{1}{2}$  parts, and sodium  $40\frac{1}{2}$  parts, per cent.

The advantages which have been obtained from the employment of salt as a manure to land, may be ascribed to its possessing the following properties.

**FIRST.**—As possessing the power, in small quantities or proportions, to promote putrefaction, and thus rendering the most stubborn particles of animal and vegetable remains, a valuable food for plants, rendering them more easily soluble, as becoming more putrescent. That the application of salt in small quantities, assists the putre-

faction of animal and vegetable matters, was long since shown by the experiments of Dr. Macbride and Sir John Pringle.

SECONDLY.—As promoting the destruction of weeds, worms, grubs, and all sorts of animalculæ, the constituents of which, consisting of the most finely divided carbon, immediately become subservient to vegetable life. “To enumerate,” says Sir H. Davy, in his very valuable *Lectures on Agricultural Chemistry*, “all the destroying animals and tyrants of the vegetable kingdom, would be to give a catalogue of the greater number of the classes in Zoology; almost every species of plant is the peculiar resting place or dominion of some insect tribe, and from the locust, the caterpillar, and snail, to the minute aphis, a wonderful variety of inferior insects are nourished and live by their ravages upon the vegetable world.”

THIRDLY.—As being itself a direct manure, almost all the varieties of life comprehended in the vegetable world, contain common salt. It is a constituent of almost every kind of animal and vegetable manure.

FOURTHLY.—As a stimulant to the growth of plants: Dr. Darwin, is of opinion, that salt used for manure, operates as “a stimulant, which excites the vegetable absorbent vessels into greater action than usual, and applied in a certain quantity, it increases their growth, by enabling them to take up more nourishment in a given time, and consequently to perform their circulations and secretions with greater energy.”

This opinion of the above distinguished naturalist, is, I think, clearly supported by the experiments of Mr Gilbert, steward to the late Duke of Bridgewater, which I shall hereafter notice, when treating upon the application of salt, to the various purposes of horticulture; and I think, his opinion will be considered well established, by the

following experiment, which I have lately witnessed, upon a large white-heart cherry-tree, of 30 years growth, standing in my father's garden, at Great Totham, Essex.

This tree is upon a light gravelly soil, and had constantly borne a profusion of blossoms, and producing only a very few cherries, although in the highest health in every branch, and vigorous in its growth.

After various schemes had been tried, without success, to render it fruitful, an application of salt was determined on. In the Autumn of 1818, about four pounds of salt were placed in two trenches, on opposite sides of the tree, six or eight inches from the surface, and six feet from the tree, and two or three handfuls were afterwards spread round it, upon the surface of the ground.

This tree, in the Spring of 1819, bore its usual profusion of blossom, and the cherries instead of falling off, as before, became fine fruit, and yielded thirty times its former produce. The tree is well situated in an old garden; it is never deficient in moisture; or infected with insects. A clearer evidence of salt operating as a stimulus to the absorbent vessels of vegetable life, I should think, it would be difficult to produce.

FIFTHLY.—By promoting and retaining the moisture of the ground, incessantly absorbing it from the atmosphere, and from the deliquescent nature of salt; it is of most important value for such purpose.

“The soils that are the most efficient in supplying the plant with water, by atmospheric absorption,” says Sir H. Davy, “are those in which there is a due mixture of sand, finely divided clay, and carbonate of lime (chalk,) with some animal or vegetable matter, and which are so loose and light as to be freely permeable to the atmosphere. With respect to this quality, carbonate of lime,

and animal and vegetable matter are of great use in soils; they give absorbent power to the soil, without giving it tenacity.

“Sand, on the contrary, which also destroys tenacity, gives little absorbent power.”

“I have compared,” says, Sir Humphrey, “the absorbent power of many soils, with respect to atmospheric moisture, and I have always found it greatest in the most fertile soils, so that it affords one method of judging of the productiveness of land.

“1000 parts of a celebrated soil from Ormiston, in East Lothian, when dried at a temperature of  $212^{\circ}$ , gained in an hour, by exposure to air saturated with moisture, at temperature  $62^{\circ}$ , 18 parts.

“1000 parts of a very fertile soil from the banks of the river Parret, in Somersetshire, under the same circumstances, gained 16 parts.

“1000 parts of a soil from Mersea, in Essex, worth 45s. an acre, gained 13 parts.

“1000 parts of a fine sand from Essex, worth 28s. an acre, gained 11 parts.

“1000 parts of a coarse sand, worth 15s. an acre, gained 8 parts.

“1000 parts of the soil of Bagshot Heath, gained only 3 parts.”

The following experiments were carefully made by myself, in November, 1819, to ascertain the extent of the increased absorbent powers of the soil, as imparted by the application of a top dressing of salt.

1000 parts of a very rich soil near Maldon, Essex, worth 42s. an acre, dried at temperature  $212^{\circ}$ , absorbed in 18 hours, by exposure to air saturated with moisture, at temperature  $62^{\circ}$ , 25 parts.

1000 parts of the same field, which had been salted

with twelve bushels an acre, under the same circumstances, gained 27 parts.

1000 parts of the same field, salted with six bushels per acre, gained 26 parts.

The question may be asked—If the ground is kept moist by salt, how would such a salt moisture agree with vegetable life?

FIRST.—Repeated experiments of various philosophers have demonstrated, that different plants will live for weeks, in solutions of various salts, and not only live, but increase in size.

And some experiments of M. Saussure have shewn, that plants possess the power of absorbing the water from saline solutions, and leaving the salt.

“From the experiments of Saussure,” observes Dr. Thomson, in his valuable *System of Chemistry*, vol. iv. p. 325, “we learn, that plants absorb saline solutions in very different proportions, and that in general, those are absorbed in greatest quantity, which are most injurious to vegetation.

“He dissolved the following substances in water, in such proportions, that each solution contained  $\frac{1}{100}$ th part of its weight of the substance dissolved, except the last, which contained  $\frac{1}{25}$ th part.”

- 1 Muriate of Potass
- 2 Common Salt
- 3 Nitrate of Lime
- 4 Glauber Salt
- 5 Sal Ammoniac
- 6 Acetate of Lime
- 7 Blue Vitriol
- 8 Crystals of Sugar
- 9 Gum Arabic
- 10 Extract of Soil.

“ Into each of these solutions he put plants of polygonum persicaria, or of bidens cannabina, furnished with their roots.”

“ The polygonum grew for five weeks in the solutions of muriate of potass, nitrate of lime, common salt, glauber salt, and extract of soil, and the roots increased in them as usual. It languished in the solution of ammoniac, and the roots made no progress. It died in eight or ten days in the solution of gum, acetate of lime; and in less than three days in the solution of blue vitriol.”

“ The bidens absorbed pretty much the same proportions, but in general did not vegetate so long as the polygonum. In these trials it was the blue vitriol and the sugar that were absorbed in the greatest abundance, and these were the substances which proved most injurious to the plant.”

“ Saussure explains this apparent anomaly, by supposing, that a portion of the roots were soon destroyed in these liquids, and that then, they absorbed the solution indiscriminately.”

“ When various salts were dissolved at once in the same solutions, and plants made to vegetate in them, it was found that different proportions of the salt were absorbed. The following table exhibits the results of these trials, supposing, as before, the original weight of each salt to have been 100.

“ Each solution contained  $\frac{1}{100}$ th part of its weight of each salt.”

		Proportion absorbed.
1	{	Glauber Salt ..... 11,7
		Common Salt ..... 22
2	{	Glauber Salt ..... 6
		Common Salt ..... 10
		Acetate of Lime ..... 0



“On examining the plants, the salts absorbed, were found in them unaltered.”

The above experiments demonstrate that plants do not absorb saline solutions indiscriminately, but that they possess a discriminating power, which enables them to absorb common salt with avidity, and reject acetate of lime entirely.

SECONDLY.—When 40 bushels of salt per acre, were mixed well with the earth, even this large quantity could not bear any comparison with the quantities of salt employed by M. Saussure.

THIRDLY.—When salt is used with the primary intention of preserving moisture in the ground, it ought to be sown upon the land early in the spring, before the moisture is materially evaporated from the soil. The salt would immediately dissolve, forming a solution with which the surface of the ground would be kept moist; so that the heat of the sun, in the height of summer, instead of having to act upon an already parched soil, exhausted of moisture, would have to evaporate a solution of salt to dryness, (a solution too incessantly renewed) before it could evaporate a single particle of the substrata of moisture.

With respect to the moistening properties of salt, it may be useful to observe, that common salt has the property of absorbing the watery particles always contained in the air, which aqueous particles are in the largest proportions during the summer months.

The remark, of Dr. Anderson, that when we cannot account for the manner in which an effect is produced, we are disposed to disregard the fact, and to ask, (as I have heard on this subject,) how can salt act as a nutritive substance to the increase of vegetable produce, or in the fattening of cattle? has so often appeared to me, to be a

common sentiment, and the greatest check to its more general use, especially as a manure; that I am induced to endeavour to give a rational explanation of the resources of vegetation, independent of farm manure; and also of the advantages to be derived from salt as a manure, as I have often heard the question asked—Do you think it possible that vegetation of any kind, can grow luxuriantly without the aid of animal or vegetable substances, in a state of putrescence?

Now I might have replied, first, by enquiring—How have the woods of this country existed, without the application of manure? They are at certain periods, cleared of timber and underwood, and yet no diminution in their produce, has been perceived; and from the acorn, to “the wide spreading oak,” whence came its nourishment, its myriads of leaves, its immense body, branches, and fruit? These questions are decisive, in leading us to conclude, that the application of common manure, is not absolutely necessary, for the most extended and healthy vegetation. If manure was absolutely necessary, ground so incessantly cleared of trees and underwood, would soon be rendered absolutely sterile; instead of continually producing such an immense vegetable growth, constantly improving in luxuriance.

To shew how analogous in composition, wheat, barley, and straw are to wood, I shall insert the analysis of each, as made by various distinguished chemists.

From one hundred parts of the ashes of each, M. Sausure, jun. extracted the following substances.

	Perfect wood of Oak.	Ripe seeds of Wheat.	Straw of Wheat.	Seeds of Barley.
Soluble Salts.....	38,6	11,	22,5	29
Earthy Phosphates ..	4,5	15,	6,2	32,5
Earthy Carbonates ..	32,	0,25	1,	0,
Silica.....	2	54,	61,5	35,5
Metallic Oxides ....	2,25	1,	1,	0,25
Loss .....	20,65	18,75	7,8	2,8

Wheat flour is composed almost entirely of gluten and starch. In the following table, I shall compare the composition of these substances with pure woody fibre. I shall take the analysis of gluten from albumen, "which has been shewn," says Dr. Thomson, "by Link, to resemble gluten, so closely, that it cannot be considered, as a distinct principle."

For the following analysis of oak, beech, gluten, and starch, I am indebted to M. M. Gay, Lussac, and Thenand.

	Wood of Oak.	Wood of Beech	Gluten.	Starch.
Carbon	52,53	51,45	52,883	43,55
Oxygen	41,78	42,73	23,872	49,68
Hydrogen	5,69	5,82	7,540	6,77
Azote	—	—	15,705	—

I have given the foregoing analysis of the produce of the forest and of corn, to show that they are both composed of the same substances, and only differ in their proportions; and, consequently, as it cannot be shown that any thing but a sufficient supply of moisture is absolutely necessary for the most vigorous growth of the forest, so I contend, that a due supply of moisture is the chief requisite for the most vigorous growth of corn; to supply which moisture common manure operates so beneficially, and if it be admitted, as stated by Darwin, that salt will excite the absorbent powers of the plant to act with greater energy, and that it will also most materially contribute to preserve moisture in the ground; the value of this substance in agriculture has certainly not yet attained its proper estimation, as a substitute for other manures, or as an important assistant to their use.

In my opinion, the nourishment supplied by the atmosphere, earths, salts, and moisture or water, might be so regulated as to grow any thing whatever, without

the application of manure from decayed vegetable or animal matter.

The atmosphere furnishes carbon, (the chief constituent of manure) the earth, silica, alumina, lime, and magnesia; a sufficient degree of moisture might be retained (in my opinion, a chief if not the greatest good property of manure,) by a proper application of salt, and which would furnish that stimulant, at present obtained from the salts in common manure.

The idea that animal and vegetable matter, applied to the soil, produces such good effects, principally by assisting in the preservation and absorption of moisture, and not from the carbon and other constituents of plants which they contain, is supported, I think, by the experiments of Arthur Young, esq. upon tanner's bark, which are detailed in his valuable *Prize Essay upon Manures*. He found the application of tanner's bark in no way beneficial to vegetation, but rather the contrary; when, however, tanner's bark is properly putrified, it becomes a valuable manure, a fact well known to agriculturists, but from the slow way in which it becomes putrid, it is generally mixed with farm-yard dung, which extremely assists its decay. Peat is often used, mixed with dung in the same way.

In these cases, we have two instances of carbonaceous matter being, in one state, rather pernicious; and in another form, beneficial.

It clearly demonstrates, that the component parts of a manure, individually taken, are but very slightly beneficial; for the bark is composed almost entirely of carbon, the great supporter, or the vital air of vegetable life; and yet in its first state, its application is of no use to the plant! What, then, has the bark acquired, to be so changed in its properties? What has it absorbed?—Really, nothing:

all the difference that the chemist can discover is a slight loss of some of its constituent particles, and a great alteration in its appearance; and that which was devoid of all power to absorb or retain moisture, is reduced into a mellow saponaceous state, and the fibres of the plant can now penetrate into it, without obstruction, in search of the moisture which this manure is now enabled plentifully to retain: this then is clearly the change which the bark has undergone—nothing is lost, nothing absorbed but water; from a mass of dry fibres, unretentive of moisture, it becomes highly absorbent, and saturated with water, yielding its aqueous and dissolved particles to the plant with the greatest facility.

The putrefactive powers of salt, would here be of the greatest service, in bringing the bark into a fit state of decay, and where the farmer has access to peat, it will assist its putrefaction also; as the experiments of a noble Scotch agriculturist have shown, that peat requires, to render it an assistant to vegetation, the same degree of putrescence as tanner's bark.

Another fact, in support of the theory, that dung does not principally operate by furnishing its constituents to the plant, as a direct food, is furnished by the well-known agricultural axiom, that the greater the number of cattle a farmer can keep, the better for his soil; and yet, when we come to enquire a little into the facts of the case, we find, that cattle are of no use in generating carbon; on the contrary, at every respiration they evolve it in the state of gas, (carbonic acid gas,) which carbon is thus lost to the dung-hill, and would be to the soil, had not the Creator of all things, endowed the vegetable world, with the power of inhaling and digesting from the atmosphere this very gas, which is evolved in respiration from animals. The carbonic acid gas, evolved from the lungs of a man,

in the experiments of Messrs. Allen and Pepys, amounted to  $27\frac{1}{2}$  cubic inches per minute, or 39,534 cubic inches in 24 hours; a quantity, which contains about 11 ounces of solid carbon.

The cattle kept in the farm-yard, generate among other things for the service of the soil, several salts of ammonia, the constituents of which salts, they inhale from the atmosphere; still not a particle of these salts of ammonia ever enters the composition of the plant. They only operate in a lesser degree, in the same way as salt does, namely, in absorbing and retaining moisture from the air; in which operation the vegetable and other fibres of the manure materially assist.

Hydrogen and oxygen are furnished by the decomposition of water, which is composed of oxygen 8 parts, and hydrogen 1 part. "If," says Dr. Thomson, "we consider the great quantity of hydrogen contained in plants, it is difficult to conceive, how they should obtain it, provided the water which they absorb, does not contribute to furnish it." *System of Chemistry, vol. IV. p. 354.*

Alumina and silica are never absent from arable soils. Lime and magnesia are either found in the ground, or are supplied in chalk.

Acetic acid abounds in heath, moor, and common lands, and in all those lands denominated sour; hence the use of chalk, which removes the acid, forming acetate of lime.

Acetic acid is composed, as are all the vegetable acids of carbon, oxygen, and hydrogen, all which gases are absorbed by the plant, either from the atmosphere or from water. "100 grains of acetic acid," says Dr. Henry, "consist of carbon 50,224, oxygen 44,147, and hydrogen 5,629." *Elements of Experimental Chemistry, vol. II. p. 279.*

Phosphoric acid also abounds in heath, common, and

sour lands, and chalk neutralizes this acid also, and forms two salts, indispensable constituents of good wheat, flour, and a variety of other plants; which in the chemical nomenclature, of the present day, are denominated, phosphates of lime and magnesia.

