ia

Digitized by the Internet Archive
in 2007 with funding from
Microsoft Corporation

THE
Extensive Practice
OF THE
NEW HUSBANDRY,
EXEMPLIFIED
ON DIFFERENT SORTS OF LAND, FOR A
COURSE OF YEARS;

IN WHICH
THE VARIOUS METHODS
OF
PLOUGHING, HOEING, HARROWING,
AND MANUREING;

AND EVERY OTHER PROCESS IN
AGRICULTURE,

RECOMMENDED BY

MR. TULL, SIR DIGBY LEGARD, MR. DUFF, MR. RANDALL,
OF YORK; ARTHUR YOUNG, ESQ; AND
THE COMPLETE FARMER, ETC. ARE
CONSIDERED AND EXAMINED.

TO WHICH IS ADDED

AN APPENDIX,

CONTAINING

PARTICULAR DIRECTIONS FOR PRACTISING HUSBANDRY IN THE
BEST MANNER, AND WHERE THE DRILL-PLOUGH
MAY BE HAD THAT IS USED IN IT.

THE SECOND EDITION.

BY MR. FORBES.

L O N D O N:

PRINTED FOR W. TAYLER, N^o 5, WARWICK-COURT,
WARWICK-LANE, 1786.

[PRICE FIVE SHILLINGS IN BOARDS.]

2-1-46

S495

F74e

1786

[1]

ENGLISH HUSBANDRY.

Agric Dept.
ALL who practise the *New Husbandry*, exemplified in the following Treatise, or who incline to make a candid Trial of it, may now be supplied with A DRILL PLOW accurately constructed on the Principles improved by the latest Experience of the celebrated Mr. TULL.

By this Plow, all Seeds, from *Beans* to *Turneps* and *Lucerne*, may now be properly delivered in Rows of any Distance, with regularity and dispatch.

And the Instrument can at last be obtained at an unparalleled and unexpected *low Price*, occasioned by the ingenious Construction of it By Mr. JOSEPH TYLER, Cabinet-maker, at N^o 54, in Wardour-street, Soho.

* 2

493302
AGRICULTURE

T H E
E D I T O R
T O T H E
R E A D E R.

THE publication of this little treatise has been delayed till now, by the death of its author Mr. Forbes.

The work was printed off under his inspection; and the following pages, that precede it, were prepared for the press by him.

The reader will perceive that the intention of this publication was to extend the practice of the celebrated Mr Tull's Horse-hoeing Husbandry, according to the genuine method of that gentleman, upon his latest improvement of it.

To obtain this end, Mr. Forbes had also prepared for the press an accurate edition of Mr. Tull's Essay, containing the final rules he drew from the whole course of his experience, and his many valuable remarks, that lie almost smothered in the polemical appendixes, &c. to which Mr. Tull was provoked by those literary vermin, that are as injurious to the agriculture of England, as the fly is to our turnips. And this work will not be lost to the public, should a charitable disposition, to a poor widow and distressed family, sufficiently prevail among the friends to rational agriculture.

What

What is said in the following advertisement of the instruments necessary to this method of Husbandry, was in great forwardness when Mr. Forbes died; and may be yet carried into execution, if, from application to the publisher, there should appear to be any demand for them. And in such case, every possible method shall be taken to insure justice to be done to the purchasers.

The last part of the advertisement will not indeed be so easily supplied. Mr. Forbes was a gentleman of much experience and skill in this Husbandry; he was an unconceited man of integrity; and was actuated by no bye-views that could interfere with his earnest desire to promote this English method of agriculture, which, after long practice, checked by sound theory, he found to be the best.

Whether any person, equally to be relied upon, can be found to do the good service to our Husbandry that Mr. Forbes proposed, must be left to time to discover. But the public may be assured, that no other will be presented to them in any connection with the Editor of the present work.

T O T H E
R I G H T H O N O U R A B L E
T H E
E A R L O F M A R C H M O N T,

T H I S
T R E A T I S E
O N T H E N E W
H U S B A N D R Y

I S, W I T H G R E A T R E S P E C T, I N S C R I B E D

B Y H I S L O R D S H I P ' S

M O S T O B E D I E N T S E R V A N T,

T H E A U T H O R.

THE NATIONAL

AND

THE NATIONAL

THE

THE NATIONAL

THE NATIONAL

THE NATIONAL

THE NATIONAL

THE NATIONAL

THE NATIONAL

THE NATIONAL

INTRODUCTION.

SOME late Writers on Agriculture having raised objections to the New Husbandry; it was thought necessary, and the most agreeable method, to satisfy the publick of the great utility of this Husbandry, to produce from authors of credit their extensive experience and successful practice of this culture for a long series of years; which it is presumed will fully prove, that its principles are founded in nature, and that the general practice thereof will be a national benefit.

ABSTRACT

A B S T R A C T
O F
T H E , C O N T E N T S .

THE different methods of cultivating land in the Old and New Husbandry for corn.—The food of plants; different opinions concerning it. Plants receive it principally by their roots, and from the earth; but common earth is not that food; it is communicated to the earth from the atmosphere, in proportion to the quality of the soil.—The first hints of the New Husbandry taken from the Vineyards in Languedoc, by Mr. Tull, the first inventor of the drill-plough, and new system of vegetation.—His success in the culture of wheat upon ordinary land, without manure, for thirteen years, by means of
deep

deep hoeing. The causes of this effect.—Not necessary for farmers to know the nature of the vegetable food ; but very useful for them to know, that it is derived from the atmosphere.—The different methods of hoeing, and the instruments adapted to each described.—Hoeing with a plough superior to all others, and the reasons.—Objections to this husbandry considered and answered ; particularly those made by Mr. Harrison, and the author of the Farmer's Kalendar.—The use of manure in the Old Husbandry admitted, and to many hoed crops ; but not necessary for wheat and other corn, proved from Mr. Tull's success, and from the success of several eminent cultivators in Britain, who have practised this husbandry extensively, and upon various sorts of land, from eight or nine to near thirty years.—The profit of this beyond the Common Husbandry shewn.—Dung and manures of great use, when applied properly ; otherwise very prejudicial to the farmer. A striking instance of this given.—Land well horse-hoed

hoed requires no rest. Greater crops of turnips obtained thereby, than by hand-hoeing, shewn by an accurate comparison.—The Alternate Husbandry described, and shewn to be much inferior to the New Husbandry, with respect to profit.—The Hoeing Husbandry of universal use, applicable to plants in general, and in all climates, exemplified in the culture of the sugar-cane; may be practised to great advantage, where little or no manure can be had, either on light land, or very strong land, of difficult culture in the Old Husbandry.—The superior advantages of the New Husbandry, in several respects, to the farmer, and to the publick.—Other examples given of the comparative advantages of the Old and New Husbandry; and the New proved to be the most profitable, from a series of crops of eight years continuance; and the New shewn to be the least expensive.—The New proved to be the most advantageous, from a comparison with the most improved culture in the Old Husbandry in Suffolk,

folk, near Scarborough, and in Switzerland. Some mistakes in the practise or the New, in England, pointed out; and remarkably in Ireland.—A very late and valuable author, a favourer of the New Husbandry. Some observations upon his method, and the instruments he recommends, with improvements.—Many remarkable experiments made in France and Italy, which confirm the principles of the New Husbandry; but, throughout this essay, are fully proved by practical examples in Britain, from persons of undoubted credit and character, of very extensive practise on various sorts of land, and for a course of years.—And the objections of some modern authors, answered; and shewn to be erroneous and inconclusive.

ADVERTISEMENT.

WHEREAS many persons, desiring to practise the *New Husbandry*, have been discouraged from attempting it, for want of the proper instruments; the author of this treatise hath undertaken to furnish the instruments for that Husbandry, upon an improved construction, and at the lowest prices; and, to prevent imposition, all that are genuine will be stamped with his name; and a note, signed by him, will be sent with such instruments only as shall have been examined and approved of by him. As soon as the first of these instruments is ready (which will be in a few weeks), public notice thereof will be given in the *Daily Advertiser*, and in the *St. James's Chronicle*.

If the purchasers of these instruments shall find any difficulty in using them, or of practising the *New Husbandry* in any other respect, and please to communicate the same by letter, with their
address

xvi A D V E R T I S E M E N T.

addresses, to the publisher hereof, the author will answer their letters, endeavour to explain the difficulties that may arise, and, for the benefit of the public, will publish the same *occasionally*, together with such valuable and authentic experiments in Agriculture, as his correspondents shall favour him with, as soon as they amount to a small volume.

Sept. 11, 1777.

FRANCIS FORBES.

OF THE NEW HUSBANDRY,

AND

The IMPORTANCE of it to BRITAIN.

THE New Husbandry is an improvement of the Old: but the tillage is performed in a different manner, and at different times.

In the Old Husbandry, the tillage, *viz.* the ploughing and harrowing, is done first: the ploughing, to open the land; and the harrowing, to make it fine, and get out the weeds. Dung, or other manure, is then spread upon the land, which is ploughed-in; and then the seed, as of wheat, or other corn, is sown by hand, broad-cast, which is covered by the plough or harrow. Nothing more is usually done till harvest, except weeding, when the weeds are grown up pretty large. Dung promotes the growth of weeds; and though many

of the large weeds are pulled up, the others remain, run to seed, and fill the land with weeds; and these, together with those that were pulled up, and a large quantity of seed-corn, very much impoverish the land. To support these, and keep the soil open for the roots to spread in it, dung is added to the tillage: but, as the land receives no more tillage while the crop is growing, from seed-time to harvest, which for wheat is from September to August, or about ten months, and more in very light land, the land during that time becomes stale and hard, particularly strong land; for the tillage, to open the land, makes it lighter and more porous than it was naturally; but no sooner is the tillage finished, than the earth begins to settle and subside, and continues to do so till it recovers its natural specific gravity, and it then becomes as close and consolidated as it was before any tillage was bestowed upon it. This gradually confines the tender roots of the plants, so that they cannot spread and extend so much as in open and porous ground; and by this means many of the plants have not sufficient nourishment; many of them are thereby stunted, and not a few are starved, and die; as is plainly seen in all crops of wheat sown broad-cast, with a large proportion of seed.

These inconveniencies are prevented by the New Husbandry. The land is made very clean from weeds at first, by planting single rows

rows of large plants, upon ridges, between four and five feet broad, as of turnips, beans, &c. These are horse-hoed alternately, by ploughing away the earth from the rows of plants, first from one side; and after returning the earth to the row, plough the earth away from the other side, and thus alternately; allowing a proper space of time between each hoeing, *viz.* till the weeds begin to grow, and so as never to suffer the earth of the intervals to grow hard or stale, and always to hoe when the earth is dry, and will break and crumble into small parts, called pulverizing. These hoeings, being repeated, will destroy the weeds in the intervals; and the weeds next to and in the rows are likewise eradicated, by pulling them down with a hand hoe, and weeding the rows by hand. In this manner the land may be made clean; and till it is so, these crops of turnips or beans should be repeated, which will be no loss to the owner: for they will not only pay all expences, but will also produce a clear profit; and are therefore preferable to fallowing, unless the land is uncommonly foul.

The land, being thus made clean, will also be in fine tilth; so that once ploughing it will be sufficient to form new ridges, of about four feet nine inches wide, upon the former intervals, and then the middle of the ridges will consist of fine tilled mould, upon which two rows of wheat are to be drilled, nearly

two inches deep, with about three pecks of seed to the acre. This is the largest quantity usually drilled; and the smallest quantity about two pecks to an acre, when sown early and in very good land. In this method land is drilled with wheat to be horse-hoed, the partitions to be hand-hoed, and the rows to be hand-weeded; that the land may be kept clean, and no weeds suffered to run to seed, or to grow large, which should be carefully prevented. The land thus cultivated will be kept clean; nor can it grow hard and stale, as in the Old Husbandry; for it is to be repeatedly hoed in the intervals with the hoe-plough, and the partition between the double rows, which are ten inches asunder, are hoed and kept clean with the hand-hoe; by these operations, the land is kept loose and open, and in an high state of pulverization, all the time the crop is growing; which so encourages the plants to spread their roots; to form new ones, and furnishes them with such abundant nourishment, that they tiller or branch greatly; produce larger ears and fuller grain than one commonly produced from wheat sown broad cast with three times the quantity of seed; and, what is of great value, the hoed wheat crops, if the hoeing is well performed, require no dung or other manure; which is not only a saving of the principal expence of broad-cast wheat, but also enables the owner to conquer the weeds, as none are brought

brought to seed wheat among dung or other manure.

It is found by experience that the deep or horse-hoeing enriches the land, not only to produce a single crop of wheat (which is all that is commonly obtained of sown wheat); but to so great a degree, that a second third, and a succession of wheat crops, are obtained by this culture, for as many years successively upon the same land, as the owner thinks proper to cultivate it in this manner by the hoe-plough, and that without manure. This is an uncommon circumstance; for constant successive crops of wheat cannot be obtained in the common husbandry, even with the assistance of manure; nor is it usual for farmers to sow land with wheat even two years successively, though manured.

Land is impoverished, in some degree, by every crop taken from it, whether of wheat or other corn; which all farmers allow, and are sensible of, and they endeavour to restore the land, and recover its lost fertility, by tillage, fallowing, and manure. They do not apprehend that tillage and fallowing alone will recover it, and here no manure is used; whence then is the land recruited with vegetable nourishment, as in this case, that it is able to bear crops of wheat, year after year? And this not only without being impoverished; but, on the contrary, land of moderate fertility is found to become more fer-

tile by this tillage, well performed, though it bears a crop every year. This is totally different from the effects of the common Husbandry; though the land in that Husbandry has the assistance of manure, and the hoed wheat crops have no such assistance. This recruiting of the soil is not the consequence of tillage and hoeing; these do indeed break, divide, and pulverize the soil; but breaking, dividing, and pulverizing, are mere mechanical operations; they add no new matter to the land, and are therefore so far of themselves from enriching land, that they only prepare it for the roots of plants to run and extend in it the more freely, which, instead of enriching the land, only prepares it to be more readily exhausted of its fertility, for the more pabulum, or the more nutritious aliment, the roots draw from the land, the poorer the land becomes, and the less stock of nourishment is left in it, to support the next crop. Tillage therefore, ploughing, harrowing, and hoeing, add nothing to the fertility of land; they only prepare and open the land, for the roots to run, extend, and multiply in it; this helps to nourish the plants, yet does not add to the fertility of the land, but only prepares it to be the more quickly exhausted of the vegetable nourishment.

I have insisted upon this the more particularly, because farmers do not usually attribute
their

their land recovering its fertility to any thing but dung and manure; and those late authors, who mean to decry the New Husbandry, do not appear to comprehend the true practice of it, nor the principles upon which it is founded; as we shall have occasion to shew, and to prove that its principles are founded in nature.

The operations of nature are not the objects of our senses; they are too abstruse and subtle to be discovered by us: for which reason, we know not certainly what is the vegetable food, or that matter which intimately joins, and unites with, the substance of plants, and whereby they are enlarged and nourished. Several learned and ingenious men have endeavoured to discover this, but hitherto without success; and they differ much in opinion. So that, if this were necessary to be known, it does not appear that farmers, or any cultivators of land, could attain to any certain principles of vegetation: and, what is still of further importance, we are not certain whether the knowledge of the food of plants would enable us to derive any practical advantages from it.

It appears from experiments, that the leaves of plants imbibe air and moisture; and with these, other kinds of matter; but the principal source of the vegetable food is universally allowed to be derived from the earth, whence plants receive their nourishment

chiefly by means of their roots, and principally by their fibrous or small roots; for they are seen, by good microscopes, to be spongy or porous on their surface. The vegetable food enters at these pores, and, by a wonderful mechanism, is thence conveyed to the several parts of the plant.

If the earth were dense and solid, the roots of plants could not penetrate into it, to collect nourishment: but all earth consists of parts of various sizes, from stones and gravel, to fine sand and an impalpable powder. This is seen by dissolving earth in water, in a tall glass; wherein the earth, when broken, mixed and dissolved in water, will settle, the largest and weightiest parts descending first, and the rest in order, according to their several respective gravities; the finest and lightest parts subsiding last of all, and settling at top. This substance that settles at top is very visible in gross; but the parts of it next the top are so exceedingly minute, that their figure and consistence cannot be distinguished by the naked eye, and the finest of them not even by the assistance of the greatest magnifiers. It is easy to obtain this finest part, by taking it off the top of the glass; or it may be obtained separate, by washing over, in the manner performed by colourmen.

All sorts of land have in them some of this fine matter in different proportions. Gravelly soils have but little of it; sandy soils have
more

more (except sheer, sharp sands, which contain none of it, or very little): but rich loams, and rich clays, contain the largest proportion. This matter, so far as it can be traced by the eye or microscopes, appears to be sand, and probably it is all sand; for such of it as is too fine to be denominated so with certainty, has the same colour and appearance as that part of it that is seen to be sand. There are other means of discovering the nature and qualities of the finest part of this matter: and it is recommended to the curious to examine it further.

The surface of small bodies is larger than the surface of bodies that are greater, in proportion to their respective solidities; and when the surfaces of the smaller bodies are joined, they touch in more points than the larger, and therefore cohere more strongly. Hence clayey soils have a stronger cohesion than loams whose parts are larger; and, for the same reason, loams cohere more strongly than sands or gravels. Pure clays, having neither stones nor coarse sand in them, cohere very strongly, are of difficult tillage, and require great strength of cattle; whereas sands having larger parts, and touching in few points, are loose and easily tilled; some of them tilled as easily by one horse as strong clays are by three or four. A loam that consists of a just proportion of large and small parts,

parts, is flexible, suitable to all sorts of plants, and profitable to cultivate.

The roots of plants are of different degrees of strength. Beans and oats penetrate into close strong land, better than barley; and tap-rooted plants push their tap-roots deep in the ground; but their lateral or side roots, as of carrots, are slender and weak; yet are the carrots or tap-roots nourished by the weak lateral roots; for when the weak lateral roots are able to penetrate and extend, as in light sandy soils, the tap-roots also grow strong and penetrate deep into the ground; but in strong soils, where the lateral roots are confined by the hard, close earth, and they cannot collect much nourishment, the tap-roots also suffer, and are unable to penetrate deep into the ground. If carrots are in strong land, their lateral roots cannot extend and collect nourishment for the plant, which then declines; but if the strong land is lightened, and kept open by good hoeing, not only the weak, lateral roots are at liberty to range for food, but the carrots, or tap-roots, are thereby so much strengthened, that they penetrate into the earth below, even though it remains hard, and deeper than it is opened by the plough.

It appears, in this and in many other cases, that plants receive their nourishment principally by means of their fibrous or small roots; but whence are the roots supplied with this nourish-

nourishment? Many farmers and others think, that the earth is recruited of the vegetable nourishment by manures: but what recruits the land that is not manured, and yet continues to bear annual crops of wheat; and not only wheat, but all other horse-hoed crops; as of barley, or other corn; and that may be had every year successively, without manure? Annual crops of pease, beans, tares, and other plants may be continued without manure; and so large plants, as vines are thus cultivated, and annually produce large quantities of grapes, without any manure at all: the low vineyards in France and Italy, which produce the best wines, are not manured, nor have any other assistance but the hoeings given by the plough. This is therefore the great point to be considered, the discovery of which will explain the true system of vegetation, and the principal foundation of the New Husbandry.

Some have supposed, that roots feed upon the fine particles of earth: but this cannot be admitted; for by much the greater part of land consists of stones, gravel, and sand; which are all too gross and solid to nourish plants, or to enter the extremely minute pores of roots: or, if plants could be nourished by fine earth, the proportion of it is so small, in most sorts of land, that if a quantity of it, sufficient to nourish the plants, was carried off by every crop of corn and weeds, they would carry off such large quantities, and carrots, parsnips, cabbages, potatoes, and other large plants,

plants, so many tons every year, that the richest land would be soon exhausted of all its fine parts, and, if carried away by the crops, could never be recruited again, but the land would be exhausted of all its fertile parts, and would remain for ever after emaciated and totally barren; which is contrary to experience; for the lands that were noted for their fertility and depth one or two centuries ago are known to continue the same to this day; they have still the same depth of staple, and the same remarkable fertility, that they had in former times; whereas, had every crop for a series of ages, or only for one or two centuries, carried off part of their fertile earth, they must long ago have been totally exhausted of their fertility. We must therefore endeavour to discover elsewhere the genuine source of the vegetable nourishment, by which such weighty crops are obtained every year, without diminishing the soil.

The earth is surrounded by a fluid body, commonly called the air, but more properly the atmosphere, which consists of all kinds of matter, of air, water, salts, oil, fire, and earths of every kind; for all the volatile parts that arise from the sea, from lakes, rivers, and other waters, or moist places; all the exhalations from the earth, from hills, vallies, caverns, mines, or other dry places that are lighter than air, ascend into it, float, and mix there: the perspiration likewise from

trees

trees and all plants, from living animal bodies, and those in a state of putrefaction or dissolution by fire or other agents; all these, and every kind of volatile matter lighter than air, ascend into it, and compose that fluid body called the atmosphere. In this body are contained the most active parts of matter, and the principles, or elements, of all natural bodies. This fluid body surrounds the earth's surface, and, being constantly in contact with the earth, must have very great influence upon it; and in fact we see it has so; for heat and cold, drought and moisture, dews or rain, snow and frost, do all proceed from the sun and atmosphere; they direct the seasons and temperature of the air and earth, and are the great causes of its fertility, or of its barrenness.

Rain and dews contain the vegetable nourishment in considerable quantities; and it is by them introduced and deposited in the soil. If the soil be loose and porous, they introduce it to a considerable depth, as in light sandy land; but stiff loams and clays being much more close and compact, the rain and dews do not easily penetrate into them, or but to a small depth; for which reason, such close lands are enriched by them near the surface only.

This is seen in land that has lain some time at rest, whereof the surface, called the staple, is of a somewhat darker colour, and richer than

than the earth that lies deeper; for which reason, gardeners, when making composts, chuse for that purpose, the surface of commons or pastures, which they find to be the richest part of these soils. The dark colour of the staple is from the influence of the atmosphere, to which the surface of the land is most exposed, and is always richer than the earth below; even though the lower earth be naturally of the same, or of a better quality than the staple. But if this under-earth is brought up to the surface, and exposed to the atmosphere, it will in time be impregnated by the atmosphere, and become as rich as the staple. It will, however, require time to become as rich as the staple, more or less, as it is more or less strong or light, and pervious to the atmosphere; for, as before observed, strong, close earth is not so easily penetrated, by the rains, dews, and other influences of the atmosphere; nor do they go so deep in them, nor in so short a time, as they do in lighter soils, that are more open, and more easily penetrated by the dews, rain, heat and cold, drought and moisture, of the atmosphere.

Hence it appears, that the richness of land does not consist in the nature and qualities of the soil itself, but in something extraneous that adheres to it, that is communicated to it by the atmosphere, and that it may be divested of by the roots of plants; for it seems

to adhere closely to the particles of the soil, and is not easily separated from them by any other means than by the roots of plants: all land enriched by the atmosphere continues so, in different states; if laid down to pasture in a rich state, it will be found rich, when broken up for arable, years afterwards: but, after it is broken up, it is soon impoverished by a few crops taken from it; unless care is taken, that it be at the same time recruited with new vegetable food.

That the vegetable food is something distinct from the earth, not natural to it, but adventitious, is derived elsewhere, and capable of adhering to it, or of being detached from it, in a greater or less degree, has been observed by some husbandmen, whereof we have a remarkable instance in Mr. Lisle's Husbandry; who, speaking of the fertility of land being abated by cropping it, says, that this is perceivable by the colour and appearance of the land. "For," says he, "this vegetable
 "balsam, though so difficult to say wherein
 "it consists, yet, it may be averred, is as easily
 "seen as understood: for, though almost as
 "subtle as a phantom, yet its marks are
 "clearly discovered by the diligent husband-
 "man, conversant about arable land. We
 "can easily perceive, by the different colour
 "of our land (as it turns up under the
 "plough), whether it has borne one, two,
 "three, or four crops; and how, in propor-
 "tion,

“tion, the virtue is gone out of it. And as
 “sensible are we, by its rest, and lying to
 “pasture, how, with its vigour, it renews also
 “its colour. We do not better see and know
 “when the plumb or grape is covered with,
 “or has lost, its bloomy hue, than we know
 “by the colour the fertility of our soil:
 “which colour arises from the principles be-
 “fore intimated, of dung, air, fire, earth,
 “&c. mingled together; which, by often
 “sowing, are absorbed into the corn in too
 “liberal a manner, to be renewed by a daily
 “recruit from those elements.”

This observation of Mr. Lisle's is agreeable
 to what is said above; that the fertility of
 land is not any thing permanent in it, but is
 fluctuating, subject to be carried away by the
 crops, and restored to it again by the atmo-
 sphere. Mr. Lisle attributes that partly to
 dung; but we shall shew hereafter, that
 these changes happen in land from the atmo-
 sphere only, and where no dung or other ma-
 nure is used.

It is further observable, that land is enriched
 by the atmosphere in proportion to the na-
 ture and quality of the finer parts of it: for
 all land is not equally enriched, though
 equally exposed to the atmosphere. The
 sheer, sharp sands, in many places, appear to
 be incapable of attracting or receiving the ve-
 getable food; for they continue barren for
 ages, though constantly exposed to the atmo-
 sphere,

sphere, as do also the shifting sands in Norfolk and other places: for no seed or plant will vegetate in these sands, nor in chalk, and some other calcareous earths, not even in those hills of chalk that have for ages lain exposed to the atmosphere, and though the chalk consists of exceeding fine parts.

The common method of preparing land for wheat is by fallowing and dressing it with dung or other manure, and, as before observed, after the seed is sown and harrowed in, nothing more is usually done to it till harvest, unless the land be foul; and then the wheat is weeded in the summer. The quantity of seed sown is from two and a half to about three bushels; the crop is uncertain; some years from thirty to forty bushels per acre, upon good land; and in others, not above half that quantity.

Another method of cultivating wheat was introduced by Mr. Tull; who, going abroad on account of his health, was some years in Italy and the south of France. He was a curious observer of their agriculture, particularly of the low vineyards in Languedoc. They plant their vines there in straight lines, about four feet distant, and frequently plough between them; which destroys the weeds, and keeps the land in tilth. With this culture the vines produced good crops annually, unless the tillage happened to be omitted; for then the vines languished, and produced but little

wood, discoloured leaves, and small bunches of poor stunted grapes : but soon after the tillage was renewed, the vines recovered, and yielded large clusters of grapes, and good crops, as they had done before. These vines are low, their heads just above ground, and their heads and roots being so near together, they found that dunging the vineyards in that hot climate, in order to obtain larger crops, gave the wine a bad taste ; and therefore the only culture they bestowed was tilling the land between them with the plough, a practice that had been continued there for ages ; and which the natives saw without making any reflections upon it : but Mr. Tull saw it in a different light, and as a law of nature, leading to a general system of vegetation, that was applicable in other countries, and upon other plants. He was a lover of agriculture, had before practised it upon a farm he had in Oxfordshire ; particularly upon sainfoin, which he had much improved : for the custom before that was to sow seven or eight bushels of seed upon an acre of land ; but he there invented a drill-plough, which sowed his land with one or two pecks of sainfoin seed ; and produced better crops than were commonly raised from eight bushels ; and with this drill-plough he likewise sowed wheat in equidistant rows, a foot asunder, and hand-hoed it ; and by this method, obtained better crops than common, and at a less expence. Some who appear desirous of depreciating Mr. Tull, have

have pretended, that he was not the first inventor of the drill-plough, and that it was first invented, some say in Spain, some in Germany, and some in England, and for this they quote the Spanish Sembrader, Mr. Worlidge's drill-plough, Platte's setting-sticks, and some others, all which were only proposals; and a method that seemed desirable to save seed: but there is no proof of any other instrument that really performed this at large in the fields; and what is of still more consequence, the great merit of Mr. Tull's husbandry does not consist in the drill-plough, though a very ingenious invention, but in the new method of culture introduced by him, as will plainly be shewn hereafter.

Having recovered his health, he returned to England, and settled upon a farm he had near Hungerford in Berkshire, called Prosperous Farm, where he began his horse-hoeing, or New Husbandry, upon turneps and potatoes; which succeeded so well, that he extended it to wheat, upon part of a field, which he made very clean from weeds, and drilled it with wheat; but finding, that ridges were preferable, he laid his land up into six feet ridges, and drilled two, three, or four rows upon each ridge, seven inches distant: so that between the rows of each ridge, there was a space or interval left, of about four feet, to be deep hoed with a plough, and the partitions between the rows were cultivated with the hand-hoe. This succeeded so well, that

he had good crops, some years four or five quarters upon an acre, from three pecks of seed, which was the greatest quantity he usually drilled upon an acre. The neighbouring farmers were surprized, to see such crops raised from so small a quantity of seed, and from only about a fifth or sixth part of the land sowed; and still more so, that the same land produced such crops every year, without fallow, rest, or manure: but as they did not understand the principles of this culture, few of them attempted it: they are in general averse to innovations in Husbandry, and were so particularly in this case, as it was so different from the Husbandry they had been accustomed to.

Mr. Tull however proceeded in this Husbandry, and extended his wheat crops gradually from a part of a field, to one hundred and twenty acres.

In the mean time, several noblemen and gentlemen came, and viewed these wheat crops; and being convinced, that extending this Husbandry would be very advantageous to the public, they persuaded Mr. Tull to publish his method of culture; which he at last complied with, and printed it, first a Specimen in 1731, and an Essay on the Horsehoeing Husbandry in the year 1733. He continued to cultivate wheat, in this manner, with success, for thirteen years; and in that time made several improvements in his method

thod of cultivating wheat; which, together with answers to the objections, which he understood had been made to his Husbandry, he published at different times, to the year 1739, which was about two years before his death: after which his Husbandry was very little practised in England. The farmers did not come into it; and being also disliked by the stewards and bailiffs of some noblemen and gentlemen, who had engaged in it, very few continued to practise it, after Mr. Tull's decease.