It is this presence of phosphoric acid, in newly cultivated poor soils, which assists potatoes to flourish in these lands, with greater luxuriance than any other crop; as potatoes contain, about 12 parts in 1000 by weight of this acid; when the acid is removed by chalk, the soil becomes less fit for potatoes—a fact well known to agriculturists. Wherever a piece of chalk touches a potatoe, a hole or scab is formed; which the farmer calls, burnt with chalk. Is not this appearance, a wound or disease, caused by the chalk absorbing all the acetic acid, from the part of the potatoe, with which it is immediately in contact?

Phosphoric acid is a product of the animal and vegetable world; it is composed of phosphorus and oxygen, a constituent part of the atmosphere.

Phosphoric acid of commerce is procured by burning phosphorus, either in oxygen gas, or, what is the same thing, in a confined portion of the atmosphere, which contains 21 per cent. of this gas.

“Air,” says Sir H. Davy, “analyzed, in different quarters of the globe, in cities, and in the country, on sea, and land, has been found not perceptibly different in composition; the accurate proportions of oxygen and azote, are 21 and 79.” *Elements of Chemical Philosophy, vol. I. p. 253.*

The carbonic acid gas in the atmosphere, amounts to about 1000th part. *Thomson's System of Chemistry, vol. II. p. 86.*

With respect to a sufficient supply of carbon, it is well known, that all the great class, included under the name

of the "vegetable world," inhale, by means of their leaves, carbonic acid gas, a peculiar gas, from the atmosphere; composed of carbon  $27\frac{1}{4}$  parts, and oxygen  $72\frac{3}{4}$  parts per cent. The carbonic acid gas, is decomposed by the plant, the carbon is retained, and the oxygen evolved.

From hence then, is chiefly derived, that great supply of carbon, which enables the vegetable world, to grow with such strength and beauty; and which enables the woods of the warmer countries to bloom, in unvaried spring.

When a plant is placed in an atmosphere, from whence all the carbonic acid gas is removed, the plant becomes languid, and ceases to grow, for its respiration is destroyed; when, on the contrary, a plant is placed in an atmosphere, in which carbonic acid gas is in excess, its vegetating powers are increased in proportion, to a certain degree, to that increased quantity of carbonic acid gas. "M. Saussure found," says Dr. Henry, "that a proportion of carbonic acid in common air, exceeding  $\frac{1}{3}$ th is always injurious to vegetation; but that in this proportion, it promotes the growth of plants, and is manifestly decomposed."

Carbonic acid gas is always contained in rain and other water, hence one of the advantages of rain, affording also a sufficient degree of moisture to vegetation. Sennebier found, that plants supplied with water, impregnated with carbonic acid gas, grew more luxuriantly, than plants watered as usual.

The following experiments of M. M. Percy and Vauquelin, are decidedly in favour of the above argument—that the principal supply of carbon is not derived from the soil.

These experiments were made, to determine the quantity of nutritive matter contained in various substances; the following are the results:

Lentiles contain 94 nutritive parts in 100



Peas	contain 93 nutritive parts in 100
French Beans	———92
Common Ditto	———89
Bread	———80
Meal	———34
Potatoes	———25 (dry matter.)
Carrots	———14
Spinach	———14
Cabbages	——— 8
Turnips	——— 8

The conclusion, which I would draw from these experiments, is simply this—

All farmers, at least all whom I have conversed with, are of opinion, that peas, beans, and lentiles, when kept clean, draw or impoverish the soil little or nothing; that is, these three crops, absorb very little manure or carbon from the soil.

If it was true, that plants derived their chief supply of carbon from the ground, we ought to find upon examination, that these plants contained but very little carbonaceous matter, compared with the more drawing crops. But instead of finding this to be the fact, M. M. Percy and Vauquelin, two distinguished French chemists, discovered that these substances contained more nutritive or carbonaceous matter, than any of the other vegetable substances they examined; containing, all of them, from 89 to 94 per cent. nutritive matter; whilst carrots, cabbages, and spinach which draw as much carbonaceous matter from the soil, as any of the preceding, contain only from 14 to 8 parts per cent. of nutritive matter. Does not this demonstrate, that the pea, bean, and lentile crops, possess very different powers of supplying themselves with carbon, from the atmosphere, from those possessed by carrots, cabbages, and spinach? All these crops exhaust the soil equally,

they all absorb an equal quantity of carbon from the earth; and yet the three first, contain 70 per cent. more carbonaceous matter than the three last. Does not this prove the immense resources possessed by the vegetable world, in the atmosphere, and furnish another series of facts, in support of the theory, that manure acts chiefly as a nourishment to plants, by assisting in the retention and absorption of moisture?

An enquiring farmer, who was not aware of the admirable manner, by which the Creator of all life has supplied this unbounded and incalculable consumption of carbonic acid gas, from the atmosphere, by the vegetable world, might ask—how can such an immense supply of carbonic acid gas, be furnished from the atmosphere, without producing a speedy exhaustion?

Every chemist could reply, that what the vegetable world consumes, is as unceasingly supplied by the animal creation; and, *vice versa*, what the animal world unceasingly consumes, is supplied by the vegetable creation.

A confined portion of air, in which a mouse died in 15 minutes, for want of oxygen gas or vital air, was so replenished with this gas, by introducing a sprig of mint, that a fresh mouse being introduced, he lived as long as the former mouse. This experiment elucidates and proves the truth of my statement—that animals of all kinds, inhale oxygen gas, and exhale carbonic acid gas; vegetables, on the contrary, inhale carbonic acid gas, and throw out oxygen gas.

“As the constitution of the atmosphere,” says Sir Humphrey Davy, “constantly remains the same, it is evident that there must be some processes of nature, by which a quantity of oxygen is produced, equal to that consumed. One principal cause of the renovation of oxygen, appears to be in the process of vegetation.

Healthy plants, exposed in the sunshine to air, containing small quantities of carbonic acid gas, destroy that elastic fluid, and evolve oxygen gas; so that the two great classes of organized beings are dependent upon each other. Carbonic acid gas, which is formed, in many cases, of combustion as well as in respiration, if not removed, from air, by its excess would be deleterious to animals; but it is a healthy food of vegetables, and vegetables produce oxygen, which is necessary to the existence of animals; and thus this part of the economy of nature is preserved, by the very functions to which it is subservient: and the order displayed, in the arrangement, demonstrates the intelligence by which it was designed." *Elements of Chemical Philosophy*, p. 234.

The chief powers of salt, to assist vegetation, may then be thus classed.

FIRST.—As a promoter of putrefaction.

SECONDLY.—As a destroyer of weeds, grub, animalculæ, &c.

THIRDLY.—As a direct manure and constituent of the plant.

FOURTHLY.—As a stimulant to the absorbent powers of the plant.

FIFTHLY.—As keeping the ground moist.

I shall, in proceeding to remark upon its application to various crops, fallows, &c. often have to refer to these five important properties of salt.

### FALLOWS AND KIND OF SOIL.

I have often heard the question asked, "upon what kind of soil will salt produce the greatest effect, heavy or light land?"

This question may be thus answered—As a promoter of putrefaction—as destructive to weeds, animalculæ

grubs, &c.—as a direct manure—and as, according to Darwin, a stimulant to the absorbent powers of the plant it would be equally beneficial to all soils—but in keeping the ground moist, by absorbing moisture from the air, it would seem to be most useful to light soils—But there is one case, in which its application to a heavy soil, under fallow, would from its great moistening properties, be equally useful.

In the summer months, when the farmer is endeavouring by every exertion, to reduce his heavy land into a finely pulverized state, for his turnip crop, his progress is impeded, and in some cases entirely stopped, by the adhesive qualities of the soil. There is no way of overcoming this adhesive property, but by moisture. A judicious application of salt, in the early part of the fallow, would scarcely fail of being productive of the happiest effects: its penetrating and moistening particles, would introduce themselves into the centre of the most stubborn clods, and by keeping them moist, prevent their adhesion, and thus enable the plough to act with tenfold advantage in the soils, where at present, its most judicious employment, is often little better than useless. And I have no doubt, that from the retentive nature of such soils, that the salt passing away much slower, they will not require so much as lighter soils.

In lands that have been chalked or limed in excess, a case often occurring in the north of England, and to newly chalked lands in general, the application of salt, would not fail of being beneficial; as the salt mixing with the chalk, would cause a peculiar action to take place, the result of which, would be the production of two new substances.

FIRST.—A salt, very absorbent of moisture, which is muriate of lime.

**SECONDLY.**—Soda, very valuable to vegetation, from its great moistening and dissolving properties, as regards the stubborn particles of animal and vegetable matters, besides being a direct manure; and often, in small quantities, forming a constituent of vegetable life.

Soda abounds in the rich lands of Syria, whose luxuriant crops have been celebrated for many ages.

With respect to the most proper time for applying salt to a fallow, I think there can be little doubt, as the sooner it is mixed with the soil, the earlier will it assist in the destruction, of the already half-dead or dormant varieties of animal and vegetable life, seeds, &c. and in dissolving the more stubborn particles of carbonaceous matter, &c.

“The chemical theory of fallowing,” observes Sir H. Davy, “is very simple; fallowing affords no new source of riches to the soil, it merely tends to produce an accumulation of decomposing matter, which in the common course of crops, would be employed as it is formed; and it is scarcely possible to imagine a single instance of a cultivated soil, which can be supposed to remain fallow for a year, with advantage to the farmer; the only case where this practice is beneficial, seems to be in the destruction of weeds, and for cleansing foul soils.”

The employment of salt, must therefore be highly beneficial in a fallow.

**FIRST.**—It would powerfully assist the accumulation of decomposed matter, that is, of animal and vegetable remains.

**SECONDLY.**—It would assist very greatly in destroying weeds and vermin, and cleansing foul soils.

**THIRDLY.**—In stiff cloddy land it would assist, by its great moistening properties, the operation of the plough, in getting the lands properly pulverized; an operation, which on some lands, it is often impossible to accomplish in dry seasons, in due time.

“When,” says the late Mr. Hollingshead, of Chorley; who was, from 20 years experience, a warm advocate of salt, for manure, “a farmer intends to fallow a piece of ground, he ought first to sow it with such a quantity of salt, as would be sufficient to *destroy* all vegetation, viz. 40 bushels per acre; which by cutting and dividing the vicious substances which are in the earth, would reduce it to a proper state, to become food for plants. The farmer must take notice, that this salt is to be sown upon the ground, sometime before he begins to work it. The salt being thoroughly mixed and incorporated with the soil during the spring and summer following, whilst the land is on the plough, will, by the time the seed is sown upon it, be reduced to that strength, which is the most proper for effectually and vigorously assisting and supporting vegetation, while the seed is on the ground; and such lands, will be found to produce a crop, superior to those under any other mode of cultivation—the advantage of which, will be experienced for several succeeding years.”

“What a striking and manifest superiority is here observable, in favour of manuring with common salt; which does, as it were itself, in a good measure prepare the soil, before its nutritive operation takes effect, and thus, having cleared the soil of all extraneous and pernicious weeds, gives room and full scope to the genuine plant.—This method of sowing the intended fallows with salt, will therefore serve, very much to lessen the labour of the husbandman in working his grounds, for the tough and adhesive clods and lumps which are generally so troublesome, especially upon clay soils, will be so completely broken and dissolved by the operation of the salt, as to give much less obstruction to the harrow, at the first working.”

“Its effects upon fallow lands,” observes Dr. Holland, “are equally advantageous, by sowing it at the time of breaking up the land for a fallow, its strong saline quality destroys vegetation and every noxious insect; but by being mixed sufficiently with the soil before the wheat is sown, it adds a strong nutriment, and insures the best of crops.” *Agriculture of Cheshire*, p. 237.

Bishop Watson remarks, that “in Cheshire, whenever the soil abounds with rushes and weeds, it is customary to spread a quantity of rock salt to destroy them.” *Chemical Essays*, vol. II. p. 37.

### WHEAT.

On the subject, respecting the best time for applying the salt to wheat—should it be sown with the seed? or when the plant is just up? or in the spring? We should be induced, I think, from every reasoning upon the subject, to prefer applying it immediately after the seed has been harrowed in; which agrees with the recommendation of Mr. Hollingshead, and the experiments of Sir John Sinclair, and other writers, as well as with what I have witnessed in Essex; or, it may be applied, when the wheat is well up out of the ground, not later than February. It would operate early in the destruction of seeds of weeds, by killing them when sprouting, and would not injure the wheat plants. We should prefer its application thus early, instead of waiting till the spring, because—

FIRST—It would operate with greater advantage upon young weeds, grubs, &c. which it would meet in their most tender state, and have more time to bring the carbon, of which they are composed, as well as the more stubborn carbonaceous substances in the soil, into more forward state of putrescence, for the service of the wheat.

SECONDLY.—With respect to preservation of moisture, wheat does not require, that the moisture of the soil should

be so carefully preserved, as some other kinds of grain, as it is generally too far advanced in its growth, before the droughts of summer, to feel any great want of moisture; although, if it be admitted, that in some lands and counties, an increased supply of moisture would be beneficial; and also, if it was thought, that the salt applied early in the winter, in any situation, might have lost its full operation, if excessive rains soon followed, and have been too much deprived of its powers of preserving moisture, or promoting putrefaction, this might be easily remedied, by slightly renewing the application in the spring; or may be provided against, by using  $\frac{2}{3}$  rds of the intended quantity in the winter, and the remaining  $\frac{1}{3}$  rd in the spring.

I have witnessed the following experiments, which were made by my father, with salt manure; to wheat, on a light gravelly soil, after a crop of potatoes, on one acre of which a quantity of brined ashes had been spread, containing about 2 bushels of salt, without any particular effect, except where the heap of brined ashes had been deposited for 12 hours. The produce of potatoes, in that spot, was allowed, by every person, to exceed double the quantity obtained from any other ground of equal extent in the field; and the plants far exceeded all others in height and strength. And as in the autumn this field was sown with wheat, by the drill, this spot afforded, in 1819, the clearest evidence of the advantages of salt manure, extending with nearly as great effect to the second crop, as to the first; as the large quantity of wheat, and perfection of the ear, attracted the particular notice of every farmer, passing by it, which superiority, would have appeared somewhat greater, if the surrounding ground had not had some assistance, from the salted ashes, put on with the potatoes.

In consequence of being satisfied, from the before mentioned evidence, that 20 bushels of salt per acre would



not be too large a quantity, for wheat. In the autumn of 1818, 8 rods of ground were marked out, in the wheat field, extending across 6 lands, on which I assisted carefully to spread, by the hand, 56 pounds of good salt, in the second week after the seed had been harrowed in, and marking the ground with stakes.

From the first appearance of the wheat, till it was reaped, we could never satisfactorily discern a clear promise, of any material advantage from the salt manure; although, some farmers asserted, that they discerned a considerable difference, compared with the unsalted ground.

At the time of reaping it, a rope line was placed, as a sure guide to a proper measure of ground to be reaped; and on the same day, two other spaces of like extent, were marked out, one on each side the salted ground adjoining to it, which were reaped at the same time, to determine the advantages or disadvantages of manuring with salt. This half of the field, of 2 acres, had that year no other manure, than the load of ashes steeped in brine, as before mentioned, but which brine, in some degree, contributed to increase the produce from the unsalted ground, as it was commonly observed by the neighbouring farmers, that they had never seen the field produce so good a crop of wheat, and did not expect it, in so dry a summer.

The wheat reaped for the experiment, having been well harvested, was immediately thrashed out, with every care, and gave the following produce:—

The average produce of wheat, from the 2 unsalted lands was  $75\frac{1}{4}$  pounds, and the produce from the salted was 91 pounds, and the sample better; the first weighing 58 pounds per bushel, and the second 58 pounds 14 ounces; and as these products were obtained from 8 rods of land or  $\frac{1}{20}$ th of an acre; the first was equal to 25 bushels, 55 pounds per acre, and the second to 31 bushels, 22 pounds per acre.

shewing a difference in favour of the salt manure, of 5 bushels, 25 pounds per acre, which difference, as I have before stated, would have been somewhat greater, if all the ground had not been sprinkled with brined ashes.

For the following account of an experiment with salt, I am indebted to the obliging communication of Mr. Thomas Belfield, of Elford, near Lichfield, dated January 25, 1819.

“ Agreeable to your request, I give you the following answers to your questions, respecting the land on which I applied salt for wheat, which field had previously a dressing of soot.”

FIRST.—What was the extent of land, and of what nature the soil?

“ The extent of land was  $\frac{1}{4}$  of an acre, on a strong loamy soil,”

SECONDLY.—What quantity of salt, by weight or measure, was used per acre?

“ Sixty pounds of salt were used on the  $\frac{1}{4}$  of an acre.”

THIRDLY.—At what time put on, and in what manner?