But his Essay, or Method of Husbandry, published in 1733, being translated into French, M. du Hamel, a curious gentleman in France, began to try experiments in this Husbandry; and he, and several of his correspondents, being much surprized at the effect of horse-hoeing wheat, they extended that culture to several other plants, which likewise succeeded; and their experiments fully confirm the principles of the New Husbandry. Mr. Du Hamel collected and published these experiments in French, and Mr. Mills translated them into English, which have induced many persons in Britain to try this Husbandry; and some of them have practised it extensively in the fields, and for many years. As I had opportunity of knowing some of these, and to be well informed of others, by corresponding with the persons who made them, I have in-

ferted some of them, which are very valuable, in the following pages.

Many, who had neglected to practise the New Husbandry from Mr. Tull's own success, were prevailed with to engage in it upon the recommendation of these foreign gentlemen; and it is now making considerable progress among farmers, in the culture of beans, pease, and cabbages, and in some measure of wheat; but not much in the way of horsehoeing wheat, which, though the most profitable, is more difficult to perform well, than it is to drill and hand-hoe it. But they have found little difficulty in applying the horse-hoeing culture to cabbages, particularly in the north of England; which indeed is so necessary to these plants, that, unless they are so cultivated, they would not answer to cultivate them at all, for feeding cattle.

To have a just notion of the benefits of hoeing, it should be observed, that land brought into fine tilth by the plough, as soon as the ploughing is finished, it begins to settle, and continues to do so, as we have observed, till it becomes as close and consolidated as it was before it was ploughed: by which means; many of the roots of plants growing in such ground are confined and unable to extend and spread in it, to collect nourishment for them. To prevent this in some measure, the land is dunged, and the dung, by fermenting in the soil, contributes to keep it open longer than it would

would continue so by the ploughing only ; but this is attended with an inconveniency to the wheat, which is so much forced by the dung, that it grows too luxuriant in its infancy, and occasions it to be rank, and apt to lodge ; but having no new supply of nourishment, it is then apt to be blighted, and produce a small crop of thin blighted corn.—Wheat is only a small grassy plant for five months, or more, after it is sown ; in all which time the earth is subsiding, and the virtue of the dung abating : so that afterwards, as the plants grow large, produce ears, and the corn advances to maturity, it stands in need of more nourishment than it did at first, but is in fact supplied with less ; the consequence of which is, that many of the plants die for want of proper nourishment, and the rest are dwarfed or stunted : for it may be seen, while it is in blossom, that the ears of Lammas wheat are formed by nature to produce each sixty, seventy, or more grains ; yet the largest ears of broad-cast Lammas wheat do not usually produce more than forty grains of wheat, and, at an average, not half that number ; as has been found, by examining a quantity of wheat in the ear before it was thrashed.

The New Husbandry for wheat differs from the Old in several respects : First, with respect to dung, of which none is used in the New Husbandry for that crop, but the earth

is not suffered to settle: for the ridges on which the wheat is drilled, are hoed before winter, as soon as the wheat has three or four blades, by ploughing a furrow from each side of the ridge, within two or three inches of the wheat, which remain so till the spring, till the wheat begins to spindle, and then the plough is run along in the same furrows that were made before winter; the plough now going deeper, and nearer to the rows of wheat, in order to plough away the earth hardened in the winter, that would now obstruct the roots of the wheat from extending in the intervals. The earth is then ploughed up in ridges, and this has a sudden and visible effect on the wheat; causing it to grow luxuriantly, and of a healthy dark-green colour. The wheat is likewise now hand-hoed between the rows, and the two narrow slips of earth on the outsides of the wheat, which were left there by the hoe-plough. In this situation the land remains, till the weeds begin to advance; and then the earth, in the intervals, is again ploughed up to the rows, and the hand-hoe made use of between them; the rows are likewise hand-weeded, if necessary. If the wheat stands fair, it is again hoed with the hoe-plough, to and from the rows; and if any earth remains in the furrow between the ridges, it is turned up to them with the hoe-plough at two furrows; or with a double-mold board-plough, which performs it at one furrow,

furrow, and leaves a clear, open trench between the ridges. Thus the wheat has in all at least six hoeings, and one of them should be when the wheat begins to blossom, and another should be done just after it has done blossoming: for by these hoeings, the wheat is made to blow strong, and to fill the grain with flour. All the hoeings should be performed when the earth is dry.—Mr. Tull directs so many hoeings, in his Book of Husbandry published in 1733, being then his practice; but afterwards he altered his ridges, making them narrower, and then found four horse-hoeings were sufficient.

He drilled his wheat for some years upon six-foot ridges, and three rows upon each ridge: but the hoe-plough coming near the two outside rows, they were improved so much more thereby, than the middle row was by hand-hoeing, that they were always remarkably more vigorous, taller, and fuller of corn, than the middle row. In order to make the middle row equal to each of the outside ones, he raised his ridges higher in the middle, whereby the middle row had a greater depth of mould to spread its roots in; and then it was equal to the others. But he suspected this was no advantage, and that the outside rows, being deprived of the earth that was added to the middle, the produce of them was lessened more than was gained by the middle rows, and upon trial he found it was
so;

so; which determined him to leave out the middle rows entirely, and to drill only two rows upon a ridge. He then reduced his ridges from six feet to four feet and eight or nine inches broad, and drilled two rows upon each ridge, ten inches distant. In this way, the intervals between the double rows, to be hand-hoed, were near four feet wide; which is the proper room for a hoe-plough. In this method, he had better crops than before, and recommends it as the best. And his servants being now experienced in managing the hoe-plough, he found, that four horse-hoeings were sufficient for a crop of wheat; especially as he could now hand-hoe the ten-inch partitions deeper than the former seven-inch ones.—After harvest, all the preparation necessary for a new crop is, to plough up the earth in ridges upon the former intervals; which is easily done, commonly at four furrows, or six at most. This is one whole ploughing, and the four horse-hoeings are equal to another ploughing, or two common ploughings in all to an acre of wheat.

have of the It may seem very extraordinary, that a good crop of wheat can be raised upon ordinary land by so small a quantity of tillage; and that good successive crops of wheat can be raised by tillage alone, without any dung or manure, and without fallowing, or rest: several circumstances concur to produce this effect, the principal of which are the following:

1. In

1. In common broad-cast sowing, the land is seldom made so clean from weeds as it ought; nor can a broad-cast crop be kept so clean as a hoed one; for which reason, the land sown broad-cast is much more exhausted of the vegetable food: weeds, being natives of the soil, grow vigorously, and rob the corn of much nourishment, especially such of them as run to seed; which the weeds in hoed crops are not suffered to do, nor ever to grow large, much less run to seed, where the hoeings and weedings in the New Husbandry are performed as they ought.

2. The land sown broad-cast is also exhausted by four or five times the number of wheat plants more than the drilled; upon one is sown ten or twelve pecks of seed, and on the other is drilled three pecks; or, on good land sown early, but two pecks: these supernumerary wheat plants, and many weeds, greatly impoverish the land, in the common Husbandry.—The land, it is true, is prepared by fallowing and manure; but, this being done before the seed is sown, much of the effect of them is spent upon the wheat, while the plants are young and small; but they have no fresh supply of nourishment when they grow large and want it most. This is an unfavourable circumstance to sown wheat, but the drilled is under a quite different management: for,

3. The

3. The drilled wheat, while young, requires only a small share of nourishment. It subsists then upon the vegetable food, remaining in the soil after harvest, with what it receives from the first horse-hoeing. This opens a furrow close to the rows of wheat in autumn, whereby they are kept dry in winter, which is of consequence to wheat. Ploughing the earth then from the rows, destroys the weeds in the intervals; and by turning and exposing a large new surface, to the influences of the atmosphere, the land receives a new stock of vegetable food. This is an important circumstance, and peculiar to the New Husbandry. The surface of the land at rest, as before observed, is made fertile, by exposure to the atmosphere; but land that is turned up by the plough, being open and in tilth, is much more easily penetrated by the atmosphere than hard, stale, land at rest; and is quickly impregnated with the vegetable aliment, in the winter, by rain and frost, and in spring and summer by the sun and dews (for well hoed-land is as fine as garden mould), which in the hot weather fall plentifully in the night, and are imbibed by the fine spongy soil, as deep as the plough goes, which is deeper than the sun exhales them in the day. Whether the dews are attracted to the finer parts of the soil, and communicated from thence to the roots, or whether the nutritious matter enters the earth, made porous

porous by the hoeings, and is absorbed immediately by the roots, may be doubtful; but certain it is, that the earth, by the hoeing and exposure, is greatly enriched, to such a degree, as to give sufficient nourishment to the wheat; for the repeated annual crops of it have no other supply of nourishment.

Thick sown wheat, that has the benefit of good tillage and manure, is apt to run too much to straw, and though it grows high, has frequently but small ears. Whereas wheat well hoed does not grow so tall, but tillers or branches much, from five to ten or fifteen stems rising from one grain, and from some to a greater number; the ears are also almost twice the length of sown wheat, and the grain much larger. The advantage of the New Husbandry over the old, does not however consist in the largeness of the crops of wheat (for they are frequently not greater nor so great as the sown crops), but in the expence; the expence of a hoed-crop being commonly no more than about an eighth, and sometimes no more than a tenth part of the expence of a sown crop, upon the same land.

I have been particular in describing the culture of wheat in the New Husbandry; not only because it is a valuable one to the farmer, but because it requires more skill to cultivate it well, than any other crop of corn. Mr. Tull took great pains to bring it to perfection.

perfection. And whoever can cultivate a crop of wheat well, in this Husbandry, will not find much difficulty in raising other crops.

The old Husbandry not being usually conducted upon scientific principles, and the New being founded upon them, has been made an objection to it; because the objectors suppose, that common farmers cannot understand the nature of the food of plants, and in what manner they are nourished by it: but those who make such objections do not seem to understand the New Husbandry, wherein it is not necessary for farmers to be acquainted with these philosophical points. The curious, it is true, have endeavoured to determine them; but the operations of nature, are not the objects of our senses, and are too abstruse to be discovered by the most acute philosophers, who differ in opinion concerning the vegetable food or aliment, and in what manner plants are nourished by it: but the principal points necessary to be known are, whence that food is derived, and by what means it may be obtained. These are intelligible to farmers; they may know, that the air or atmosphere has an influence upon the surface of land that is exposed to it; that the air, sun, rain, dews, and frost, enrich land; that the more earth is broken, opened, and exposed, to receive these, the richer it will be; and that the roots of plants will receive the

the

the more nourishment from it; particularly if the means of obtaining and communicating that nourishment to them, is continued during the time of their growth as it is found to be by hoeing, and more especially by deep or horse-hoeing: this will be obvious to every farmer: for these effects are extremely obvious to every practiser of this Husbandry, who gives his land due tillage, hoeing, and exposure. There are several methods of hoeing, performed by different instruments, and that have different effects. The first is the hand-hoeing, which is practised by all gardeners, and now known to most farmers. It is very useful to cut down weeds; but does not go deep in the ground; and for that reason the effect of it is but superficial; particularly the Dutch hoe, which cuts off the tops of the weeds very near the surface, and this hoeing is called scuffling.—2. The hoe drawn by horses, some of them intended only to kill the weeds, cutting the tops of them close to the surface, as the skim or skim of Kent; which is a hoe made of a plate of iron, the fore part of which is made sharp to cut the weeds. This and other plate hoes cut much in the same manner as the Dutch hoe; they scuffle the surface of the ground, but more expeditiously and cheaper, being drawn by a horse.—Some are made to go deeper in the ground, as the nidget; which has three triangular small hoes fixed in a frame: these go deeper in

in the ground than the shim, and serve to destroy the weeds and to break and pulverize the soil some inches deep ; and in that respect are more beneficial than the plate hoes.—Others are made to go deeper in the land, in the manner of harrow tines ; these pull out weeds, and stir the ground deeper than the nidget ; but do not kill the weeds so effectually as the plate hoes—One of the Gentlemen abroad, the very ingenious M. De Chateauvieux, who practised the New Husbandry, invented a long triangular hoe, larger than those in the nidget, which stirs the ground deeper, but goes wholly under ground, and raises the mould as it passes along ; and as soon as it has passed, the mould sinks down again, where it was before. This instrument he named the *Cultivator*.—These and other instruments, drawn by one or two horses, are by some called horse breaks, cultivators, and horse hoes. But the horse hoe is properly a plough ; and hoeing with a plough, is properly the New Husbandry, and should be so named to distinguish that husbandry from all other methods of tillage.

The instrument made use of for horse hoeing, is a plough, by some made with shafts, but this is not necessary. The swing plough, called the Rotheram, or patent plough ; or the common swing plough, made use of in Middlesex, Surry, and some other counties near London, are proper for horse hoeing. A small swing plough, without wheels, and having a notched

notched bridle, at the fore-end of the beam, to make the plough go more or less deep, and to give more or less land, viz. to cause the plough to go more or less to the right or left, is the instrument proper for horse-hoeing. This plough is familiar to ploughmen in several counties, (and the common swing-ploughs will do for this purpose, so as they are not too clumsy), and provided the earth-boards, &c. stand a few inches higher than common, is convenient in trench-hoeing, viz. when the plough is drawn twice in the same furrow, to make it deeper; for then a high earth- or mould-board turns all the earth fairly over to the right, and prevents any or most of it from running back towards the left side.—

The turning of the furrow exposes a new and double surface to the immediate action of the atmosphere: this is necessary, that these surfaces may receive the enriching influences thereof, the air, sun, dews, rain, &c. as deep as the hoe-plough goes; which, in trench-hoeing, is to the depth of two common furrows, and greatly enriches the land through the whole substance of it; the surface being changed at every horse-hoeing.—These advantages of depth and exposure are peculiar to this method of hoeing, which is properly the horse-hoeing, or New Husbandry; no other method of hoeing is of equal advantage to the crop, or to the land. They are only so

far beneficial, as they approach nearer to the horse-hoeing.

Another instrument made use of in the New Husbandry is, a double mould-board or earth-board plough, with which furrows between the ridges are deepened at last, and which clears the earth out of these furrows, throws it all up to the ridges, and leaves a clear, deep trench or furrow between the ridges; this it does at one draught or furrow, that would require two furrows of the hoe-plough. The earth-boards of this plough should be made pretty high, that they may throw all the earth up to the ridges on each side: and it would be convenient to make the two mould-boards moveable, to be set wider or narrower one from the other, because the ridges are not always equally distant; and, by means of the mould-boards being moveable, the earth may be thrown up higher or lower upon the ridges. This plough may have two small fins, one on each side of the share, and is useful in the Common Husbandry, to open furrows in level ground, into which beans or potatoes are to be dropped, and afterwards covered with a harrow or hand-hoe. These two ploughs being useful in the Common Husbandry, and not peculiar to the New, are not properly chargeable to the New alone.—The only instrument of consequence, peculiar to the New Husbandry, is the drill-plough, whereof Mr. Tull's is the best yet commonly used;

used; and is also cheap, if the seed-boxes are made of hard wood. A very short stone-roller, plain or fluted, is also sometimes very useful to be drawn along between the ridges in strong land, to break the clods there in very dry weather; which it will do very expeditiously, reduce them to powder, and make the earth fine, and in order to be turned up to the ridges. Such a roller may be drawn in a frame with shafts, by which it is drawn by one horse.

Though the New Husbandry promises many advantages to the judicious practisers of it, and to the public, it has not escaped the censures of the prejudiced; but it has been censured chiefly by those who were not practisers, or did not perfectly understand it. Of these I shall mention only a few late instances.

Mr. Harrison, author of the Farmer's Complete Guide, recommends the Old Husbandry in general, and condemns the New. He has borrowed a great deal from Mr. Young, who recommends it for beans, and gives the following example of it.—Three half-acres of the same land were sown with tick-beans, broad-cast, each with one bushel of beans; and one of these half-acres was twice hand-hoed. The other half-acre was laid up in five-foot ridges, drilled with three pecks of beans, three rows of seed, at a foot distance, upon each ridge. These had three hand-hoeings, and were four times horse-hoed.

	Bushels.	Pecks.
The broad-cast half-acre, not hoed, produced,	4	1
The half-acre, ditto, hand-hoed, produced	8	2
The half-acre, drilled and horse-hoed, produced	13	2

We have here an instance, that the New Husbandry is not generally known in England, even by curious farmers. Mr. Tull drilled six feet ridges with three rows of wheat; but upon narrower ridges he drilled but two rows, at ten inches distance. It was therefore very improper to drill three rows upon five ridges, of such large plants as beans. The two partitions between the rows, of one foot each, which was hand-hoed, took two feet breadth of the ridge, in the deepest part of it; and only three feet, viz. a foot and an half on each side of the ridge, remained to be horse-hoed, being the shallowest part of the ridge. The middle rows were not likely to receive much benefit by horse-hoeing such small quantities of earth on the shallow outsides of the ridges; and had little more assistance than what it received from hand-hoeing, which undoubtedly lessened the crop.—To have seen the full effect of horse-hoeing, there should not have been a middle row upon such narrow ridges. When Mr. Tull sowed three rows of wheat upon six-foot ridges, the middle rows were remarkably shorter and poorer than the outside rows, though the partitions

titions between the rows were but seven inches each, and the hoe-plough came five inches nearer to the middle rows of wheat on each of them, than it did to the middle rows of the beans ; which shews the impropriety of drilling three rows upon five-foot ridges.—Here Mr. Young adds, “ that, on a
 “ general survey of experiments, carried much
 “ further than the foregoing, it appears that
 “ the face of the matter is not altered, but
 “ still bears the same complexion, with re-
 “ gard to the different methods of sowing
 “ abovementioned. In a course of no less
 “ than nine experiments, the drilled beans
 “ have been found, after the payment of all
 “ expences, to be superior to the broad-cast
 “ by full two pounds and three shillings per
 “ acre, besides the difference of the land being
 “ left in so much better heart by the latter
 “ than the former. The superiority of the
 “ drill culture, as a preparation for wheat or
 “ barley, I do not think can be estimated at
 “ less than fifteen shillings per acre. Here is
 “ a superiority of near three pounds an acre,
 “ in favour of drilling. Is it not evident,
 “ that this, in a large piece of ground of clay
 “ or loam, will amount to some hundreds of
 “ pounds per annum ?”

Several other experiments are related by Mr. Harrison, also from Mr. Young, intended to shew, that in other crops, the Old Husbandry is much superior to the New. It would

be unfair to suppress the evidence arising from experiments, as they are our surest guides, in determining the merits of every mode of husbandry; and no person, who impartially enquires after truth, will decline to allow the full force of such evidence. But it is necessary that the experiments be related particularly, which is not done here, except in one instance of a comparative experiment of both sorts of husbandry, and continued for four years, viz. 1764 to 1767, both inclusive, which we shall consider.

The BROADCAST HUSBANDRY.

Expences.				Products.													
		l.	s.	d.			l.	s.	d.			l.	s.	d.			
1764	Turnips	2	17	0	28	Tons	1	11	4	Loss		1	6	4			
1765	Barley	2	5	11	33	Bushels	4	19	0	Profit		2	13	1			
1766	Clover	1	17	11	3	Tons	19	6	12	0	Profit		4	14	1		
1767	Wheat	2	11	10	20	Bushels	5	14	0	Profit		3	2	2			
		<hr/>					<hr/>					<hr/>					
			9	12	8				18	16	4				10	9	4
Average		2	8	2				4	14	1				2	12	1	

The HORSE-HOEING HUSBANDRY.

Expences.				Products.			
l. s. d.				l. s. d.			
1764	Fallow	}	5 13 2	26 Bushels	Profit	1	3 4
1765	Wheat			13 Bushels	Profit	0	3 5
1766	Wheat		3 14 7	13 Bushels	Profit	0	3 5
1767	Wheat		3 17 10	9 Bushels	Loss	1	3 10
			<hr/>			<hr/>	
			13 5 7	48 Bushels		0	2 11
Average			3 6 4	42 Bushels	Profit	0	0 8 ³ / ₄

It

It was formerly the general custom to fallow land, intended for wheat, every third or fourth year, and in many places it is so still: but of late years several farmers substitute a hoed-crop of turnips or beans, or a crop of clover, instead of a fallow; and by that means they get a crop in the fallow year, and save the expence of fallowing. This is a valuable improvement in the Old Husbandry; and with this improved Husbandry the horse-hoed wheat crops are here compared. In a comparison of two methods of Husbandry, the trial that is to determine the merit of each should be fair and equal, which here it is not; a crop of turnips, obtained the fallow year, is allowed by all to be profitable to the farmer; and, if so, should not the New Husbandry have that benefit as well as the Old? But instead of this, the Old Husbandry has here the advantage of a crop of turnips the first year, and the New Husbandry is charged with the expence of a fallow, or has no advantage that year. It is true, the crop of turnips is charged as a losing one, and would be really so to appearance some years, when the farmer is obliged to give the turnip-land two or three ploughings, harrowings, and seed, extraordinary, on account of the turnips being repeatedly destroyed by the fly: but in the years when that accident happens, and that the expence and rent exceed the value of the turnips, they are not even in such years unprofitable, be-

cause the repeated ploughings and harrowings for the turnips improves the land and following crops. We are not indeed informed of particulars, and from what circumstance it happened that this turnip-crop was a losing one; which should not have been omitted.

There is the same objection to the other articles, which, had they been related particularly, the reasons of the ill success of the New Husbandry would have been seen; for I shall produce several unexceptionable examples of the success of the New Husbandry, and the great profit of successive hoed crops of wheat, for many years, on large tracts of different sorts of land.

But even in the general manner, in which these horse-hoed crops of wheat are stated, it will be very apparent to those who understand the New Husbandry, that they were not cultivated in the proper manner, according to that Husbandry.—For here the expences of the second and third crops of wheat (wherein no fallow is concerned) one of them is charged at 3 l. 14 s. 7 d. and the other at 3 l. 17 s. 10 d. which are much beyond the real expence of horse-hoed wheat crops, whereof the tillage and seed is not above fourteen or fifteen shillings per acre, and of all expences, harvest-home, they do not commonly exceed seventeen shillings per acre. Now, if the rent of this land was so high as eighteen shillings per acre, and that was included in this charge, the
expence

expenſe might then amount to 1 l. 15 s. but this is not ſo much as is charged here by near two pound per acre. What then are we to think of this experiment, brought to determine the merit of the New Huſbandry; where, inſtead of about 1 l. 15 s. per acre, which is the higheſt expenſe it would really coſt, it is charged at 3 l. 14 s. 7 d.?

Another remarkable circumſtance in this experiment is, the decline of the drilled wheat crops; which the firſt year was twenty-fix, the ſecond thirteen, and the third but nine buſhels per acre. This, as will be ſhewn hereafter, is very different from the crops of the cultivators, experienced in this huſbandry, which are greater than the firſt of theſe, and do not decline as they did here; but, on the contrary, the laſt crops at the end of twenty years are as good, and frequently better, than at firſt: for this culture duly performed improves the land without manure, though it produces every year a good crop of wheat.—Probably theſe drilled wheat crops were managed no better than the bean crops above-mentioned were; three rows upon five-feet ridges, and horſe-hoed only four times: but there ſhould not be more than two rows of wheat upon each ridge, with a partition of about ten inches, and the ridges four feet eight or nine inches. Experience has proved four horſe-hoeings ſufficient to obtain good ſucceſſive crops from ordinary land thus laid out

out and cultivated. How this land was laid out and cultivated, we are not told, which should not have been omitted in the description of experiments that were to decide the merit of any mode of Husbandry.—When the experimenter found that the crop declined, he should have given the land five or six horse-hoeings, as the author of this Husbandry directs, which would have improved the land : and he should have bestowed some manure upon it, as a hand-dressing in the spring. But here it will be said, that the author disclaims the use of manure for the horse-hoed wheat ; which has often been said by those who are prejudiced against this Husbandry. But the fact is otherwise, the author directs some manure to be used for drilled wheat in such cases. As in the preface to his Husbandry, p. 4. “ There may,” says he, “ be such wet
 “ clayey land, which the plough cannot pul-
 “ verize without help of the ferment of dung.
 “ And in any sort of land, when it is sus-
 “ pected that the earth of the partitions was
 “ not well ordered in the summer, the best
 “ remedy is, to strew a small quantity of
 “ malt-dust, or other fine manure, upon the
 “ rows, about the month of February ; this
 “ will strengthen the plants, and enable them
 “ to send their roots into the interval the ear-
 “ lier in the spring.” This appears to have been wholly omitted ; and likewise to give the land any more than four horse-hoeings, though

four was the number given, when only two rows of wheat were drilled on each ridge; but, when three rows were drilled upon each, it was the author's practice to horse-hoe his wheat six times; and he directs, that wheat sown in that manner should be hoed so often, or in proportion to its poverty.—And therefore, instead of concluding with Mr. Harrison, p. 406, that this experiment is decisive in favour of the Old Husbandry; we may conclude with certainty, that it was not an experiment in the New Husbandry, but in a method different from it, in several essential circumstances: and therefore proves nothing, but the experimenter's ignorance of the New Husbandry.

We have seen, that Mr. Harrison acquiesced in the experiment upon beans (though badly performed), though in favour of the New Husbandry. If the principles upon which the culture of beans succeeded are right, why should not the same culture succeed when applied to wheat and other plants. He makes no reflection upon this; but, as others have done, proceeds to condemn the New Husbandry, though unacquainted with it, and without any experience of it: for it does not appear that he has made any trial of it himself.

It is observable in some modern writers of agriculture, who depretiate the New Husbandry, that they do not found their arguments
upon

upon their own experience, and a practice of that Husbandry for a series of years, and on any considerable extent of land of different sorts; which without doubt is necessary, to form a true judgement of the merit of any Husbandry; but being prejudiced against this, they are easily confirmed in their prejudices, and endeavour to persuade others, by referring to such small detached trials as are too superficial to convince any who are unprejudiced, especially in a matter of such consequence, that so greatly concerns the public. Very different from this was the conduct of the ingenious author of the New Husbandry; he discovered, in the culture of the vines, what the cultivators of them had not perceived for ages, but did not endeavour to support his opinion by small detached experiments; but, finding his ideas confirmed by trials upon turnips and potatoes, he began trying the same upon wheat; part of a field at first, and by degrees extended the same to great part of his farm, till he had annually from a hundred to one hundred and twenty acres of horse-hoed wheat; he applied the same culture to such other plants as suited his land, barley, pease, and sainfoin. He published his Husbandry at last, at the solicitation of many who saw his success; and he was a gentleman of such acknowledged probity, that those who were prejudiced against his Husbandry did not presume to question his veracity. It is therefore very
unfair

unfair of those who pretend to determine upon the merit of this Husbandry, that they take no notice of his extensive and successful practice of it for many years; but refer their readers to a few small trials, improperly conducted, and which prove nothing, but that the experimenters were unacquainted with the principles and the approved practice of this culture.

The same ignorance or inattention is observable, with regard to the experiments in this Husbandry made abroad by M. Duhamel and many of his ingenious correspondents; who, pursuing Mr. Tull's directions, found them succeed in a manner that much surprized them; and their experiments have long since been published in English. They succeeded remarkably in the culture of wheat, and other corn; also of lucerne, sainfoin, turnips, carrots, and other garden-plants, lettuce, asparagus, &c. of hemp likewise; and remarkably in the culture of vines, much beyond what they attained to from the method of culture for vines common in that country. Is it not therefore very extraordinary, that some inconclusive trial upon a few perches of wheat should be referred to as of consequence, and not the least notice taken of those extensive ones, upon such a variety of plants, whercof some only are here mentioned, and in general succeeded, as the experimenters declare, much beyond

beyond their expectations, though they expected much from the author's own success, related in his essay?

A late anonymous writer, the author of the *Farmer's Kalendar*, has endeavoured to shew, that the principal or only benefit of tillage, and hoeing, is to destroy weeds; and that manures are the farmer's only dependence to enrich and improve his land.

This he expresses in the introduction to his work as follows.

“ About fifty years ago, a celebrated *Eng-*
 “ *lishman*, Mr. Tull, made many experiments,
 “ in a new method of culture, the great design
 “ of which was, to set aside the use of manures.
 “ To this day he has had many followers.
 “ With the gentlemen that pursue his system,
 “ tillage alone is necessary,—the plough is all
 “ in all; and nothing is to be dunged or
 “ otherwise dressed, but meadows or pastures.
 “ Were such ideas to become general, it is
 “ inconceivable how much mischief they
 “ would occasion: for there cannot be more
 “ false principles, than those whereon they are
 “ built. Throughout these sheets, care is
 “ taken, to keep clear of such errors; the
 “ great importance of manures is duly attended
 “ to, and the farmer well instructed how to
 “ raise as much as possible himself. This
 “ point of Husbandry can never be too much
 “ attended to, nor can any have been more
 “ neglected, by the generality of writers:
 “ indeed

“ indeed except by one or two (who it must be
 “ owned have treated it in a very masterly
 “ manner) they have not thought it worthy
 “ their attention.”

In disquisitions on controverted points, those especially of importance, every writer should adhere strictly to facts, or speak cautiously where he is not certain of them. Mr. Tull published his Husbandry in the year 1733, wherein he does not set aside the use of manures, but in particular circumstances, and in the culture of particular plants; neither does he, or his followers, limit the use of dung and other dressings, to meadows and pastures only. He cultivated chiefly wheat and turnips in the horse-hoeing way; and he manured his turnips, and recommends that practice to others: but to shew particularly that this author has misrepresented his system, I shall recite the account he gives of it in his own words.

Page 19. “ But though dung be, upon
 “ these and other accounts, injurious to
 “ the garden [giving the roots, &c. a bad
 “ taste] yet a considerable quantity of it
 “ is so necessary to most cornfields, that,
 “ without it, little good can be done by the
 “ Old Husbandry. Dung is not injurious to
 “ the fields, being there in less proportion.
 “ And such plants as cabbages, turnips,
 “ carrots, and potatoes, when they are de-
 “ signed only for fattening of cattle, will not
 “ be

“ be injured by dung, tillage, and hoeing all
 “ together; which will make the crops the
 “ greater, and the cattle will like them never
 “ the worse.

“ Common tillage alone is not sufficient
 “ for many sorts of corn, especially wheat,
 “ which is the king of grains. Very few
 “ fields can have the conveniency of a suffi-
 “ cient supply of dung, to enable them to
 “ produce half the wheat these will do near
 “ cities where they have plenty of it: the
 “ crop of twenty acres will scarce make dung
 “ sufficient for one acre, in the common way
 “ of laying it on. Under the name of dung,
 “ we may also understand whatever ferments
 “ with the earth, except fire, such as green
 “ vegetables covered in the ground, &c.
 “ Dung without tillage can do very little;
 “ with some tillage doth something; with
 “ much tillage pulverizes the soil, in less
 “ time than tillage alone can do: but the
 “ tillage alone, with more time, can pul-
 “ verize as well.”

Page 211. “ Though dung is so necessary in
 “ the old *Virgilian* raftering, and *fat erit* Huf-
 “ bandry; yet to most sorts of land, used in
 “ the old and new pulverizing Husbandry, it
 “ is not necessary; as it appears by mine,
 “ and by the experience of all farmers, who,
 “ being emancipated from *Virgilian* prin-
 “ ciples, have made proper trials. They find,
 “ as well as I, that dung may be supplied,
 “ by

“ by an encrease of tillage. But I never
 “ have said any thing against the use of dung
 “ in the corn fields, except where it cannot
 “ be procured at all; or when the whole
 “ expence of it is likely to exceed the profit.
 “ It is probable, that in some places, dung
 “ may be had at a less price, than the encrease
 “ of tillage necessary to supply the quantity of
 “ dung required. That dung may be useful
 “ when properly applied, I believe was never
 “ denied by any author.

“ The Virgilian Husbandry [of burning
 “ the land, &c] being shewn, its opposite is,
 “ not to pulverize land by fire, nor put trust
 “ in dung and harrows, to supply the place of
 “ the plough; but, on the contrary, to give
 “ to every sort of land, proper and sufficient
 “ tillage (the poorest requiring most), and to
 “ use only what dung we have, or can rea-
 “ sonably get, in the properest manner, is
 “ that Husbandry which I call Antivirgilian,
 “ of which my horse-hoeing scheme is a
 “ species.”

He says likewise, in the preface to his essay,
 written six years after he began the horse-
 hoeing of wheat: “ The particular scheme
 “ of raising constant annual crops of wheat,
 “ without dung or fallow, is as yet only upon
 “ probation: but by the six crops I have had
 “ in that manner, I see nothing against their
 “ being continued. This, it is true, requires
 “ greater care in the management, than any

“ other branch of the Husbandry: but he
“ who can do this without dung or fallow,
“ may easily do it, with one or both of them.
“ And there may be such wet clayey land,
“ which the plough cannot well pulverize,
“ without help of the ferment of dung. And
“ in any sort of land, where it is suspected
“ that the earth of the partitions was not well
“ ordered in the summer, the best remedy is
“ to strow a small quantity of malt dust, or
“ other fine manure, upon the rows, about
“ the month of February. This will strengthen
“ the plants, and enable them to send their
“ roots into the intervals the earlier in the
“ spring.”

Here we see, that Mr. Tull does not set aside the use of manures. He agrees that dung is beneficial for crops of turneps, cabbages, carrots, potatoes, and such vegetables as are cultivated for cattle; that dung is absolutely necessary for corn and other crops in the old Husbandry; and that dung and other manures are to be used, where they can be had at a less expence than the tillage proper for hoed crops. From these passages and others in his book, it is evident, that he does not say, as the above-mentioned author asserts, “ that
“ nothing is to be dunged, or otherwise
“ dressed, but meadows or pastures.” His principal crop was wheat, for which he said dung was not necessary, in the hoeing culture;

culture ; and this he said upon good grounds, as will afterwards be shewn.

The above author, in several places, endeavours to establish an opinion, that the only use of fallowing is to destroy weeds ; that the land is thereby pulverized, but not benefited by the atmosphere. This he particularly insists upon, p. 294, as follows : speaking of fallowing, he says ;

“ The autumnal tillage is absolutely requisite, for the mere work of killing weeds, without recurring to the attraction of any beneficial particles from the air. The latter effect may appear very equivocal to a common farmer, never used to consider things deeper than first appearances. Unhappily this is a part of Husbandry, on which we can only speak from idea, and not in the least from experiment. Of all the volumes that have been published on Husbandry, none gives one a clear proof, of the acquisition of manure from the atmosphere. The benefit of fallowing is no clear proof ; because it is never experienced exclusively of killing weeds ; and unless such effects were known distinctly, one cannot with any precision attribute a certain degree to each. As experiment has not and probably will not prove this important point, it remains for the disquisition of reason alone, which may adopt whatever ideas appear most just to individuals. There are many

E 2

“ argu-

“ arguments to be produced, to shew, that
“ the great benefit of fallowing, at whatever
“ season, is the destruction of weeds, and mere
“ pulverization, without any reference to sup-
“ posed acquisitions from the air: a strong
“ one is the equality of crops that succeed
“ complete fallows and other crops: the
“ latter, if sufficient care has been taken to
“ destroy the weeds, are generally as good as
“ such as follow compleat summer fallows.
“ Wheat, for instance, after beans well hand-
“ hoed, is as good: after pease, if a great
“ crop, the same, without any hand-hoeing at
“ all; after clover also, in which the land is
“ bound, and matted together with roots:
“ and the great fertility of new-broken-up
“ grass lands, should look, as if the very con-
“ trary state to fallowed lands was most be-
“ neficial. Many writers talk of the benefit
“ of thick shade, and the putrid fermentation
“ of thick and luxuriant crops. It may be
“ all very true; but surely the whole is
“ founded on principles extremely different
“ from the acquisition of aërial benefit by
“ fallowing! I know of none in which they
“ agree, but the killing of weeds.

“ The acquisition of nitre, say some, is well
“ known to be greatly effected, by land being
“ ploughed on to the ridge in winter; and
“ nitre, say others, is the principle of vege-
“ tation. This fact, of nitre being so very
“ beneficial, seems rather to be a deduction of
“ reason,

“ reason, than an experimental proof. Salt-
 “ petre, in every application, has often been
 “ proved rather poisonous than beneficial.
 “ Why, therefore, should we suppose it of
 “ such consequence in the air? I am by no
 “ means *asserting* the contrary; but only ex-
 “ pressing doubts of those maxims, which do
 “ not seem to have had experiment for their
 “ foundation. Let us, for these various rea-
 “ sons, be contented with recommending au-
 “ tumnal ploughing to the husbandman, on
 “ principles that he can understand, and
 “ effects which are visible to him, pulveriza-
 “ tion, and the killing of weeds: and not
 “ persuade them to the practice, for reasons,
 “ which are *Greek and Hebrew* to them.”

Here the author has given the sum of his
 objections to the New Husbandry, relative to
 the effects of the atmosphere. “ Of all the
 “ volumes, says he, that have been published
 “ on Husbandry, none gives one a clear proof
 “ of the acquisition of manure from the at-
 “ mosphere.” This is a very extraordinary
 assertion. It is founded upon what he said
 before, “ Unhappily, this is a part of Hus-
 “ bandry, on which we can only speak from
 “ idea, and not in the least from experiment.”
 But how does this consist with what he said in
 the introduction, “ that a celebrated English-
 “ man, Mr. Tull, made *many experiments*, in
 “ a new method of culture, the great design
 “ of which was to set aside the use of
 “ manure?”

“manure?” But was not his design likewise to prove by these experiments, the acquisition of manure from the atmosphere? and how then can this author say, that we cannot in the least speak of this part of Husbandry from experiment? is not this a very disingenuous manner of treating the author of these experiments, and the subject, he and others have since treated upon; and have not they published their experiments, to prove, that the earth is fertilized by the atmosphere? and that they have proved it, we shall demonstrate. This author recommends to the farmer, “autumnal ploughing, on principles that he can understand, and effects which are visible to him, pulverization, and the killing of weeds.” What is the farmer to understand by pulverization? He knows that ploughing breaks or pulverizes the land; it is a mechanical action, that adds nothing to the soil, adds no new matter to it: on the contrary, by opening the soil, it is made more pervious to the roots of plants to exhaust it; consequently, the more land is ploughed and fallowed, the more it is liable to be impoverished by the next crop. How then is the land to recover its fertility? This author tells the farmer, that this is to be done by dung and manure; but he alledges, that Mr. Tull’s design was to set aside the use of manure; should he not have informed the farmer, what success he had in this design?

That

That he cultivated wheat without manure, for thirteen years; that he raised successive crops of wheat, every year during that time, upon very ordinary land; that he obtained good crops, of four quarters and upwards, without manure, and without impoverishing his land; and that many persons abroad had practised his method with success? How will the author excuse his concealing this from the farmer? It is a matter of great importance in Husbandry, and merits the particular attention of every cultivator of land.

Mr. Tull, the author of the *New Husbandry*, cultivated a part of his estate near Hungerford in Berkshire, and there introduced the method of horse-hoeing, which he practised chiefly upon wheat and turnips. His land was in general a light, poor soil, which he describes as follows, p. 227, and 263.

“ The bulk of the land belonging to this
 “ farm is, on the south side, for near a mile
 “ in length, always called *Bitham Hills*, and
 “ are, for the most part, declining grounds,
 “ a sort of *graciles clivi*, being all on a chalk.
 “ In dry weather the whole staple looks of a
 “ white colour; it is full of small flints, and
 “ smaller chalk stones. Below these hills is
 “ a bottom, where are some grounds, upon a
 “ chalk also, but had not then [when his
 “ *Essay* was published] been used in hoeing,
 “ having lain with faint soil thirteen or four-
 “ teen years. On the west side, all the land

“ is called *East Hills*, being on the east of the
 “ farms to which they all formerly belonged.
 “ On the north-west side, is a high field,
 “ called *Cook's Hill*, and is the only field of my
 “ farm that is not upon a chalk. It is a
 “ very wet spewy soil, of very little value,
 “ until I made it dry, by ploughing cross the
 “ descent of the hill. This soil is all too
 “ light, and too shallow, to produce a tole-
 “ rable crop of beans. This farm was made
 “ out of the skirts of others. Great part of
 “ the land was formerly a sheep down; and
 “ whilst the whole was kept in the Virgilian
 “ management (usual for such land), it had
 “ the full reputation of poverty. The highest
 “ part of it used to be sown (as I am well
 “ informed) with oats once in two or three
 “ years, upon the back [once ploughing],
 “ and if the summer proved dry, the crop
 “ was not worth the expence of that once
 “ ploughing. The generality of farmers,
 “ were then of opinion, that if this should be
 “ thoroughly tilled and pulverized, it would
 “ become so light, that the wind would blow
 “ the staple away; but the contrary happened,
 “ for it being ploughed *five* times instead of
 “ *once*, it produced good barley and other
 “ corn, and never has returned to its former
 “ degree of lightness since; and this was
 “ above fifty years ago. And now tillage
 “ and foreign grasses are come into fashion,
 “ inclosed lands, that do not *rot* sheep (as
 “ not

“ not one foot of mine is wet enough, or rich enough to do) are become of greater value than formerly.

“ My farm was termed a *barley farm*, not from the good crops of barley it produced, but because the land, being almost all hilly, was thought too light for wheat. In a dry summer, the barley crop failed for want of moisture, and of more pulverization, and was not worth half the expence.

“ Land is seldom too dry for wheat; and this dry soil, in the hoeing culture, brings very good crops of wheat, which is the reason I have now no barley except what is sown on the level; as it always must be for planting saint foin and clover amongst it; were it not for that purpose, I should plant no barley at all.”

Upon this unpromising soil for wheat, Mr. Tull began his horse-hoeing Husbandry; first upon one field, and afterwards upon the rest of his land, still encreasing the quantity, till at last he had one hundred and twenty acres, drilled with wheat, and horse-hoed; and part of these was annually under wheat crops, in succession for thirteen years, without rest, change of crops, fallow, dung, or any kind of manure, during that time; and the land notwithstanding was not impoverished, but improving.

This he takes notice of in several places, particularly in the thirteenth year, p. 273, where

where he says, “ My field, whereon is now
“ the thirteenth crop of wheat, has shewn,
“ that the rows may successfully stand upon
“ any part of the ground. The ridges of this
“ field were, for the twelfth crop, changed
“ from six feet to four feet eight inches : in
“ order for this alteration, the ridges were
“ ploughed down, and the whole field was
“ ploughed cross-ways of the ridges, for
“ making them level; and then the next
“ ridges were laid out the same way as the
“ former, but one foot four inches narrower,
“ and the double rows drilled on their tops;
“ whereby of consequence there must be some
“ rows standing on every part of the ground,
“ both on the former partitions, and on every
“ part of the intervals. Notwithstanding
“ this, there was no manner of difference in
“ the goodness of the rows, and the whole
“ field was in every part of it equal, and the
“ best, I believe, that ever grew on it. It
“ has now the thirteenth crop, likely to be
“ very good, though the land was not
“ ploughed crossways.

“ The crop of the six score acres of wheat,
“ that was growing at the time of publishing
“ my addenda, was much greater than the
“ crop the year before it, and would have
“ produced more grain in proportion, if the
“ heavens had been as propitious : but the
“ heavy rains that fell, when the first planted
“ was in blossom, diminished the filling of
“ the

“ the ear, and its grain ; yet not so much as
 “ of most sown wheat, especially of the very
 “ early sown, which generally escapes the
 “ best in this common calamity. The burn-
 “ baked wheat being always early sown, I am
 “ informed, had next to no grain in it ; and
 “ this is the most expensive sort of Husbandry,
 “ the tenants pay such exorbitant fines for
 “ the liberty of ploughing this land.”

From these experiments, and the success of horse-hoed wheat upon the author's whole farm, we must conclude, that land is enriched from the atmosphere : for it is evident, that this land had no other assistance ; and yet, though poor, or very ordinary land, continued year after year, without intermission, to produce good crops of wheat, that are acknowledged to be exhausting crops ; so exhausting, that no good farmers will venture to sow wheat on the same land, for only two years successively, without manure ; nor with manure, unless the land has an intermediate fallow, or a change of some meliorating crop : so that horse-hoeing appears here to be superior to manure.

This fertility can be attributed to nothing else but the atmosphere, and to this Mr. Tull does attribute it : for, says he, p. 63. “ If it
 “ should be demanded, from whence the soil
 “ can be supplied with vegetable matter, to
 “ answer what is carried off, by these constant
 “ crops of wheat, that the land be not con-
 “ sumed

“fumed by them; the soil, in this our case,
 “cannot be supplied in substance, but from
 “the atmosphere”—and then he proceeds to
 shew, that this supply is from rain, dews,
 &c.

After a thirteen years experience of horse-
 hoeing wheat, Mr. Tull concludes; “the
 “same six score acres, that was wheat the last
 “year, is planted with wheat now, and is
 “all of it as strong, and likely for a good
 “crop, as in any of the former years; though
 “there is but about one acre of it dunged.
 “The whole is the freest from weeds before
 “hoeing, that ever was seen, and the sown
 “wheat of the neighbourhood the fullest
 “of them.

“I can shew at this instant, one of the ex-
 “periments I have recommended, which
 “though it be on less than two perches of
 “ground; yet must convince every man who
 “has seen it (and doth not renounce the evi-
 “dence of his reason and senses) that pulve-
 “rization by instruments can vastly exceed
 “the benefit of common manure.

“It is to such experiments, that I leave the
 “progress of my horse-hoeing Husbandry;
 “assuring the publick, that in all my practice,
 “which is now thirteen years, I have never
 “met with one instance, that gives me the
 “least suspicion of the truth of the prin-
 “ciples I have advanced; and that, I believe,
 “they have nothing to fear from enemies,
 “but

“ but the false relation of facts, or fallacious arguments.”

About two years before Mr. Tull wrote this, he was desired to take an exact account of the product of a single acre of hand-hoed wheat, and of an acre in the middle of a field of twenty-five acres of horse-hoed wheat, in order to know the different quantities produce by them.

“ The first was in a common field, and
 “ planted upon the level, with the same drill
 “ that planted the other, whereby there was a
 “ space of ten inches between two rows, and
 “ a space of eighteen inches between those
 “ and the next row: so that each row had
 “ fourteen inches of surface for the roots
 “ to spread in. It was hand-hoed very well.
 “ The land hath not been dunged in any
 “ manner since the year 1719. This crop
 “ was reaped very low, and threshed out im-
 “ mediately. It produced eleven bushels and
 “ a half: the measure of the land being fifty-
 “ two perches, the product is at the rate of
 “ thirty-six bushels and six gallons to an acre.
 “ It is situate next the ditch of a meadow,
 “ and is all the land I have in the common
 “ field. The lands adjoining to it, of the
 “ same goodness, were judged by all gentle-
 “ men and farmers who viewed them not to
 “ have above half the wheat on them, that
 “ this had, perch for perch; and yet there
 “ was no difference in the management, except
 “ this

“ this being regularly planted, and hand-
 “ hoed, without dung, and the other sowed
 “ at random, and dunged (as they always are
 “ once in three years): the fallowing and
 “ ploughings of both were the same. Mine
 “ was said by several of the farmers of the
 “ place to be the best land of wheat in the
 “ parish.

“ This indeed ought to be allowed, that
 “ mine being mostly *white cone* wheat, and
 “ the adjoining lands of clean *lammas*, might
 “ make some part of the difference; but there
 “ being some of the same sort of *lammas*
 “ amongst this cone, it was observed to be as
 “ high as the cone, and the ears of it to be
 “ of double the bigness of those in the conti-
 “ guous sown lands.

“ As to the acre of horse-hoed wheat, it
 “ was measured eight perches broad, and
 “ twenty long, which is equal to sixty-six
 “ feet in breadth, and six hundred and sixty
 “ in length, this being the statute measure of
 “ an acre, and we use no other for land in
 “ this country.

“ This acre being laid by itself, was, after
 “ some time threshed, and yielded twenty-
 “ nine bushels and six gallons of clean
 “ wheat.

“ Before it was threshed, it was somewhat
 “ diminished by cows that found a hole betwixt
 “ the boards of the barn, and pulled out some
 “ of it; and poultry eat more of it; but the
 “ most

“ most extraordinary waste was made by bad
 “ reapers, to whose lot this acre fell. They
 “ cut it so high that many of the ears, which
 “ by their great weight bended down very
 “ low, were cut off and fell on the ground,
 “ and were there left much thicker than is
 “ usual. This waste was greater than any I
 “ had ever seen: so that, I believe, if it had been
 “ as well reaped as most of the rest of my
 “ wheat was, there would have been thirty-
 “ two bushels received from this acre.

“ The difference of the appearance of the
 “ hand-hoed and of the horse-hoed, whilst
 “ they were standing, was so great as to de-
 “ ceive many who saw them, and to induce
 “ many to imagine, that the product of the
 “ former, would be double to that of the
 “ latter; though it was really little more than
 “ an eighth part greater.

“ The horse-hoed shews the whole interval
 “ empty until the grain is almost full, which
 “ is a great advantage to the crop: because,
 “ unless the air did freely enter therein, to
 “ strengthen the lower parts of the stalk,
 “ they would not be able to support such pro-
 “ digious ears (some containing an hundred
 “ and twelve large grains a-piece) from fall-
 “ ing on the ground.

“ When the grains are full, the ears turn
 “ their upper ends downwards, and are all
 “ seen in the intervals, and nothing but straw
 “ on the rows: this reverse posture of the
 ears

“ ears defends them from the injuries of wet
“ weather, when ripe: for the rain is carried
“ off by their beard and chaff, which like tiles
“ protect the grain from being discoloured,
“ as sown wheat always is by much rain,
“ when ripe.

“ This difference was fully shewn last har-
“ vest, when all my wheat was in the same
“ posture: none of the ears reached the
“ ground, but some reached within a foot,
“ others within half a yard of it, and some
“ not so low. None of the straws were
“ broken by the weight of these large ears;
“ they only bended round at the height of
“ about a yard, or higher, in a manner that I
“ never saw in any other wheat but the
“ horse-hoed. In these intervals, notwith-
“ standing this bending posture of the ears,
“ one may walk backwards and forwards,
“ without doing any damage: for the ears,
“ when thrust out of their places, will, by
“ their spring, return to them again, like
“ twigs in a coppice.

“ If a field of such wheat, for want of a
“ good change of seed, or by any other cause,
“ should be smutty, the smutty ears will stand
“ upright over the rows, and may, at the
“ expence of about a shilling an acre, be cut
“ off with scissars by women and children,
“ which is the only perfect cure for that ma-
“ lady, when it happens; and the damage is
“ nothing but this small expence, and the loss
“ of

“ of the ears cut off; which, though they
 “ should be but the fortieth part of the crop
 “ (as they are seldom more), would spoil it:
 “ but, being thus taken out, leave the remain-
 “ der generally large-bodied, and as fine as
 “ that which hath no smut amongst it; ex-
 “ cept that it is not fit for seed.—There is
 “ not this convenience either in sown or
 “ hand-hoed wheat.

“ As to the different profit of the hand-
 “ hoed and the horse-hoed crops, it will, upon
 “ examination, appear to be contrary to the
 “ opinion of the vulgar. The soil of the
 “ hand-hoed being, at least, as good as of the
 “ other; let us suppose them equal, and also
 “ the expence to be equal, though, in gene-
 “ ral, that of the horse-hoed is the least.

“ The hand-hoed was planted on a fallow,
 “ but the other had a good crop of wheat the
 “ preceding year, drilled in double rows, and
 “ the year before that had a crop of barley,
 “ drilled in treble rows; the ridges always of
 “ the same breadth. All these crops were
 “ horse-hoed: but in the year before the first
 “ of these, the field had a crop of sown black
 “ oats: so that there were four successive
 “ crops, without any fallow or dung; and
 “ there is now growing a fifth crop, being
 “ wheat, likely to be much greater than any
 “ of the precedent, if the year prove as fa-
 “ vourable: therefore, here being two crops
 “ of wheat for one, the profit of the horse-

“ hoed is almost double to that of the hand-
“ hoed.—And as the hand-hoed has but one
“ wheat crop in three years, and one barley
“ crop, which is commonly scarce half the va-
“ lue of a wheat crop; and the expence in
“ three years being in seed, tillage, &c. as
“ much as of the three wheat crops, the pro-
“ fit of the horse-hoed will be more than
“ double that of the hand-hoed.

“ And this, I think, is a strong proof of
“ the efficacy of deep hoeing, which, with-
“ out a fallow, can (as in this case) cause
“ one double row to produce as much wheat,
“ as two double rows of the shallow-hoed
“ did, with a fallow, in an equal quantity of
“ ground: which could not be, unless each
“ row of the lesser number did produce more
“ or greater ears, or both, than each row of
“ the larger number. Neither could this be,
“ if the roots did not take the greater part of
“ their nourishment from the pulverized in-
“ tervals; considering that the rows that had
“ no fallows must, without the deep pulve-
“ rization, have produced much fewer and
“ lesser ears than an equal number of rows
“ that had the benefit of a fallow.

“ Vain therefore is the opinion of those,
“ who say the roots of wheat do not reach
“ further than two or three inches from the
“ stalks: for if they did not, these horse-hoed
“ rows could have very little or no nourish-
“ ment from the pulverisation of the inter-
“ vals

“ vals not entering into them ; and then must
 “ have produced less than an equal number of
 “ rows of the hand-hoed (that had a fallow)
 “ did, instead of almost twice as much.”

In the year following, he writes, p. 274,
 “ My single land of fifty-two perches in the
 “ common field, mentioned in my *Addenda*,
 “ brought the last harvest a crop of barley
 “ (in the opinion of all who viewed it) dou-
 “ ble to the land, of the same goodness, con-
 “ tiguous to it, at the end and side of it.
 “ This shews, that the benefit of pulverisa-
 “ tion of *one* good hand-hoeing, performed
 “ half a year after planting the wheat, toge-
 “ ther with the less exhaustion of half the
 “ seed, and no weeds, vastly exceeded the
 “ use of dunging for the wheat on the con-
 “ tiguous land, there being no other differ-
 “ ence.”

[This example of horse-hoed wheat shews, not only the great advantage of that culture beyond the common course of Husbandry, with fallowing ; but likewise its superiority to the Modern Improved Husbandry of fallow crops, as turnips, cabbages, &c. instead of a fallow : for while the land is yielding a fallow crop, it would, by horse-hoeing, produce a crop of wheat, which is of more value than any of the common fallow crops, including the expence of the dung or manure bestowed upon them.]

Mr. Tull proceeds to give some account of the rest of his horse-hoed wheat, whereof the products are not stated by measure, as of the acre above-mentioned; but, as he computed them, his hoed wheat that year, amounting to an hundred and six acres, yielded nearly two thousand one hundred and sixteen bushels; or about twenty bushels per acre: which considering the quality of the land, and circumstances of it when drilled, may be reckoned a good crop: for he relates, that being advanced in years, and in an ill state of health, he intended to have let his farm, and had agreed with a tenant, and therefore omitted to prepare a considerable part of his land for drilling with wheat: and the tenant disappointing him, he was obliged to plant it with summer-corn, which put him out of his course of Husbandry, and was an injury to the land.

“It is true,” says he, “I was at great loss by giving attention to that tenant; but I was desirous of being out of all business, my infirmities increasing upon me.” And this to such a degree, that, as he takes notice elsewhere, he was frequently confined within-doors, and sometimes to his bed.—And another circumstance was, that his Husbandry was managed altogether by day-servants. These circumstances, together with the inferior quality of his land, being considered, are much in favour of the New Husbandry, which, under such unfavourable circumstances, could

could succeed, so as every year to produce profitable crops; and no other means used to obtain them but hoeing, and once ploughing the land.

The established reputation of this gentleman, for candour and veracity, leaves no room to doubt the truth of these experiments, which were also often inspected by many noblemen and gentlemen. These might have been sufficient to satisfy the author of the Farmer's Kalendar, that the principles of the New Husbandry are not false, as he asserts; and that the general practice of it would not be mischievous, as he fancies; but very much the reverse. It is not, however, necessary to refer wholly to these experiments, for many have been since made abroad with the same success, and published by M. Duhamel and his correspondents. Also that eminent cultivator, Sir Digby Legard, practised this Husbandry upon the very poor wolds near Scarborough, where he raised barley and wheat upon seven acres of land, in the method of drilling and horse-hoeing for eight years successively, raising crops of barley and wheat every year, without manure, upon so light a soil, that one horse was sufficient for the hoeing. Sir Digby, in a letter to the London Society of Arts, relates the particulars of this culture, which he recommends, as superior to the Common Husbandry; and particularly takes notice that his land was improved by it, and

produced much better crops the last four years than it did at first: though in all that time it was neither rested nor manured.

Another gentleman in *Berkshire*, the Rev. Mr. *Deane*, in a letter he wrote some years since, says, “ I had the pleasure of being acquainted with Mr. *Tull*, and made him two visits at *Prosperous*, and took an experienced farmer with me; where I saw some excellent crops, and some very poor ones, on his own, and on other people’s land; and was convinced the poor crops were not owing to his Husbandry, but to the native poverty of the country; being a light, poor, shallow, chalky soil, situated near the top of the *Hampshire-hills*, and very little land there is proper for wheat; and he advises practitioners, not to attempt to cultivate wheat upon such poor land.

“ In my opinion Mr. *Tull*’s principles are founded in truth, and on the certain laws of nature. Being convinced of the reasonableness and truth of his principles, I have practised his horse-hoeing Husbandry above twenty years, on the same land, with successive crops of wheat, with but few intermissions, and can see no reason to question the truth of his principles.

“ My soil is not the best wheat-land, nor rightly adapted to the *Tullian* Husbandry, because we suffer greatly by the extremes both of wet and dry seasons; sometimes our

“ land being bound up as hard as iron, not to
 “ be touched with a plough ; and sometimes
 “ all in a pap, not to be trod upon. Fre-
 “ quent avocations of my men and horses to
 “ other business, indocility of servants, and
 “ averseness of rustics to be put out of their
 “ old tract, have sometimes occasioned neg-
 “ lects in catching critical seasons for horse-
 “ hoeing ; and consequently my land became
 “ foul and out of tillage, which was the reason
 “ of my intermitting my annual crops, in
 “ order to clean the land and restore the til-
 “ lage, which happened about three times
 “ since I began ; and in the intermission I
 “ once gave the field a summer fallow,
 “ ploughing across the lands, to lay them out
 “ in a new manner ; at other times, I planted
 “ part with pease, and part with vetches.

“ Part of a field near my house has tasted
 “ no dung, or other manure, since I began, for
 “ experiment's sake ; the other part was fre-
 “ quently dunged, and the whole field other-
 “ wise cultivated alike ; but the difference of
 “ the crops at harvest was scarce discernible.
 “ My servants, who knew the place, thought
 “ they could perceive the odds ; but it would
 “ be very difficult for a stranger to find it
 “ out.

“ In general my *Tullian* crops (which are
 “ large and upon various fields) have been
 “ nearly equal to the sown crops of my neigh-
 “ bours in the different years. I plant about

“ three pecks of wheat on a statute acre, and
 “ receive from two to four quarters return.
 “ The farmers in the old way usually plant
 “ about ten or twelve pecks on an acre, and
 “ receive in return no more than I do, *communibus annis*.”

Another and very ingenious practiser of this
 husbandry, William Craik, Esq. near Dum-
 fries in Scotland, has practised the new hus-
 bandry many years, and thus describes his
 land: “ My soil is stiff and very moist; that
 “ is, in the bottom below the staple, is a hard
 “ and almost impenetrable till, impervious to
 “ water, which of consequence keeps the top
 “ poachy, and therefore am obliged to drain
 “ every field with covered drains filled with
 “ stone. Add to this, that our climate is ex-
 “ tremely watery, so that both soil and climate
 “ are against me, especially in the New Hus-
 “ bandry.