“ It was sown broadcast, 2 days before the wheat was sown.”

FOURTHLY.—Was the wheat broadcast, drilled, or dibbled?

“ It was broadcast.”

FIFTHLY.—What was the difference, or produce, compared with the same field?

“ The produce was  $1\frac{1}{2}$  thrave, or rather more than 2 bushels, than on the same quantity of land in the same field.”

SIXTHLY.—In what year was the trial made, and was clover seed sown with the crop?

“ The trial was made in 1818, and there were no seeds sown with the crop?”

Admitting Mr. Belfield's report and trial, to be a correct account, and that by the assistance of only 5 bushels of

salt, there was an increase of 8 bushels of wheat, what more important subject, can claim the farmer's attention?

"I am well assured from a Scotch gentleman," says a writer in the *Practical Husbandman*, published in 1733, "that they have long used salt, in that part of Great Britain, always sowing 10 or 12 bushels, of their coarse salt, on an acre of young green wheat, sometimes in November, December, January, or February, it being, from the several accounts which I have heard of it, very effectual in the killing of tender weeds among corn, yet, at the same time, cherishing the corn; and, though it does not add altogether to the bulk or height of the straw, yet it does much to the goodness and plumpness of the grain."

Extract from the evidence, given before the Committee of the House of Commons, in April, 1818, by Mr. James Manley, a farmer, residing at Anderton, in Cheshire; shewing, that salt is a valuable assistant to marl.

"Have you ever tried the use of salt in marling ground, by using brine, instead of water in getting the marl?"

"Yes, I have a marled field, of 8 statute acres; in one part of the field, marl was got with brine, and in another part of the field, it was got with water."

"Can you state the difference of the produce you marled with brine, and that which you marled with water?"

"It (the crop) was as much as 5 bushels, to a statute acre, more in that produced by brine, than that produced by water."

"What was the crop?"

"Wheat."

### SMÜT, SPUR, AND MILDEW IN WHEAT.

Common salt has long been used, in some parts of England, for the purpose of making a steep for the seed

wheat, before sowing, and has been considered the best preventative against the disease, when in the ear; called smut.

This disease, there is every reason to believe, from the researches of the venerable Sir Joseph Banks, is produced, by a very small parasitical fungus, which fixes upon the grain. The seeds of this fungus, are carried by the seed wheat, and from thence, communicated up the stalk into the ear. The way in which salt prevents this disease from proceeding, appears to me, to be this—The steep, partly washes the seeds of the fungus away from the seed wheat, and further prevents, the fungus striking root into the pores of the wheat, which pores are filled by the brine, in the act of steeping. The necessity of the pores of the plant being open, for the quick propagation of this fungus, is shown by the fact, that smut is much more rapidly propagated in wet, than in dry weather. In wet weather, the plant is green, tender, and juicy; but in dry weather, has a tendency to be dry and hard.

There is another fungus or disease, which more particularly belongs to rye, although wheat is often affected by it, called in this country the spur, which salt could hardly fail to eradicate. M. Candolle, “thinks he is justified in coming to the conclusion, that this ergot, is a species of mushroom, of the genus schlerotium, to which he gives the title of clavus. That the spori or organs by which the plant is reproduced, are situated at the exterior, and not the interior; and that the spawn or seed falls to the ground, mingles with the soil, is conducted into the interior of the plant, by the water which feeds it, and is forwarded along the vessels, by the circulating juices, to the spot destined for the developement of each germ.”

Another opinion, that of M. Vauquelin, is, that the spur is a disease of the plant.

If it is a parasitical fungus, its seeds must be conveyed in the seed corn: steeping the seed in brine, therefore, removes these seeds or kills them, by preventing their striking root into the pores of the plant. If, on the contrary, this is a disease of the plant, derived from the atmosphere, those plants which are most healthy and strong, will be most likely to escape the infection.—Any thing that keeps the plant in health, keeps away the spur; what, therefore, can thus operate more beneficially than salt?—Salt tends to keep the plant in health.—

**FIRST**—By its putrefying properties, hastening the supply of food.

**SECONDLY**.—By its moistening powers.

**THIRDLY**.—By destroying insects, animalculæ, grubs, &c. to which may be added, the property, ascribed to it by Dr. Darwin, in his *Phytologia*, of stimulating the absorbent fibres of the plant.

This clavus or spur is of so poisonous a nature, that the people of the United States of America impute a disease, called the spotted fever, to the unwholesomeness of the bread, made from corn so infected.

Mr. Seckler, of Henver, in the parish of Gwinear, Cornwall, made a little heap of earth, in the middle of a field, on the top of which, a cart load of refuse salt was thrown, the earth in the heap, itself, and, (after its removal,) the earth under it, for upwards of 2 feet deep, to the clay, was rendered so perfectly barren, that the most common weeds would not vegetate in it; this barren earth, however, furnished the richest dressing for the remainder of the field. Mr. Seckler found salt the best preservative against the mildew in wheat. *See Sir Thomas Bernard's Case of the Salt Duties.*

Extract from the evidence of Sir John Sinclair, before the Committee of the House of Commons, on the Salt

Laws, April 21, 1818. With respect to steeping corn to prevent the smut.

“Have you ever seen experiments on the subject?”

“Yes, in East Lothian, the favourite practice, as a preservative of seed wheat against the smut, is, to immerse it in water, so impregnated with the saline particles, that the wheat will float in it, which being frequently stirred all the unsound grains will rise to the top, which are then scummed off; after the wheat is separated from the pickle, it is spread on the floor, and a sufficient quantity of newslacked lime, to dry the whole, is sifted upon it.”

Sir John Sinclair has since reported an experiment upon the use of salt, as a manure and a preventitive of the blight in wheat.—On the first of November, 1818, 28 pounds of marine salt were sown upon 3 falls of sandy land, mixed with seed wheat; this is at the rate of 26 bushels per Scotch, or about 20 bushels per English acre. The crop was reaped, on the 27th of August, and the part salted, produced at the rate of 3 bushels per acre more, than the rest of the field. The whole crop was much injured by the blight or rust, *excepting* the part that was salted, which although not altogether free from it, yet the injury was very inconsiderable, and, perhaps, would have been totally avoided, had a greater quantity been used. It is thought best, that the wheat should be sown first, and the salt after the corn has been harrowed in; as it was observed, that the wheat did not spring up so well, in consequence of being sown in immediate contact with the salt.

Dr. John Paris, of Dover-street, London, and who resided 5 years in Cornwall, observed in the course of his evidence, before the Committee of the House of Commons, on the Salt Laws, when speaking of the benefit of salt as a manure, April 6, 1818—“I would beg to state one other circumstance, that where wheat or barley has fol-

lowed turnips, the land of which had been salted, the crop following has escaped the mildew, which has affected lands immediately adjoining, on which salt had not been used."

### BARLEY, OATS, PEAS, AND BEANS.

On the subject, respecting the most proper time for putting salt on the land, for these crops, we want more instruction from experience, than for wheat; all writers, appear to agree, that it is most proper to put on the salt after the wheat has been harrowed in, or by the end of February; and experience has proved, that such rule is most proper, even for the west of England, where more than double the quantity of rain falls yearly, compared with the eastern counties; but, notwithstanding this instruction as best for wheat, we are directed to put on the salt to spring crops, after the seed has been harrowed in, which is not till the commencement nearly of the summer.—Now it must be obvious to every person, that a rule may be good for Lancashire or Ireland, that may be entirely wrong for Essex and the eastern counties: for if all the rains of winter, in the western parts of England, do not diminish the proper effect of the salt on wheat, I can perceive nothing to justify delaying to put the salt on till summer, for any crop, in the eastern counties, (where the rains which fall in the course of the year, according to Mr. Townley, average as 19 to 44 inches, in proportion to those, which fall in the western counties;) excepting, that it might be adviseable, in some very light and dry soils to reserve a portion, (as a third,) of the intended dressing of salt, till after the seed was harrowed in, that by its attraction for moisture, on the surface of the land, it may preserve the substrata from losing its proper nourishment for the plants, if very dry weather should immediately follow sowing time. From what I have before stated, it is evident,

that the time for putting on the salt to spring crops, if not most proper to be done at the season, when it is put on for wheat, for every county, that it must, at least, be a question to be decided according to situation. And as the following successful experiment, from using a small quantity of salt, on a crop of barley, put on early in the spring of the *previous* year, is particularly in favour of my views of the subject, I will proceed to refer to such facts as have come under my own examination, as supporting the arguments I have urged, to excite caution, in delaying to put on the salt for spring crops, until the seed has been harrowed in.

The following experiment with salt on barley, was made upon the half of a 4 acre field, a rich loamy soil, in the farm of Mr. Thomas Butler, at Heybridge, Essex, selected from its foulness, for the purpose of proving, in particular, the power of salt in destroying weeds.

A quantity of ashes steeped in brine, containing about 4 bushels of salt per acre, were spread, by hand, upon 2 acres of the field, in January, 1818. The whole field having been 3 or 4 times ploughed, and well manured with farm-yard dung, for turnips; no striking difference appearing in this crop, and the first object in view, being to ascertain, if the weeds would be more destroyed, in that part of the field which was salted, than in that which was unsalted; no attention was strictly paid, to ascertain which crop of turnips was superior. The succeeding crop, for the year 1819, was barley, and such was the very foul state of the unsalted part of the field, as to cause 10 times the labour and expense, to clear it of weeds, as was necessary for the salted ground; and, which after every exertion, was not at the time of the corn ripening, to be compared with it for cleanness. The produce of the field, where the salt was spread, was 5 quarters 6 bushels per acre: the produce of the unsalted ground, is not



expected to exceed, (from what has been thrashed out, to the present time,) 4 quarters per acre, and which, from the foul state of the land, must be its utmost produce; for although the exact result is not yet ascertained, it must be admitted, that after a foul field has had its weeds converted into manure, whilst in the other land the, weeds continued to grow to the injury of the crop, it will not be surprising, that the one should yield 14 bushels per acre more than the other, (besides saving the charges of weeding.) This trial affords, to the agriculturist, a remarkable evidence of what is to be effected, by the correct application of a few bushels of salt; and clearly demonstrates, that it is not necessary, in every situation, to delay putting on the salt until the seed has been harrowed in, to yield the most powerful effect.

In further confirmation of the propriety of duly considering, the district of country, where salt is intended to be applied to spring crops, I have witnessed that both barley and oats, when salt was put on them, immediately after their appearance above ground, in the spring of 1819, that not the least effect could be discerned from its application, although the time of putting on the salt was immediately followed by rains, to dissolve it sufficiently.

Extract of a pamphlet, by J Hollinshead, esq. of Chorley, Lancashire.

“ For other corn lands, sown in the usual way, after a spring ploughing, the best method will be, to sow 16 bushels of salt per acre, immediately after the grain is covered in by the harrow; this by meliorating the soil, destroying weeds and insects, and attracting moisture, will produce an abundant crop, and by sowing 10 bushels of salt per acre annually, these lands will ever after, be exceedingly productive.”

Extract from an Essay on Manures, in the Annals of Agriculture, by R. Legrand, esq.

“ Having tried salt upon a small scale, on a sandy soil, I can assert, that 16 bushels is a proper quantity for one acre. It gradually advanced in its effect to 16, and as gradually diminished to 40 bushels, when vegetation was destroyed; twice only, have I had an opportunity of buying a few tons of foul salt, and used it both times on a barley tith, sowing the salt immediately after the barley. The event was perfectly satisfactory, its verdure, in the spring, exceeded any thing of the kind, I ever saw, and the ripened appearance was whiter by many shades, than I ever beheld.”

Extract from Dr. Holland’s Agricultural Survey of Cheshire.

“ A gentleman lately carried a small quantity of couch grass roots and other rubbish, harrowed off his land, to the salt works, and laid it, for some time, upon the ground, where the foul salt, by the directions of the exciseman, is destroyed; he then carried it back, and mixed it with other manure.—His barley and his hay grass were strong, from this composition, beyond his most sanguine expectations.”

Peas, in dry weather, are very subject to be infected with lice—this was particularly the case in the summer of 1819, whole fields being destroyed by them. The reason for lice abounding, more in dry weather than in wet, I apprehend is this—There are few crops, that are more juicy, or that abound more in saccharine matter than peas; on a warm day, the pea plant when rubbed between the fingers feels glutinous; but whilst a proper supply of moisture is afforded to the plant, nothing stagnates—its sap and other juices freely circulate; but as soon as this supply is withheld, the saccharine matter, exuded by the leaves, begins to ferment, thus affording a nursery for the eggs of the louse, which may soon be observed to increase in endless numbers, especially if no refreshing showers come to disturb

them. If salt was applied early to the peas, I think, it would render the propagation of the louse difficult or impossible, for it would enter the plant with the moisture of the ground, and, by its presence in the exuded matter, either prevent the fly from depositing her eggs, or kill the louse as soon as hatched; besides, the stimulating and moistening properties of salt would also operate, most beneficially, in preventing the stagnation and consequent corruption of the circulating saccharine juices of the plant, by increasing its vigour and absorbent powers, and supplying it with moisture.

With respect to the application of salt to beans, although I find no experiments on record, yet, I should think, reasoning from analogy, it must be very serviceable to them; for when well dissolved, in the soil, it would not only preserve and absorb moisture, but its stimulating properties, would operate in a way, which no other manure could equal.

The bloom of the bean is very subject, especially in very dry weather, to be killed and turn black, although the rest of the plant continues in health—this was particularly the case in the summer of 1819, whole bean fields, although presenting to the eye the most beautiful appearance, had not beans enough to pay for harvesting. This falling off of the bloom, seems to be very analogous to the case of the cherry-tree, the experiment upon which I have already detailed, in which the application of salt succeeded, by stimulating the absorbent vessels of the tree, in preventing the premature falling off of the blossom; and by whatever means we give vigour to a plant, we also prevent injury from blight or insects.

### TURNIPS.

Turnips are generally sown after a fallow, and we have

thus a good opportunity afforded of incorporating the salt well with the soil; the salt has also time to kill all kinds of weeds, grubs, animalculæ, &c. as well as to bring all carbonaceous matters into a state of putrescence; the earlier, therefore, the salt is applied, the greater will the benefit of its application be perceived in the following crop. With respect to the application of salt after the seed, for the primary purpose of preserving moisture, it appears, that owing to the time of year at which the turnips are sown, no benefit will be acquired by sowing the salt at seed time, in preference to the earlier stages of the preceding fallow. Turnips are generally sown at a time of the year, when there is little moisture for the turnip to absorb, or the salt to preserve; the salt, it is true, would keep the surface moist, and check further evaporation, but this would not be of any material advantage, if the soil is already deprived of a sufficient moisture, by the droughts of the summer.

The turnip crops, more especially in the eastern counties, are generally very much impeded in their growth, by want of internal moisture; and this impediment generally continues, till the autumn rains set in, and then there is seldom a want of it. The application of salt, after the seed has been sown or a short time previous, should, I think, be confined to those cases, where it is impossible to apply it on the preceding fallow. When well mixed, in the earlier part of the fallow, with the soil, it would preserve a very advantageous general moisture, very far superior to that, which is possible to be produced, by applying it on the surface, at a season of the year, as I have before observed, when there is seldom any internal moisture to be preserved. And if putting on the salt is delayed, till after the seed is sown, and any considerable rain should immediately follow, it may be injurious to the

seed, and afterwards, not be so beneficial to that which may vegetate; as proved by the following experiment, which I have witnessed, in a field, situated at Heybridge, Essex, which may be useful to state.—On the 15th of June last, (1819,) 65 gallons of saturated brine, containing about 180 pounds of salt, were mixed in about 30 bushels of ashes, and immediately spread over  $\frac{1}{2}$  an acre of ground, where the seed, for Swedish turnips, had just been harrowed in; and on the following day, an exact equal quantity was, as carefully, spread over  $\frac{3}{4}$  of an acre, nearly adjoining—it happened, that each spreading, was immediately followed by a smart shower of rain, which carrying down the brine rapidly, the seed sown on the  $\frac{1}{2}$  acre totally failed, whilst those on the  $\frac{3}{4}$  of an acre, produced a sufficient crop. But on resowing the  $\frac{1}{2}$  acre, a fortnight afterwards, the seed, not only produced a much larger crop, but escaped the mildew, which affected all the rest of the field, even to those on the other salted ground, which had so well come up. This trial gives a remarkable evidence of the necessity for care being taken, that the salt should be well mixed with the soil, to succeed properly, and give due nutriment and energy to the plants.

Extract from a Letter to the Right Hon. Nicholas Vansittart, by William Horne, esq. of Liverpool.