“ About seven years ago, I began to drill
 “ wheat in double rows, on ridges five feet
 “ two inches broad; but have now reduced
 “ them to four feet ten inches on the last-
 “ taken-in fields; which size I find answers
 “ every purpose best for double rows of
 “ wheat; and single rows for turnips and po-
 “ tatoes. I continue the double rows of
 “ wheat; and drill a little short of a Win-
 “ chester bushel to the Scots statute acre
 “ [one and a quarter English]. My return
 “ upon the average is about twenty-five
 “ of

“ of said bushels, since I first began ; and the
 “ total expence, harvest-home, is about a
 “ guinea, seed included. But the return
 “ would considerably exceed this, were it not
 “ for some parts in every field, that have
 “ every year quite failed : in some occasioned
 “ by a vein of sandy, gravelly soil, that runs
 “ across two of my fields ; and in all others,
 “ from the old ridges being very high raised
 “ by the former farmers, and at the same
 “ time very broad and crooked, which obliged
 “ me to level the whole ; the consequence of
 “ which is, that the tops of the old ridges
 “ continue barren for several years, to my
 “ great loss. I was for some time in hopes,
 “ that frequent cultivation and exposure to
 “ the air would in time remedy this defect :
 “ but, finding little alteration in these parts,
 “ I am now applying proper dressings, suited
 “ to the different soils, which I have already
 “ found will answer the purpose, and make a
 “ very sensible difference in my profits.

“ When the crop is off, the ridges are
 “ ploughed up, and formed anew, then
 “ smoothed by the drill-harrows, and drilled
 “ with the drill-plough. When the wheat
 “ has got three or four leaves, I horse-hoe
 “ from the rows, agreeable to Mr. *Tull*. In
 “ the spring, I always deepen the same fur-
 “ rows, made before winter ; after which it
 “ lies till the wheat begins to spindle, when
 “ I horse-hoe back the earth, so as to earth up
 “ the

“ the plants two or three inches, to strengthen
 “ or secure them. In this operation a slip of
 “ earth remains untouched in the middle, of
 “ what was ploughed first from the rows ;
 “ and as a new surface is exposed by the last
 “ hoeing, I leave that slip untouched for
 “ some time, to receive the advantage of ex-
 “ posure, and till the weeds come, when I
 “ plough up this slip with the double-mould-
 “ board-plough, which covers the weeds, and
 “ leaves a wide, deep, and clean trench. If
 “ the wheat stands fair, so as to admit the
 “ horse-hoe, which with me is seldom the
 “ case, I hoe a small furrow back from the
 “ rows, and return it with the double-mould-
 “ board-plough : but do not think this neces-
 “ sary, if the former operations are properly
 “ executed.

“ Though my soil is stiff and heavy, I only
 “ use two horses to the single hoe, and three
 “ to the double-mould board hoe. The single
 “ hoe horse hoes two and a half Scots acres
 “ *per* day, and the double-mould board five ;
 “ the first having a full bout to each ridge,
 “ the other only half a bout. I have tried to
 “ hoe with oxen, but found they did not
 “ answer in my wet soil ; and now only use
 “ horses, as they poach the land less.

“ I have now [in 1766] the seventh crop
 “ of drilled wheat growing on my first acre
 “ (which I chose as near the average of my
 “ soil as I could), and it at present promises to
 “ be

“ be the best. This acre consists of twenty-
 “ two ridges, nine of which were, three years
 “ ago, strongly dressed with dung; that side
 “ being lighter than the other, and generally
 “ failed : since dressing, that part has proved
 “ better, but still inferior to the undunged
 “ side. This acre, as well as all my fields,
 “ was dressed at first with shells, and bore four
 “ broad-cast crops, immediately preceding the
 “ drilled crops.

“ I have only, this year, thirty Scots acres
 “ in drilled wheat; the wet seed time last
 “ year, having prevented my drilling a ten
 “ acre field, now in turnips and potatoes: for
 “ I dare not touch my soil with the plough,
 “ when wet.

“ The field with the sixth crop of drilled
 “ wheat, and which had five broad cast crops
 “ previous to these, hath at present as full a
 “ crop as can stand upon it; except where
 “ the sandy vein comes in. The field with
 “ the fifth crop is inferior to it, though equally
 “ good soil. In general, where the soil was
 “ originally tolerable, and exclusive of the
 “ particular accidents I have mentioned, I can-
 “ not perceive hitherto any decline in the
 “ crops, even these that have not received any
 “ dressing with dung; but how long this will
 “ go on, time only can determine.

“ I always horse-hoe from the rows, whe-
 “ ther double or single, at one bout, half a
 “ bout to each side; and could return this
 “ bout,

“ bout, with the double mould board, at half
 “ a bout, which was for some time my
 “ practice: but now find it more profitable,
 “ first to return the bout by another bout
 “ of the single hoe, which exposes a large
 “ new surface; and then, when the weeds
 “ are up, clean up with the double mould
 “ board. But at the second hoeing from the
 “ rows, which is after the grain is got into
 “ ear, I only take two small furrows. viz. one
 “ from each side; these I return at once, with
 “ the double mould board.

“ I have used the white lammas wheat, the
 “ *Kentish* red; the *Zealand*, from *Holland*; the
 “ white and grey cone; and this year, a small
 “ quantity of *Smyrna* wheat, *Spica multiplici*.
 “ Yet I find none of them can resist the vio-
 “ lent storms of wind and rain of our climate.
 “ Both the cones stand the best; but our
 “ millers have not art enough to grind them;
 “ on which account our bakers are shy to
 “ buy. I have mostly sown for the horse-
 “ hoe, the grey cone. A part of my last
 “ year’s crop went to the *Isle of Man*, to *Ram-*
 “ *say*, and was so large a grain, that our
 “ bakers objected to it on that account.

“ My crop this year consists of the grey
 “ cone, the red *Kentish*, and the white lam-
 “ mas, some of each in the same field, on
 “ purpose to see which stood best; and now
 “ find, the red *Kentish* has suffered most;
 “ and that the white lammas, of a kind I had
 “ from

“ from *London*, stands equally well with the
 “ grey cone ; which has determined me to
 “ sow it mostly for the ensuing crop.

“ My drilled wheat is generally, by the time
 “ it gets into blossom, so laid over, though not
 “ broke, that I can neither horse-hoe, hand-
 “ hoe, or hand-weed. So that a second crop
 “ of weeds never fails to spring up time enough
 “ to ripen their seed, before the crop is cut :
 “ and this, with me, is the great and invinci-
 “ ble objection to a succession of wheat crops
 “ in this way ; at least in my soil, and this
 “ climate. What I propose, to remedy this,
 “ is, to take a crop of horse-hoed turnips,
 “ next a horse-hoed crop of beans ; next
 “ two or three crops of horse-hoed wheat ;
 “ and then return to the turnips. In this
 “ way, I am sure to extirpate the weeds,
 “ during the turnip and bean crops, and have
 “ reason to expect my wheat shall be a full
 “ crop, after these meliorating ones.

“ If the drilled wheat stood fair, it would
 “ be cut down at one half the expence of
 “ broad-cast, at least : for, even when laid
 “ over, and very much disordered, I do it for
 “ two-thirds of the expence of the other.

“ Were it not for the parts that fail in my
 “ fields, my horse-hoed crops would exceed
 “ four quarters. Last year, on half an acre
 “ *Scots*, I had twenty-two *Winchesters* [thirty-
 “ five bushels per *English* acre], but this was
 “ all equally good.”

By

By this gentleman's state of his successive wheat crops, it is evident, that his land was not impoverished by them, but improving; as appears by his last crops, though it had no manure.—And though his tolerable good land was so much enriched by the horse-hoeing and exposure, that it produced as good crops every year, as are commonly obtained in the Old Husbandry, with the assistance of manure; yet it is remarkable, that the influences of the atmosphere did not penetrate deep enough into the old ridges to enrich them; but, by opening the land by horse-hoeing, and at the same time frequently changing and exposing the surface, that was sufficiently impregnated with the vegetable aliment, to produce every year a good crop of wheat.

These drilled crops were remarkably profitable. The whole expence of the culture and seed, harvest-home, at one guinea, is about seventeen shillings per English acre; and therefore, when wheat is only five shillings per bushel, less than four bushels of wheat pays the whole expence of the seed and tillage of an acre: and if the tillage and rent together should amount to forty shillings an acre, eight bushels pays all the expence of a horse-hoed crop of wheat; and all the crop above eight bushels per acre is clear profit.—The profit of the Old Husbandry does not come near this, though the crops should be as great or greater: the fallows, or fallow crops, not equal in value to wheat, so much reduce the farmer's profit,

profit, that he cannot equal the Drill-Husbandry with his corn crops, nor unless he substitutes the potatoe, cabbage, and carrot Husbandry, instead of barley, oats, and pease.

The reader may perceive how different these examples of extensive practice are, from the trifling, inconclusive experiments upon a few perches of ground, referred to by the authors above-mentioned; wherein neither the nature of the land is mentioned, nor the manner of performing the culture is shewn; and yet we are referred to these inaccurate and plainly-unskilful attempts to imitate this Husbandry, as conclusive, in determining the merits of two different methods of Husbandry; than which nothing can be more trifling and inconclusive; especially as it is evident, that these experiments were made by persons who were ignorant of the New Husbandry, or performed without skill or accuracy, and even contrary to the real practice of this Husbandry: the reader therefore of these pretended experiments need not be surprized to find the event of them so entirely different and contradictory to the genuine practice of the skilful cultivators here quoted: who have fully proved upon their lands at large, and for a continued course of many years, that the New is much more profitable than the Common Husbandry; whereof one of the gentlemen, Mr. Craik, can fully justify what has been here said of his success upon land not the best adapted

adapted to this Husbandry, and in a climate very unfavourable to constant and successive crops of wheat upon the same land.—This excellent cultivator succeeds also in horse-hoeing beans; turnips also in single rows, upon his ridges near five feet broad, in order to clean his land perfectly from weeds.—Potatoes likewise in single rows upon the ridges, which, by horse-hoeing, produces him greater crops, than is obtained there in the Common Husbandry. He cultivates also some other crops in the horse-hoeing method with success; and even Lucerne for years past, which produces four cuttings in every summer, upon his cold moist land. All his crops thrive with him, and have done so for many years; though both soil and climate are against him; an evident demonstration of the excellency of the New Husbandry; as its failing in the above trifling experiments is of their unskilful management.

Since writing the above, I have perused a late Treatise of Husbandry, entitled *The Complete English Farmer*, said in the title-page to be written by a Friend of the late Mr. Jethro Tull, Author of the Horse-hoeing Husbandry.

The author of this is said to be a gentleman-farmer, who resided formerly near Hungerford in Berkshire, and since that in Kent. He appears to be well acquainted with the Common Husbandry; and it might be expected, from the title of his book, that he was also well informed

informed of the New, being a near neighbour and friend of Mr. Tull. But it seems, by his description of the New Husbandry, that he knows only the first practice, which Mr. Tull exploded, and says nothing of the alterations and important improvements made by Mr. Tull, and which he has recommended in the additional parts of his work, the Supplement, Addenda, and Conclusion. As these were published long since, and the Complete English Farmer's book not till the year 1771, his readers, who, from the title, may expect a satisfactory account of the New Husbandry, will be much disappointed; and whoever shall be persuaded, by reading this treatise, to attempt it, will be misled. But it is presumed very few, if any, will, from his account, which tends to discourage beginners; and he raises several objections to that Husbandry; whereof some of the principal are the following. In his Preface, p. 15. "In
 " the horse-hoeing culture," says he, "though
 " the expence of labour may be less, the
 " waste of land is out of all proportion
 " greater [than in the Common Husbandry];
 " for there only *four* inches out of
 " *seventy-two* are planted, the remaining
 " sixty-eight are left for the introduction of
 " the hoe-plough. And will any one say,
 " that in the nature of things four inches can
 " be made to produce as much grain as *seventy-*
 " *ty-two*, provided the whole *seventy-two*

“ are all in the same heart before planting?
“ From my own experience, I am inclined to
“ conclude they will not.”

This objection refers to Mr. Tull's method of drilling wheat upon six-foot ridges (or seventy-two inches), and two rows upon each ridge; which two rows, the author supposes, occupied four inches; and then he asks, will any one say, that in the nature of things four inches can be made to produce as much grain as seventy-two; seventy-two he means, or the land all sown as thick as it is usually done. The answer is, yes; the four inches can be made to produce as much as the seventy-two commonly does; and for this we have this author's own authority; for he acquaints his readers, p. 213, when speaking of the alternate Husbandry, “ that Mr. Tull had *often* “ upon two rows in six-foot lands, at the rate “ of five quarters of wheat on an acre.” This is a great crop, much greater than is commonly obtained by farmers, who cover all the ground with plants. But covering all the ground is no sure way to obtain a full crop: for plants do not produce most seed when they stand thick upon the ground, but in proportion to the room and nourishment their roots have in it, which the author seems not to have considered; nor to have known, that Mr. Tull had left off drilling wheat upon six-foot ridges. He also reckons the horse-hoeings of wheat as so many whole ploughings,
though

though a hoeing is only two furrows, and a whole ploughing four or six furrows; and though only half the number of the same horses is necessary for hoeing as for ploughing the same land.

This author recommends the Common Husbandry; but, in estimating the profits of it, he says, that a farmer who takes five hundred acres of land, whereof two hundred acres are to be always corn, should be possessed of a sum to begin with of fifteen hundred pounds; and p. 62, “that the beginner must “not flatter himself, that less than fifteen “hundred pounds will be sufficient.” Yet he tells him, p. 204, “that fifty pounds a “year laid by in clear profit is nearly as “much as a farmer can annually accomplish, “who rents two hundred pounds a year.” If this is all the profit he is to expect, there is little encouragement for a farmer to lay out his money in the Common Husbandry: for this is eight pence an acre clear profit, for all his labour and hazard; and from his arable land, meadows, and pastures; also from his sheep, cattle, dairy, hogs, &c. It is but three and one-third per cent. for his money; which he might employ to much greater advantage in other business, and at common interest at four or five per cent. Very different from this is the New Husbandry, which does not require near so large a capital, and, as we have seen above, that land of moderate fertility

lity produces profitable crops of wheat, Mr. Tull's twenty bushels per acre ; Mr. Craik's twenty-five bushels per acre, at the expence of only a guinea, for expences of seed, culture, and carriage home ; and the author of Rural Improvements has justly observed, that there is a profit from only eight bushels of wheat per acre : so that an hundred acres of wheat in the hoeing Husbandry is really more profitable than a farm of five hundred acres in the Common Husbandry.

It will be unnecessary to take notice of all the objections made to the New Husbandry, by the author of the Complete English Farmer ; and may be sufficient to acquaint the reader, that Mr. Tull began his hoeing culture for wheat upon level ground at first, drilling two, three, or four rows, at seven or eight inches distance ; and, leaving a space of about four feet, drilled two, three, or four rows more as at first ; the narrow distances between the rows, called *Partitions*, was hand-hoed, and the wide or four-feet spaces, called *Intervals*, was horse-hoed ; viz. was tilled with a plough, while the crop was growing. But finding upon trial, that drilling upon six-feet ridges, two, three, or four rows upon each, the ridges were easier horse-hoed, and produced better crops, he left off drilling wheat upon level ground, and drilled only two or three rows upon each ridge. The method of drilling three rows he continued for some years,

years, and then horse-hoed his intervals usually six times, and the partitions were once or twice hand-hoed, according to the weeds, and state of the land. But in this way, the middle row was greatly inferior to the outside rows; and then he endeavoured to make it equal to them, by deepening the soil in the middle of the ridge; to do this, the ridges were raised higher in the middle; but the two outside rows being deprived of so much mould thrown to the middle of the ridge, though the produce of the middle row was encreased, the outside rows were diminished in a greater proportion. This observation induced him to leave off entirely the middle rows, and to drill only a double row ten inches distant, upon ridges of about four feet and eight inches broad; by this method, the intervals to be hand-hoed were nearly of the same breadth as before, were only four times hoed, and in a different manner, and the rows in the partitions, being wider, could be deeper hand-hoed. This was his last and best method of cultivating wheat, and as such he recommends it. I have here taken notice of this particularly; because none have excelled him in the culture of wheat, but several have fallen short of him. The gentlemen abroad did so, because they followed Mr. Tull's first method; his improvements not being then published, and translated into French, as his Essay was; and several modern authors in England appear to be unacquainted with the

latter parts of this Husbandry ; among these the author of the Complete English Farmer, by which he has done it a real injury ; as it may be expected, that one who calls himself a friend to Mr. Tull would have given an account of his Husbandry to be depended upon ; and therefore it is hoped that, if his book comes to a second edition, he will do justice to his friend, and acquaint the public of his latest and improved practice.

When the transactions of the patriotic Society of Arts were published, by Robert Dossie, Esq; he takes notice in his first Volume, p. 72, “ That when the Society endeavoured
 “ to procure information and trials requisite
 “ to the deciding the important question, re-
 “ specting the comparative utility and advan-
 “ tages of the *Drill* and *Broad-cast* Husban-
 “ dry: the public had,” p. 78, “ very little
 “ ground, when the Society took that mat-
 “ ter up, of known experiments and calcu-
 “ lations, on which to form a judgement,
 “ how far it was worthy the notice of those,
 “ who are ready to adopt feasible improve-
 “ ments in Husbandry.” So imperfectly were the merits of the Hoeing Husbandry then generally known ; and Mr. Dossie speaks doubtfully of them.

But, after the Society had received the accounts sent them of this Husbandry, by Sir Digby Legard and Mr. Lowther, Mr. Dossie observes, p. 386. “ These facts furnish very
 “ con-

“ conclusive reasons for believing, that what
 “ can be cultivated constantly, without ma-
 “ nure, even on land not very well suited to
 “ it, with greater profit than the common
 “ crops in the broad-cast, with the aid of fal-
 “ low and manure. But this profit would
 “ necessarily be found to be much greater
 “ on land that is properly suited to that grain.
 “ —If we take the same view of the actual
 “ produce in the experiments of the barley
 “ cultivated in the drill-way, for which this
 “ land was proper, the facts shew the real
 “ profits equal to those we have deduced here
 “ with respect to wheat by conclusions.”

Some of the other experiments recited in
 this treatise, of long successive crops of wheat,
 on various sorts of land, superior to any re-
 lated by Mr. Dossie, abundantly confirm the
 merits of this Husbandry in the culture of
 wheat. To which, if the improvement of
 many other crops be added, no doubt can re-
 main of the superiority of the New Hus-
 bandry.

These examples of horse-hoed crops may
 be sufficient to shew, that land is fertilized by
 the atmosphere, contrary to what the author
 of the Farmer's Kalendar says, “ that of all
 “ the volumes that have been published on
 “ Husbandry, none gives one a clear proof of
 “ the acquisition of manure from the atmo-
 “ sphere.” This may be admitted in general,
 of the authors who have wrote upon the Old

Husbandry; as the acquisitions from the atmosphere were unknown to them, or very imperfectly understood, till Mr. Tull explained, and proved it; and therefore this author was not likely to find it proved in their works; but, as he quotes Mr. Tull, he cannot be excused in advancing this, so opposite to the principles of the New Husbandry, fully explained and proved by him, as well as by several foreign authors, whose works have been published many years ago. But, says he, “the benefit of fallowing is no *clear* proof, “because it is never experienced exclusively, of “killing weeds; and unless such effects were “known *distinctly*, one cannot with any *precision* attribute a certain degree to each.”

And because we cannot know these effects *distinctly* and with *precision*, the author would persuade us, that therefore the atmosphere has no effect at all, in enriching land; but that the benefit of fallowing, is wholly owing to killing the weeds—But, in a course of tillage, the injury done by weeds is, at an average, nearly the same one year as another; and if, as farmers in general allow, fallowing is beneficial to land, that must arise in part from the atmosphere, and is certainly so in the New Husbandry, for there no weeds are suffered to grow, or nearly the same one year as another; and yet is the fertility so much increased by hoeing and exposure, as to nourish a crop of wheat every year, equally as with manure—

“But

“ But as, says he, experiment has not, and
 “ probably will not prove this important point,
 “ it remains for the disquisition of reason
 “ alone.” This author appears to be a practical husbandman, and makes many good observations upon husbandry; but his partiality to the common systems, and over-rating the value of manure, has led him into an indefensible partiality to it. Dung with him is every thing. On the culture of madder, he says, p. 341, “ the article of manure is the soul of
 “ this culture; the plant delights to grow in
 “ a dunghill, so that you need not fear over-
 “ doing it; perhaps one hundred loads an acre,
 “ of black rotten dung, may be found the
 “ proper quantity for the first crop of madder.
 “ And for the second crop, the earth being
 “ dug three feet deep, it will be absolutely
 “ necessary to mix in with it from fifty to
 “ one hundred loads of rotten farm-yard dung,
 “ a year and half old, that has been twice or
 “ thrice turned over; this will enrich and
 “ mellow it in a surprising manner;” and so indeed it ought, for this is a surprising quantity. He directs almost as much for liquorice, and great quantities for some other crops. But this author should have known, that much dung is an injury to madder, debasing the colour of the dye. And that the liquorice raised near London is much inferior to that in other parts of England, only because the liquorice grounds about London are dunged too much.

With

With regard to what this author advances, that experiment has not, and probably will not prove, the acquisition of fertility, or (as he calls it) manure from the atmosphere; the above experiments have not only proved it, but he might have easily satisfied himself of the truth of it, by a small experiment of some plants, of wheat, &c. upon a few perches of ground; and by well cultivating them, and keeping the ground perfectly clean from weeds, he might have discovered, whether the benefit of a fallow arises merely, as he supposes, from killing of weeds.

But, to answer this objection fully, I shall recite an experiment made by the very ingenious M. de Chateauvieux. “ Repeated ex-
 “ perience, says he, the effects of which have
 “ constantly been the same, have taught me,
 “ and I can safely affirm, that extremely bad
 “ lands, which could not so much as yield a
 “ crop that would pay the expence of tilling
 “ them, have been rendered good and fertile,
 “ merely by ploughing, and without the as-
 “ sistance of any manure. This is a striking
 “ truth; it was that first determined me to
 “ practise the New Husbandry; and therefore
 “ it was of consequence to me to be certain of
 “ it. To this end, I was resolved to make a
 “ trial on a small spot of ground, which I knew
 “ to be incapable to produce any thing. Some
 “ years before I had dug away the earth three
 “ feet deep, from a space of 60 square toises
 “ [about

“ [about eight English perches]; nothing re-
 “ mained in it but a close white clay, fit for
 “ potters use. This spot, thus circumstanced,
 “ seemed to me a proper one for my experi-
 “ ment. As the space was too small for the
 “ plough to work in, I made use of the spade
 “ and hoe: it was made into beds, which
 “ were afterwards sowed with wheat, and the
 “ spaces between them frequently stirred.
 “ The first year my plants were very poor, and
 “ branched only into two, three, or four stalks
 “ apiece; the second year they did much
 “ better; and the third year they were as large
 “ and as fine as any my garden could have pro-
 “ duced. This spot continues to produce
 “ equally well.

“ We have here a remarkable instance of
 “ what may be done, by sufficiently pulve-
 “ rising the earth: that which I am speaking
 “ of, is now like mould; and, which is very
 “ remarkable, it has lost its former white
 “ colour, and is now black: let us but allow
 “ the same with any of our bad lands, and per-
 “ severe in ploughing and stirring them a suf-
 “ ficient time, and the success will not
 “ be doubtful.” This one small experiment
 is a sufficient answer to the objection of the
 above author.

But so ready is he to recommend dung on
 every occasion, that, speaking of manuring
 grass-lands, he says, p. 284. “ It is difficult
 “ to over-manure arable lands, but very easily
 “ done

“ done with grafs.” A maxim this, the reverse of the practice of the best farmers, especially of arable lands cropped with corn. The following letter from an Essex farmer will shew this very clearly.

“ It is now upwards of seven years, that I
 “ have been tenant of a considerable farm in
 “ Essex; but as there are some particular cir-
 “ cumstances attending this farm, I must beg
 “ leave to say a few words on the subject.

“ The soil, which is for the most part a
 “ mellow loam, or what is in general called
 “ a good wheat soil, was in very good heart,
 “ and not impoverished; yet the last tenant
 “ broke on this farm, and the landlord lost
 “ by him near two years rent: for his crops
 “ of wheat were continually damaged by
 “ smut, let him take what care he would of
 “ the seed, and were besides often laid; and
 “ the land got very foul, though he was not
 “ sparing of his fallows.

“ On the contrary, since I have occupied
 “ this land, it has borne large crops of good
 “ sound wheat, with very little smutty corn;
 “ and barley, oats, pease, beans, and other
 “ things in proportion. What will appear
 “ still more surprizing is, that I do not lay on
 “ half so much dung as he did.

“ It will now perhaps be necessary to ex-
 “ plain this seeming paradox. At no great
 “ distance from the farm lives the land-
 “ lord, who is a man of fortune, and drives
 “ a set

“ a set of horses. This gentleman keeps no
 “ land in his own hands, so that he was
 “ for many years obliged to buy all the
 “ straw used for the litter of his stables,
 “ which amounted to a very considerable
 “ quantity: however, when the last tenant
 “ of this farm came to it, having been a ser-
 “ vant in the family, he offered to supply the
 “ squire with straw for his stables, provided
 “ he might have all the dung except what the
 “ gardener had occasion for. The squire
 “ thought this a good proposal, and the far-
 “ mer imagined he had the best of the bar-
 “ gain; so the matter was soon settled.

“ Now, you are to understand, that the
 “ squire kept, besides seven coach-horses, a
 “ stable of hunters, a number of road-horses,
 “ and a pack of hounds; so that there was
 “ on his premises, in a year, an incredible
 “ quantity of rich dung.

“ The farmer imagined he was now in a
 “ fair way of making his fortune; for his
 “ father had taught him, that the man who
 “ can command dung, is always sure of large
 “ crops: but this did not prove true, in the
 “ present case.

“ To proceed, my predecessor went on
 “ ploughing his land, got his fallows in good
 “ order, dressed them largely with dung, and
 “ always sowed them with wheat.

“ His crops of this noble grain, however,
 “ by no means answered his expectations: his
 “ wheat

“ wheat constantly looked well and promising, in winter and the early part of the spring of the year; but as it advanced, it grew rank; and at harvest, was either run all to straw, and was besides very smutty; or else, if a heavy shower of rain happened to fall, it was lodged, matted, and grew. This was, indeed, a very mortifying circumstance, but our farmer could find no remedy for it. He several times, without success, tried folding some sheep on his wheat: but this part of Husbandry, for want of skill, he managed so badly, that he lost two entire crops: for he had scarcely the return of his seed at harvest. This could never hold long; so that, in the end, he was, as I said before, broke and ruined.

“ This man never could be persuaded, that any part of his loss was to be attributed to the dung he laid on his land; though he constantly manured it with horse-dung, before it was half-rotten; and without any mixture, to allay its great heat. This kept the soil in a constant state of fermentation; and stocked it with weeds; insomuch, that when I took possession of the farm, some of the soil was absolutely mouldy, and stunk again, it was so rank.

“ I will now inform you of my method of management, that you may be able to judge how far I was benefited by the errors of my predecessor.

“ I found

“ I found fixty acres of fallow, ready for
 “ sowing with wheat: these, as the land
 “ was rank, I sowed with the winter tare;
 “ which I knew by experience would choak
 “ the weeds, and abate the rankness of the
 “ soil. In some parts, where the soil was
 “ not so rank, I ploughed-in the tares, in or-
 “ der to sow wheat over them. In other
 “ parts, I suffered the tare to stand for a crop;
 “ which however was not considerable, they
 “ ran so much to straw or haulm.

“ When the tares were off, I got the land
 “ instantly in order, and sowed the whole
 “ with wheat, of which I had a better and
 “ cleaner crop, than had been known upon
 “ the land for upwards of seven years before;
 “ this all my neighbours acknowledged. How-
 “ ever, it was neither clean enough, nor
 “ considerable enough, to satisfy me. Some
 “ of your readers may perhaps wonder, what
 “ I did with my tares, as but few are sold at
 “ the country markets: but I must inform
 “ them, that I live within ten miles of a
 “ sea-port town, whither I sent them at va-
 “ rious times, in order to their being carried
 “ by sea to London.

“ I am to observe to you, that I continued
 “ the agreement, of giving the squire straw
 “ for his dung: but I made use of it very
 “ different from my predecessor.

“ I make it a rule, never to manure for
 “ wheat, or sow wheat on a fallow. I do
 “ not

“ not indeed allow many fallows on my land;
“ and when I do, I generally sow my fallow
“ with barley, to which I allow four or five
“ ploughings. This commonly yields me a
“ large return, and I have a good crop of
“ wheat after it.

“ This, however, is not my general me-
“ thod: for I am very fond of the Hoeing
“ Husbandry; to practise which in some de-
“ gree, is the only infallible way of keeping
“ land clean. To begin then with my me-
“ thod; I never lay any dung alone on my
“ land, let it be ever so rotten; but as soon
“ as I get any long dung from the squire’s, I
“ carry it to my compost-heap, where it is
“ mixed in alternate layers, or beds, with
“ fresh virgin-earth (if I can get it), lime or
“ chalk, lime-rubbish, scourings of ditches
“ and ponds, turf, leaves of trees, and all
“ the dung and offal of my family, of the
“ hog-yard, the poultry-yard, and the dog-
“ kennel. As to my pigeons dung, I always
“ preserve it to mix with foot, and use the
“ mixture as a top-dressing for my wheat,
“ whenever it happens to be too backward in
“ the spring.

“ But to return to my compost: I have al-
“ ways several distinct heaps of different
“ ages, and I sometimes leave it three years
“ before I use it; and never lay on any under
“ three years old.

“ When I have got a plot of ground in or-
“ der, I give it a thorough-good dressing of
“ this

“ this compost, which I immediately plough
 “ in. I then sow it with some crop that re-
 “ quires hoeing, such as horse-beans, broad-
 “ beans, or white or grey pease. During the
 “ whole summer, I take care to keep these
 “ crops very clean, by hoeing, especially if
 “ the season is rainy; and I am particularly
 “ cautious in preventing any of the weeds
 “ from perfecting the seeds.

“ When my hoeing-crop, which generally
 “ more than pays me all my expences, is off
 “ the land, I immediately get it into as fine
 “ tilth as I possibly can, by repeated plough-
 “ ings; and then sow it, either with wheat
 “ or barley, whichever is likely to pay me
 “ best: for, little as some of your readers may
 “ think of it, barley, when it is sown on
 “ good land, well prepared, is very frequently
 “ as profitable as a crop of wheat.