“ In the 27th volume of the Annals of Agriculture, there is a communication, from Davies Giddy, esq. of some interesting experiments on the use of salt, in the culture of turnips, by which it appears, that on a part of a field, which had been previously exhausted, half a crop of turnips was produced, but the crop totally failed, where the ordinary manure was laid without salt. In another instance, 3 acres of land, which, on the preceding year, had borne a crop of wheat, not exceeding 12 bushels on an acre, were ploughed up before Christmas, and brought into a fine tilth, by the

Midsummer following. On each acre were sown 20 bushels of salt, except that 2 ridges, towards the middle of the field, were purposely left without any; on these 2 ridges, the turnips totally failed, but the remainder of the field produced a plentiful crop. It is further instanced, that 4 acres of land, completely worn out, by successive tillage, were ploughed before Christmas; 3 acres were sown with salt, at the rate of 25 bushels, without any other manure, and the remaining acre with 18 bushels, without any other manure: the crop was in general a good one, but was visibly the best, where the greatest quantity of salt had been used. Crops of turnips were subsequently raised, with equal success; and in the severe winter of 1794-5, they were much less injured by the frost, than others similarly treated, and cultivated in the common way.

“Equal quantities of salt and turnip seed,” says Sir John Sinclair, in a paper distributed by the Board of Agriculture, “were tried on a small plot of a garden, by the author of this paper, and the produce was more abundant, than from the same quantity of turnip seed sown without salt.”

The following extract is from Sir Thomas Bernard's Case of the Salt Duties, communicated by Dr. Paris, late of Penzance, now of Dover-street, London.

“Salt answers best as a manure for green crops, especially turnips and clover, it is not of so much benefit to barley or wheat, if sown by itself, but in compost, it proves very advantageous; using 30 Cornish or 45 Winchester bushels per Cornish acre, which is larger than the statute acre,—nearly in the ratio of 6 to 5. Prepare the ground for turnips, and sow the salt a fortnight before the seed, or earlier, if a larger quantity of salt is used.”

“Mr. Seckler, of Henvver, in the parish of Gwinear, has just applied salt, in the above proportion, to poor

exhausted land, being clay, inimical to turnips, the effect has been a heavy rich crop, which I have had an opportunity of seeing. It is such an one, as 100 tons of dung per acre, would scarcely produce on the same land."

"The salt employed, is that which is considered refuse, after having cured the fish, and been condemned by the excise; over this they throw some dirt, and it is then sold to the farmers, by the fish curers. If the duty was taken off salt, for every bushel now used, there would be at least 100 bushels employed for that purpose. It has been said, that the value of refuse salt as manure, depends upon the soil and animal matter which adheres to it; but the farmer knows, from experience, that that salt is to be preferred, which has cured only one bulk of fish, and they give a higher price for it, than for that which has been twice employed, and which consequently contains more animal matter. Where an estate has been salted for 2 or 3 crops, the effects are visible, for at least 7 years. It has a particular tendency, to convert poor and light, soils into firm and adhesive ones, giving them body; among the farmers, there is generally a scramble, for the refuse salt, to see who can get most of it by purchase."

### GREEN CROPS.

From the horticulturist we learn, that salt is good for every produce of the garden; and from the evidence given before the Committee of the House of Commons, it appears to be considered, in the west of England, as more beneficial to green crops than to any other. And, therefore we cannot doubt, that the same rule adopted for these crops, as for turnips, must be equally beneficial; and when it is intended, that either of them should be adopted in the autumn, after a summer crop, it will be proper, when salt is intended to be put on, to let it be done immediately after

such crop is cleared off, that the rains or dews may forward its mixing with the soil.

### GRASS LAND, MEADOWS, AND CLOVER LAYS.

The earliest application of salt to grass land, in general, after the crop is mown, seems, from every consideration, to be the most proper. The earlier it is spread, the sooner will the carbonaceous remains, of the animal and vegetable substances, come into use, as food to the grass, and as additional preservatives of moisture.

No other crop affords a greater nursery for worms, grubs, animalculæ, &c. than grass.

Those meadows which are subject to be flooded, in the winter, generally contain a very large proportion of vegetable and other remains, deposited by the waters, in the winter months. In such a situation, the good effects of salt, would soon be very apparent: it would speedily evince its powers of promoting putrefaction, and it would restore the portion of salts washed out by the floods. These effects would also be proportionably apparent, in high situated clover lays, as here a want is often experienced, different from meadows—a deficient supply of moisture.—Wherever this is feared, either in clover lays or meadows, a slight renewal of the salt, very early in the spring, before the moisture was evaporated from the ground must be very beneficial. Dr. Paris stated to the Committee, of 1818, appointed by Parliament, that in Cornwall, salt is considered, the most beneficial manure for clover crops.

Extract from Dr. Holland's Survey of Cheshire, p. 236.

“The account, of the following experiments, made by a gentleman of Northwich, is from the original Report of the County of Chester.”



“After draining a piece of sour rushy ground, about the middle of October, some refuse salt was spread upon a part of the land, after the rate of 8 bushels to the acre, and in another part 16 bushels. In a short time, the vegetation disappeared totally, and during the month of April following, not a blade of grass was to be seen, but in the latter end of the month of May, a most flourishing crop made its appearance, on that part, where 8 bushels had been laid, and in the month of July, the other portien produced, a still stronger crop; the cattle werere markably fond of it: and during the whole ensuing winter, (which is 10 or 12 years since,) and to this day, the land retained, and still exhibits, a superior verdure to the neighbouring closes.”

“Another experiment, was made in a meadow, where the after-grass, being of a coarse rank nature, which the cattle refused to eat; salt being laid upon a part of this meadow, they have ever since preferred the grass growing on that ground, to every other part of the field, and eaten up every blade.”

“It is,” says the Practical Husbandman, (published in 1733,) “the usual pratice of the Milanese, to sow salt on their pastures.”

“For meadow land 14 or 15 loads of dung, 5 bushels of salt, and 4 of pond earth, the quantity of each to be altered, according to the quality of the ground.”

Extract from a Treatise upon Fruit Trees, by Mr. T. Hitt, Gardener, of Chiselhurst, Kent.

“To shew an acquaintance of mine, the effects and advantages of salt, properly applied to vegetables, I made the following experiments. In an extreme dry summer, upon a bare piece of pasture land, out of which the cattle were taken, for want of grass, I marked 4 places with stakes, each of which I watered, 9 nights successively, in

the following manner. The first, with spring water alone, to the quantity of a gallon. The second, with the same quantity of water, on the same extent of ground, adding an ounce of common salt. The third and fourth, with the same quantity, mixing the water in the third place, with 2 ounces of salt; and that in the fourth, with 3 ounces, which produced the following different effects. The grass in the second place, grew more and of a darker green than that in the first. In the third, it only grew by spots, for part of it was killed, where the greatest quantity of water fell. And the fourth, was quite brown for a greater compass than the third, by which it appeared, that an ounce of salt, in a gallon of water, had a better effect, than the water had alone; and that 3 ounces mixed with a gallon of water, was more than the grass could immediately receive: but the fourth place, in the ensuing spring, was the most fertile of them all."

Extract from a pamphlet, by J. Hollinshead, esq. of Chorley, 1802.

"When salt is used upon pasture land, it may either be sown upon them, in a simple neat state, after the rate of 16 bushels to the acre, or mixed with compost, mud, or loamy earth; if mixed with 20 loads of earth, to be turned in the heap 2 or 3 times; to incorporate it properly, this compost should be laid on and spread in the autumn. For meadow lands, we would advise the farmer to sow 6 bushels of salt per acre, immediately after the hay is got in; this would be found peculiarly beneficial, in hot and dry summers, and upon limestone and sandy soils, which after they are mown, are often so much parched by the heat of the sun, that not only the eddish is destroyed, but also the crop of the ensuing year is very materially injured; but by sowing it with salt, moisture would be attracted and retained, sufficient to assist vegetation, so powerfully, as

in a short time, again to cover the face of the ground with grass; and by that means, effectually to screen the roots, which would otherwise be too much exposed to the direct rays of the sun."

"It may indeed be said, that dung will answer the same purpose—in some degree it might—but dung cannot always be had, and never in sufficient quantities; besides, if it could, this objection lies against it—that neat cattle will not eat the eddish after dung, consequently one valuable crop is lost to the farmer, which if salt were used, would be both productive and wholesome."

"The following account we had transmitted by Mr. Thomas Sutton, of Middlewich, Cheshire."

"About 12 years since, I dug up a quantity of earth, out of a field, where a new building was going to be erected, in which there was some appearance of salt springs, the water from which, had oozed up through the soil and left an incrustation, composed of the particles of salt, upon the surface of the soil. The soil, together with the salt contained in it, I mixed with horse dung, after it had laid some time in the heap. I spread it upon a piece of meadow ground, which has been mown ever since, without any other manure ever having been laid upon it; and the other part of the meadow, has been manured in the usual way, *every other year*, and yet it is now, in no better condition, than that which was covered with salt and dung, 12 years ago."

"A farmer, in the county of Sussex, some years ago, had a field, one part of which was very wet and rushy, and the grass produced upon it, was of so sour and unpleasant a kind, that the cattle would not graze upon it; he tried several methods to improve it, but to little purpose—at last, having heard of the benefits of salt, as a manure, he determined to try it; for which purpose, he procured a

quantity of rock salt, which in a random way, without any regard to the precise quantity, he threw upon this rushy ground, fencing it off from the other part of the field; the first effect of which, was a total disappearance of vegetation. In a short time after, however, it produced the largest quantity of mushrooms ever seen, upon an equal space of ground, in that county. These, in the spring following, were succeeded by a most plentiful and luxuriant crop of grass, far exceeding the other part of the field, in the richness of its verdure, and the quickness of its growth; the cattle were remarkably fond of it, and though the salt was laid upon it, upwards of 20 years ago, this part is still superior to the rest of the field."

"Mr. Wedge, in his Agricultural Survey of the County of Cheshire, says,"—

"Foul salt is a most excellent manure, either for pasture land or fallows, and it is much to be regretted, that so large a quantity as 7 or 800 tons, should annually, in Cheshire alone, be lost to the community. The heavy duty upon refuse or dirty salt, preventing its use for manure. A difference of opinion," he continues, "having been entertained, as to the utility of salt as a manure, we insert the following experiment, which we have been favoured with, by a gentleman of Northwich."

"In a meadow, where the after-grass, being of a coarse rank nature, which the cattle refused to eat, salt was laid upon part of the meadow, and the cattle have ever since preferred the grass growing on that ground, to every other part of the field, and have eaten up every blade. He also states, that the good effects of salt, are particularly seen, by mixing it even with the coarsest manure, and then laying it upon the land."

"The following experiment, is communicated by William Stephenson, esq. banker, London."

“ Upon a small grass field, which for many years after it had been in tillage, produced nothing but a very dark coloured dry kind of grass, (which neither horses or neat cattle would thrive upon,) I sowed about 16 bushels of foul salt per acre, in 1778; and ever since that time to 1802, it has been perfectly green, both in summer and winter, and cattle of all kinds thrive on it remarkably well.”

Major John Taubman, the Speaker of the House of Keys, in the Isle of Man, in his evidence before the Hon. the Board of Trade, in April, 1817, stated, “that he had used refuse salt, as a manure, on meadows, with the greatest advantage; it was sown thinly, by hand, cannot speak to the quantity used: the meadow had been much covered with moss, which the dressing of salt entirely destroyed.”

For the following experiment, which clearly demonstrates, how important it is, to apply salt at one particular season of the year, (which we are instructed to attend to, in preference to an indiscriminate application,) I am indebted to the obliging communication of William Thurlow, esq. of Gosfield Park, Essex.

“ In October, 1818, 16 bushels of salt were spread on an acre of grass land, and in February, 1819, the same quantity of salt, was sown upon an adjoining acre. This meadow land was flooded, during part of the winter. The produce of hay, from the first, which was salted, in October, was double the weight obtained, from an equal extent of ground, in the same field, that had not been salted; but the second, which was not so treated, till February, 1819, was not benefited, but appeared rather injured from the application.”

The above experiment also demonstrates, that the salt applied to meadows, in the autumn, is not much injured, although flooded, in winter; as the dissolved salt, in such a compact soil, from being heavier than fresh

water, cannot easily mix with the flood waters, in the manner, that rain water does with the salt, of the loosened soil of arable lands; so that the floods, or rains, appear only more effectually to spread the salt, through the soil.

### POTATOES.

This crop, generally follows a winter fallow; and the potatoe, being a watery plant, delights in moist situations, and is found to succeed best, in the light lands of the west of England, and in most parts of Ireland, where there is an abundance of rain. I am of opinion, that it is because of the frequent rains in the western counties, that we are instructed by Mr. Hollinshead, of Chorley, Lancashire, to put on 20 bushels of salt per acre to this crop, after the plants are covered in; but, which rule appears to me, not to be correct, for the eastern parts of England—as I have witnessed, in the season of 1819, great benefit, in Essex, from putting on 20 bushels per acre to potatoes, on a light gravelly soil, in September, and but little advantage from putting on the same quantity, after the plants were covered in, when followed by a dry summer. That for the eastern parts of England, I should advise,  $\frac{2}{3}$  rds of the salt to be put on in the autumn, and  $\frac{1}{3}$  rd for a top dressing, after the plants were harrowed in, which would act most beneficially, as a preservative of moisture.

The potatoe, with a variety of other salts, contains muriate of potass; a salt formed by the mixture, and decomposition, of common salt with potass; which alkali is found in all soils.

The following experiments, on the application of salt to potatoes, were made upon a light gravelly soil, which had not been many years enclosed; and having assisted at these experiments, I can vouch for their correctness.

In 1817, an Act of Parliament having passed, by which

the farmer, was allowed to use brined ashes, from the salt works, a quantity was procured, for the purpose of spreading over an acre of a field, preparing for potatoes. It being late in the evening, when the team returned with the brined ashes, they were thrown down in a heap, in the middle of the field; and during the night a drainage of brine took place, which we considered, from its excess, would render sterile, the earth on which they were laid.

But instead of this being the effect, the plants in this place, produced twice the weight of potatoes compared with any other plot, in the same field, of an equal extent. The ashes distributed over the field, were not of material benefit to the crop, as the quantity of salt, which remained in them, could not have much exceeded, 2 bushels to the acre.

On observing so large a proportion of salt, operate beneficially, where the heap of ashes were laid, further experiments were made, in the ensuing year, upon a field of 2 acres, preparing for a similar crop, and which, like the former, was a light gravelly soil, and had last borne a crop of peas; in which field, arrangements were made, for the following experiments.

**FIRST.**—To ascertain the produce per acre, without the assistance of salt or any other manure.

**SECOND.**—The produce per acre, manured with salt only, at the rate of 20 bushels per acre, put on in the second week of September, 1818.

**THIRD.**—The produce per acre, manured with common dung only, put on in the spring before planting.

**FOURTH.**—The produce per acre, with common manure, put on as last stated, and 20 bushels of salt previously put on in September.

**FIFTH.**—The produce per acre, with 20 bushels of salt put on in September, without other manure; and an equal

quantity of salt in the spring, after the plants were harrowed in, to ascertain if the rains had diminished the power of the first salting, and if so much salt would be injurious.

SIXTH.—The produce per acre, from twice salting, as last stated, assisted with a dressing of common manure before planting.

On carefully taking up a rod of potatoes, from each of the prepared lands, near to each other, and having them well cleaned, the following were the produces of weight per acre, allowing 56 pounds to the bushel.

## EXPERIMENTS.

NO.		BUSH.
1	No manure produced .....	120
2	Twenty bushels of salt, put on in September	192
3	Manured in the spring, with stable dung alone	219
4	Stable dung and 20 bushels of salt .....	234
5	Salt alone, 40 bushels .....	192½
6	Stable dung with 40 bushels of salt .....	244

From the first appearance of the plants, and throughout the season, each land strongly shewed the promise of a produce, in the proportion as ascertained, excepting that of number 5, which had been twice salted without any other manure. These plants rose so high and strong above those of number 2, which had been but once salted, that every person, who viewed them, expected a large increase.

But as the second application of salt did no good, may it not be concluded, that the drought of the summer, prevented the proper descent of the salt applied in the spring, and thus prevented it operating for the service of the crop, otherways than by assisting to preserve the surface of the ground moist, but which moisture might probably, be all consumed by the plant? as the moisture, transpired



by the leaves of a potatoe plant must be very considerable, since a cabbage emits, according to Dr. Hales, in a warm day, half its own weight of water.

That although salt is recommended by Mr. Hollinshead and others, as I have stated, to be most properly applied, in the western counties of England, after the potatoes are covered in; yet on the eastern coast, where less than *half* as much rain falls in the year, ought it not to be put on, at least, 2 or 3 months sooner? and it is probable that instead of putting the salt on in September, the produce of numbers 2 and 4 would have been as great, had it been put on in January or February; and I am confirmed in the opinion, that an early application of salt is best, by the experiment which I have detailed on the subject of barley, in which experiment the salt was applied early in the preceding year.

Extract from a pamphlet, by the late John Hollinshead, esq. of Chorley, on the importance of using salt, as a general manure.

“ In deep, loamy, dry earth, upon which wheat has been grown, after the crop is got in, the land should be ploughed, and lie in that state until the spring, when it must be cross-ploughed, and wrought fine with the harrow, and planted with potatoes; as soon as they are covered with earth, then sow or spread 16 bushels of salt per statute acre upon them, and when they are dug up in the autumn, then sow a crop of wheat, taking care to pick the potatoes clean out, that they may not injure the wheat, in the following spring, by growing up among it. By this method of cultivation, alternate crops of wheat and potatoes may be permanently produced, on the same ground, instead of losing a whole year’s produce according to the old custom, whilst the land is in fallowing.”

Extract from a Letter, to the Right Hon. Nicholas

Vansittart, by William Horne, esq. Merchant of Liverpool.

“Notwithstanding the excessive duty on salt, numerous experiments have been made, and almost invariably with uniform success. An interesting detail from the Rev. E. Cartwright, will be found in the 4th volume, of Communications to the Board of Agriculture, which is conclusive, as to the application of salt as a manure for potatoes. It appears from this communication, that the experiment could not have been tried on a soil, better adapted to give impartial results. Of 10 different manures, which were resorted to, most of them of known and acknowledged efficacy, (one only excepted,) salt was superior to them all. Its effects when combined with soot, were extraordinary; yielding in a row 240 potatoes, whilst 150 only, were produced from the row manured with lime. It was observable also, where salt was applied, whether by itself or in combination, the roots were free from that scabbiness, which often infects potatoes, and from which none of the other beds, were altogether exempt; (and there were in the field, near 40 more that made part of the experiments.)”

“I may notice here,” observes Dr. Holland, (Agricultural Survey of Cheshire, p. 143,) “a practice pursued at Weston, near Frodsham, in the culture of potatoes, which seems deserving of attention; at this place, situated close to the junction of the Mersey and Weaver, sea mud is used as a manure for crops of potatoes. Twenty loads, being the quantity usually laid on an acre. The ground thus manured, not only gives a large produce of potatoes, but is in a state of excellent preparation for a succeeding crop, of either wheat or barley; the adoption of this practice has increased very greatly the value of land, about Weston.”

## WORMS, GRUB, AND ANIMALCULÆ.

The advantages, which would be derived, from the destruction of the endless myriads of worms, grub, animalculæ, &c. contained in the soil, it is hardly possible for us fully to appreciate. The earth, with every weed, and every particle of water, swarms with innumerable numbers of the animal creation, in an almost endless variety of forms—all are dependant, all are fed by the vegetable world. This teeming nursery of living matter, seems to be peculiarly open to the irresistible attack of salt, which would turn a destructive race of insects, into a valuable supporter of vegetable life—the richer the soil, the greater would be the destruction of vermin by the salt. The destruction of these parasitical insects, and bringing such rich carbonaceous matter into use, as a valuable manure, is one of the great properties of salt, which claims particular attention. The largest earth-worms die by the application of a few drops of brine, almost instantaneously:—the application of a few grains of salt, is a well-known means, of making leeches void the blood, with which they have gorged themselves.

“Salt,” says Lord Dundonald, “destroys vermin in the ground, by making them void the contents of their bodies; such evacuations being too powerful for them to withstand. It has this additional advantage, that the vermin thus become food, for those very plants, which otherwise they would have destroyed.”

Extract from the evidence, given by Sir J. Sinclair, before the Committee of the House of Commons, on the Salt Laws, April the 21st, 1818.

“One of the most important uses of salt, as connected with agriculture, is, that it preserves seed when sown, from the attacks of the grub—this has long been the

practice, in the western districts of Scotland; and from the great destruction the crops of oats received from the grub, it has been lately revived. Observing an account of it, in a Scotch newspaper, I wrote to the Earl of Hoptown, the Lord-lieutenant of West Lothian, in whose districts the practice has been tried, to know the effect; and he sent me a letter the other day, from which it appears, that it has been attended with great success, and that in the cold districts of the west of Scotland, its effects are considered to be so very great, that few of the farmers have omitted it this season."

Extract from an Essay on Plantership, by Samuel Martin, esq. of the island of Antigua.

"Soils which are subject to the grub, and must be fertilized by common dung, which is a proper nest for the mother beetle to deposit her eggs, must be well impregnated with brine of dissolved salt, after the dung is well cut up;—2 large hogsheads of salt, will make brine enough for a dung-pan, of 50 feet square. This cure for the grub is a late discovery, for which I am obliged to a judicious planter, and which I have tried with success, so far as the experiment has been made. But though it proves effectual to destroy that pernicious insect in plantations, I must doubt and believe, it will not be sufficient without a new application of salt pounded to a powder, because the first brine must be washed away by the time, when the rattoons spring up. I therefore advise the planter, who would save his rattoons from grub, to cut off the heads of the stools, by sharp hoes, 3 inches below the surface of the soil, and then strew a handful of salt round each stool, and cover it up to a level, with fine mould taken from the edges."

#### FLAX.

The application of salt to flax, has been found very ad-

vantageous. The oily seeds, above all others, require a large and regular supply of carbon and water; the moistening properties of common salt, among its other powers, are of great service in enabling the plant to absorb these, its constituents, both from the soil, and from the atmosphere, in which last they are contained in the gaseous state, in inexhaustible abundance.

Extract from the *Practical Husbandman*, published in 1733.

“A merchant of Liverpool, who is well acquainted with that trade, affirms, that the finest crops they have of flax and hemp among the Dantzickers and others, who raise these commodities, in those countries, are from land on which salt is strewed.”

Extract from the evidence of Sir John Sinclair, before a Committee of the House of Commons, upon the Salt Laws, in 1818.

“I would also mention one other thing, which is, the benefit of salt to oily seeds; it was first discovered in America, in the culture of flax, and has since been ascertained in this country, by the experiments of Mr. Lee, of Old Ford, near Bow, in Middlesex, who tried it at my desire; the quantity of salt should be that of the seed sown, namely, about 3 bushels per English acre; it should be strewed upon the surface, after the seed has been sown; it improves greatly the quantity and quality of the flax, and in particular, the quantity of the seed from the new crop. It is thence conjectured it, would be of use in other seeds, of an oily nature.”

### MOOR AND COMMON LAND.

Many millions of acres of moor and common land, are at this time almost useless; the improvement of such lands, has long been a desirable object; the most common

application to these soils, is chalk, which neutralizes the acids, producing phosphate of lime. But this manure would be doubly useful, if used in conjunction with salt, which would furnish that stimulant to vegetation, which is furnished by the salts in common dung, and which stimulating powers are found neither in chalk nor lime; besides, heath and moor lands, are generally of a very light and porous description, the rain readily passes through them, and is as quickly evaporated by the sun and winds; the absorbent power of such soils, is very weak. Sir H. Davy found, that the soil of Bagshot Heath, when dried at 212, absorbed from air saturated with moisture, only 3 parts by weight, whereas a soil from Ormiston, under the same circumstances, absorbed in 1000, 18 parts. Salt would therefore, be a very great assistant to such soils, in enabling them to absorb and preserve, an additional proportion of moisture, and would very greatly promote the putrefaction of the turf, and other vegetable matters; and would be, as I have before stated, a valuable assistant to peat lands or bogs, preparing for cultivation.

Sir John Sinclair recommends salt, as beneficial for the improvement of moor lands; he states, "that the abbey of St. Pierre, at Ghent, broke up about 450 acres of moor land, near Oudenarde; and to procure manure, they adopted the plan of collecting the heath clods or lumps, which the soil produced, into piles, and intermixed them with strata of salt; and that when the salt had become well mixed with the soil, it produced valuable crops, but it was necessary to renew the salt every third year. On the land being let to farmers, the plan of using salt was given up, and the soil becoming unproductive, was planted with coppice."

This statement of the effect of salt alone, on a poor unproductive soil, that appears not to have been worth cul-

tivation, without the use of salt, is material information; and probably, the farmers would have continued the land always in tillage, if it had been considered, that by throwing the salt on the land at a proper season, they might have saved the labour and charge of gathering the earth into piles, and turning them to mix the salt well, and of the time wasted, of 2 or 3 years, it seems, for this preparation.

### RYE, HOPS, &c.

Concerning the benefit which may result, from the application of salt to any vegetable produce, not yet particularly ascertained, we may remark, that the same benefit which is received by wheat, would be given to rye, and as it is recommended by Mr. Hollinshead, for every crop of the field, and by Mr. Hitt as beneficial to every crop in the garden, and to every fruit tree; no person can reasonably doubt its valuable use, to every crop of the field; and therefore, when its nature and mode of operation are duly considered, it will depend only on its proper application, to produce the most beneficial effect to hop plantations, and every other vegetable produce; and it yet remains to be determined, as fruit trees are so greatly benefited by a little salt, how far it may be adopted to advantage, to put a small quantity of salt in the ground, near to young timber trees.

As we are not in possession of any exact experiment made to ascertain the effect of salt, as a manure, to hops, it may be useful to mention an anecdote, lately stated to my father, by J. Tyrrel, esq. Remembrancer of the city of London.

“A friend of Mr. Tyrrel’s, (who is deceased,) occupied extensive hop plantations, in Kent, and adopted various manures, to promote their produce, and particularly related to him, that having purchased, at a low price, a

large quantity of spoiled dried herrings, and spread them upon the land, he obtained a remarkable produce of hops, from their assistance.”

To this statement it will be objected, that this experiment afforded no evidence, that it was not the fish or animal matter, which produced the whole of the good effect. In answer, I would observe, first, that it shewed, that there can be no hazard in using salt to hops, as it did not prevent benefit from the fish; and, secondly, that on referring to the evidence given by Dr. Paris, as stated under the article Turnips, p. 43, that the farmers of Cornwall, who scramble to obtain the salt from the Pilchard Fishery, will give a higher price for the salt, that has been used only once, and is most free from the oil of the pilchard's, than for that salt, which has been used oftener, and is more foul, from the mixture of animal matters with it.

Hops contain muriate of potash, a salt formed by the decomposition of common salt by potash, which alkali is contained in all cultivated soils.

### HAY.

The power of salt when applied to hay, of very much increasing its fattening quality, may be attributed to its property, of greatly promoting digestion, as well as making the cattle relish their food better, and thus consume a greater quantity. It has also the property of preventing mouldiness and mow-burning. When salt is spread in a hay-stack, the steam evolved dissolves the salt, and the fermentation distributes it to every part of the stack. It will be found particularly beneficial, when applied to the second crop of clover, or when any crop of hay has received much rain, as it checks fermentation and prevents moulding; if straw be mixed with the hay, it will be further prevented, by its imbibing the moisture, and cattle will not



only eat such salted hay, but even the straw mixed with it, more eagerly than better hay not salted, and will thrive better on it.

Extract from a pamphlet, by John Hollinshead, esq. of Chorley.

“The hay when put into the mow or stack, should be always sprinkled with salt on every layer; and when it is housed soft, this should never be omitted, as it would prevent, what the farmers call, the mow-burn, and make the hay far more pleasant and nutritious for the cattle in winter.”

Extract of a Letter, from a very considerable North American Planter, to the editor of the *Museum Rusticum*.

“Just before I left America, I had a crop of hay, which was in a manner spoiled by rain, being almost rotted in the field; yet did this hay spend as well, as if it had been got in ever so favourably. When my servants were making the stack, I had it managed in the following manner—as soon as a bed of hay was laid, about 6 inches thick, I had the whole sprinkled over with salt; then another bed of hay was laid, which was again sprinkled in like manner; and this rule was followed, till all the hay was stacked. When the season came for cutting this hay, and giving it to my cattle, I found, that so far from refusing it, they ate it with surprising appetite, always preferring it before the sweetest hay, that had not in this manner, been sprinkled with salt.”

Extract from Sir T. Bernard's Case of the Salt Duties.

“The improvement of bad hay by salt, applied in the proportion of about 100 weight of foul fishery, or 56 pounds of pure salt to 3 tons, and sprinkled between the layers, is very striking—preventing mildew, and rendering it more grateful and beneficial to cattle, especially if

the hay is bad, and even good hay is very greatly ameliorated."

Extracts from Papers, published by Sir John Sinclair.

"Lord Somerville is of opinion, that salt cannot be conveyed into an animal in a more effectual way, than by sprinkling the salt through a sieve, at the rate of 25 pounds weight of salt to a ton of hay, when in the act of putting it together, for every particle is imbibed in the fermentation, without a possibility of waste. This salted hay is of great use to sheep, when put on turnips, early in the season, for the tops being then rank and strong, many of the sheep die suddenly, from pent up wind, occasioned by excess of fermentation in the stomach. Salt or salted hay is then devoured by them with a greediness, which denotes its salutary effect. By the use of salted hay, Lord Somerville did not lose one sheep, upon turnips, in the autumn of 1801, though the season was rainy and unfavourable."

"Dickson in his Husbandry of the Ancients, vol. II. p. 418, says, 'the ancients were accustomed to prepare their straw, for feeding stock, by keeping it for a considerable time sprinkled with brine; it was then dried, rolled up in bundles, and given to oxen instead of hay.'"

"In a recent communication from A. Bricebridge, esq. of Walton on Thames, he states, 'that some years ago, the clergyman of Holmes Chapel, who lived near the salt works, gave a favourite old mare, which was much broken winded, some spoiled hay that had been salted, the mare had nothing else to subsist on, but thrived on that food so well, that she was fit to be put to work again next spring. This induced Mr. Bricebridge, to drench some rotten sheep, night and morning with strong brine, after which he did not lose one; they became fat and the meat was as fine and good as, if the animals had never been affected.'"

Extract from Lord Somerville's communications to the Board of Agriculture.

“ It is well known, that hay, mouldy from rain, is rendered palatable and remarkably nutritious to cattle, by simply strewing salt on the stack, at the rate of 10 or 15 pounds per ton when, making: equally notorious is it, that a sensible effect is hereby produced to the taste, that cattle will prefer it to better hay, well put together, and will demand, when fed on it, without injury to themselves, three times as much water, which circumstance alone, accounts for that aptitude to fatten, which is conspicuous, in cattle fed upon hay so salted. It remains to be proved, how good hay, which had not spent its strength in premature fermentation, would bear such a quantity of salt, as would invigorate the stomach, quicken the circulation of the blood, and excite in cattle a desire to drink largely. That it does bear it, and that the effect this hay has upon stock, almost surpasses belief, we have ascertained; some of our hay lately in use, was of the first quality of sheep hay, the produce of rich and deep loam, and upon a limestone bottom; it was put together without wet, and had 25 pounds of salt per ton, sprinkled through a sieve, a greater quantity than has yet been used. In colour, flavour, and proof, it equalled any hay whatever, and satisfied us, that this, or a greater quantity, may be infused into hay of the best quality, and with the best possible effect.”

“ In confirmation of these facts, we have also the authority of Mr. Drake, of Breedon, one of the most celebrated graziers in the kingdom, who has mixed salt with his flooded mouldy hay, 8 pounds of salt only to a ton, and declares, that his Hereford oxen did better on *it*, than others, that had the *best* hay he had; and that he was, and is convinced, that it had all its good effect from the salt. Salt cannot be conveyed into an animal, in a

more effectual manner, than by sprinkling it on hay, through a sieve, when in the act of putting it together, for every particle is imbibed in the fermentation, without a possibility of waste. It will upon trial, no doubt, prove a better breakfast, than those cold dews, which prevail in this country, 9 months out of the 12, and which are more prejudicial to the wool and carcase, of those feeble animals, than has hitherto been considered."

Extract from the Annals of Agriculture, vol. VI.

"As the season for hay-making is drawing near, we must beg leave to recommend, the salting of ricks. I am persuaded, that few farmers are aware of the benefits arising from this practice, particularly in stacking in sultry weather. The salt preserves the hay from over heating, and becoming mildewed; it may be put together greener, than otherwise, without danger of firing; all kinds of cattle prefer inferior hay thus managed, to the best that can be placed before them, that has not been salted. The salt assimilates with the juices of the hay, and thereby prevents too great a fermentation, and by its soporific quality, gives it a superior flavour. The proper way of using it, is, when building the stack, to sprinkle the salt alternately between each layer of hay, in the proportion of 100 weight to 7 or 8 tons."