“ By thus sowing my wheat, after a hoe-
 “ ing crop with dung, I have always a good
 “ return of clean corn, often five quarters on
 “ an acre; and my land will still be in heart
 “ enough, to give me a reasonable crop of
 “ oats; after which, without any fallow,
 “ comes my hoeing crop, &c.

“ When I sow barley after the hoeing
 “ crop, I suffer wheat to follow it; and then it
 “ is that, if I find it necessary, I give the
 “ wheat in the spring a top-dressing of foot,
 “ mixed with pigeons dung.

“ I sometimes allow only six pecks of
“ feed-wheat to an acre: this is when I sow
“ over it, in the spring of the year, eighteen
“ bushels of broad-clover-feed; which I har-
“ row in with a pair of very light harrows,
“ and it does not in the least damage my
“ wheat-plants. I leave the clover only two
“ years on the land: for the second year after
“ I have mown the first crop for hay, I suffer
“ the second to grow very rank (having
“ given my land a slight dressing from my
“ compost dung - till the preceding year)
“ which I plough in, and over it sow wheat,
“ to be harrowed in at once ploughing.

“ These crops of wheat are smaller in
“ quantity than any others I get; but the
“ grain is finer, plumper, brighter, and hea-
“ vier, generally selling for more at market,
“ as being always very clean, and clear from
“ seeds of weeds.

“ In my method of farming, some parti-
“ culars are to be noted. In the first place,
“ as my crops succeeded one the other very
“ quick, I am under a necessity of having all
“ my stubble extirpated, before I give the
“ land the first ploughing after the crop is off.
“ If it is a wheat or bean stubble, I generally
“ have it all pulled up by hand by women
“ and children; barley and oat-stubbles I
“ have torn up by a pair of loaded drags, and
“ afterwards gathered into heaps, and carted
“ to the compost heap. This I do to prevent
“ the

“ the stubble from being buried by the plough,
 “ and from growing mouldy in the land :
 “ from which mouldiness, I have great reason
 “ to think, smut proceeds.

“ Another thing to be noticed is, that I al-
 “ low less seed to my land than most of my
 “ neighbours ; my quantity being from seven
 “ to nine pecks of wheat, from nine to twelve
 “ of barley, and about twelve of oats, to an
 “ acre of land : but it is always to be pre-
 “ sumed, that the seed I sow is good. If
 “ any farmer should imagine, that these
 “ quantities are too small, let him suppose
 “ every wheat-plant to occupy a space of six
 “ inches square, which is small enough ; let
 “ him then calculate, how many such spaces
 “ there are in a square acre. When he has
 “ done this, let him proceed to count how many
 “ grains of wheat there are in a pint, which
 “ multiply by the number of pints in nine
 “ pecks, and he will find, by the result, that
 “ I, in fact, allow too much seed.”

In the third volume of the *Museum Rusticum*, p. 151. an old Norfolk farmer gives a very sensible account of his management of wheat crops, respecting the feeding down wheat in the spring, with sheep ; and then concludes, as follows ;

“ We must not always judge the farmer's
 “ profits by the produce of his land, which
 “ some of your readers may think odd ; but

“ I will make it appear by an example from
“ my own practice.

“ In the year 1743, I had two fields of
“ twenty acres each in wheat ; one of which
“ yielded me at harvest, at the rate of four
“ quarters an acre throughout ; the other
“ yielded me only twenty bushels, one acre
“ with another : yet I got more by the last
“ than the first. The case was thus : falling
“ short of dung, I was obliged to buy ; but
“ it was so dear, that I only bought enough
“ for the first field, giving the other two
“ ploughings extraordinary, instead of ma-
“ nuring it ; and these ploughings I reckon
“ at a mere trifle, as my horses would other-
“ wise have stood still.”

The importance of manures in the common practice of farming is known, and generally acknowledged : but of late, some writers on Agriculture have contended for such an universal use of them, as seems to resolve this art to the single point of collecting and applying immense quantities of dung to their arable land. They endeavour to persuade their readers in the stile of the above Essex farmer's father, “ that the man who can command
“ dung, is always sure of large crops.” A very fallacious rule, if adhered to literally ; though of great use, when applied with judgement : as appears by the different success of those two farmers on the same land. A distinction ought to be made in the culture of
plants

plants for feeding cattle: for them dung and manures are particularly useful, because they promote a great luxuriance in these plants, which is much for the farmer's profit: but a luxuriance in wheat, and other corn, is so far from being beneficial, that it is often hurtful, producing much straw, and but little good corn; such gross crops are also the most liable to distempers, and to be blighted and lodged. This may be said in general of all plants cultivated for seed; and may be observed also in gardens. I have cultivated radishes in a rich soil, which have grown remarkably large, have spread greatly, and continued all the season to produce many blossoms and pods, but not one ripe seed.

The above Norfolk farmer's two fields of wheat shews the difference of profit of tillage and manure. One that produced but twenty bushels of wheat per acre, was more profitable to him, than thirty-two bushels per acre produced by the other. The difference in the two crops, being twelve bushels per acre, was in a great measure owing to the dung, whereof the other field had none. But farmers should consider, not only the crops, but the expence attending them. The two ploughings extraordinary might cost about eight or ten shillings, or the value of two bushels of wheat, which being deducted from the other greater crop, there remains ten bushel;

to obtain which, cost the farmer about 2 l. 10 s. per acre, or upwards.

It is indeed remarkable, that two common ploughings should, in point of profit, exceed a dunging, and is a strong argument in favour of tillage, and of the New Husbandry: for in that method, the tillage is performed in a manner more advantageous to the crop, and also much cheaper, than common ploughing.

The common reckoning of the price of dung per acre; is from three or four to five pounds: but the dung does not advance the crop to that value beyond a drilled and horse-hoed crop; as appears from what has been shewn above of the hoed crops. And it has been also shewn, that horse-hoed crops of wheat may be, and actually have been, repeated many years, without intermission, and without manure.

In the old method of farming in England, a fallow once in three or four years was thought necessary, and by most farmers is thought so still. But of late years it has been found by the more curious, that fallowing is not necessary; and that land may be kept in heart by a change of crops only, and without fallowing. This saves the expence of rent and fallow every third or fourth year, and is undoubtedly a great improvement in Husbandry. Yet the Hoeing Husbandry is superior even to this new mode of culture, wherein the farmer's aim is to obtain a crop
of

of wheat every third year, or, at most, every second year; wheat being universally by them esteemed to be their principal and most profitable crop, to obtain which is the chief intent of fallowing; and the intermediate crops of beans, pease, &c. are allowed to be inferior to wheat. But in the New Husbandry, the farmer obtains a crop of wheat every year: or, if he has a mind to change sometimes for any other crop, or is obliged to do so, as Mr. Craik does, from a peculiarity of soil or climate; he can do it to as great advantage as the common farmer, or more so; hoed crops being generally more profitable than the broadcast.

Upon the whole, the reader may perceive, how groundless is the assertion of the author of the Farmer's Kalendar, that "were such
 " ideas (as those of the New Husbandry)
 " to become general, it is inconceivable how
 " much mischief they would occasion; and
 " that there cannot be more false principles,
 " than those whereon they are built:" which before any author had presumed to assert, he ought to have understood them, and to have disproved them by a fair trial; or acquainted his readers, where they were disproved by persons of character: but this was not in his power to do. These principles are founded upon truth and nature; they have been proved by the most accurate experiments, and by ex-

tensive practice, on various sorts of land, and cannot be disproved by negative arguments.

Though the horse-hoed wheat crops are very profitable, farmers are not advised to go largely into that Husbandry at first, because it requires more skill and attention in the management, than other crops that do not continue so long upon the ground : for which reason the farmer should begin it at first upon a small quantity of land ; and encrease it, upon further experience.

Mr. Tull at first drilled three or four rows upon six-foot ridges, afterwards two rows only upon narrower ridges, as mentioned above. But the most perfect culture in this Husbandry, is of single rows upon ridges : for where there are two or more rows upon a ridge, the partitions between the rows cannot receive the full benefit of the horse-hoeing, and are cultivated only with hand-hoes ; and it is difficult to get the weeds clean out of the rows. It seems to have been for these reasons, that the very ingenious author of this Husbandry began, towards the latter end of his practice, to try the culture of single rows of wheat upon ridges ; which he thought might answer, if single rows of Smyrna wheat were drilled upon ridges three feet and eight inches broad. This wheat has one large middle ear, with smaller ears growing out from the bottom of the middle ear, and all round it ; he was promised some of this wheat, but disappointed ;

pointed ; and he thought the white and grey cone (the sorts he commonly cultivated with the horse-hoe) were not large enough to be drilled upon ridges in single rows ; and, I believe, has not been tried in this manner ; but there is another method, that has been tried with success, which the farmer may practise with safety, till he is well acquainted with horse-hoeing double rows upon ridges. This is, to drill his wheat in single equidistant rows, of two feet or thirty inches asunder, with about two pecks of seed per acre, if sown early. The thirty-inch spaces should be cultivated with a small swing-plough, (in the manner the ridges are hoed) the first hoeing before winter, taking care that the plants of young wheat are not covered with the mould falling upon them. In this way, the wheat should not be hoed on both sides of the rows at once, for that would leave them too much exposed ; as the plough should go within two or three inches of the wheat : but the rows should be hoed alternately, one of the spaces in autumn, and the next to it in the spring ; and in this manner during the growth of the wheat. If the land is so strong, that it would get stale and hard before the spring-hoeing, the wheat may be hoed alternately in autumn, on both sides, which is done by returning the earth hoed from one side, immediately, or soon after it was hoed from the wheat ; and then hoe the other side, which
may

may lie open during the winter, to carry off the rain-water, and keep the wheat dry till spring. The last hoeings in summer should earth the rows up on both sides, which will help to strengthen and support the wheat. In this way, there is little occasion of hand-hoeing, except for the narrow slips left by the hoe-plough next the wheat, and the rows are easily cleaned of weeds.—Great crops have been obtained in this method of culture, where the rows were but two feet distant: but if they are drilled at the distance of two feet and an half, the spaces may be deeper hoed, which will be more advantageous to the crop and the land: though the two-feet rows are very profitable, and will probably be at first preferred by farmers.

It is proper to prepare land well, that is intended for wheat; and, if the land will bear to be deep-ploughed, the crop will be the more plentiful. This is a circumstance not sufficiently attended to by many farmers; and some writers have been so ignorant, as to recommend shallow ploughings, as of four or five inches: but plants are nourished by their roots, and the more good well-tilled earth they have to spread in, the more vigorous the plants will grow, and the greater crop they will produce. Many instances might be given of this; but it may be sufficient here to take notice, that, in cultivating madder, very little or no manure is used, but the land is dug

dug three or four feet deep: the land is employed in the preparation and crop of madder three or four years; and then it is dug up, and well-broken, to get out all the madder-roots, and this digging is also about four feet deep: the same land is not usually replanted with madder immediately, but with wheat or other crops for four years or more; not being thought proper for madder, till it has been planted with corn, or other crops, for several years. Wheat usually succeeds madder, but the land is not dressed with dung, or any manure, for wheat; yet it is found, that after such deep digging, if the season is at all favourable, they are sure of a great crop of wheat; and that the benefit of such digging continues for several succeeding crops.

The crop of wheat, cultivated as above, is reaped at a less expence than the broad-cast, and, being perfectly clean from weeds, is soon in order to be carried home, which is no small advantage in a catching harvest.

Good Husbandmen begin plowing, their land early in autumn, to prepare it for the next crop, for which three plowings are often necessary, sometimes more; but the farmer, who understands the Hoeing Husbandry, will not lose five or six months, and be at that expence, merely as a preparation for a crop next summer. He may have a crop in winter, which will defray the expence of winter-fallowing, and bring him some profit besides.

Land is not impoverished by a crop, if that crop is well horse-hoed, as we have shewn of wheat crops; and as wheat crops, thus cultivated, do not require manure, the farmer may spare some manure for a winter crop.—As suppose his land, in the present case, is strong, it may be ploughed as soon as the wheat is carried off, laid up into five-foot ridges, and immediately planted with a double row of cole-feed plants upon each ridge, the rows a foot asunder, the land being first well dressed with dung or compost. The plants being thus disposed, there will be a space or interval between the double rows, of four feet wide, which is a proper distance to give room for the hoe-plough; and these cole-feed plants, well horse-hoed and hand-hoed in the partition between the rows, will come forward apace, and produce a considerable quantity of good feeding for large cattle and sheep to the beginning of February, about which time the land should be cleared of all the cole-feed plants, and immediately planted, five feet each ridge, with a double row of beans, to be horse-hoed. Once ploughing of the ridges is a sufficient preparation for the beans: for it is an advantage peculiar to the New Husbandry, that one crop may immediately succeed another, without further preparation or expence than ploughing once for a new crop. I have proposed to plant cole-feed, as August is a proper time to transplant them for a crop; and they
are

are very good feeding for cattle, and so hardy as very rarely to be injured by frost: If the farmer is situated near a great town, the green curled favoys, or cabbage plants, &c. for sale, may be still more profitable to him.—The beans, well hoed, will yield a larger and more profitable crop than in the common way of planting them; and as soon as they are cut, the land may be ploughed down level and drilled with wheat, to be cultivated as before.—In this method of cultivating wheat, very good crops will be obtained, but the land is not so much improved as it is by the horse-hoeing of wheat upon ridges; and for that reason it will not be adviseable to attempt raising successive crops of wheat every year in this method of drilling it upon the level, as may be done upon ridges. Yet in this way the farmer will find it much more profitable than the Old Husbandry, and the most approved course of crops in that Husbandry, viz. turnips, barley, clover, and wheat; for in this course the farmer can have but one crop of wheat in four years, whereas in the hoeing method just mentioned he has two crops of wheat in four years, better crops than he commonly obtains in the Old Husbandry, and at a less expence, besides the advantage of the winter crop of cole-seed for his cattle.—And when he is so expert in the hoeing, as to undertake the culture of wheat in the best horse-hoeing method as described above, he may have

have a crop of wheat every year upon the same land, to much greater profit than any course of crops in the Old Husbandry, as we have shewn above.—If the land is not very strong, instead of beans, the farmer may raise a crop of carrots or potatoes after the wheat, and thus have wheat and potatoes, or wheat and carrots, alternately.

Having shewn that wheat and beans are cultivated to greater profit in the New than in the Old Husbandry, I shall proceed to some other crops, and prove the advantage of hoeing, by a fair comparison of both at large. We have an example of this in the culture of turnips by Mr. Wynn Baker, near Dublin, which, in his report to the Dublin Society, he relates as follows. He prepared land for several different crops, whereof part was turnips; this was five times ploughed, and laid in five-feet ridges. Compost was laid in the furrows between the ridges, which were at the last ploughing turned back upon the compost, and a single row of turnip-feed was drilled upon the middle of each ridge over the manure. Half an acre was ploughed six times, dressed with the same compost as the ridges (but with double the proportion that was given to the land in ridges), and he sowed it with turnip-feed, broad cast; at the same time the ridges were drilled, viz. the 14th of July.

“ The

“ The half acre before mentioned,” says
 Mr. Baker, “ I manured with at least double
 “ the proportion of compost that was allowed
 “ to the other part of the fallow, as it was
 “ flat, and it was necessary to manure every
 “ part of it, being intended for turnips, to
 “ be sown in the promiscuous way, or broad
 “ cast: to this piece of ground I gave a sixth
 “ ploughing, as it could not have the benefit
 “ of the horseshoe, when cropped; and there-
 “ fore I thought it necessary to reduce it as
 “ fine as possible, in order to give the broad-
 “ cast crop of turnips every advantage I
 “ could.—My turnips should have been sown
 “ at least three weeks earlier; but the immo-
 “ derate and continual rains of the preceding
 “ winter involved me so much with my spring
 “ sowing, that I could not accomplish my
 “ turnip-sowing earlier. When the drilled
 “ turnips were about three inches high, I
 “ thinned them by hand, as being much
 “ preferable and more expeditious than any
 “ instrument, intending to have them singled
 “ out to about one foot asunder in the rows;
 “ but, it being so new a work, the women
 “ could not be brought to do it effectually at
 “ once, they apprehending that the whole
 “ crop would be lost, and arguing that they
 “ were sure there was already too much
 “ ground allowed to one row: under these
 “ circumstances, I could not get this work
 “ done quite to my mind this year; as I had,
 “ besides

“ besides this field, two others sown in the
“ same way, amounting in all to about
“ twelve acres.—These turnips were horse-
“ hoed upon the 17th of August, for the first
“ time, by taking off, at one furrow of the
“ plough, only one side of each ridge, close
“ to the plants; thus they remained till the
“ 25th, when I run the plough in the same
“ furrow; by which, with the first furrow,
“ I ploughed about twenty-one inches deep.
“ This being finished, I immediately returned
“ the earth back to the plants; this afforded
“ them fresh nourishment; and, in order to
“ give their roots time to penetrate this fresh
“ earth (which by the horsehoeing was be-
“ come very fine mould), I let them remain
“ in this state till the 12th of September,
“ when I horsehoed them again, by taking off
“ the other side of every ridge, and on the
“ 20th deepened the furrow in the same man-
“ ner as the former, and immediately returned
“ back the mould to the plants, and on the
“ 18th of October threw up a small furrow
“ on each side of every ridge, which finished
“ the culture of these crops, and restored the
“ ridges to the form in which they were
“ when the plants were put out upon them.”

—This is his description of horsehoeing the
cabbages he had planted in the same field;
and he refers to that account for the turnips,
which, he says, were horsehoed in the same
manner, and nearly at the same times, as
these

these cabbages, “ with this difference only;
 “ that I deepened the furrows of but a few
 “ ridges of the turnips in another field by a
 “ second ploughing in the same furrow,
 “ which I did not find to benefit the turnips
 “ much; for, if the ground is well prepared
 “ before the sowing, the depth of one furrow
 “ will be enough for the turnips, provided
 “ that be deep and bold.

“ Thinning the turnips in drills by hand
 “ cost me eight-pence an acre; weeding
 “ them cost me four-pence; and the repeated
 “ horse-hoeings about fourteen pence an acre
 “ for workmen’s wages, exclusive of the
 “ horses; of which I generally used two,
 “ except in very hot days, and then I found
 “ three were necessary.—The broad-cast tur-
 “ nips were carefully thinned by hand, when
 “ they were about two inches high, which
 “ the women did with more courage than
 “ they did the drills; and some time after-
 “ wards I hoed them once, and weeded them
 “ twice. Thinning them by hand cost me
 “ four shillings. Hoeing them afterwards
 “ cost eight shillings, and weeding them cost
 “ me two shillings and four pence. They
 “ were scarcely half an acre; this expence
 “ being therefore doubled, they cost me at
 “ the rate of twenty-eight shillings and eight-
 “ pence an acre, over and above the extraor-
 “ dinary ploughing and double proportion of
 “ manure. In truth, this crop greatly ex-
 “ ceded

“ceeded my expectations, being by far the
 “best I ever had in the broad-cast way ; but
 “I attribute their success wholly to the thin-
 “ning them by hand ; for two, three, four,
 “and often five more turnips will be so united
 “and interwoven, that it would be impossible
 “for the most dextrous hoer to separate
 “them ; whereas the fingers and thumb will
 “preserve the master plant, whilst the others
 “are most conveniently drawn from it by the
 “other hand of the person employed. Add
 “to this, that there is no labour in which we
 “are more liable to be deceived than in tur-
 “nip-hoeing.

“December the 17th I measured out three
 “square perches of the best of the broad-cast
 “turnips, and also three square perches of the
 “drilled ; and the produce was as follows :

	C.	q.	lb.		T.	c.	q.	lb.
“ Three perches of the drilled weighed	17	2	21	which	47	2	3	2
“ is <i>per</i> Acre	-	-	-					
“ Three ditto of the broad-cast	16	1	0	which	43	5	3	6
“ is <i>per</i> Acre	-	-	-					
“ In favour of the drilled						3	16	3 14

“ Thus we see, that, notwithstanding the
 “extraordinary proportion of manure, and the
 “extraordinary ploughing, which was af-
 “forded to the broad-cast turnips, the drilled
 “crop, with intervals of five feet, produced
 “the greatest quantity upon an a. re.

“ It now remains to describe the nature
 “and quality of the land. The land lies
 “upon

“ upon a lime-stone quarry, which is very
 “ near the surface ; and is naturally a strong
 “ and stubborn soil, with an infinite number
 “ of loose lime-stones in it. With dry
 “ winds, or a parching sun, the ground
 “ unites, and is as hard as bricks; moderately
 “ wet, it is reducible by instruments ; but
 “ when thorough wet, it runs together ; and
 “ is like brick-clay, when tempered. This, I
 “ repeat it, is the natural quality of the
 “ land, and is what the writers would call
 “ a barren, grey, stiff earth, but is not quite
 “ a clay. I have found repeated tillage, when
 “ the land is in a proper state of moisture,
 “ will reduce it, and divest it of its natural
 “ adhesion. Tillage and manure together
 “ render it capable of producing any thing ;
 “ as I believe such agents will do upon any
 “ land, provided it can be kept moderately
 “ dry. The fields which I had under turnips
 “ and cabbages have been in appearance all
 “ the summer a fine loam, and really bore the
 “ complexion of very fine land, abstracted
 “ from the rich appearance of the crops.”—
 Upon this accurate experiment, we may make
 the following remarks.

1. He acknowledges a partiality shewn to the
 broad-cast turnips, in bestowing upon them a
 double quantity of manure, and an extraordi-
 nary ploughing, which doubtless made that
 crop considerably greater than it would have

been with only the same tillage and proportion of manure.

2. Ridges four feet broad are sufficient for turnips for feeding cattle, as was experienced by Mr. Tull, and by others since. Upon four-foot ridges the crop would have been greater than upon those of five feet, in the proportion of five to four; and the crop would have been 58 tons, 7 c. 21 lb. viz. 2 tons, 13 c. 1 qr. 11 lb. more superiority per acre than computed by Mr. Baker.

3. The expence of the broad-cast was much greater than of the drill, for the broad-cast cost 1 l. 8 s. 8 d. per plantation acre, and the drilled cost but 4 s. 2 d. per acre, reckoning the horses at one shilling a day each, which is a good price there: so that the expence of cultivating the broad-cast turnips was above six times as much as for the drilled. This difference is very great, and would amount to a large sum in cultivating turnips extensively.—The drawing up and carriage of the broad-cast costs also more than the other; and if not drawn all clean up, what is left in the ground will grow, and damage the next crop, especially if that is barley.

4. The land where the broad-cast turnips grow becomes hard and stale, and will require several poughings to bring it into fine tilth for another crop: whereas land that has been horse-hoed is in fine tilth, while the crop of turnips are growing upon it (as Mr. Baker

Baker takes notice the cabbage-ground was, with the same tillage); and therefore this land required only once ploughing of the ridges to prepare it for the next crop; and ridges are also ploughed with less labour, and at fewer furrows, than the same extent of land that lies level.

5. Land lying in ridges is not only ploughed and prepared for a succeeding crop in a shorter time, and at a less expence, than land that lies flat; but the earth of the horse-hoed ridges is likewise much richer, though it produced a larger crop than the level ground sown broad-cast. For the land that is ploughed deep, turned, and a new surface exposed to the air at every horse-hoeing, is receiving new supplies of the pabulum, aliment, or food of plants, all the time it is thus cultivated; and the level ground, not cultivated with the hoe-plough, is losing the vegetable aliment all that time. If the succeeding crop requires ridges of the same breadth, all the cultivator has to do is, to plough back the ridges upon the present furrows, and then the middle of the new ridges will be composed of fine earth, well pulverized by the former horse-hoeings, and impregnated with nutritious aliment received from the atmosphere.

6. We see, in the present case, that the horse-hoeing makes a great saving of manure; half only of what is given to broad-cast turnips was made use of here; and, in some

crops, as wheat, no manure is necessary; hoeing alone is sufficient to nourish the growing crop, and to enrich the land for the succeeding one.—Many other examples might be given of the enriching effects of deep hoeing; but these may be sufficient as a specimen.

There is a method of culture lately practised and recommended: which is, in some measure, upon the principles of the New Husbandry, and said to be superior to it. The invention of this method has been attributed to Dr. Hunter of York, and to Mr. Melvill of Lincolnshire. I know not which of these gentlemen introduced it, but the latter describes it as follows:

“ It will be almost unnecessary to observe,
 “ that weak arable lands have been restored
 “ by means of a fallow, which the judicious
 “ husbandman makes more or less frequent,
 “ in proportion to the poverty of the soil.
 “ Upon the high wolds in this country, and
 “ in Yorkshire, where the soil is poor and
 “ thin, oats and barley are principally cultivated. The usual Husbandry is one crop
 “ and a fallow; and in some places, where
 “ there is a greater poverty of soil, they take
 “ one crop, and then let the land rest for
 “ some years, to recover itself. This last is
 “ something like the Husbandry of the wild
 “ Arabs.

“ Being greatly dissatisfied with the above
 “ manner of cultivation, I employed myself
 “ some

“ some years ago in forming another, which
 “ might be more consistent with the laws of
 “ vegetation, as well as œconomical Huf-
 “ bandry. The system that I have adopted is
 “ as follows, viz.

“ Instead of having the land laid out in
 “ broad ridges, I order them to be made only
 “ nine feet wide. When the seed-time comes,
 “ I sow every other land broad-cast, and har-
 “ row-in the grain in the usual manner.
 “ The intermediate spaces, which I shall call
 “ the fallow-lands, are ploughed two or
 “ three times, at proper seasons, by a light
 “ plough, drawn by one horse, in order to
 “ make a clean fallow for the succeeding crop.
 “ Upon these lands the seed is sown as before.
 “ The stubble, in turn, becomes the fallow,
 “ and is treated accordingly. In this alter-
 “ nate way, I manage my weak arable lands,
 “ and I have the satisfaction to find, that
 “ very little manure is required; which is a
 “ most agreeable circumstance, as such lands
 “ are generally remote from a large town. I
 “ dare venture to say, that the same field,
 “ managed in this alternate way for two
 “ years, will be found to produce one-third
 “ more corn, than when cultivated in the
 “ usual manner, by a crop and a fallow, and,
 “ at the same time, be attended with much
 “ less expence to the owner.

“ This seeming contradiction will be rea-
 “ dily removed, when we reflect, that vege-

“ tables, no more than animals, can continue
“ long in a state of health, without the free
“ enjoyment of air. In a large field, when
“ the weather is calm, the air remains in a
“ state of stagnation; whereby the perspira-
“ tion of the plants is permitted to remain
“ too long upon the ears of corn. Hence
“ many inconveniences arise to the crop. On
“ the contrary, in the Alternate Husbandry,
“ the air is constantly in motion; the interme-
“ diate fallows serve as funnels to carry it off;
“ and along with it all superfluous moisture.

“ In consequence of this freedom of air,
“ upon which I lay a great stress, the ears of
“ corn are always observed to be well fed, and
“ the stalks firm and strong. When by se-
“ vere weather the corn happens to be laid,
“ it is thrown upon a clean fallow, where it
“ has no chance of being bound down by
“ weeds. It is consequently sooner raised by
“ the current of air which is constantly pas-
“ sing along the fallows.

“ Turnips, or, when the soil is deep and
“ sandy, a few carrots or potatoes, may be
“ placed upon the intermediate lands. But I
“ have always found it best, to keep them as
“ perfect fallows. Every thing that grows
“ takes something from the soil; and as our
“ land is supposed to be poor, and not sup-
“ ported with much manure, we ought not
“ to suffer the smallest vegetable to take root
“ upon it.

“ If the farmer chuses, he may vary his
“ crops;

“ crops; but I am of opinion, and I speak
 “ from some experience, that the same grain
 “ may be cultivated as long as he pleases
 “ upon lands managed in the manner that I
 “ have recommended. In consequence of
 “ this happy disposition of the soil, every
 “ kind of grain may be suited to the land most
 “ proper for it. I do not confine the Alter-
 “ nate Husbandry to oats and barley; I have
 “ successfully followed it upon good wheat-
 “ land; and, if the farmer attends to his bu-
 “ siness, he will find his wheat-crops greatly
 “ to exceed his expectations. Near twenty
 “ bushels of wheat may be got annually from
 “ one acre of land cultivated in this alternate
 “ way, and with little expence of manure.

“ I acknowledge, that many of these ad-
 “ vantages are in common with the Drill
 “ Husbandry; but I flatter myself, that there
 “ are others, which that ingenious system
 “ does not enjoy.

“ I know it will be objected, that, in this
 “ manner, the fallows will be lost to the
 “ sheep during the summer months. I an-
 “ swer, so much the better; if possible, the
 “ fallows should not be permitted to bear
 “ a single leaf. The farmer ought to find
 “ other ways to support his sheep; and, if he
 “ is an intelligent man, he will readily do it.
 “ It is an odd kind of Husbandry, when the
 “ fields bear corn one year for the owner, and
 “ the next, weeds for his sheep.

“ When

“ When first I practised the alternate Cul-
“ ture, I was apprehensive that the pigeons
“ and crows would prove my greatest enemies,
“ by settling upon the fallow-lands, and pulling
“ down the ears of corn. I have now the
“ pleasure to assure the public, that, after
“ some years experience, I find my lands no
“ more liable to those depredations than the
“ neighbouring ones.

“ The lands cultivated in this way, being
“ clear of weeds, require consequently but
“ little manure. They are always in excel-
“ lent tilth; and as their surface is frequently
“ changed, they have every opportunity of
“ drinking up the nutritious matter of the at-
“ mosphere.

“ I have the satisfaction to find, that in-
“ closures are begun upon the Lincolnshire
“ and Yorkshire wolds; in consequence of
“ which, a greater quantity of corn will be
“ produced for a few years than formerly.
“ To those gentlemen whose estates lie in
“ those countries, or in similar ones, I beg
“ leave to recommend the Alternate Husbandry.
“ I dare venture to say, that, in point of
“ profit and convenience, it will be found
“ greatly superior to the Drill Husbandry.
“ The implements used are those of the coun-
“ try; and the mode of cultivation is within
“ the capacity of the meanest ploughman.”

Though

Though the Alternate Husbandry is a cheap method of culture, Mr. Melvill is much mistaken in supposing it to be much more profitable than the Drill-Husbandry; as will appear from a fair comparison. Premising, that more than twice ploughing is necessary in fallowing, to keep down the weeds, which continue growing seven or eight months, in which time a fallow should be ploughed, at least, four times; and ploughing with one horse is quite insufficient to plough the land to a proper depth: but, to give this Husbandry every advantage, we shall charge no more to it for these than he has stated. Some manure he acknowledges is necessary in the Alternate Husbandry, but not how much. A common dressing with dung, to be carried some distance, as in this case, costs for the dung, carriage to the land, and spreading, from three to five pounds an acre; and admitting it can be done here at the lowest rate, three pounds per acre, and also that a quarter dressing is enough for this land, the expence of manure, at the lowest, will amount to fifteen shillings an acre. Let us suppose the field to be cultivated measures twenty acres. In the Alternate Husbandry, half or ten acres is fallow, and the other half or ten acres produces a crop of wheat every year. The expence in the Alternate Husbandry is, for rent of twenty acres, at suppose only five shillings an acre, five pounds; twice ploughing the fallow, at
only

only three shillings an acre, is, for ten acres, thirty shillings. And seed-wheat for the other ten acres, twenty-five bushels, at five shillings per bushel, is 6 l. 5 s. Reaping the wheat, five shillings per acre, 2 l. 10 s. In all, 15 l. 5 s. The crop is twenty bushels an acre, which is two hundred bushels on the ten acres, at 5 s. per bushel, is 50 l. from which deducting the rent and expences, 15 l. 5 s. there remains 34 l. 15 s. clear profit on the twenty acres. In the Drill-Husbandry, the whole twenty acres produces every year a crop of wheat; and the land being deep horse-hoed, and no weeds, will produce twenty bushels of wheat per acre at least, or as much as it does with the shallow ploughing in the Alternate Husbandry; and so much Mr. Tull's ordinary land did produce, on a medium of about ninety acres; and his measure was the common measure of that country, viz. nine gallons to the bushel; so that his crop was about twenty-two bushels and a half per acre, Winchester measure; though his land that year was not in the best order, on account of his being disappointed of a tenant, as was taken notice of above. Now we have shewn, that eight bushels of wheat paid all Mr. Craik's expences of cultivating an acre of his land, viz. of a Scotch acre, which is an acre and a quarter English; and, if so much is reckoned here per acre, there will remain a
profit

profit of twelve bushels per acre, or two hundred and forty bushels upon the twenty acres, at five shillings per bushel, or 60 l. pound profit upon the twenty acres, by the Drill Husbandry; and if every article was stated at the full extent, the profit on the Drill would be double to that of the Alternate Husbandry.

The Alternate Husbandry, as here stated, is, without doubt, a very cheap method of culture, and is founded on a practice somewhat similar to that mentioned by Mr. Tull, in his chapter of tillage, p. 21. "It is of late," says he, "fully proved, by the experience of many farmers, that two or three *additional* ploughings will supply the place of dung, even in the Old Husbandry, if they be performed at proper seasons; and the hiring price of three ploughings, after land has been thrice ploughed before, is but twelve shillings; whereas a dunging will cost three pounds. This was accidentally discovered in my neighbourhood by the practice of a poor farmer, who, when he had prepared his land for barley, and could not procure seed to sow it, ploughed it on till wheat seed-time, and (by means of such additional ploughing) without dung had so good a crop of wheat, that it was judged to be worth more than the inheritance of the land it grew on."

This passage is quoted by Mr. Maxwell, in his Treatise of the Transactions of the
Edin-

Edinburgh Society; to which he adds, that a tenant to Sir John Paterfon, near Edinburgh, being in like manner unable to provide feed for his land in the spring, kept on ploughing it till autumn, and sowed it with wheat; and had so great a crop, that he was encouraged to continue the same method of culture upon great part of his farm; which succeeded so well, and his circumstances were thereby so much improved, that in some years he could have purchased the farm.—These are pregnant instances of the great advantage of tillage, without dung; and justify the retorting, upon the author of the Farmer's Kalendar, what he says of the New Husbandry, and high encomium of dung beyond tillage, “Were
“ such ideas to become general, it is incon-
“ ceivable how much mischief they would
“ occasion: for there cannot be more false
“ principles, than those whereon they are
“ built.”

The examples here given may be sufficient to shew, that the New Husbandry is applicable to many different plants; and it is no less certain, that it is so in different climates. It succeeds when applied to the vines in France and Italy, it has done so in some of the northern colonies in America, where they cultivate a great deal of maize or Indian corn, by hand-hoeing; but a person there, having a mind to try hoeing some of it with a plough, though not performed in the best manner, the success
was

was so great, that some farmers who saw it were so much struck with it, that they immediately attempted to cultivate it in that method, and continue there to do so.—In Jamaica likewise, and some other of the West-India Islands, they are extremely attentive to provide great quantities of manure for their sugar-canes ; so that they keep there a great number of cattle, for the sole purpose of providing dung for their sugar-plantations. They likewise employ great numbers of negroes to hand-hoe them ; yet, notwithstanding, these are all far inferior to horse-hoeing, an example of which is related by Mr. Miller, in his Dictionary, under the article *Saccharum*.

“ I have,” says he, “ been assured, by two
 “ of the most sensible and judicious planters
 “ in America, that they have made some ex-
 “ periments of the horse-hoeing culture for
 “ their canes, which answered much beyond
 “ their expectations. One of these gentlemen
 “ told me, he planted an acre in the middle
 “ of a large piece of canes, in rows at five
 “ feet asunder, and the hills were two feet
 “ and a half distant, and but one cutting to
 “ to each hill. The ground between the
 “ rows was from time to time stirred with the
 “ horse-plough, to destroy the weeds, and
 “ earth the plants. With this culture, the
 “ canes were double the size of those in the
 “ same piece, which were cultivated in the
 “ usual way : and when the canes were cut,
 “ those

“ those which had been thus planted and managed were ground and boiled separately ;
“ the produce of sugar was full as great as
“ the best acre in the same piece, and the expence of boiling was little more than a sixth
“ part of the other ; and he sold the sugar for
“ six shillings per hundred weight more than
“ he could get for the other. These
“ canes are planted thin for the conveniency
“ of horse-hoeing them ; for they are commonly planted a great deal closer,” as Mr. Miller takes notice. “ The distance,” says he, “ which the planters usually allow to
“ their canes, is from three to four feet, row
“ from row, and the hills are about two feet
“ asunder in the rows ; in each of these hills
“ they plant from four to seven or eight cuttings ; which is a very great fault, and is
“ the cause of most of their blights, so much
“ complained of lately : for, if all these grow,
“ which is frequently the case, they rob each
“ other of their nourishment ; and, if a dry
“ season happens before they have acquired
“ strength, they are very soon stunted in their
“ growth, so are attacked by insects, which
“ spread and multiply so greatly, as to cover
“ a whole plantation in a little time ; when
“ this happens, the canes are seldom good
“ after : therefore it would be the better way
“ to root them entirely up, when they are so
“ greatly injured, for they very rarely recover this perfectly : for although the insects
“ are

“ are not the cause of the disease, yet they
 “ confirm it, and cause it to spread.”

The distance of the rows being usually but half what was allowed in this experiment, and from four to eight cuttings commonly planted in each hill, and here but one cutting in each, it appears that the planters set about ten times the number of canes that is necessary or is proper to be done in the New Husbandry ; the great effect of which here is very evident, that deep hoeing with the plough causes one plant to produce as much sugar, and of a much superior quality, as ten plants produce in their common method by hand-hoeing ; and this, notwithstanding the great quantities of the richest manure, with which they constantly dress their sugar-plantations.

The West-India sugar-planters are at a very great expence for Negroes, which cost them fifty pounds and upwards each, and an annual supply to keep up the number. A principal part of their employment in summer is hand-hoeing their sugar-plantations ; which, though very superficial, is all the culture usually given them. The Negroes, for their keeping and the number necessary to be purchased every year, amount to an annual expence of above one third part of all the articles in a plantation ; so that the shallow hoeing of the canes is an exceeding high expence to the planter, though in effect infinitely short of horse-hoeing. The first cost and keeping

of a great number of cattle, for the sole advantage of their dung, is another heavy expence. The first of these, the hand-hoeing, might be entirely saved, the hoe-plough, where it comes, rendering hand-hoeing altogether unnecessary; and a much less quantity of dung would do for the canes, if horse-hoed. The expence would be so much reduced, and the crops of sugar so much advanced by this culture, that every planter who adopts it will be a great gainer, and, if generally practised in the islands, would advance the profits of the planters more than half a million sterling every year, in the article of sugar only; and, if extended to other plants here, and to tobacco, maize, indigo, wheat, and other crops on the continent, to which this culture is adapted, the profits to the planters and the public would be immense; for it appears that the horse-hoeing Husbandry is highly profitable to very many plants; and that the principles of the New Husbandry are not limited to any one kind of land, nor any one climate, but that they are universal.

It was for some time supposed to be only a matter of curiosity, to raise annual successive crops of wheat upon the same land without manure, but it appears to be a matter of great importance; that the hoeing culture is founded upon general principles; that all plants are much improved by hoeing, and large plants particularly by the hoe-plough, much beyond

beyond any other method of culture ; and at the same time the crops and also the land is highly improved by it ; and therefore it is hoped that, now the value of it is better known than formerly, it will become more general in Britain and Ireland.

It is indeed said by some, the New Husbandry is unnecessary when the farmer has great plenty of dung and other manure at a small expence ; and it must be acknowledged that this is a very favourable circumstance for the farmer ; but this does not exclude the hoeing husbandry, which is found to be a great benefit to manured land and to the crops. Dung and other manures may be laid upon land too liberally, as was shewn in the instance of the Essex farmer mentioned above ; and, though it is acknowledged that greater crops are frequently obtained this way in the Old Husbandry than in the New without manure, this does not prove that the Old is the most profitable. In this case a series of crops should be taken for a considerable number of years to determine this fairly. With high manuring ten large crops may be obtained in fifteen years ; but it may happen, and frequently does happen, that much manure is an injury to the crop, which might do so much damage to the five intermediate crops as would much reduce the profits of the fifteen crops upon an average. Very few of those who have practised the New Husbandry have had land that was

good and favourable to that Husbandry, as appears in the examples of it given above. Mr. Craik's is not good land, and his climate is very unfavorable; yet the clear profit of his drilled wheat is to the value of 16 or 18 bushels of wheat *per* acre; the least of these is four pounds an acre: where is the farmer that in the common Husbandry gets so much as four pounds *per* acre for the average crops of his lands that he sows once in three or four years with wheat, and the intermediate years with turnips, barley, and clover? His crops of wheat may be greater than Mr. Craik's; but can he obtain these crops at so small an expence as the value of eight bushels of wheat, or forty shillings? The more manure he lays upon this land, the greater will be the expence of it, and of the carriage and spreading of it; and it is often uncertain, because it depends upon the seasons, whether highly manuring of land shall be a benefit or an injury to a crop of wheat or other corn; for in very dry seasons much dung burns the crop, and in wet seasons it makes the crop too luxuriant, and then it lodges and is blighted.

In many farms, where manure is scarce, the farmer's principal dependence is upon his sheep to dress his land; but, where there are not extensive downs and sheep-walks, the farmer makes nothing of his poor land, nor attempts to do it, for want of manure: many hundred thousand acres, thus neglected, let for

for no more than a shilling an acre; and many more, at not more than two shillings or half a crown an acre, that might by the New Husbandry, be advanced to double and triple their present value; whereof we have a pregnant instance in the high wolds in Yorkshire near Scarborough, where the land lets at no more than a shilling an acre, and though poor, light land, Sir Digby Legard found, by an eight years experience, that profitable crops of barley and wheat were to be obtained from it by the New Husbandry without manure: for his crops were better than by the Old Husbandry with manure, and he recommends the Hoeing Husbandry, even for that land which is so light that only one horse was sufficient to horse-hoe it; and by this, he observes, it was so much improved, that his crops, in the last four years, were almost double to those of the four first.

Many are afraid to hoe light dry land in hot dry weather, being fearful that the heat and drought would burn up their crop; but this is for want of knowing the benefit of deep hoeing, of which the farmer may soon satisfy himself by the following easy experiment, viz. dig a hole in the hard dry ground, in the driest weather, as deep as the plough ought to reach; beat the earth very fine, and throw it back into the hole; after a few nights dews, he will find this fine earth is become moist to the bottom, and the hard

ground all round will continue dry.—Or till a field in lands, make one land very fine by frequent deep ploughings, and let another be rough by insufficient tillage, alternately ; then plough the field cross-ways, in the driest weather, that has continued long dry ; he will perceive, by the colour of the earth, that every fine land will turn up moist, but every rough land will be dry as powder from top to bottom. Hence it appears, that good hoeing, by opening and pulverising the soil, lets the dews into it, which penetrates as deep into it, as it is well hoed ; and that the moisture thus communicated to it by deep hoeing, is not exhaled by the sun or drought ; but that it continues to retain still moisture sufficient to refresh the roots of plants that grow in it.

This great benefit is observable in all land that is well and deep-hoed, and is a singular advantage to all plants in dry soils peculiar to the New Husbandry. We find a remarkable instance of this related in M. Duhamel's Husbandry, of some cabbages that were cultivated by deep-hoeing ; which are plants that require much moisture : and they were kept so moist by this hoeing, in dry hot weather, that they stood upright, and their leaves remained juicy and crisp : but at the same time, some of the same cabbages, that grew in the gentleman's garden who tried this experiment, drooped in the middle of the day, notwithstanding their being carefully watered every day

day by his gardener.—The same thing is observed by Mr. Wynne Baker, who says, that his horse-hoed cabbages continued upright and in health and vigour in the hottest weather, which had a contrary effect upon the cabbages in gardens in that neighbourhood.

This effect of horse-hoeing is of great importance in light, dry soils, causing the crops raised upon them to grow vigorously in hot seasons, that scorch and burn them in the common Husbandry: but the farmer should carefully observe, that he will not receive this benefit by hoeing land, that is not first brought into fine tilth: for a cloddy, rough soil does not drink-in the dews like one that is fine; and, if moistened by rain, is soon dried again, on a return of drought and hot weather; whereas fine mould is moistened by the dews as deep as it is made fine, and is dried by the sun but a few inches deep.—It is likewise a favourable circumstance to the industrious hoer, that the dews are commonly most plentiful in the nights when the weather is very dry and hot in the day-time.—Hence it appears, that the dry, waste lands, whereof there are many vast tracts in the kingdom, which are now looked upon as unprofitable, and of very little or no value to the owner or tenant, may, by this Husbandry, be brought to bear profitable crops; and, if any of them are so poor, that they will not yield profitable crops of wheat without some manure, a very

little manure, with good hoeing, will cause them to yield wheat, or other valuable crops, where none could before be raised, and cannot be obtained but by this Husbandry.— There are some lands in every county, and in some a great deal, that are so remote from great towns, and from the homesteads of farm-houses, that they cannot be manured; and where the prime cost, or the carriage only of manure, would amount to more than the value of the crops. In such situations, the New Husbandry will be of infinite use, and more especially so, if these waste and unprofitable lands were laid into small farms.

Some have objected to the New Husbandry, that it cannot be brought into general use, because some lands lie so irregularly, that they cannot be horse-hoed; which in some instances is admitted; but all lands that can be ploughed in the Old Husbandry, may be improved by cultivators, or hand-hoeing, to more advantage than they are sown broad-cast.— Another objection, which is of much greater consequence, is, that clayey, wet lands cannot be horse-hoed at all; and, if it be true, what a late author hath asserted, that two parts in three of all the arable land in England consist of such strong, stubborn land, the New Husbandry for wheat is at once excluded from such land, and cannot therefore be of general use.— To this it may be replied, that these heavy, clayey, stiff lands are of difficult tillage

tillage in every mode of Husbandry: but that they are more so in the New than the Old, is said by those who are unacquainted with the New Husbandry; as will be evident to them who consider both.—For, admitting that this strong land in the Old Husbandry is summer-fallowed for a wheat crop, whereby it may be brought into tilth, and, being well dunged, is sown with wheat in September, the crop having no further assistance till harvest, or the beginning of August, such strong land will in all that time, or above ten months, become very hard and stale; and a farmer who considers it in this light, as growing stale, during the growth of every crop, will be ready to conclude, that it will be impracticable, or extremely difficult, to bring the land into proper order, and in proper time, for drilling and horse-hoeing.—But let those consider, that land cultivated in the New Husbandry is never suffered to grow stale, or out of tilth, as in common sowing. It will not be denied, that the land may be brought in order for the first crop of wheat to be sown broad-cast; and that this first crop may be drilled in September, and the land brought into this order upon narrow ridges. When this is done, and the wheat has three or four blades, the earth is not then become so stale, but it may be horse-hoed, turning a furrow from the rows on each side: in the spring the horse-hoeing is to be repeated, the plough going in the same

same furrow: and then also the land may be hand-hoed in the partitions, between the two rows of wheat; and, as the horse-hoeings are to be repeated as often as the owner finds necessary, the land in the intervals cannot become stale; and upon that part of the land which has been kept in fine tilth, the next crop drilled again with wheat, or is to be planted with a winter-crop, which should be done without loss of time, that the land may carry a crop in winter, to be horse-hoed; which may be some of the cabbage kind, that is most suitable to the farmer, for all the plants of these kinds will grow well upon such land. The farmer should never allow such land to lie idle and grow stale. It will bear constant cropping, and the hoeing will keep it always in heart: or it may be conveniently dressed for any crop, by laying the manure in the furrows between the ridges; upon which the new ridges will stand, and the crops planted upon these ridges will stand over the manure as upon a hot-bed.—Land thus cultivated, being in narrow ridges, and the ploughing and hoeings made deep, the corn or other crops standing high on the tops of the ridges will not be much liable to injury from wet, which may be carried off by means of the deep furrows—The land is soon prepared in spring for another crop, as of beans; and these may be succeeded by wheat, for which no other preparation is necessary, but
once

once ploughing back the ridges into the intervals, and upon them to drill the wheat.

A common farmer finds it very difficult to cultivate clays, or other strong, stubborn soils, and concludes that such land cannot be drilled with wheat a second time, thinking it would become hard and stale during the growth of the first crop of wheat, which he finds it does in the Common Husbandry. But the management of land, in the Old and New Husbandry, is so different, that the arguments drawn from the Old are often fallacious, when applied to the New: and for this reason, several late writers have erred egregiously, when they pretend to condemn the New Husbandry, though not experienced in it. Thus clays or very strong land become stale and hard, while a crop of wheat is growing upon it: but, in the New Husbandry, land is never permitted to lie unhoed till it becomes hard; and the new crop of wheat is drilled upon the last years intervals; which are by deep hoeing kept as fine as garden-mould. The only difficulty is in wet seasons, which require attention.

In this method the farmer obtains every year alternately a crop of wheat and beans, and a winter crop besides of cabbage-plants. —Or he may have a crop of wheat every year in succession, which will require no manure, and only about four hoeings: and these, together with once ploughing, to form new
ridges,

ridges, upon which the wheat is to be drilled, are only equal in labour to two common level ploughings; which, considering that the hoeing of lands in tilth requires but two horses, or only half the strength that is necessary to plough the same land when out of tilth, is undoubtedly a very cheap culture, and a method of obtaining good crops of wheat, at a much less expence than the farmer can possibly obtain them in the Old Husbandry: to this is to be added the expence of dung, which strong land particularly requires to ferment in it, and help to keep the soil open in the Old Husbandry, but is not necessary in the New.

If it is said, that greater crops are produced in the Old Husbandry than in the New, this is admitted to be so in some years; but in others the weeds do great damage to the broad-cast wheat; in hot, dry seasons, much dung is hurtful, and greatly so in wet seasons, making the wheat too luxuriant, to run too much to straw, to lodge, and be blighted; this must be acknowledged being too common in the Old Husbandry: and therefore, to make a fair comparison, we must take the crops at an average; and we have seen, by the account of two experienced cultivators, that the average crops of wheat in the New Husbandry were as good as the Old: this may be fairly concluded from Mr. Craik's account of his crops; and Mr. Dean asserts expressly, that his were so upon his strong land, notwithstanding

standing the difficulty he sometimes found in catching the critical seasons for hoeing: but this difficulty was partly owing, as he intimates, to the circumstance of his men and horses being then otherwise employed: for he received his tythes in kind, and employed his own men and horses to bring it home. A fairer trial of the crops than in his case cannot be expected; for he had then practised the New Husbandry for wheat about twenty-four or twenty-five years, and continued it to the time of his death, for about four or five years more, in all about thirty years; and this upon several fields.

The wheat crops in both methods of Husbandry being nearly equal, there would be no great advantage in the New Husbandry, if they were also equal in other respects, but this is far from being the case: for, not to insist at present upon other circumstances, the saving of dung is alone a matter of great consequence. From three to five pounds an acre saved in a crop of wheat, is an expence that cannot be balanced by any superiority that even the greatest favourers of the Common Husbandry have alledged: but some may say, what is to be done with the dung and manure, that farmers take so much care to obtain, and that they are by all advised to provide? The answer to this is obvious; wheat and other corn require no manure, or very little, in the New Husbandry, but potatoes, carrots, cab-
bages,

bage, and in general all plants and roots cultivated for feeding cattle, and that are improved by a luxuriant growth; to them both manure and hoeing are very beneficial; to lucerne and sainfoin, and to meadows and pastures: for these and such crops manure is highly useful, and all that the farmer can save from corn, and apply to these, will be extremely advantageous to him.

Besides the saving in manure, there is another saving made by those who practise the New Husbandry; in wheat, they save above two-thirds of the seed commonly sown broadcast, which is from eight or nine to twelve pecks per acre; and the quantity of seed-wheat upon ridges to be horse-hoed is only from two to three pecks per acre. If the wheat crop is drilled upon level ground, to be hoed with a cultivator or hand-hoe, half the usual quantity of seed is sufficient; and the saving in seed by drilling is commonly more than half, and not less for other crops, pease, beans, barley, and oats: a saving of only half the usual quantity of seed is a matter of some consequence to the farmer, and amounts to a very large quantity to the public; who are greatly interested in promoting the New Husbandry, wherein the crops are raised from a much smaller quantity of seed than was thought practicable before this Husbandry was introduced.

Another

Another considerable advantage is, the cleanliness of the crops from weeds: a horse-hoed crop of wheat, if well cultivated, has scarce any weeds in it at harvest, and is fit to be carried home almost as soon as it is reaped; but sown wheat, growing upon land much dunged, is so full of weeds at harvest, that it cannot be carried home and housed or stacked safely till the weeds are withered: the wheat is all that time exposed to the weather and other accidents, and does frequently receive much damage by that delay.—Barley and oats suffer still more, particularly barley, by the clover usually sown with it being often damaged by the clover; and in catching seasons, the crop is sometimes totally lost, and the young clover injured, and this notwithstanding a great expence the farmer is put to, in endeavouring to save this crop: so that, in wet or very catching seasons, it would be more for his interest to mow his barley when in ear, which together with the clover would make excellent fodder for his cattle; and by this means his extraordinary expence would be saved, and his young clover would come forward again apace.

When these and other circumstances are duly considered, every experienced husbandman will be sensible, that extending the New Husbandry will be very advantageous to the farmers who practise it, and immensely so to the public: for it evidently appears by the
examples

examples we have produced of extensive practice, on various sorts of land, that it is exceedingly profitable upon them all: so that it cannot be doubted, that the extending of the New Husbandry generally will be an advantage to the public of more than one rent of all the arable lands in the kingdom, not only of land under wheat and other corn, but of other crops; for they are all improveable by the New Husbandry, and by every mode of good hoeing, particularly when performed by horses; for by them all hoeing is done in the cheapest and best manner. The supposition, that the New Husbandry will be an advantage to the public of more than one rent of all the arable lands in Britain, thus calculated, is very moderate: for we have seen by the foregoing examples of extensive practice, that much more profit is obtained, where it has been skilfully practised on land of very different qualities, for wheat and other corn, for a succession of years, and wherof the farmers are most doubtful: but with regard to single or annual crops, it is so evident, that the most incredulous do not pretend to dispute it: turnips, carrots, cabbages, potatoes, and others, are utterly unprofitable and worthless, unless set out thin and hoed; and in every fair trial, the horse-hoeing is found to excel every other mode of culture. To this should be added, the saving of great quantities of manure, now employed for wheat and other corn: which

which, if applied to other crops that now have not enough, will be a great additional profit to the farmer, and this he will obtain by cultivating his wheat and other corn according to the New Husbandry.

The foregoing instances of the culture of wheat, and some others, in this Husbandry, it is presumed, will be acceptable to all who are desirous to practise it: but as there are others mentioned only in general above, and that have been very lately published, which may be acceptable to the reader, I shall give an account of some of them here, as a confirmation of the others; to shew that this Husbandry gains ground, notwithstanding the unmerited opposition made to it by superficial reasoners and unskilful cultivators; those, in particular, who draw general conclusions from such small trials as cannot be depended upon in general practice, nor be justly made a standard in any Husbandry, especially by those who are evidently defective in the principles of cultivation: for this reason, the above experiments were given, not detached experiments, but the continued practice of the New Husbandry at large, and in a variety of soils; which carry an evidence with them, not to be denied, or set aside, by the partial deductions that are drawn from small or single experiments, made by biased relators, and who omit circumstances that ought to be particularly related.

L

I mentioned

I mentioned in general, and from memory only, Sir Digby Legard's practice of the New Husbandry; but this gentleman having great experience in Husbandry, and his letters to the London Society containing so many valuable observations, that, though too long to be all here inserted, an abstract of some principal matters in his letters to the Society of Arts, will without doubt be acceptable to the reader.

In his letter dated from Ganton near Malton, Yorkshire, Jan. 24, 1767, he writes,
 " About nine years ago, I was induced to be-
 " gin experiments by an accidental perusal of
 " Mr. Tull's book of Horse-hoeing Husban-
 " dry. The promise of such immense ad-
 " vantages accruing from a particular mode
 " of tillage, seemingly neither difficult nor
 " expensive, made by an author of established
 " reputation, demanded at least a candid trial.
 " If the author's principles were true, why
 " not adopt them? On the contrary, if false,
 " it was high time to undeceive ourselves and
 " others.

" Though my first experiments did not an-
 " swer in that degree which I had flattered
 " myself they would, they, however, encour-
 " aged me to proceed: neither were the
 " faults I committed, nor my ill success, un-
 " edifying; since I had the good fortune to
 " correct the former, and gain experience
 " from the latter.—Having now practiced
 " the drill culture constantly during nine
 " years, as well the horse-hoeing part, as
 " that

“ that branch of it which consists merely in
 “ sowing corn, &c. in equally distant rows;
 “ having applied these methods of culture,
 “ not only to corn, but to most of the legu-
 “ minous plants; and having extended my
 “ experiments very considerably; I may ven-
 “ ture, at last, to recommend zealously a
 “ practice I have always found both enter-
 “ taining and profitable.

“ It is true, many writers on this subject
 “ have given a much more flattering account
 “ of drilling than I am able to give. If their
 “ account be not exaggerated, either they
 “ have been more fortunate than I, in culti-
 “ vating a soil more peculiarly adapted to
 “ horse-hoeing; or they have conducted their
 “ experiments with superior skill. However,
 “ I have never been able, from a single crop,
 “ in any one year, of any kind of vegetable,
 “ to obtain a larger produce from the same ex-
 “ tent of equally good ground, where the
 “ land was laid out in beds [lands or ridges]
 “ drilled and horse-hoed, than where the
 “ corn was sown at random. Vegetables of
 “ the pulse kind are the most improved by
 “ the horse-hoe; possibly as great a crop of
 “ pease, beans, or turnips, may be obtained
 “ by it. But wheat, barley, or oats, have
 “ usually yielded me a third more from ran-
 “ dom sowing; that is, if three quarters of
 “ wheat may be produced from one acre in
 “ the Common Husbandry, the same ground

“ will, *cæteris paribus*, produce no more than
 “ two quarters, when drilled and horse-hoed.
 “ But the superiority of one method over
 “ another is not to be determined by its ad-
 “ vantage of a particular crop, but by many
 “ successive ones, deducting the expences, and
 “ considering the nett profits: this I have
 “ done, and the result is, that I cannot avoid
 “ giving the preference to the drill system.

The actual produce of a field of seven acres,
 horse-hoed without dung, during eight suc-
 cessive years.

DRILL HUSBANDRY.

Years.	A.	Corn sown.			Co. reaped.			Med. Pr.		Value of the crop.				
		qrs.	bufh.	p.	qrs.	bufh.	p.	s.	d.	l.	s. d.			
1759	{	2	Oats	0	1	2	8	6	0	1	6	5	5	0
		5	Barley	0	4	0	10	2	0	2	0	8	4	0
1760	{	4	Wheat	0	1	3	4	5	0	3	9	6	18	9
		3	Barley	0	2	1	10	2	2	1	6	8	5	0
1761	{	4	Wheat	0	2	0	5	3	0	3	9	8	1	3
		3	Barley	0	1	2	12	0	0	2	0	9	12	0
1762	{	4	[Turnips 1 lb.]				[60 tons.]					7	0	0
		3	Barley	0	1	2	7	2	0	3	0	8	14	0
N.B. Turnips were sown in the intervals of the barley, worth											3	10	0	
1763	7	Barley	0	4	2	22	0	0	3	0	24	4	0	
1764	7	Wheat	0	5	2	12	4	2	6	3	31	8	1½	
1765	7	Wheat	0	6	2	10	0	2	5	6	22	0	0	
1766	7	Wheat	0	5	3	6	5	0	7	0	18	11	0	
		56		4	4	1	109	6	0		161	11	0½	
Deduct for the value of the feed											7	14	4	
Remains nett produce of seven acres, in eight years,											153	16	9½	

COMMON

COMMON HUSBANDRY.