### CATTLE, AND LIVE STOCK IN GENERAL.

The evidence we possess, in support of the value of salt as a manure, however great, is at present exceeded, in the number, and weight of the various attestations to its important use, when given with the food of cattle; this circumstance may be easily accounted for, as experiments with salt, to ascertain its benefit to cattle, are soon decided; and a few weeks only are necessary, when salt has been given to a part of a flock or herd, to enable us to discern

its effect, from the difference in their fatness and sleekness. But its advantages as a manure, cannot be so soon, or so easily determined, as a year is at least necessary, to have an experiment well and satisfactorily decided; as it requires, that the crops should be compared and measured, and we must attend to, and allow carefully for difference of effect, from the nature of the soil, the state of the land, and the season of the year when put on, to obtain a correct guide for future operations.

The good properties of common salt, when employed as a seasoning for the food of cattle, seem to be universally ascribed by the medical world, simply, to its powers of promoting digestion, and preventing the prevalence of worms. Some idea of the use of salt to man, in the way thus ascribed, may be formed from the following fact, as detailed by the late Lord Somerville, in his address to the Board of Agriculture.

“In Holland, the ancient laws ordained men to be kept on bread alone, *unmixed with salt*, as the severest punishment, that could be inflicted, in their moist climate. The effect was horrible, these wretched criminals, are said to have been devoured, by worms ingendered in their own stomachs.”

“Common salt,” says, Dr. Duncan, in the Edinburgh Dispensary, “is useful in some cases of dyspepsia, (indigestion,) it is a common ingredient in stimulating clysters.”

“The gastric juice of herbivorous animals,” says, Dr. Thomson, in his System of Chemistry, “contains a pretty large quantity of common salt.” The gastric juice, is the liquid contained in the stomach of animals, by which the whole of their food is dissolved or digested; that when the constituents of this juice, are ill supplied, from the food consumed by the animal, all the concomitants of indigestion follow.

The great prevalence of worms among the poor children of Cornwall, is imputed by their parents, and by the faculty, to their having but little salt with their food

“Salt,” says Dr. Brownrigg, “provokes the appetite, strengthens the stomach, promotes the digestion and concoction of the aliments, resists putrefaction, prevents unnatural concretions of the humours, and is most friendly and agreeable to the human body, entering its composition as a necessary ingredient; no wonder, therefore, that the Laplanders, amongst whom the use of salt is unknown, seem to discover the want of it, by the exility of their bodies, and the weakness of their constitutions; being much less robust and strong, than other northern nations, who enjoy this excellent gift of God; moreover its uses extend to animals—black cattle and sheep take a pleasure in licking it, and by it are preserved from many diseases; they also thrive to admiration, and quickly grow fat, in marshy grounds, that are frequently overflowed by the sea.” *Art of Making Common Salt*, 1748, p. 157.

Extract from the evidence of John Christian Curwen, esq. Representative in Parliament, for the city of Carlisle, given before the Committee of the House of Commons, April 7, 1818.

“Have you any information to give to the Committee relative to the operation of the Salt Duties, on the Agricultural Interest of the country?”

“I hold in my hand, an affidavit, that has been made by a person, who has the charge of the cattle, and the conduct of an experiment that has been carrying on, since November last, in feeding, with the addition of salt. The affidavit was made, in consequence of an application by Sir Thomas Bernard. I requested, that he would make the application for it, that it might not be said, any influence had been used on my part; he did so, and which

application was made to a Mr. Thompson, an attorney at Workington, the Secretary to the Agricultural Society there, in consequence of which, the feeder was examined before Mr. Thompson, as to the effects of the experiments, and I have in my hand his affidavit, taken before a magistrate. It was delivered in and read.”

“ William Glover, of the Schoose farm, in the parish of Workington, in the county of Cumberland, the feeder and superintendant of the cattle, of John Christian Curwen, esq. at the said farm, maketh oath and saith, that this deponent, began to give salt to the cattle under his care, the 19th of November last past, and from that time, till now, the said cattle have had salt, as follows: 40 milch cows and breeding heifers, have had each 4 ounces per day; 14 oxen for fat, and 16 oxen for work, each 4 ounces; 27 young cattle, 7 of them 2 years old, the rest one year old, have had each 2 ounces per day; 26 young calves, each 1 ounce; 2 bulls had also salt administered to them, and 48 horses kept at the farm, have had each 4 ounces per day; 441 sheep had 4 stones, or 2 ounces each per week, given at twice, on slates. The advantages of salt for sheep, appear to be greater, as he said none of the stock have died in the sickness, since they commenced giving salt, and they have had none in the rot; in other years they lost some of their ewes and wethers, in the sickness.”

“ The cattle, both old and young stock, have their salt given, in steamed chaff, twice a day, which makes them eat it up as well, as other inferior food. The horses have their salt given amongst their steamed potatoes, twice a day, which makes them clean out their cribs, and is a benefit to their health and condition; that the cattle have been in the highest health, ever since they commenced the use of salt. And this deponent saith, that he has

now kept the cattle at the Schoose farm, for 10 years, and they were never so long without sickness; they were formerly subject to obstructions and inflammations, and that he has not had occasion to use any medicine, since the 29th of November last, except in one instance of a cow, now quite well; and he can show, the whole of the said stock, 125 head of cattle, without the exception of any one animal, that is out of order. And he believes, there is nothing that will promote the health of cattle, and their good condition, more than salt, when rightly administered; and that medicine would, in his opinion, be little required, if he had salt at command. And this deponent saith, that the 14 oxen above mentioned for fat, were fed on straw, steamed chaff, and turnips only, and 8 of them were weighed on the 13th day of February last, and again on the 17th day of this month of March, and the increased weight of the 8, was 30 stones of 14 pounds to the stone."

"WILLIAM GLOVER."

"Sworn, the 25th day of March, 1818, before me, Richard Watts, one of his Majesty's Justices of the Peace, in and for the county of Cumberland."

Mr. Curwen, in December, 1818, observes in a letter to the editor of the Carlisle Journal: "I avail myself of this opportunity, to say a word or two on the subject of salt. I rejoice to find the trials of it are numerous. In addition to what I have stated in favour of it, I am now enabled to add, that having killed 50 shearling Devons this winter, at the Schoose, the whole have been perfectly sound: previous to the use of salt, it was rare to find a liver (of a sheep) that was not more or less tainted. The cattle and horses are continued in the free use of salt. Latterly at the Schoose, I have given 6 ounces per day to work horses, 4 with steamed potatoes, and 2 with steamed chaff. I fully expect, it will operate powerfully



in preventing horses greasing. In the course of a few months, I shall be able to speak more decidedly on the subject. I find the additional quantity of salt, so far to agree perfectly well with the horses."

To the foregoing instructions, from such authority as Mr. Curwen's, I am enabled to add, through favour of a letter from that gentleman, to my father, in December, 1819, the following confirmation, of the use and value of salt to cattle, and that it has been found, that the quantity given per day, has been beneficially increased to some stock, as shown by the following table.

	APRIL, 1818.		DECEMBER, 1819.
Horses,	4 oz.	—	6 oz.
Milch Cows,	4	—	4
Feeding Oxen,	4	—	6
Yearlings,	2	—	3
Calves,	1	—	1
Sheep,	2 per week	—	2 to 4 } per week if on dry pastures,

but when feeding on turnips or coles, it should then be given without stint.

Mr. Curwen further states, "in the spring, my flock was attacked with an inflammatory disorder, I gave them considerably of salt, some took 5 ounces a day; the disorder was speedily stopped by it. Salt removes the taste of the turnips, from milk and butter. It is a preventative of the grease; I have given a pound a day, with advantage, to horses that have been excessively greased. I have the pleasure to say, that numerous trials by my neighbours in Cumberland, wholly corroborate my statements, of the usefulness of salt in feeding stock." What more perfect evidence, of the use, and value of salt, to farming stock, can be required, than Mr. Curwen's, and so confirmed by more than two years experience?

Extract from a Letter, from a very considerable North American Planter, to the editor of the *Museum Rusticum*.

“ I do not find, that the farmers in England, know the great advantages which may be derived from the use of salt in the business of fattening cattle, whereas! in America, we think it in a manner absolutely necessary, and accordingly give it to almost every kind of cattle; and those with parted hoofs are particularly fond of it. Horses are as fond of it as black cattle, for with us, if they are ever so wild, they will much sooner be brought, by a handful of salt, than any kind of corn whatever.”

“ We also give salt to our sheep: to this practice of feeding with salt, it is generally ascribed, that the American cattle in general, are so much more healthy than the same animals in England; certain it is, they are there subject to much fewer diseases.”

The following Letter, from Mr. Charles Adams, of Kitton, near Bridgewater, Somersetshire, on the black scour in sheep, was addressed to the editor of the *Farmer's Journal*, Jan. 4, 1819.

“ Salt possessing, septic and antiseptic qualities, it is obvious it should be used with caution; indeed, experience (the best test of wisdom) has so instructed me—I have for the last 10 years and more, given salt to sheep in the following proportions, in all cases of diarrhœa, with the best possible success: 2 drachms (apothecaries' weight) of dry salt, for a lamb of 9 months old, and that quantity increased to  $3\frac{1}{2}$  drachms for a large and full grown sheep, and in the same ratio, for the intermediate ages. The mode I adopt, is, to introduce the specified quantity into the mouth of the sheep with a spoon, withdrawing the spoon, and closing the mouth. In a few moments the salt dissolves in the saliva, and the sheep readily swallow it.

I consider water, not only as inconvenient, but improper, as a superabundance of it, was, in my opinion, the original cause of the disease. I have seldom found the repetition of the above dose, necessary, but if *one* should not prove effectual, there can be no objection to repeating it every other day, till the desired effect is produced."

Extract from a paper, drawn up by Sir John Sinclair, and distributed by the Board of Agriculture.

"In Flanders, it has been found, that a small quantity of pounded salt, is very beneficial for horses, when new oats are given them, if the oats are at all moist; and there can be no doubt that moist food in general, might be rendered less injurious by the same means, for instance, when raw potatoes are first given to horses."

"Mr. Birbeck in his Notes on a Journey in America, recently published, mentions, "that the horses he saw in the interior of that country, were of an excellent description, and are in high condition, even when travelling at the rate, of 45 miles per day, on long journies; they are well fed, getting from 4 to 5 gallons of oats, besides hay, with a good handful of salt, about twice a week. Salt given to cattle cures the botts, and it is said, it might be given with great advantage to race horses, and would prevent the necessity of applying those severe purges, to which they are at present subjected.—In the East Indies, they give salt to their bullocks in general, daily to the amount of 2 or 3 ounces, mixed with their feed of pulse; a due proportion of salt they consider, to be essential for their health, and almost as necessary as food.—Great quantities of salt are considered to be injurious to hogs, but in America, salt is occasionally given to them, to render them tame, and prevent their being lost in the woods.—Mr. Curwen also mixes some salt, with the steamed potatoes he gives his hogs, and he thinks, with benefit."

Letter addressed to Mr. Arthur Young, in the *Annals of Agriculture*, vol. XXIV.

“ In looking over the first volume of the *Memoirs of the Royal Academy of Sciences at Paris*, I met with a paper, entitled, *Physical Observations on the Effect of Salt in Fattening Cattle*; the title excited my curiosity, and on reading the *Memoir*, the author’s reasoning appeared to me, not only pleasing, but convincing; his views are certainly enlarged, and directed to objects of the most important kind, viz. the improvement of land and the increase of cattle. He lays it down as an axiom or self-evident truth, that by increasing the cattle, land may be improved, and by improving land, cattle may be multiplied. The farmer, says he, who has more than an ordinary stock of working cattle, reaps a double advantage, the one, by having his work done in season, the other, by enriching the greater proportion of his land, by means of additional manure; the only difficulty is, how to maintain an increased number, without increasing the expence, this he asserts may be done by the use of salt, and advances the 3 following propositions.

“ **FIRST.**—That salt given with the food of cattle, augments the nourishment of that food.”

“ **SECONDLY.**—That in proportion to the quantity of salt eaten by cattle, the effects of that augmentation will be perceivable.”

“ **THIRDLY.**—That no ill consequence will follow, from excess of salt eaten by cattle, even though it should be given them without stint.”

“ These propositions, he endeavours to support, by unquestionable facts. In the jurisdiction of Arles, in the county of Provence, there is, he says, a district called the Crau, extending in length about 6 leagues, and in breadth about 3; the whole surface of which is covered with small

rough stones, and not a tree or bush is to be seen in the whole district, except here and there upon the borders; yet on this spot, so seemingly sterile, by the free use of salt, more numerous flocks of sheep are bred and reared, than upon any other common of equal extent throughout the whole kingdom; and what is not less remarkable, the sheep are healthier, hardier, and endure the severity of the winter with less loss, though they have fewer sheep-cots, than those fed and bred in more copious pastures, and who have the benefit of more convenient shelter. Add to this, that the wool of the flocks, bred and brought up in the Crau, is not only the finest in the whole country, but bears the highest price of any in France. From hence he concludes, that it is to the unlimited use of salt, that these surprising effects are to be ascribed, for it frequently happens, that the Crau is so burnt up in summer, that the poor animals are found to turn up the very stones to come at the few blades of grass, that grew round them, and yet none perish for want of food. Let every excellence, therefore, that can be reasonably supposed inherent in the herbage, be allowed it; yet the quantity of it is so small, that without the abundant use of salt, a fourth part of the sheep kept in the Crau, could not subsist upon it. But as a still further demonstration, that this astonishing effect is solely to be attributed to salt, we have, says the writer, in Languedoc, on the borders of the Rhone, a spot of the same kind of stony land, in every respect similar to that of the Crau, though in other respects, it is by no means inferior; the wines and other fruits produced on the borders of each, being in goodness and other essential qualities equal. Having his first proposition incontrovertibly demonstrated, he proceeds to prove the second—to recommend an easy experiment, which it is in every farmers power to make: and that is, give one half

of his cattle salt, and to the other half none, in less than a month the difference will be discernible; the cattle, to whom salt is given, will shew it in their looks, in the sleekness of their coats, in their growth, in their strength, and firmness for labour; he adds, that with little less than half their usual food, all these effects will be produced. To establish his third proposition, he appeals to the practice about Arles, where the cattle have as much salt as they will eat, and none are so healthy, or thrive so fast, as those that eat most of it."

"To the above observations, of our correspondent, adds the editor, we may state, that in Spain, where the finest wool in the world is produced, great quantities of salt are given to the sheep, to which they attribute, in a great measure, the fineness of the wool. The salt is laid upon the rocks, and the sheep come and lick it, and are exceedingly fond of it."

Extract from the late Lord Somerville's communications to the Board of Agriculture.

"We are not aware, that the practice of giving salt, in its raw state to sheep, is to be found any where in this kingdom, except in our estate, (the estate belonging to the Board of Agriculture,) we shall therefore speak with due caution on the subject, confining ourselves to what has actually been done, and to the effect which, in several years trial, has been most apparent. The heavy duty now imposed upon salt, seems sufficient to deter others from its use, as it for some time deterred us. At length, we fortunately lost sight of this timidity, our motive was not to promote this or that imaginable effect, but to keep sheep in health. It was reasonable to conjecture, that the flock would demand more salt in the autumn and spring months, when dews are heavy, than in the summer or dead winter months—and so it proves. In Spain, 1000 sheep use in

5 months, 4 arobes or one quintal of salt, which is 128 pounds weight. Their sheep would fatten, at about 13 pounds per quarter, upon the average—this is the quantity given out, all of which may not be consumed; and as the price of salt in that country is no object, more would be given, if more were necessary. Without reference to what was given in Spain, (for the increased moisture of our climate, and the peculiar properties of our various soils, would not allow such a reference safely to be made,) the quantity given to our sheep, was such as, we have before stated, would render them healthy, or such as they appeared to demand. It is given in the morning, when the sheep are looked over, in order to counteract the ill effects of the dew. They have consumed at the rate of a ton of salt, for every 1000 sheep, annually, amounting to 36£. sterling. The consumption of 1000 sheep, might occasionally (but varying according to the season) amount to 30£. sterling per annum, and no more. A small handful of salt, is put on a flat stone or slate, and 10 or 15 of these slates, set a few yards apart, are enough for 100 sheep; at first, the sheep may be moved towards them. If they feel a craving for salt, they will lick up quickly as much as is necessary; if they do not want it, what remains dry, at next looking at, is taken up and reserved for future use; twice a week has been usually found sufficient, in particular cases, it may be offered thrice. As to any doubt, respecting their inclination to it, none can be maintained; for of a flock approaching to 1000, there are not 10 old sheep, which have not taken kindly to it, and not a lamb which does not consume it greedily.”