Years.	A.	Corn sown.	Co. reaped	Med. Pr. per bush.	Value of the crop.	
					l.	s. d.
1	7	Turnips 10 lb.	140 tons	worth	14	0 0
2	7	Barley 2 qrs. 5 b.	28 qrs.	2 s. 8 d.	22	8 0
3	7	Clover 1 lb.	11 load	worth	10	10 0
4	7	Oats 3 qrs. 1 b.	35 qrs.	1 s. 5 d.	19	5 0
5	7	Turnips 10 lb.	140 tons	worth	14	0 0
6	7	Barley 2 qrs. 5 b.	28 qrs.	3 s.	33	12 0
7	7	Clover 1 lb.	11 load	worth	10	10 0
8	7	Oats 3 qrs. 1 b.	35 qrs.	1 s. 8 d.	23	6 8
		<hr/>	<hr/>		<hr/>	<hr/>
56		11 qrs. 4 b. 2 p.	126 qrs.		147	11 8

Deduct for the value of the seed 9 l. 10 s. 7 d. and
210 load of dung at 2 s. per load, 21 l. } 30 10 7

Remains nett produce of seven acres, in eight years, 117 1 1

Drill Husbandry, total produce of seven acres, in }
eight years 153 16 9½

Common Husbandry, total produce of seven acres, }
in eight years, 117 1 1

Consequently the Drill is more advantageous by 36 15 8½
Proof 153 16 9½

“ N.B. It is presumed, that the plough-
 “ ing expences are nearly equal in each me-
 “ thod; and therefore there is nothing
 “ charged here on that account, on either side.
 “ [The expence of ploughing is generally more
 “ in the Common than in the New Husb-
 “ dry: for in the New, the land is once
 “ ploughed to form the new ridges for wheat
 “ or other corn, and horse-hoed four times
 “ afterwards; not exceeding two common
 “ L 3 “ plough-

“ ploughings in all. But, in the Old Huf-
“ andry, all the land is usually ploughed
“ three times, often with four horses; whereas
“ two horses are enough for hoeing, or half
“ the number necessary for common plough-
“ ing.] The value of the seed and crop is
“ set down to each, according to the medium
“ prices of corn each year. The above seven
“ acres of experiment have not been selected
“ as being particularly successful; but only
“ as it happened to be the field where they
“ were begun, and continued to this time,
“ I was thereby enabled to relate the series
“ of several years success. The soil is light,
“ deep, and dry; a hazle mould, excellent
“ for barley, but generally thought not of
“ sufficient tenacity for wheat; and worth in
“ this neighbourhood fifteen shillings per acre,
“ tythe-free. The beds extend east and west;
“ and the field lies gently sloping to the
“ north.

“ This field has never been manured, as I
“ observed before, since my experiments were
“ begun, nor for many years preceding.—It
“ may be remarked, that the first crops are
“ not the best; but, on the contrary, a re-
“ gular improvement for some years kept pace
“ with its cultivation: and the value of
“ the four last crops is almost double to
“ the former ones. The greatest fault com-
“ mitted at first was, the sowing too little
“ seed. The land seems yet in perfect heart;

“ and

“ and though the product of last year was less
 “ than in former ones, it was well known,
 “ that the wheat crop failed all over Eng-
 “ land; as is evident by the present high
 “ price of that grain. For I cannot allow,
 “ that the dearness of corn is owing to the
 “ bounty, as some pretend; having ever con-
 “ sidered that act of parliament as the Magna
 “ Charta of English agriculture, and tending
 “ on the whole to make grain more plentiful
 “ and cheap.

“ Besides the general causes of a scanty
 “ crop in my field of experiments last year,
 “ there were particular ones, occasioned by
 “ my absence in the spring, and great part of
 “ the summer; whereby the hand-hoeing, a
 “ very material operation, was neglected, and
 “ the horse-hoeings not regularly nor duly per-
 “ formed. I perceived, on my first examin-
 “ ing the ridges in June last, that the parti-
 “ tions were full of weeds, and the intervals
 “ hard and compact; but it was then too late
 “ to apply an effectual remedy, though the
 “ weeding and horse-hoeing were, even now,
 “ of manifest service. The bad condition of
 “ the beds made me determine not to sow
 “ wheat again for the next crop, but to give
 “ the land a thorough ploughing in winter;
 “ and I prepared it to be sown in spring.
 “ The aforementioned field is valued at fifteen
 “ shillings an acre;

	l.	s.	d.
“ consequently the rent of se-	42	0	0
“ ven acres, in eight years, is }			
“ Ploughing expences are, at }	42	0	0
“ most, 15 s. per acre, I allow }			
<hr/>			
“ For the rent and tillage of se-	84	0	0
“ ven acres, in eight years, }			
<hr/>			
“ The total produce of seven }	153	16	9½
“ acres, in eight years, being }			
“ valued at }			
“ If we deduct for rent and ex-	84	0	0½
“ pences of tillage }			
<hr/>			
“ There remains clear profit, from }	69	16	9½
“ seven acres, in eight years, }			

“ which is one pound five shillings clear annual
 “ profit, from one acre. And though this
 “ profit be not near so considerable as I be-
 “ fore computed, from an actual crop of
 “ barley, where the land was in fine order,
 “ and every operation of hand and horse-
 “ hoeing exactly performed; yet I judge it to
 “ be superior to the old method, and suffi-
 “ cient to demonstrate the advantages of pul-
 “ verization.

“ The

	l.	s.	d.
“ The total produce of seven “ acres, in eight years, in the “ old method, is	117	1	1
“ Deduct for rent and expences, “ the same as above,	84	0	0
<hr/>			
“ There remains clear profit on “ seven acres, in eight years,	33	1	1
<hr/>			

“ which is not quite twelve shillings clear
 “ annul profit from one acre. Though this
 “ clear profit be much less than I calculated
 “ before; yet, I apprehend, that there are
 “ many farmers hereabouts who do not clear
 “ more. And, if some good managers do
 “ clear twenty shillings an acre, which I
 “ hope and believe to be the case; I have
 “ shewn in my first calculation, that the im-
 “ proved Drill Culture is almost doubly bene-
 “ ficial: and by my last calculation of a
 “ farmer’s profit, who is not at the top of
 “ his profession, compared with the actual
 “ produce in a course of drilling, where
 “ numberless faults were committed during
 “ the five years; the comparative advantage
 “ is as much on the side of drilling, as where
 “ I reckoned the produce of each method at
 “ a higher rate; and the proportionable ex-
 “ cellence

“cellence still remains annexed to the system
“of Tull.”

The culture here given is from Sir Digby's last letter to the Society, as he was then become more expert in the New Husbandry than at first; and for this reason, as he observes, his drilled crops the last four years were near double to what they were the first four years; and hence it appears, that the impartial comparison of the two methods should be when both are well executed; and that the first four years, “wherein numberless faults were committed,” should not be included in the comparison, as the merits of the Old and New Husbandry are neither of them to be determined by a few, or small trials, unskillfully conducted, but by a continued course of culture, managed with care, and in the best manner: for if the New Husbandry was so much superior, “when numberless faults were committed,” the advantage of it over Old Husbandry, when well performed, is very striking, being near doubly profitable to what Sir Digby has stated it.

The land is described as being light, deep, and dry; yet not so much as Mr. Tull's was in general, much of whose land was light and dry, but not deep: yet it appears, that his crops of wheat were much greater than Sir Digby's were, even in the last years of his practice. One reason of this appears to be, that the land here was twice ploughed, to
form

form the new ridges, which is not necessary; but is a real injury to the crop, if one of these ploughings is reckoned to be as advantageous as a horse-hoeing, which was the case here; for it appears by the description, that this land was horse-hoed but three times for each crop, viz. first, by turning a small furrow from the rows of corn on each side; next, by deepening these furrows, turning the earth still from the corn; and, last of all, ploughing the earth back to the ridges. Now though these operations were very useful and advantageous to the crop, the land did not receive the full benefit of exposure, so much as it does by four horse-hoeings, twice from and twice towards the ridges: for these should be of a good depth, and a new surface is at each hoeing exposed to the atmosphere; by which means, the oftener a new surface is exposed to the atmosphere, at proper intervals of time, the more will the land and crop be improved: but, if time is not allowed for the exposure, and the earth is immediately ploughed back, without allowing it time to lie exposed to the air, it will not be improved by such second ploughing, any further than twice ploughing may be an advantage to land, by breaking and pulverizing it more than once ploughing. Whence it happened that this circumstance was not attended to here, does not appear in Sir Digby's letters; though he was acquainted with the benefits of exposure,

ture, as appears from his letter above quoted, where he says, "The repeated stirrings not only improve the soil by keeping it in a loose state, proper to be penetrated by the roots and fibres of plants, which are thus enabled to draw their nourishment from it: but they expose every particle, in its turn, to the influence of the atmosphere; and procure an inexhaustible supply of food for the purposes of vegetation." This is found to be true from experience: and giving this land but three horse-hoeings, instead of four, appears to be the reason that this gentleman thought, that twelve bushels of wheat on an acre is about the medium quantity to be obtained from moderately fertile ground without dung; whereas we have seen, that Mr. Tull obtained a great deal more; and that he, Mr. Dean and Mr. Craik, obtained near as good crops, in the way of drilling and hoeing, as was usually obtained in the common or broad-cast Husbandry.

One cause of the drilled crops falling so much short of the broad-cast has been, that the experimenters have depended too much on the fineness or pulverization of their land; which is without doubt necessary, that the roots may freely penetrate and extend in it; but pulverizing does not of itself enrich land: it rather prepares it to be exhausted, by the roots of plants extending more freely therein; whereas exposure brings additional riches to the

the land, and therefore should never be omitted, how fine soever the land may be: land finely pulverized is indeed more susceptible of the influences of the atmosphere, than land that is more close and compressed; but no land, however fine, receives so much benefit from the atmosphere, as those parts of it that are exposed to its immediate action, by being turned and laid open to it, and remaining some competent time to be impregnated by it. By not attending to this circumstance, and supposing pulverization to be the same as exposure, several experimenters have been misled; and some have fancied, that the principles of the New Husbandry were erroneous; whereof we may have occasion to shew another proof hereafter.

The first letter from Sir Digby Legard to the patriotic Society of Arts was in 1763, giving an account of his culture of barley in the New Husbandry, for which they presented him with a gold medal. He speaks at first with great diffidence of this Husbandry, but, upon further experience, was clearly of opinion, that it was more profitable than the Old Husbandry; and found it was so, though his drilled crops were not so large, and were indeed smaller, for the reasons above assigned, than some other ingenious cultivators have obtained, as we have fully shewn.

“ I wish,

“ I wish,” says Sir Digby in his first letter,
“ it were in my power to determine precisely
“ the most profitable method of culture : but
“ since several years experience, and the most
“ careful observations I have been able to
“ make, have not been sufficient to clear up
“ my own doubts, I shall not presume to dic-
“ tate to others, or to speak very positively
“ on so nice a subject. I would reject the
“ most plausible theory, if unconfirmed by
“ experiments. And even experiments them-
“ selves, if they are not executed with care,
“ often varied in different soils, situations,
“ and circumstances, and repeated several
“ years, are too apt to mislead. It is both a
“ very important and difficult task, which
“ the advocates for the New Husbandry have
“ undertaken, to overthrow entirely the old
“ system of fallowing and dung ; nay, even
“ the more modern introduction of turnips
“ and clover (a system which the industrious
“ farmer has long found abundantly suffi-
“ cient, if not to acquire riches, at least to
“ enable him to maintain his family) ; in
“ order to introduce the more fashionable
“ scheme of pulverization ; asserting confi-
“ dently, that nothing more is necessary, in
“ order to create an immense and lasting fer-
“ tility, in almost every soil, than thorough-
“ ly to break and divide the earth. But the
“ assertors of a new doctrine are apt to be too
“ sanguine. Let us beware of being imposed
“ upon

“ upon by novelty; or of preferring inge-
 “ nious to useful discoveries. I am the more
 “ inclined to communicate these experiments
 “ of last year; because I think the compari-
 “ son less favourable to the New Husbandry,
 “ in that than in any other years, wherein I
 “ have made experiments. For I would al-
 “ low every advantage to old customs, that
 “ they can naturally or reasonably claim.”

[By this it appears, that Sir Digby was not
 at first, nor for some years, inclined to be
 partial, or even favourable, to the New Hus-
 bandry; upon farther experience, he came to
 have a more favourable opinion of it, and
 was at last fully convinced of its superiority;
 which was in consequence of a long and cri-
 tical observation of the effects of both me-
 thods, and this he had opportunity of trying
 extensively.]

“ Five acres of an inclosed field, the soil
 “ of which is naturally pretty rich, but light
 “ and dry, inclining to a hazle mould, and
 “ nearly of an equal goodness throughout,
 “ was destined to be sown with barley, part
 “ according to the old, and part to the new
 “ method of Husbandry, in order to ascer-
 “ tain the most advantageous method of cul-
 “ ture. This land had borne four successive
 “ crops, viz. one of barley, two of wheat,
 “ and one of turnips; was disposed in beds
 “ [or ridges] from the first; and had been
 “ horse-hoed every year; but it had never
 “ had

“ had any manure, except that the turnips
 “ had been eaten off by the sheep. On the
 “ 26th of April, 1753; half an acre was
 “ sown by hand in the random way, and
 “ took five pecks of feed. Half an acre was
 “ drilled in equally distant rows, one foot
 “ asunder, and took three pecks. Two acres
 “ were drilled in ridges or beds, five feet
 “ broad, in double rows, eleven inches asun-
 “ der, and four feet one inch interval, to be
 “ horse-hoed, and they took six pecks. Two
 “ other acres were drilled, on five feet ridges,
 “ in triple rows, seven inches asunder, and
 “ took four pecks.

“ N.B. I feared, at the time of sowing
 “ these last two acres, that the seed had been
 “ too sparingly dispensed: but the plants
 “ branched so much afterwards, that the rows
 “ seemed tolerably compleat.

“ The above five acres had but one plough-
 “ ing: viz. just before seed-time, after the
 “ harvest, 1762. On the 30th of May,
 “ the first horse-hoeing was performed on the
 “ four acres sowed in ridges, with M. Duha-
 “ mell's one-wheeled plough. But, on ac-
 “ count of the rows being drilled unevenly,
 “ this could not be done very regularly in
 “ some places, the plough coming so near
 “ the rows as to tear out some plants, and co-
 “ ver others with mould; and in others
 “ going at too great a distance from the corn.
 “ To remedy this in some measure, the rows
 “ so

“ so covered had the earth taken off, and an-
 “ other horse-hoeing was given on the 7th of
 “ June, the earth being very dry. By this
 “ last operation, the first furrow was cut
 “ deeper, and the plough went at a proper
 “ distance from the rows.” [It is necessary
 to make the ridges and rows of plants to be
 horse-hoed, very straight at first; and they are
 frequently not made straight enough by com-
 mon ploughmen, which, as in this instance
 of Sir Digby’s, is inconvenient, and attended
 with some extraordinary expence: this may
 be prevented, and the ground laid out straight
 at first, by drawing a couple of cart or other
 wheels upon the surface of the level ground,
 after it is harrowed fine; these wheels being
 connected together by an axle of a proper
 length, and drawn by one horse in shafts, or
 a couple of poles, will mark the exact dis-
 tances of the rows, and guide the ploughman
 to make the ridges equal.] “ On the 8th
 “ of June, all the five acres were hand-hoed;
 “ but, by reason of the dry season, not many
 “ weeds had sprung up. The effect of the
 “ horse-hoeing on the four acres was great,
 “ and the corn seemed to flourish exceedingly.
 “ The plants were of a deep green, and re-
 “ markably vigorous. The part drilled in
 “ equally distant rows without intervals re-
 “ mained always of a paler green. But the
 “ part sowed in the common way was a de-
 “ gree still paler, though this last part ripened

“ the earliest, the drilled half-acre next, and
“ the four horse-hoed acres last of all. The
“ third and last horse-hoeing was performed
“ in the beginning of July. This turned the
“ earth towards the rows, and left a furrow
“ in the midst of the intervals.

“ On the 31st of August, 1736, the half-
“ acre sowed by hand, and the half-acre
“ drilled in equal distant rows, were mowed;
“ and on the 15th of September, the four
“ horse-hoed acres were mowed: the ears of
“ these were far from being equally ripe, be-
“ cause the extreme wet season had caused se-
“ veral fresh shoots at the time the first and
“ principal were ripening. The seed was
“ sowed too thin on the two acres drilled with
“ triple rows, and in consequence there
“ were several vacant spaces in the rows; and
“ this was certainly some diminution of the
“ crop. The ears of barley throughout the
“ four horse-hoed acres were surprizingly
“ large. Several contained thirty-eight grains
“ each (which is uncommon, at least, in my
“ neighbourhood). I believe the number of
“ grains in an ear were, at a medium, about
“ thirty.

“ The many storms of wind and rain had
“ lodged the corn in many places. I had
“ some barley this year, sown by hand, on
“ fresh and good land, which was so lodged
“ in those places where the land was the
“ richest, and the corn the thickest, that the
“ greatest

“ greatest part was wasted. Nevertheless,
 “ though the horse-hoed barley inclined every
 “ way, owing to storms, in various direc-
 “ tions, and entirely covered the four inter-
 “ vals so that no land could be seen; yet
 “ were the stalks only bent, but no way in-
 “ jured: and this is one great advantage,
 “ which horse-hoed corn has over that sowed
 “ at random. For, though the ears are very
 “ large, the stems are proportionably strong
 “ and hard, and being constantly exposed, by
 “ means of the broad intervals, to the in-
 “ fluence of the sun and air, they acquire
 “ such a degree of firmness, as generally to
 “ resist all attacks of wind and rain. The
 “ only inconvenience attending these bent
 “ stalks was, that they were difficult and
 “ awkward to mow; and, by covering the
 “ intervals, prevented their being sown, and
 “ deprived me of a good crop of turnips.
 “ For I have generally sown turnips in the
 “ intervals, immediately after the last horse-
 “ hoeing about the beginning of July. The
 “ land is then reduced to excellent tilth; and no-
 “ thing more is necessary than to sow the seed
 “ pretty thick. The first shower of rain
 “ washes it into the ground, and covers it,
 “ without the aid of the harrow. The young
 “ plants enjoy the benefit of the fresh-tilled
 “ earth; and the corn being reaped soon af-
 “ terwards, the whole field is left for the tur-
 “ nips to extend their roots in it. I have had

“ near as good crops of turnips this way, as
 “ when the land was occupied by that plant
 “ alone.

	qrs.	bufl.	p.
“ The total nett produce of one			
“ acre of barley, in the Old	5	4	2
“ method, was,			
“ Ditto of one acre, sown in	6	0	2
“ equally-distant rows,			
“ Ditto of one acre, drilled and	3	0	2
“ horse-hoed			

“ The land of both these trials was, as
 “ nearly as possible, of equal goodness, and
 “ in equal order, lying contiguous in the
 “ same field. The feed-corn of both was
 “ exactly the same, and all sown on the same
 “ day. So that the difference in the produce
 “ of each acre must be attributed to the quan-
 “ tity of seed sown, the manner of distri-
 “ buting that seed in the earth, and the cul-
 “ ture bestowed on the plants whilst grow-
 “ ing. It is evident, however, that the land
 “ in the Old produced nearly double to that
 “ which was cultivated in the New way.
 “ But the greatest produce was from the land
 “ sown with the drill-plough in equally-dis-
 “ tant rows, one foot asunder. Yet are we
 “ not from thence to determinē too rashly in
 “ favour of either method.

“ I own,

“ I own, from the appearance of the crop
 “ whilst growing, and even after it was
 “ reaped, I did expect that the quantity from
 “ the four horse-hoed acres would have been
 “ more considerable. Indeed I can account
 “ for some diminution of the crop from the
 “ following accidents, viz. the horse-hoed
 “ corn ripened unequally, owing, as was be-
 “ fore observed, to the excessive wet season;
 “ and, as it was later reaped than the other,
 “ it was more exposed to the depredation of
 “ sparrows and other birds, which certainly
 “ got part of it. And, being first carried
 “ into a Dutch barn, and removed some time
 “ afterwards into a common barn to be
 “ threshed, there was not only a loss by scat-
 “ tered seed in the removal, but likewise by
 “ pigeons, which devoured a good part,
 “ having a constant and free access to the
 “ tops and sides of the barn where it was first
 “ deposited. Whereas the produce of the
 “ parts cultivated in the Old way, and drilled
 “ in equally-distant rows, was carried into
 “ the barn, and threshed immediately, and
 “ therefore not liable to the ravages of ver-
 “ min, or to any other loss.

“ But it must be allowed notwithstanding,
 “ from this experiment, that the advantage
 “ appears to be on the side of the Old me-
 “ thod. On the other hand, although six
 “ quarters on an acre is confessedly a very
 “ large increase from land sown in the common

“ manner, yet it is no less true, that this
 “ great fertility was, in a considerable mea-
 “ sure, owing to the excellent culture be-
 “ stowed on it by the horse-hoeing method.
 “ Constant tillage, during the four preceding
 “ summers, had undoubtedly supplied the
 “ place of manure: and four succeeding crops,
 “ which were none of them bad, were so far
 “ from having exhausted the earth, that there
 “ seemed to be an increase of vegetable food.
 “ The soil appeared so thoroughly divided,
 “ that, since the harvest of 1763, the above
 “ four acres have been drilled with wheat at
 “ once ploughing, and promise a good crop,
 “ the ridges being now where the furrows
 “ were last year: but those parts which
 “ were sown at random, and in rows, have
 “ been manured at the rate of sixteen loads of
 “ stable dung to one acre, in order to recover
 “ their lost fertility: and it was necessary to
 “ sow some kind of meliorating crop, to
 “ make this part of equal goodness with the
 “ rest of the field. It has accordingly been
 “ ploughed into five-feet ridges, and drilled
 “ this April with white pease, a double row
 “ on each bed, and is intended to be horse-
 “ hoed.

“ I cannot help observing here, that were
 “ I to follow M. De Chateaueux' method
 “ (although, in most instances, I am proud
 “ to follow the example of so able an expe-
 “ rimentor), and compute the produce of se-
 “ veral

“veral years on the footing of the above
 “horse-hoed crop, reckoning the land in
 “the Old way to bring a crop only once in
 “two years, the advantage would be greatly
 “in favour of the New method, even sup-
 “posing every crop in the old at the rate of
 “six quarters to an acre. For the expence of
 “manure and tillage, in the fallow year, are
 “infinitely greater than the horse-hoeing ex-
 “pences. But, if England be so much su-
 “perior to Swisserland in goodness of soil;
 “or, if our farmers are so much more skilful
 “than theirs, that we can in the common
 “management, I mean, by the culture of
 “turnips, clover, rape, &c. have a benefi-
 “cial crop every year; I should be inclined
 “to doubt, whether the very superior advan-
 “tages, which some writers attribute to the
 “horse-hoeing Husbandry, may not be more
 “imaginary than real. Not but that I
 “think there are several circumstances to re-
 “commend it, and that it may be followed
 “in some situations to great advantage. As
 “where the difficulty of procuring manure is
 “very great, or where the distance of the
 “ploughed field from the farmer’s habita-
 “tion would make the carriage too expen-
 “sive. There are also some soils more pecu-
 “liarly adapted than others to the New
 “Husbandry, as requiring an extraordinary
 “degree of pulverization; some vegetables

“ are particularly improved by bestowing a
“ culture on them whilst growing.

“ I should therefore be concerned to find,
“ that any one was deterred, by what I have
“ said from making or continuing their experi-
“ ments in the New Husbandry. My experi-
“ rience is much too small to determine ab-
“ solutely the comparative excellency of the
“ two methods. I have, however, so good an
“ opinion of Mr. Tull’s system, that I have al-
“ ready continued the practice of it for five or
“ six years, and have tried it on several kinds
“ of vegetables; and in a pretty extensive
“ manner. I propose to continue my experi-
“ ments, to extend, and to vary them. Per-
“ haps, at last, I may be able to ascertain,
“ whether or no the horse-hoeing scheme be
“ superior, and in what degree.” [This gen-
tleman has hitherto spoken like an impartial
experimenter, with caution and diffidence;
but, after continuing, extending, and vary-
ing his experiments for a course of years, and
finding the New Husbandry still superior, he
fully declares himself convinced of it; though,
on account of his hoeing his barley, and also
his wheat, but three times in the season, his
ploughing shallow at first, and giving his par-
titions between the rows of wheat but one
hand-hoeing, his crops of horse-hoed wheat were
inferior to what they would have been, had he
bestowed a more perfect culture upon them;
which evidently appears from what we have
shewn

shewn above, that some eminent cultivators obtained much larger crops, from land of inferior quality, or not so well adapted to the hoeing husbandry. To this also may be added, that Sir Digby's crops were late in ripening, which is attended with several inconveniences, and may in some measure be prevented by early sowing. Hoed crops are longer in ripening than those not hoed; as the hoeing continues to furnish them longer with nourishment, whereby the plants, and seed, are brought to greater perfection: It is therefore the interest of the cultivator, to hasten the blowing of the plants, and to protract their ripening; early sowing is a means of obtaining both these advantages.]

“ There is one prejudice,” continues this gentleman, “ commonly adopted against this “ method by the inexperienced, *viz.* that it “ is very expensive; which is entirely ground- “ less, as will appear by attending to the fol- “ lowing particulars. The two-wheeled drill “ plough, invented by Mr. Tull (which I can “ recommend as a good instrument, having “ had several years experience of it, and some “ hundreds of acres drilled with success), may “ be made compleat, with wooden seed-boxes, “ for fifty shillings. Mr. Duhamel's one- “ wheeled plough, for horse hoeing, costs “ thirty shillings. But this last, though very “ useful, is not absolutely necessary. For the “ common plough without wheels will per-
“ form

“ form all the operations of horse-hoeing ;”
[and much better than any plough that has
a wheel ; which, as it goes upon the side
of a sloping ridge, is apt to draw the plough
too much to the right.] “ Those two instru-
“ ments may be easily made, and repaired, by
“ a country wheelwright. I have several
“ made in the village where I live, at the
“ aforesaid prices, which were very perfect,
“ and have lasted several years. It is true, I
“ make use of some other instruments, which
“ may be said to be appendages of the New
“ Husbandry, as they have been contrived by
“ the practitioners of it. But the five-coul-
“ tered plough, the single and double-culti-
“ vators, &c. though extremely convenient to
“ those who practise this method in a very
“ extensive manner, are by no means neces-
“ sary in making trials, or small experiments.”
[These two cultivators are the invention of
M. De Chateauvieux ; and may be useful in
some particular cases, but are by no means
proper to be substituted for the hoe-plough ;
as we shall have occasion to shew, in treat-
ing of Mr. Wynn Baker’s experiments upon
wheat.]

“ After the first year, that is, when the
“ land is reduced to fine order, one horse is
“ generally sufficient to turn a furrow either
“ to or from the rows : and as a man and
“ horse can, with ease, horse-hoe four acres
“ in a day, it cannot cost more than one shil-
“ ling

“ ling to horse-hoe an acre, even including
 “ the repairs of the instruments. Nor are
 “ more than four hoeings commonly required.
 “ So if we reckon four shillings for ploughing
 “ the ground once over, or forming fresh
 “ ridges; four shillings more for horse-hoe-
 “ ing; two shillings and six-pence for hand-
 “ hoeing; two shillings for weeding; and
 “ six-pence for drilling; thirteen shillings is
 “ the whole expence of managing an acre in
 “ the new method.

“ Such therefore being the case with
 “ which this celebrated method is performed,
 “ so great the improvement of the land by it,
 “ and such the extraordinary effects produced
 “ by merely stirring the earth; one would
 “ think every husbandman should be induced
 “ to give it a fair and candid trial; and as
 “ there needs not the exaggerated encomiums,
 “ which its partizans have affected to bestow
 “ upon it, on the one hand; so, on the other,
 “ the inveterate prejudices, which prevail in
 “ many against this system, as they have no
 “ foundation in truth, must prove subversive
 “ of the interests of agriculture.”

Sir Digby's next letter is dated the 1st of
 November 1765.—“ The experiments,” says
 he, “ that I had the honour to lay before you,
 “ in 1763, in order to determine the most
 “ beneficial method of cultivating barley, were
 “ I fear, not entirely satisfactory; at least they
 “ were not so to me; I must beg leave therefore,
 “ to

“ to add the following, as a supplement to my
“ former letter.

“ However doubtfully I might express my-
“ self, in that letter, with regard to the ex-
“ cellence of the drill, and horse-hoeing cul-
“ ture, (not having, as I thought at that time,
“ sufficient experience to determine a point
“ of so much importance) two years careful
“ observations have since enabled me to speak
“ more positively, and have made me incline
“ much more to the side of the drill system.
“ Nor have my experiments been confined to
“ barley. I have cultivated wheat for several
“ years with success, and have applied the
“ horse-hoeing husbandry to beans, pease,
“ oats, turnips, potatoes, sainfoin, and lucern ;
“ and the effects of horse-hoeing have been
“ so constant and uniform in the cultivation
“ of all those vegetables, that I have no doubt
“ but that this method, if executed with care,
“ attention, and perseverance, during a term
“ of years, will prove much more advan-
“ tageous than the old method.

“ The same field in which the experiments
“ on barley were made (as before related in
“ 1753) is now sown with wheat, the eighth
“ successive crop, of which four crops have
“ been wheat. The two last of these have each
“ produced two quarters of wheat per acre; and
“ the land is so far from being exhausted by
“ so many burdens, that it seems yet in per-
“ fect heart, though no manure has ever been
“ laid upon it.

“ I have now practised the drill culture
 “ about eight years, and, from the most care-
 “ ful observations I have been able to make,
 “ I judge, that twelve bushels of wheat on
 “ an acre is about the medium quantity to be
 “ obtained, from moderately fertile ground,
 “ during at least six successive years, without
 “ dung. I reckon eight bushels to the quarter,
 “ and nine gallons to the bushel. Now if this
 “ be a true position, I think it will not be
 “ difficult to prove, that the drill culture is
 “ more beneficial to the farmer than any
 “ other method hitherto invented.”

If Sir Digby's twelve bushels of wheat per acre
 were more profitable than the Old Husbandry,
 how much greater was Mr. Tull's, who had
 nearly twenty bushels (also nine-gallon mea-
 sure) upon the acre in double rows also, from
 about ninety acres of his worst land; and his land
 poorer and much shallower than Sir Digby's?
 This shews plainly, that there was a defect in Sir
 Digby's tillage, and that his land, instead
 of three, should have had at least four horse-
 hoeings, deep hoeings from the rows of wheat,
 and close to them.—And Mr. Craik says,
 “ Were it not for the parts that fail in my
 “ fields, my horse-hoed crops would exceed
 “ four quarters;” that is, his crops would ex-
 ceed four quarters Winchester measure, upon
 the Scotch acre; which is twenty-five and a
 half Winchester bushels, upon an English sta-
 tute acre.]