“When turnips, in the early part of the season are stocked with sheep, and the greens are rank and strong, many die suddenly; more especially two-tooth sheep. The disorder is a pent up wind, occasioned by excess of

fermentation in the stomach; here, salted hay and salt are devoured with a greediness, which denotes their salutary effect. The autumn of 1801, was rainy and unfavourable, yet we did not lose one sheep in turnips, and probably never shall, whilst we persevere in the use of salt. In that of 1802, we had many fat wethers, gales, and hog sheep, in turnips, and lost two, the first month the turnips were stocked: certainly the chances were, that in any keep, and in any season, of such a flock more might have died. In strong pastures likewise, when seasons are wet, the rot often spreads destruction over whole tracts of the country; here salt must be beneficial, and an object of national importance. It is supposed, and with great truth, to correct acidity in the stomach, a disorder common to sheep even in Spain, but of a much more serious nature in the damp climate of England, more particularly when stocked on green floaty food, such as turnips, vetches, or young clover. Salt may not be a specific on land, naturally unsound. Such land it is madness, at any rate, to stock with sheep; but where the rot, occasionally prevails, those who have carefully noticed how salt affects cattle, can hazard little in supposing, that the disease will be much less heard of, when such a corrective is applied. We must content ourselves rather with a negative, than a positive proof, because it is not possible to ascertain, how many of our sheep might have fallen sick, or died, which are now in health and alive. But it may be put to any flock-master, whether he would not consider himself a fortunate man, if at the expense of 30*£*. sterling per annum, he could materially improve the health and condition of a flock of 1000 sheep, weighing 14 pounds per quarter? His probable answer will be, that he would double the money, to secure to himself such an advantage."



Extract from a paper of Mons. Juge, on the fattening of bullocks at Limoges, in the 18th volume of the *Annals of Agriculture*.

“ Amongst all these animals, there are some naturally better disposed to fatten than others, and care and attention are paid to giving a plentiful supply of food to those who are least inclined to fatten, in order to sell them at the same time, and to give them an equality with others, to facilitate the sale, salt is added to their common food. This ingredient, of which they are very fond, gives them an appetite, excites thirst, and facilitates digestion. There are various methods of administering it, such as hanging it up in a bag between 2 bullocks, who lick it after feeding; melting it in the white water, the paste, or in the chesnut bread; or in short, by giving them some handfuls of it either on a board, or at the bottom of the troughs, when empty.”

Extract from Sir John Sinclair's *Agricultural State of the Netherlands*.

“ In visiting Mr. Mosselman, who occupies a large farm at Chenoï, beyond Wavre, I was surprised to find a quantity of rock salt from Cheshire. He assured me, that the use of it was of the greatest advantage to him, in 3 respects.”

“ **FIRST.**—That by allowing the sheep to lick it, the rot was effectually prevented.”

“ **SECONDLY.**—That his cattle, to whom lumps of it were given to lick, were thereby protected from infectious disorders; and the cows being thus rendered more healthy, and being induced to take a greater quantity of liquid, gave more milk; and,

“ **THIRDLY.**—That a small quantity pounded, was found very beneficial to horses, when new oats were given them, if the oats were at all moist.”

Extract from Sir Thomas Bernard's Letter to the Rt. Hon. Nicholas Vansittart.

“ There is a custom in Spain and Portugal, which I have personally witnessed the practice of in North America, of daily placing on stones, in the sheep pastures, some dry salt for the use of the sheep. I have seen each of the sheep in his turn, and with eagerness, take a small portion of it. This is considered as a preservative against the rot, and as contributing to their general health and good condition. It is understood, that a considerable part of the salt, which we export duty free, to America, is used for the purposes of agriculture; though by the time it reaches the American farmer, it costs him as much as 2s. 6d. per bushel; and I have no doubt that in our humid and uncertain climate, and in the variety of our soils, it would, in small quantities, be found generally useful, in preserving our sheep from the rot, and other complaints, hitherto deemed inevitable and incurable.”

“ In Spain, the cows are regularly supplied with a little salt, and the increase of their milk, and the benefit which stable-fed cattle derive from it, are confirmed by many authorities. A Cheshire gentleman informs me, that when he wants extraordinary exertions from his horses, he always gives them a little salt, and this is analogous to the practice in the East, where the camels are allowed salt, during the passage of the caravans over the desert, to Alexandria, as a support in the extreme fatigue they undergo.”

Extract from Ashe's Travels in America.

“ The Onondargo is a fine lake of brackish water, surrounded by springs, from 2 to 500 gallons of which, make a bushel of salt. It appears, as if nature expressedly intended this region to be populated, and as a strong temptation, placed this treasure in the bosom of hills and

woods; had it not been for these and similar springs dispersed through the western country, salt must have been at such a price, as to deter persons from settling there. All the animals of those parts, have a great fondness for salt. The cattle of farmers, who give this substance to their stock, prove superior by 25 per cent. to such as are not supplied with an article so essential, not only to their general improvement, but their health. The native animals of the country too, as the buffalo, elk, deer, &c. are well known to pay periodical visits to the saline springs and lakes, bathing and washing in them, and drinking the water, till they are hardly able to move from their vicinity."

Extract from Sir Thomas Bernard's Case of the Salt Duties, 1817.

"In visiting Mr. Alderman Farley's salt works, at Droitwich, (Aug. 17, 1817,) I was struck with the appearance of an old black horse, that worked the machine, for raising the brine. He was in very good condition, and his coat was like the finest black satin. I asked the old man, named Twigg, who had the care of him, what made the horse look so sleek and plump—his answer was, that he had regularly given him a little salt in his chaff, 3 days in the week, about 4 ounces each of the 3 days, or if he was not very stout, then sometimes a little more, but that in general, the horse was very well, and did his work well. He said, he did not give him the whole 4 ounces at once, but at several times—about a table-spoonful each time. The horse had been purchased by Mr. Farley, about 4 years ago, being then about 20 years old, and his health and appearance, though he had constant work, had been since very much improved. The salt, he added, had made him eat his food, and work better. A farmer, who was present, observed, that he usually gave his horses a

little salt in their grains, and found, that it did them good; and also, that he gave it them as a cure for the botts."

Extract from *Dr. Rees's Encyclopædia*.

"There are no lands that fatten cattle sooner, than those pasture grounds, which are at times overflowed by the salt water; such are the pastures at Erith, near the Thames, which are sometimes overflowed at spring tides. Some farmers have tried the scattering of salt over their corn fields, as soon as sown, in the quantity of 2 bushels to an acre, with good success, and this quantity may be productive of all the advantages which arise from the occasional overflowing of such high tides, or natural salt springs."

Extract from the *History of the Royal Society of Medicine at Paris*, for the years 1777 and 1778.

"The mortality has increased in our fields, since the augmentation of the price of salt, has obliged the farmers to give it more sparingly to their cattle. In the district of Champsaur and the adjacent countries, we are accustomed to give every ox and cow, 4 ounces of salt every 8 days, and about an ounce to every sheep and goat, at the same intervals: when this practice is neglected, the animals eat less, they lose their spirits, their hair rises, they go licking in their stalls, the bottoms of the walls where the saltpetre is formed, they grow lean, become barren, and disease ensues."

Extract from a *Letter of William Alton, esq.* communicated to the *Chester Chronicle*, by the *Rev. B. Dacre*, of *Moseley*, near *Manchester*.

"Every species of live stock, is very much injured by being denied the due supply of salt. Salt forms an essential ingredient in the food, of every domestic animal; we feel how requisite salt is to the health and comfort of the human species—it is equally so to that of cattle: salt

softens the skin of the domesticated kinds, and makes their hair and wool fine and shining. When horses are fed on bruised gorse, or any kind of food abounding with salt, or when an handful of salt is put into their food every day, their pile becomes soft and shining. The superior quality of wool in Spanish sheep, proceeds chiefly, from an abundant supply of salt. When salt is given to cows, it improves the quality, and increases the quantity of their milk. It is necessary to cows—they are so fond of it, that they eat wet litter from under horses, or on the dung-hill, because it is impregnated with salt, the salt of urine. It is a great pity, that animals so very valuable, and whose produce depends upon their being properly fed, should be obliged to eat litter mixed with dung, to obtain a salt, with which they ought to be amply supplied.—The duty on salt, is of all others, the most improper.”

Extract from a Pamphlet, by the late J. Hollinshead, esq. of Chorley.

In the Survey for the County of Lancaster, Mr. Holt remarks, “that the high duties upon salt, operate as a great obstacle to the application of this article, to the advantage of cattle, in giving it in troughs, &c. in certain cases. It is an article most cattle are fond of; it assists digestion, promotes a disposition to fatten, prevents certain disorders; and in foreign parts, they use it in large quantities, not being loaded by high duties, and it is asserted, entirely prevents that fatal disease, called the rot.”

“When grains, ground corn, &c. are given to milch cows, feeding cattle, or horses, there ought to be 2 ounces of salt, mixed with every feed, that is given them. This has been the practice of a gentleman in the county of Lancaster, for several years, and has been attended with

the greatest success; his cows giving a much greater quantity of milk, and at the same time, being in much better condition, than those which are fed in the ordinary way."

"A salt marsh, is not only the best and most healthy place for thriving and fattening all sorts of cattle and horses, but it is likewise the best medicine, for any putrid or contagious disorder, which they may have contracted. As a proof of this assertion, when the farmer suspects his sheep are in a consumptive state, or his horned cattle or horses, have contracted any putrid disorder, they are sent (when it can be done) to pasture on a salt marsh, which is the best remedy for these complaints, and which never fails to work a speedy, and effectual cure. In Spain, salt is given to their sheep in the rot as a medicine, and also to those which are sound, by which means, the shepherds of that country say, that their wool is much improved in fineness. The grass of salted land, would doubtless be attended with these beneficial effects, in a superior degree, as it would operate constantly, and more effectually upon them; and if the salt marshes be found to be so safe and certain a remedy, for the disorders of the brute creation, might we not expect equal advantages to accrue to the human species, if our milk, butter, and all our vegetables, were produced from grounds manured with salt?"

"Nothing could be more disagreeable and prejudicial to the human species, than for them to be deprived of the use of salt, the prohibition would be insupportable; why then should we withhold from the beasts of the field, a thing which is so agreeable to their palates, and conducive to their health?"

Extract from the evidence given before the Hon. the Board of Trade, in April, 1817.

William Horne, Esq. Merchant, of Liverpool, referred

among other things, “to the practice of the late Mr. Tunstall, of Hayton, near Prescot, a large farmer, drover, and butcher, who only desisted from the use of salt, as a manure, and for his cattle, when the high duty was imposed.”

Mr. Kingston, in the course of his evidence, observed, “I had once some small oxen tied up to fatten, which did not thrive, owing as the bailiff said, to the badness of the hay, of which they wasted more than they ate, but by sprinkling it with water, in which some salt had been dissolved, they returned to eat it greedily. From this, and many other circumstances of a similar nature, that I have been informed of, by persons of undoubted veracity, I am free to say, that if the food of cattle tied up to fatten, was sprinkled with a proper quantity of salt, they would thrive much faster, than by the present mode, and would prevent their being hoven by an excess of food.”

Extract from the evidence of Arthur Young, esq. Secretary to the Board of Agriculture, given before the Committee of the House of Commons, on the Salt Laws, April 8, 1818.

*Query.* Did you ever try salt, in the feeding of your cattle?

*Answer.* Yes: but chiefly with sheep, and I found them so fond of it, by some small trials, that I had troughs, 10 feet long, 9 or 10 inches wide, and 3 or 4 deep, in which I scattered salt for them, and feeding them with my own hand, I found them so ravenously fond of it, that the moment they saw me at the gate of the field, they galloped up from every part, and surrounded the troughs so eagerly, that I was forced to place a pole over the troughs, to keep them from jumping in; but all their heads were in the troughs in a moment. The quantity they took, was a perfect contrast apparently, to the extreme eagerness with which

they came. They took a good lick at it, and went away, but they were exceedingly eager to get that lick; some would take more than others.

*Q.* Do you think that it would be beneficial, in preventing the rot in sheep?

*A.* I found it so. In the years when my neighbour's sheep were generally affected by the rot, my sheep escaped, and my land was quite as wet as my neighbour's.

Examination of Mr. James Manley, of Anderton, in Cheshire, before the same Committee, April 14, 1818.

*Q.* Can you speak to the use of salt with sheep or cattle?

*A.* I know a farmer, of the name of Sutton, who uses it for his sheep, and an old favourite horse.

*Q.* Have you understood that his flock have been better since he has used salt, and have they been freer from the rot?

*A.* Yes: he told me last week, he attributed it to salt only, that has saved them from the rot, and he has used it three or four years.

The important action of salt, as an anthelmintick or destroyer of worms in cattle, I have before mentioned. Worms are found in every part of the animal. The animalculæ found in the liver of sheep, (*fascio hæpaticæ*) are destroyed by salt. Worms exist throughout the intestines, in the urine, and even in the blood. Bots in horses are cured by giving them salt in their oats.

From a perusal of the various evidence, which has been obtained, from so many highly respectable sources, bearing testimony to the advantages derived from giving salt to cattle; the farmer will find, every reasonable assurance, that there cannot be a subject more worthy of his earliest attention, or more certain to repay him, for



the expense and trouble he may bestow upon his experiments, with a substance possessing, such valuable qualities.

### HORTICULTURE.

We are instructed, that salt is beneficial for every purpose of horticulture.

“Several herbs,” says Lord Bacon, in his *Natural History*, “such as radish, beet, rue, and penny-royal, like best being watered with salt water; and I advise the extension of this trial to some other herbs, especially those which are strong, such as, mustard, rocket, or the like.”

*FLOWERS*, which are kept in water vases, for their beauty and fragrance, will have both of these properties much prolonged, by adding a small proportion of common salt to the water, in which they are placed.

*BOWLING GREENS, LAWNS, &c.* are, in the summer months, often much injured by droughts; an application of salt, either with earth or by itself, early in the spring, would prevent the recurrence of this evil, keeping the grass alive, by its great moistening properties, and also more clear from worm casts. For an account of some experiments upon grass, with salt, see *Meadows*, p. 44.

*ONIONS*.—Salt has been found to be, a very beneficial application to onions.

The failure of the onion crops, in the year 1818, was great and general; onions were sold at one guinea per bushel, in Covent Garden Market. On the 8th of September, of that year, a paper was read, before the Caledonian Horticultural Society, from Mr. William Morton, of Biel, stating the great advantage to be derived from the use of salt, which he employed in solution, and applied to his onion, shalot, and other root beds, with the greatest advantage.

“Mr. Beck, of Chorley,” said the late Mr. Hollinshead, “has constantly made use of salt, in his garden, for upwards of 30 years, principally upon his onions, and he has invariably found the salt to exceed every other kind of manure, which he could have used for the like purpose; his method is, to sow the salt immediately after the seed is covered in, but as he never had any thought of communicating his observations and experiments to the public, he took no care to ascertain the exact quantity, necessary to be sown on an acre, and proportionably upon any smaller quantity of ground; yet, he thinks, if he might hazard a conjecture, that he has not sown less, and probably more, than 16 bushels per acre.”

“One year, by way of trial, he sowed the usual quantity of salt upon a plot of onions, after they had begun to shew themselves above ground, and the crop, so far from being improved, was entirely spoiled; from this he infers, that the experimental gardener, who may be inclined to make use of salt, will do well to throw it on, as soon as possible, after the seed is sown.”

An annual sprinkling with sea water, is the only manure which the Hindoos and Chinese have applied to their rice fields, from the earliest ages. The rice requires to be supplied with moisture, to an extent which would be fatal to wheat. It is grown in those swampy situations, which are annually overflowed, by the Ganges and other rivers, the waters of which deposit a rich sediment. The salt, therefore, as employed by the Chinese and Hindoos, is found to be beneficial in promoting the putrefaction of the animal and vegetable matters, contained in the soil; as well as in retaining and absorbing a proper supply of moisture, which under the scorching sun of India, is much more difficult to procure, than in the more variable climate of England.

*GARLIC, CUCUMBERS, AND RICE*, contain a peculiar salt, called muriate of potash: this salt is formed by the action of common salt and potash upon each other; the potash is furnished by the vegetable remains contained in the soil, which always contain this alkali.

*CARROTS*.—Sir John Sinclair, in his *Husbandry of Scotland* states, “that carrots grow well in a salted bed; the salt being laid under the surface, in the centre of the interval, between the rows, and at some distance from the roots, in such a manner, that it may be dissolved, before the fibres of the roots meet it.”

There is one property of salt, which renders it particularly beneficial in an old garden—which is, its property, when applied in small quantities, of promoting putrefaction. The soil of rich old gardens, is often rendered black, by its excess of carbonaceous matters, remains of manure, weeds, &c. which afford a perfect nursery for all kinds of animalculæ and vermin, which never fail to abound. Some persons have a custom of collecting, all the weeds of a garden into a trench, covering them over for a twelve-month with the soil; at the expiration of which time, they are converted into a half putrified kind of manure, with a large portion of the seeds of the weeds uninjured, and in the best state for vegetating. I would, therefore, recommend that before the weeds are covered with earth, they should be well mixed with salt, which would not only, most effectually kill every seed of the various weeds, but render the compost putrid, in half the time required without salt, and prepare that which was before of injurious nature as a manure, to become of the highest value.

On the subject, of the best mode of applying salt to a garden, it may be either mixed with earth, or spread on the surface of the soil, by hand; the chief point to be attended to is, that it be properly mixed with the soil, so as to

avoid its too violent action on the plant or tree; and it must never be spread over beds, when any vegetables are above ground: when it is applied to fruit trees, it may be done in the manner described in the experiment, on the cherry-tree, at p. 8. It may be safely put into trenches near a tree, as we are informed was formerly done to the apple-trees, in the cyder countries, because the extended roots of a tree, having free liberty to find nutriment, without being forced to partake of the salt, can avoid any excess of it.

In gardens, generally abounding with undissolved carbonaceous substances, from excessive manuring, salt will be found of the greatest use; and may be put on, from 10 to 40 bushels per acre.

*FRUIT TREES.*—"The honey dew" observes the late Mr. Hitt, (who was gardener to Lord Robert Manners, at Chiselhurst, in Kent,) in a Treatise upon Fruit Trees, "is a glutinous substance, very prejudicial to many kinds of fruit trees, as it contracts the minute vessels of their most tender parts, and prevents their imbibing and perspiring such fluids, as are required in vegetable life."

"A few days before the honey dew appears, you may discern small insects, on the underside of the leaves that are shrivelled, almost without motion; yet the heat of one fine day, will make them visibly increase, both in bulk and strength, and likewise more in number. If the season be wet, spread common salt all over the border, about 8 ounces to each tree; for the more salt the juices contain, which form the young branches, the more compact and smooth their leaves will be, and thereby less subject to the penetration of the honey dews. If the fly be strong, double the quantity of salt before directed, and water the bottom of every tree before the soot or lime is laid on, at the time of trenching. I have found these methods successful, even

when the flies have been very strong upon the trees, and have in a few days destroyed many of them, and caused the trees to shoot vigorously.”

“ The ants are much complained of, for destroying fruit and leaves; but when borders are rightly prepared and ordered, they cannot live. Against old walls, either of brick or stone, they are the most troublesome; for, as they lodge in the nail holes, the watering of the borders only, has no effect upon them: but the walls should be watered all over, with 2 ounces of salt to a gallon of water.”

“ When the caterpillars, which devour the leaves of the apricot, plum, apple, pear, currant, and gooseberry, make their appearance, a sprinkling with a very weak solution of salt in water will completely kill them.”

Mr. Gilbert, steward to the late Duke of Bridgewater, had an orchard on his estate, near Wincham, in Cheshire. The apple trees of which, being grown old, constantly bore a profusion of blossom, but never brought any fruit to perfection. To remedy this defect, the tenant spread a quantity of rock salt, bruised small, about each of the trees, at some distance from their stems; and from that period, all the trees in that orchard, have continued to be very productive, yielding abundance of fine, large, and well flavoured apples.

Before the duty was imposed upon salt, the cyder orchards of the west of England, were regularly supplied with salt; a few pounds were laid in a trench, round the tree, at the distance of a few feet from the stem. This application was never omitted by those who were ambitious of having fine orchards.

Salt is also of great use for destroying moss on gooseberry and currant trees. In the spring of 1819, I wit-

nessed a trial of the effect of salt upon an old currant tree; two or three weeks before the buds began to swell, all the branches were washed with brine, nearly saturated with salt, (which is best done with a long haired brush.) The above currant bush appeared so injured by moss, as to be not worth preserving. The first effect of the salt was, that it checked the appearance of the leaves and fruit—their appearance being a fortnight later than those of the other currant trees; but when they did appear, they were quite free from honey dew, which infected all the others in the garden: the fruit was cleaner and more perfect, and scarcely a vestige of moss remained; and the rains carrying down the salt to the roots of the bush was beneficial to it. The same effect, we may certainly expect, would be produced on the gooseberry tree, by the same treatment; and if it be true, that salt will act as a stimulant to vegetation, to give it new energy and strength, it consequently must, in all cases, exceedingly contribute to preserve them from all disease.

### BEES.

As salt is found to be of great service in the management of bees, it may be useful to state the following particulars.

“Of all the maladies,” says Mr. Huish, in his *Treatise on the Nature, Economy, and Practical Management of Bees*, 1817, “to which the bee is subject, the dysentery is the most frequent and dangerous. Many remedies have been prescribed, by various authors, for this malady. Wildman recommends the sprinkling of common salt, well pounded, upon the stand. This prescription of Wildman, I have great reason to believe, is founded upon truth and experience, for it is certain that bees have a great

partiality to saline waters, having myself observed them, in great numbers, drinking from the drains of stables, or the cess-pools into which the urine flows. This may proceed from an instinct of nature, which teaches them to have recourse to certain substances, as a cure for the maladies with which they are afflicted, in the same manner as the dog eats grass; for it is certain that the bee, in a healthy state, prefers a running water, to a stagnant one."

"The dysentery is less prevalent by the sea-side, than in the inland countries; and this corroborates the opinion, that salt is beneficial to bees."

The same author, in his chapter on the feeding of bees, remarks, "I have always found it very conducive to the health of the bees, to put a little salt in their food, especially in those cases, in which there is the slightest fear of the dysentery."

"Should the cottager," he continues, "not be able to afford sugar to feed his bees, treacle will be found an excellent substitute; let it be diluted in the proportion of one-third of molasses, to two-thirds of water, and mixing a little salt with it, boil it for a quarter of an hour."

It is a well known fact, among the common people of the hundreds of Essex, that those bees collect the most honey, which are nearest to the salt water.

The following statement, is contained in a letter, from Sir John Sinclair, to the Right Hon. Charles Arbuthnot, Secretary to the Treasury.

"Every day furnishes some additional evidence of the advantages to be derived from the system adopted by Parliament, last session, regarding the Salt Tax. A curious proof of it has lately come to my knowledge. It is well known that bees, do not thrive in damp seasons. A lady,

whose bees were perishing, owing to wet, was induced to try, whether salt would not be of use to them. She spread some thinly upon a dry substance, near her hives, and found, that it was regularly consumed by them. The result was highly satisfactory, for when all the bees in her neighbourhood either perished, or were unproductive, hers thrived, and produced a great quantity of honey. This discovery, may render the culture of bees less precarious than hitherto has been the case in this country, and may be of great use to the industrious cottagers."



## Observations.

From the various testimonies which have been selected in favour of salt, as a manure, and of its benefit when given with the food of farming stock, few persons, I am persuaded, will doubt its great value for such purposes: and supposing, that what has been urged in my attempt to explain its modes of operation, were in any manner incorrect; this would be of little importance, compared with the evidence of facts, which have been stated.

Who can believe, that Mr. Hollinshead, after 20 year's experience, would publish incorrect or false statements, upon such an important subject? What motive or interest could he have, to mislead the farmer, whose cause he so well advocates, and on whose prosperity he justly considers the welfare of Great Britain, its power, and high distinction among the nations of the earth depends? And if we cannot doubt the integrity of that gentleman, or question the character of any of the respectable persons, who have given their testimony, on the uses of salt, for agricultural purposes, will it not be the duty of every farmer, to make trial of so convenient and cheap a manure, and assistant to live stock, without delay? otherwise, as Sir John Sinclair remarks, "the anxious endeavours of Parliament, to promote the interests of the farmer will be in vain, unless he resolves to avail himself of the boon, that has thus been conferred upon him." As he observes, "should the importance of salt, for agricultural purposes, be confirmed, beyond the possibility of a doubt, it may be the means of inducing Parliament to commute the duties on salt entirely, that so great a source of national prosperity, may not be impeded."

It is often contended by agriculturists, that it is very improbable, that salt can be beneficial, as a manure to land, because of the known fact, that meadows and other lands, which have been flooded by the sea water, are rendered for 7 or 8 years of little value; although they admit, that at the termination of this period, they are rendered uncommonly productive; and the corn grown upon such lands, is never infected by the smut or mildew, or troubled with grub. To this argument, against the use of salt, it may be replied—when 40 bushels of salt, are carefully spread over an acre of ground, this large quantity, which is often known to be sufficient, in a fallow, to destroy for a short time all vegetation, does not amount to one ounce per square foot; which bears but a small proportion to the salt contained, in an equal space, of sea-flooded land. A square foot of soil, 6 inches deep, when flooded by the sea, on the coast of Essex, I have found to contain the salt of one gallon of sea water, which water, in summer spring tides, often contains nearly 5 ounces of different salts per gallon. These facts clearly explain this apparent anomaly. A flooding of sea water, is equivalent to an application of nearly 200 bushels of pure salt per acre; and which quantity, must also be often considerably increased, by summer evaporations.

Another objection to salt is sometimes urged, namely, that it cannot remain in the soil any time, for durable benefit, but must be soon washed away by the rains—various evidence confutes this objection. In a light gravelly soil, on which 20 bushels of salt per acre had been spread, immediately after the wheat was sown, I found upon a correct examination, that at the expiration of a year, 12 bushels of salt per acre were remaining in the earth, within 5 inches of the surface. In a strong soil, I have

no doubt, more would have been found. Again, under the head Barley, is given an account of an experiment, with only 5 bushels of salt per acre,\* put on more than 12 months previously, in which the crop of 1819 was so greatly benefited, as to shew its durable power in a very conclusive manner, and the small quantity of salt carried out in farm manure, from the urine of the cattle, and esteemed so valuable, is equally subject to injury from the rains.

It is a common and natural question with the farmer, how can salt destroy weeds, and at the same time, not destroy the corn, but do it service? This question arises, from it not being remembered, that the salt finds the weeds and corn under entirely different circumstances; when it comes in contact with the weeds, it finds them in a wounded, half destroyed state, torn and buried by the plough; or it finds them in small weak seeds, just sprouting, at which time it is found, that the same quantity of salt will then destroy those weeds, which when in a sound and healthy state, would only stimulate them to a more vigorous growth; and the tender seeds, of the most common weeds, may not endure, what the corn plant can support, but be destroyed, as were the small seeds of the turnip, on Mr. Butler's farm, (see p. 41;) besides, the field is either prepared for the corn, by well mixing the salt, with the soil, previous to the seed being sown, or the salt is put on, after the seed has been harrowed in. In either case, what does the salt find? not the corn plant wounded and disposed to perish, but the root and plant in full vigour, putting forth its shoots in great strength; and supposing the salt, in the first instance, not to be too

\* See p. 36. The exact difference of produce, from using but 5 bushels of salt, has been ascertained to be 14 bushels of barley per acre.

strong for it, that is, not to destroy it, we find, that it will delay vegetating, until the salt is dissolved away: that the plant is possessed of this elective power, has been clearly shown by the experiments of M. Saussure, which have been stated at p. 11. And it has lately been related to me, by a neighbouring farmer, that on trial of salt to wheat, this present season, sown the same day, on salted and unsalted land, in the same field, adjoining each other, that in the salted land it did not appear, till a fortnight after the unsalted wheat. Does not this clearly shew, the elective power of the plant, and the harmless nature of the salt, when used in a correct manner?

It has been stated by some writers, as a necessary caution, in using so powerful a manure as salt, that the quantity, directed by the Cheshire farmers, to be used per acre, must be considered, not as pure salt, but as refuse, containing not more than one half of pure salt; but from various evidence, this caution does not appear to be correct. Dr. Paris clearly states, in his evidence before the Committee of the House of Commons, "that he has witnessed in Cornwall great advantage from 30 bushels of *clear* salt, used with the seed, per acre;" and Mr. Hollinshead, of Lancashire, in his directions for its application to pasture lands, states, "it may be sown in its *simple neat* state, 16 bushels to the acre, or mixed with compost;" and I have witnessed the trials, with 30 bushels of clean salt per acre, both to wheat and potatoes, with great advantage to both of them.

As the farmer, when proving a new manure, may often be impatient, and be led ultimately, not to measure the comparative produce of his experimental crops, if he fails to discover some material difference in its appearance when growing; it cannot be too much impressed on his

attention, that he must not neglect an exact comparative examination on such account, as we are instructed by a writer, in the *Practical Husbandman*, (see p. 31,) that “salt does not add altogether to the *bulk and height* of the straw, yet it does much to the goodness and plumpness of the grain;” and I have myself, almost daily passed by a wheat crop, carefully and anxiously noticing its exact progress through the year, and could not discern at any period of its growth, or even when in the ear, any perfectly satisfactory difference from the adjoining unsalted corn, although when weighed, its increased produce was nearly 6 bushels per acre.

As it is indisputably established, that salt will accelerate the putrefaction of manures, the farmer cannot attend to a more important subject, than to ascertain the difference of produce on the various soils he occupies, from putting on 20 loads of manure alone per acre, compared with the effect from 10 loads of manure, and 6 or 8 bushels of salt put on after it has been spread or ploughed in; for if he should find that, the second plan was most productive, of which there cannot be a reasonable doubt, how important would this advantage be to him, when enabled to extend his farm manure, over twice the number of acres, he had before accomplished, by so trifling a charge and trouble. And it will be allowed to be an important consideration to ascertain, not only, how little farm manure will be most proper, but also, how small a quantity of salt will be sufficient to be put on annually, and to this examination we are directed by various trials with a few bushels of salt, which have been stated; and we learn by a report from the *Workington Agricultural Society*, of which Mr. Curwen is President, and which was stated in the *Farmer's Journal* of Aug. 16, 1819,

that on trial of 14 different composts, sown with turnip seed, salt and earth were found, not only to exceed farm manure and earth, although those with the farm manure for some time promised best, but it was remarked, that where least salt was used, the beneficial effect was greatest.

As the introduction of salt for agricultural purposes, as a manure, and with the food of farming stock, may be considered a new subject, in consequence of the heavy tax on salt having impeded its introduction for such purposes in this country; new instruction will continually arise, now that the public attention is so greatly influenced throughout the kingdom, to so important a subject; and when its great value for agricultural purposes shall have introduced it to more general use, a very great reduction, or a commutation of the duties on salt, may be reasonably expected, and full liberty granted, for a more convenient and cheaper supply to the farmer. As a Committee of the House of Commons, on the Salt Laws, of which Mr. Vansittart was chairman, were so satisfied of the impropriety of a tax on salt, as to state in their report to the House, which was made so long since as the 30th of June, 1801, that a commutation of the salt duties would be highly beneficial, to the agriculture, fisheries, trade, and manufactures; and productive of many great and important advantages, to all descriptions of persons, in this kingdom.

## Appendix.

As it may afford assistance to the agriculturist, I have drawn up the following table of directions, as the nearest rules for adoption, under our present imperfect state of information; and which I hope greatly to improve, should a second edition of my humble labours be published.

For *FALLOWS*, 15 to 40 bushels, according to soil and state of land. Vide p. 26.

For *WHEAT AND RYE*, 5 to 20 bushels per acre, put on after the seed has been harrowed in, the earlier the better, but may be done until March.

For *BARLEY, OATS, PEAS, AND BEANS*, 5 to 16 bushels per acre; for these crops it has been found beneficial, in the West of England, to put it on after the seed has been harrowed in; but in counties less frequented by rain, it would be more advantageous to put it on in January or February.

For *TURNIPS* and all *GREEN CROPS*, 5 to 15 bushels per acre, put on in January or February, as it cannot be too well mixed with the soil, and will meet the insects in their weakest state.

For *MEADOWS* or other *GRASS*, 10 to 15 bushels per acre, in the autumn, and ought not to be delayed later than November, but may be put on without injury until February.

For *POTATOES*, 10 to 20 bushels per acre, to be put on in January or February, if no other manure be used; but if a light dressing of manure should be intended, at the time of planting, then to spread a part of the quantity of salt mentioned, after the plants have been covered in.

For *HOPS*, 15 to 20 bushels per acre, in November or December.

All the above directions are for the first year's manuring with salt; afterwards, it is stated by Mr. Hollinshead and others, that an annual application of a much less quantity, will always keep the land in a state of the greatest fertility.

The End.







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