After

“ After I have related the two last years ex-
“ periments on barley, I shall give a compara-
“ tive view, of the expences and profits attend-
“ ing the cultivation of the land, in the old and
“ new way ; and I shall calculate the profit in
“ the old way, not according to the management
“ in use in the time of our ancestors, but accord-
“ ing to the best modern improvements, taking
“ the account from some celebrated modern
“ practitioners, as related by themselves.

“ A comparison of this sort is not so properly
“ made betwixt the Old and New Husbandry,
“ as betwixt the modern improvements adopt-
“ ed by the common farmer, and the benefit
“ peculiarly arising from the drill and horse-hoe-
“ ing system. That the latter is founded on just
“ principles, I am convinced ; and that the
“ practice of it (if any credit be due to the ac-
“ tual experiments of its professors) ought to be
“ esteemed one of the most considerable im-
“ provements in agriculture.

“ On the 26th of April 1764, two acres and
“ a half were drilled with barley on ridges
“ four feet and a half broad, viz. a double row
“ ten inches distant on the top of every ridge,
“ the intervals for horse-hoeing three feet eight
“ inches broad ; and took two bushels two
“ pecks of feed. One acre adjoining, and of
“ equal goodness, was on the same day drilled
“ with barley, in equally distant rows, one foot
“ asunder, and took two bushels of feed. One
“ other contiguous acre was, at the same time,
“ sown

“ sown in the broad-cast manner, and took two
 “ bushels one peck of seed. All the land was as
 “ near as possible of equal goodness, of a light
 “ and dry nature; viz. a good hazle loam,
 “ worth fifteen shillings per acre. This field had
 “ borne a good crop of oats, viz. six quarters per
 “ acre, the preceding year, on once ploughing.

“ N. B. It had been twenty years in grass.

“ Two ploughings had been performed since
 “ the oat crop, viz. one in the autumn, and
 “ the other in the spring. The horse-hoed part
 “ had three hoeings given at proper times, and
 “ was once hand-hoed. The one acre drilled
 “ level could not be hand-hoed, because sain-
 “ foin had been sown in the partitions, betwixt
 “ the rows of corn; and it is to be observed, the
 “ want of this hand-hoeing deprived the barley
 “ of a very material advantage. The acre sown
 “ broad-cast was also laid down with sainfoin,
 “ and was not weeded.

“ The horse-hoed corn, as well as the level-
 “ drilled, and broad-cast, were cut on the 18th
 “ of September, and produced,

	qrs.	bush.	p.
“ The two acres and a half horse- } “ hoed, when threshed,	10	5	0
“ The produce of one acre drilled } “ in equally-distant rows,	4	4	0
“ And of the one acre sown } “ broad-cast,	4	2	1

“ The

“ The horse-hoed crop may be esteemed a
“ great one, as it produced four quarters and
“ three bushels to an acre. The corn was also
“ superior in size and goodness to the other;
“ and was sold immediately for one pound five
“ shillings per quarter; some ears contained
“ thirty-eight grains. This crop suffered a
“ diminution from some horses breaking into
“ the field, and eating several rows, just at the
“ time of its getting into ear. But as the two
“ other acres of experiment were injured by the
“ corn being lodged, in some places, by storms
“ of wind and rain, these accidents might
“ nearly balance each other.

“ On the 4th of May 1765, the two acres
“ and a half, just mentioned to have been horse-
“ hoed the preceding year, were again drilled
“ with barley, after two ploughings, to form
“ the ridges; and took two bushels one peck
“ of seed. These were horse-hoed, and hand-
“ hoed; and, in short, managed in every respect
“ as in the former year. This crop was reaped
“ on the 13th of September, and threshed the
“ 22d of October. The produce was ten quar-
“ ters of fine and clear corn, sold at one pound
“ two shillings and six-pence per quarter. The
“ adjoining land, where the last years experi-
“ ments were made, could not be sown this
“ year with corn, by reason of its being occu-
“ pied by a crop of sainfoin; which now looks
“ very promising. But I observe, that this year
“ my crops of barley in general do not produce
“ more

“ more than four quarters four bushels per
 “ acre. But taking my barley crops at a me-
 “ dium for the last three years, the produce
 “ has been four quarters on an acre, in my
 “ best fields, sown broad-cast; and taking the
 “ horse-hoed crops at a medium for the best
 “ three years, the produce has been three quar-
 “ ters six bushels and three pecks. In the fol-
 “ lowing comparison therefore I shall calcu-
 “ late each year’s crops, both in the old and
 “ new way, on the above footing.

“ It is impossible to be very exact in this
 “ kind of calculations; but I sincerely believe,
 “ that there is greater probability of reaping
 “ four quarters on an acre in the horse-hoeing
 “ husbandry, than five quarters in the com-
 “ mon way, on such a soil as I have made
 “ my experiments on. It has been usual to
 “ reckon, that the farmer ought to make three
 “ rents of his land: one third of which goes
 “ to his landlord, another to the expences of
 “ cultivation, and the remaining third to the
 “ maintenance of himself and family. But we
 “ will allow that the art of husbandry is so
 “ much improved, that an intelligent farmer
 “ may receive above a third clear profit. One
 “ cannot precisely determine what the profit
 “ is, which varies probably in every county,
 “ and depends so much on circumstances and
 “ situation. I shall therefore set down a course
 “ of husbandry frequently observed by farmers
 “ in my neighbourhood, where the fields are
 . N “ inclosed,

“ inclosed, and let for fifteen shillings an acre
 “ tithe-free.

An estimate of the expences and profit of one
 acre, in four years.

	l.	s.	d.
“ For turnips first year, four } “ ploughings, at 4 s. each, }	0	16	0
“ Harrowing and seed, 2 s. hoe- } “ ing 6 s. rent 15 s. }	1	3	0
“ Fifteen loads of dung, at } “ 2 s. 6 d. per load, }	1	17	6
	<hr/>		
“ Expences	3	16	6
“ The first year's produce of tur- } “ nips, worth }	2	0	0
	<hr/>		
“ The second year barley, pro- } “ duce 4 qrs. at 18 s. per qr. }	3	12	0
“ Two ploughings and harrow- } “ ings 10 s. three bushels feed }	1	13	0
“ and weeding, 8 s. and rent }			
“ 15 s. }			
	<hr/>		
“ The third year clover, 14 lb. } “ feed, and rent }	0	19	0
“ Two crops of clover, worth	1	10	0
	<hr/>		

“ Fourth

	l.	s.	d.
“ Fourth year wheat, 3 qrs. at } “ 1 l. 16 s. per qr.	5	8	0
“ One ploughing and harrow- } “ ing 7 s. three bushels seed } “ and weeding 16 s. and rent } “ 15 s.	1	18	0
<hr/>			
“ Total produce of an acre, in } “ four years,	12	10	0
“ Total expence of an acre, in } “ four years,	8	6	6
<hr/>			
“ Clear profit in four years	4	3	6
<hr/>			

“ I have not computed the value of the straw,
 “ because it is supposed, that the expences of
 “ reaping, threshing, and carrying to mar-
 “ ket, will be nearly equivalent in this
 “ neighbourhood. In other places, where the
 “ value of straw may be thought greater or less
 “ than the expences, the calculation may be
 “ made accordingly.

" NEW METHOD.

	l.	s.	d.
" Three quarters six bushels and " two pecks of barley, on an " acre, at 18 s. per quarter, " is worth	3	8	7½
" Deduct for expences, viz. two " ploughings, 8 s. three horse- " hoeings, 3 s. hand-hoeing, " 2 s. 6 d. feed, 2 s. 1 d. ½, " rent 15 s.	1	10	7½
" Remains clear profit in one " year	1	18	0
" Consequently the clear profit " on one acre in four years, " is	7	12	0

" It appears from the above estimates, that
 " the profit is considerably greater in the drill,
 " than in the Old Husbandry; yet I have
 " supposed the fourth crop in the old way to
 " be wheat. Whereas it is much more com-
 " mon hereabouts, where the land is not
 " perfectly adapted to the culture of wheat,
 " for the farmer to sow oats, or some other
 " spring crop, after the clover; and thus is
 " the profit reduced. But I proceed to the
 " calculation of others.

" A

“ A letter in the third volume of the *Mu-*
 “ *seum Rusticum*, page 332, signed Y, reckons
 “ the clear profit of land in tillage near Bury
 “ at about fifteen shillings per acre. According
 “ to my calculation, as above, the clear an-
 “ nual profit is one pound one shilling, in my
 “ neighbourhood, in the old way. But a
 “ very ingenious treatise, in the fifth number,
 “ in the Foreign Essays on Husbandry, page
 “ 322, recommending the culture of sainfoin
 “ and clover, with intermediate crops of corn,
 “ written by M. De L’Harpe, estimates the
 “ clear profit of one acre at one pound seven-
 “ teen shillings. Therefore, as his method
 “ seems a very good one (though it is cer-
 “ tainly the highest calculation of any I ever
 “ met with), I shall compare the clear profit
 “ to be expected in the drill culture with his
 “ calculation.

	l.	s.	d.
“ Monf. De L’Harpe reckons } “ the annual produce of sixty “ acres to be worth	170	0	0
“ From which he deducts for } “ expences ten shillings per “ acre, and rent ten shillings “ per acre	60	0	0
“ Clear annual profit on 69 acres	110	0	0

	l.	s.	d.
" Drill culture 3 qrs. 6 bush. 2 p.	205	17	6
" of barley, at 18 s. per			
" acre, and for 60 acres			
" Deduct for rent, 45 l. and for	90	0	0
" expences the same			
<hr/>			
" Clear annual profit out of 60	115	17	6
" acres			

" Hence it appears, that sixty acres in the
 " drill culture is more advantageous than the
 " highest calculation of profit made by mo-
 " dern improvers. But this is not all. For
 " the above is calculated from a horse-hoed
 " crop of barley; whereas, in many soils, I
 " am convinced, it is more profitable to cul-
 " tivate wheat in that manner. I have had
 " seven successive crops from the same land
 " without manure, and the soil is yet unim-
 " poverished, and sown at present with wheat,
 " the eighth crop.

	l.	s.	d.
" I have had sometimes two	3	12	0
" quarters of wheat on an			
" acre,			
" Whereas I estimate the crop	3	8	7½
" of barley at no more than			
" But the clear profit from one	2	0	0
" acre of drilled wheat may			
" be			

" Thus

“ Thus have I, with candour, endeavoured
 “ to give a clear and comparative view of the
 “ Old and New Husbandry. During the
 “ eight years that I have practised the latter,
 “ I have been careful to observe the peculiar
 “ advantages and defects of each method:
 “ and if, upon the whole, I at last declare in
 “ favour of Mr. Tull’s system, it is with-
 “ out prejudice, and merely from conviction.
 “ That the old method, with the assistance
 “ of the more modern improvements by tur-
 “ nips and clover, and by the alternate use
 “ of the leguminous plants, which require
 “ hand-hoeing, is very advantageous, I allow.
 “ Perhaps the farmer, who pursues this me-
 “ thod in its greatest perfection, judges wisely
 “ in preferring a system he is master of, and
 “ can confide in, to another whose principles
 “ may be just, but the practice of which is
 “ totally different from his own. But the
 “ farmer, who is ignorant of these modern
 “ improvements, surely ought not to hesitate
 “ to adopt the drill culture, which a few years
 “ practice would render habitual, and which
 “ he would find to be much more beneficial.
 “ For it is certain, that this is less expensive
 “ than the old method; and, when once
 “ adopted, easier in the execution.”

Sir Digby then proceeds to relate his prac-
 tice in cultivating wheat according to the New
 Husbandry, and recommending it without re-
 serve as much superior to the Old. I have

insisted more minutely upon his first experiments than at first intended, in order to give the reader a full view of this gentleman's practice, and the judicious remarks he makes, on a comparative view of both the Old and New methods. It is, however to be regretted, that he did not more perfectly follow the New, as laid down by the author of it, by doing which his drilled crops would have been larger, and the superiority of the New Husbandry would have been still more apparent. This gentleman describes his land to be "light, deep, and dry, a hazle mould, excellent for barley; but generally thought not of sufficient tenacity for wheat." This was the opinion of the common farmers, and they were probably right: but they judged from their ideas of the Old Husbandry, which cannot be safely made the standard for the New. This land was prepared by several ploughings in the Old Husbandry, previous to sowing it with wheat, and, if it happened to be a dry summer, the wheat suffered for want of moisture; but, in the New Husbandry, this could not happen, if the land was well and deep-hoed; because, when the days are dry, there are generally plentiful dews in the night; and these dews penetrate into land as deep as the plough goes. This is found in all land tilled deep for madder, or other such crops; they produce great crops of wheat, after the madder, &c. is carried off, being moistened

moistened by the dews to a great depth, and by these the land is enriched: for no manure is laid upon these deep-ploughed lands for wheat or other corn. Mr. Tull's land was all of it light land, shallow, and very dry, except one field. "I am sorry," says he, p. 65, "that this farm, whereon I have only practised horse-hoeing, being situate upon a hill, that consists of chalk on one side, and heath-ground on the other, has been usually noted for the poorest and shallowest soil in the neighbourhood." And p. 263. "My farm was termed a Barley-farm, not from the good crops of barley it produced, but because the land, being almost all hilly, was thought too light for wheat; for in their old management it was often destroyed by poppies and other weeds, and seldom was there a tolerable crop of wheat. In a dry summer, the barley crop failed for want of moisture, and of more pulverization, and was not worth-half the expence. Land is seldom too dry for wheat, and this dry soil, in the hoeing culture, brings very good crops of wheat; which is the reason I have now no barley, except what is sown upon the level, as it always must be for planting sainfoin and clover amongst it; were it not for that purpose, I should plant no barley at all." Hence it appears, that Mr. Tull's land was both very dry and shallow; yet he planted it all with wheat, and horse-

horse-hoed it. Also it appears, that he had good crops of wheat, as appears from the account of his crops given above, much superior to Sir Digby's wheat crops, though his was deep land. Mr. Tull also horse-hoed his wheat four times, and deep; whereas Sir Digby's was horse-hoed only three times. He says indeed (as before-mentioned), "nor
" are more than four hoeings *commonly* re-
" quired; so that, if we reckon four shillings
" for ploughing the ground once over, or
" forming fresh ridges, four shillings more
" for horse-hoeing, two shillings and six-
" pence for hand-hoeing, two shillings for
" weeding, and six-pence for drilling; thir-
" teen shillings is the whole expence of ma-
" naging an acre in the New method." But though four horse-hoeings are charged here, as generally necessary for a crop of wheat, yet this land was horse-hoed but three times (for what reason does not appear), and these horse-hoeings were performed with only one horse; which, as the land was deep, might have been deeper ploughed with two horses; this would have kept the land moist to a good depth, would have enriched it more, and caused it to produce much greater crops.

Having given so full an account of this gentleman's barley and wheat crops, I shall be the shorter with respect to the other horse-hoed crops. The ninth crop upon the seven acres was in the year 1767, six acres lentils,
and

and one potatoes, in order to destroy the weeds, which by neglect greatly abounded; but the season continued so long rainy, that the lentils sprouted, and the crop became mouldy when housed, and was of little value; and the acre of potatoes was also an inferior crop; these deficiencies were not, however, owing to the New Husbandry, but to an uncommon bad season.

	l.	s.	d.
The loss is reckoned at	4	8	0
Yet including this loss, there remained a clear profit of	28	4	0
The profit from these seven acres in nine years was	65	9	0

which is an advantage of more than 28l. over the Old Husbandry: and “it is very probable,” says Sir Digby, “that when the present wheat crop, now growing, and in a flourishing condition, shall be added to the account, the excellence of the Horse-hoeing Husbandry will be more evident.

“That part where the potatoes grew makes the best appearance at present; and therefore I can particularly recommend this plant, as an excellent preparative for wheat. —Of the other exclusive benefits attending the potatoe culture, I can give the following instance. October 31st, 1765, an acre of potatoes, planted in a rich dry soil, produced

“ duced thirty-six quarters; which, at three
“ pence per peck (a very low price), were
“ 14 l. 8 s. Another acre the preceding year
“ was planted with potatoes on five-foot
“ ridges, viz. a single row on every ridge,
“ and each plant a foot distant. These were
“ well weeded and horse-hoed, and the crop
“ was thirty-seven quarters five bushels,
“ which, at three pence per peck, comes to
“ 15 l. 4 s. But here the land was very rich.
“ —Though can there well be a more profit-
“ able culture?

“ I have had very great crops of sainfoin-
“ feed this way; and once, in particular, I
“ measured a single row on a three-foot ridge,
“ and one hundred yards in length produced
“ five pecks; and consequently an acre would
“ yield seven quarters four bushels, an asto-
“ nishing quantity! But the rows were per-
“ fectly weeded, and the seed gathered by
“ hand, so that scarce a grain was lost;
“ whereas, in the common way of mowing
“ and threshing, there is generally immense
“ waste, probably amounting to half the
“ quantity. But, on the other hand, the
“ expence of gathering the seed of one acre,
“ by women, calculated from the row above-
“ mentioned, would amount to three pounds.”

{ But, if the tops were cut off with a reap-
hook, and in the dew, it will not be liable to
shed; and the seed may be saved this way at a
small expence.—Sir Digby seems to incline to
the

the opinion of many farmers, that the stalks of large sainfoin are hard and pipey, and for that reason not so agreeable to cattle, as the small leafy sort: but this is because they are apt to let it grow too old before they cut it; as they are in regard to broad clover also, and other grasses. But large sainfoin is the richest and most juicy, if cut before it blossoms; which for hay, or to be fed green, it should always be, before any of the blossoms appear. And lucerne should be cut still earlier, viz. not only before any blossoms appear, but even before the blossom-buds are formed. In this there is no loss; for the earlier these plants are cut, the succeeding crop grows the quicker.]

“ I own, I have seldom found that horses
 “ leave any, not even the grossest part of
 “ the sainfoin plant. They will eat the stalks,
 “ where the seed has ripened. Sheep are
 “ more delicate: for, though they are exces-
 “ sive fond of sainfoin both in grass and
 “ hay, you may frequently see the thickest
 “ of the stems left untouched, where they
 “ have been foddered.” [But give them
 sainfoin in grass or hay, that is cut before it
 blossoms, they will eat the largest stalks clean
 up, and make no waste.]

“ Though I do not altogether approve of
 “ drilling sainfoin, to be horse-hoed, I prefer
 “ the drilling of it in equally distant rows to
 “ sowing it by hand. Because the drill sows
 “ more

“ more regularly than the hand; and you
“ save half the quantity of feed. I am sure,
“ I have not less than one hundred acres of
“ drilled sainfoin. Some of it in rows at one
“ foot, and the rest at half a foot distance.
“ The greatest quantity I ever sow is three
“ bushels to an acre. The least, and which
“ I generally sow, is one bushel and an
“ half to an acre. I have many fields, where
“ the plants are quite regular, and stand
“ as thick as one would wish, producing very
“ good crops.

“ I have several thousand acres on the
“ wolds, that do not let for a shilling each
“ acre. The soil is generally dry, shallow,
“ and stoney. This, after being reduced to
“ fine tilth, by repeated ploughings, and
“ manured by the fold of a large flock of
“ sheep, which I keep for that purpose, has
“ been gradually and successively laid down
“ with all the various kinds of grass-seeds in
“ common use; the principal of these are
“ sainfoin, and all the clovers, burnet, tre-
“ foils, lucerne, rye-grass, rib-grass, and com-
“ mon hay-seeds; of all these, sainfoin has
“ made the most general and greatest im-
“ provement. This plant, whilst grow-
“ ing, is grateful to all kinds of cattle;
“ and the hay is excellent. The produce
“ from this land is, in a good year, about a
“ ton to an acre, taking the whole crop of a
“ large field together. It is true, I have had
“ three

“ three ton to an acre in rich land. But one
 “ ton from such poor land appears to be
 “ a more extraordinary produce : and besides,
 “ the hay is finer, sweeter, and more nour-
 “ rishing than from the former. [This prob-
 ably, because the sainfoin from the poor
 land was cut earlier than the other : for other-
 wise, and the hay equally well-made, the rich
 land produces the best hay.]

“ As to lucerne, I could never get it to
 “ succeed on such a soil ; but must now do jus-
 “ tice to its merit : for I have cultivated it
 “ with success in a rich, deep, and dry soil.
 “ I have about two acres in beds, of three and
 “ four feet breadth, in single and double
 “ rows, part transplanted, and part sown,
 “ which I keep carefully weeded, and which
 “ yields me generally three, and sometimes
 “ four, crops in a summer. The first crop
 “ is now (the 13th of May) ready to cut,
 “ being a foot and half high.” [By this ac-
 count, it seems, that Sir Digby’s lucerne was
 very imperfectly and very shallow hoed ; for, on
 such land as this, rich, deep, and dry, if well
 horse-hoed, it is ready to cut earlier than the
 13th of May in many parts of England ; and
 rises much higher than a foot and a half, and
 even to twice that height, frequently higher.
 The quality of this lucerne shews also, that it
 was poor : for Sir Digby says] “ I find it a very
 “ great saving of corn. I give it to my coach
 “ and saddle-horses regularly every day, fresh as
 “ it

“ it is cut : and I think it, in some measure,
“ supplies the place of oats. I have fre-
“ quently fed some of my horses with half
“ lucerne, and half their usual allowance of
“ corn, and found that those horses were in
“ higher flesh and spirits than the others,
“ which had their usual food, viz. hay and
“ corn.” [But there are many instances, that
horses, fed with good lucerne, require no hay or
corn; though hard-worked.] “ Either in
“ single or double rows, with three or four
“ feet intervals, transplanted or sown, it may
“ do extremely well, provided you weed care-
“ fully ; but that is essential. With such
“ care and expence, often repeated, viz. three
“ times a year, you may have good lucerne
“ on almost any soil ; and, without it, the
“ most proper soil in the world will not sup-
“ port lucerne above a year or two.”

Sir Digby concludes, as before-mentioned, with a full approbation of the Horse-hoeing Husbandry in preference to the Common ; and his success would have been still greater, had he employed two horses to hoe his deep land, and given it at least four horse-hoeings with two horses, instead of three only with but one horse. This was the least given, or directed, for wheat by the author of this Husbandry ; and none have yet excelled him in the practice of it.

In 1763 the rev. Mr. Lowther communicated to the London Society of Arts his experiments

periments in the Drill Culture of wheat in Cumberland, compared with the common course of crops in that country, viz. the first year turnips, with the full quantity of manure; the second year fallow; and the third year a crop of wheat, without manure. This course continued every three years. In the Drill Culture, the first year turnips, with half the quantity of manure, as the broad-cast; the second year, barley; and the third year, wheat. The barley and wheat repeated the fourth and fifth years, and then the manuring and turnips to take place again. It does not appear, that any manure was used for the crops of corn. The land, on which the experiments were made, was a heavy, moist soil, with a clayey bottom, and deemed too stiff for barley. It was tilled out of hay, and had borne a crop of oats. The rent eight shillings per acre.

The course of crops here mentioned is an uncommon one, and by no means the best. Mr. Lowther drilled three rows of wheat on each ridge, which were too many, and his ridges were but five feet and a half broad, which for three rows should have been six feet; and on the whole, he reckons the drilled crops were more profitable than the broad-cast in that country, by eight shillings two pence and eight-fifteenths per acre; but these experiments were not so satisfactory by much as those made by Sir Digby Legard: and
O therefore

therefore it is not necessary to relate them more particularly.

Mr. Dossie has likewise particularly related the experiments made by Mr. Cox of Wallhampton, near Lymington in Hampshire, in a field of twenty-three acres, divided into sixteen parts, and drilled on the level, some parts with red, and others with white wheat, the rows one foot asunder, and hand-hoed; some were manured with lime, and the other parts not manured. The above parts produced considerably more than the common broad-cast sown wheat in that country. The land of this field was nearly of the same quality, viz. a shallow mould on a gravel. The quantity of seed drilled was one bushel per acre. The quantity usually sown there broad-cast is from two to two bushels and a half per acre. And, as Mr. Dossie observes, that at the rate at which wheat is now sold (in 1767), there is a clear saving, in the drill method of sowing, of near the rent of the land, viz. twelve shillings and six-pence per acre. This is, reckoning the produce of all the experiments at an average, and after deducting for the hand-hoeing, and all other expences; and is a full proof, that drilling on the level, in rows a foot distant, and hand-hoed, is more profitable than the common broad-cast sowing; but drilling the wheat upon ridges, and horse-hoeing it in the proper manner, is still much more profitable than level drilling and hand-hoeing,

hoeing, or than any other way hitherto practised of cultivating wheat.

Mr. Doffie concludes this head with a quotation from Mr. Wynne Baker, wherein Mr. Baker reckons, “ that in the broad-cast, consisting of a succession of fallow, wheat, and oats every third year, he charges nine barrels of wheat per acre produce from each crop. The fallow year is lost: and the oats, yield in value to the wheat, only as four to nine. In the drill way, he obtains six barrels of wheat every year, in a constant succession.” It is proper to observe, that this is on the plantation acre, which contains 7840 square yards. The total expence, including rent, *communibus annis*, in fifteen years, is 2l. 10s. in the broad-cast; and 2l. 5s. 1d. in the drill culture, according to his state of them; which is 4s. 11d. annually, in favour of the latter. But the difference of the value of the produce, which is to be added to this saving, is so great, that it appears, as he says, according to his state, “ a farmer, having forty acres of tillage, supposing him to direct his attention to bringing it to the Drill Culture, would make, in fifteen years, 969l. 10s. more than he can in the Common Husbandry: which is such an advantage, that the greater profit in the drilling acre will purchase the fee-simple of that in the Common Husbandry at twenty-seven years purchase, valuing the land at eighteen

O 2

shillings

“ shillings an acre: Thus it appears, that, in
“ every fifteen years the fee-simple of all the
“ tillage-lands in the kingdom is lost to the
“ community by the common course of til-
“ lage.”

Mr. Baker was a very accurate experimenter, and had experience of horse-hoeing several crops, turnips, cabbages, &c. in which he succeeded; but had not then experienced the horse-hoeing culture of wheat, for a succession of years: and, as it seems from a quotation he makes, that he depended, for information of the hoeing culture of wheat, upon an edition of Mr. Tull's Husbandry, made by a person employed by the late Mr. Millar the bookseller, who seems not to have fully understood Mr. Tull; Mr. Baker appears to have been led into a mistake, viz. to suppose, that pulverization was the great principle in the New Husbandry; which without doubt is indispensably necessary, and will go far in obtaining good crops of such plants and roots as are thus cultivated for one year: but drilled wheat crops have seldom any manure bestowed upon them, and are repeated every year for many years in succession: and, as the wheat crops draw nourishment every year from the soil, this continual exhaustion requires likewise a constant recruit of vegetable nourishment: otherwise the earth will be impoverished, and the crops must decline.

The

The tillage, breaking, hoeing, and pulverizing the soil, are operations performed by ploughs and hoes: but these operations do not add any new matter to the soil; they reduce the soil into fine tilth; but mere pulverization does not, of itself, increase the vegetable nourishment, which has been taken notice of above: for earth made ever so fine *in vacuo*, and where no air is admitted, will never be enriched, in the smallest degree, by mere pulverization; it must come in contact with the air, or atmosphere; from whence alone it can be recruited with vegetable nourishment. The not being informed, and attending to this, was the reason that Mr. Baker failed in the hoeing culture of wheat, as will appear hereafter.

Mr. Doffie speaks doubtfully of what Mr. Baker supposes the drilled crops of wheat would produce annually, as he had not then seen many authentic experiments of drilled and horse-hoed wheat crops in Britain; and Sir Digby Legard's being the most clearly related, he had stated his average of wheat crops at only twelve bushels per acre, instead of about sixteen bushels computed by Mr. Baker. Yet Mr. Baker's was a moderate computation. His first years horse-hoed crop was greater than he had computed; and he might have realized his computation, or higher, had his crops been cultivated in the best manner.

To understand his estimate, it may be proper to observe, that the Irish plantation-acre is to the English statute acre, as 7840 square yards to 4840; or nearly as 8 to 5. The Irish stone is 14 pounds.

Their barrel of wheat is 20 stone, or 280 pounds; which is four English nine-gallon bushels. Their barrel of oats is 14 stone, or 196 pounds.

Mr. Baker being experimenter to the Dublin society, he was directed by them to make a comparative experiment of the drill and broadcast methods; and he allotted one plantation acre to be drilled annually with wheat, and horse-hoed for a course of years; and he sowed two contiguous half-acres, of the same soil as the other, broadcast; the seed of one half-acre to be covered with the plough, and of the other with the harrow.

These two acres were drilled with turnips in 1764 upon five-feet ridges, which were horse-hoed. And in 1765 they were sown with barley, which was drilled, two rows upon each ridge; the best part produced a good crop, the rest was inferior; the barley being sown too late, and the season unfavourable.

NEW HUSBANDRY EXEMPLIFIED. 199

	l.	d.	s.
In 1765. The one acre was ploughed once, to form the new ridges, cost,	0	10	4
October 5, Harrowed the ridges, $4\frac{1}{2}$ d. and drilled 6st 5lb of red lammas wheat, 6s 11 $\frac{1}{2}$ d.	0	7	4
November 20, Winter horse-hoeing, with two horses,	0	1	7
1766. March 15, Spring-hoeing with the single cultivator close to the rows,	0	1	2 $\frac{1}{2}$
— Ditto with double cultivator once along the intervals,	0	0	8
— 30th, Horse hoeing the intervals a second time, turning them to the rows,	0	1	5 $\frac{1}{2}$
May 12, Weeding the partitions,	0	0	7 $\frac{1}{4}$
June 17, Third hoeing the intervals towards the rows,	0	1	5
— Deepening the middle of the interval with double cultivator,	0	0	8
August 28, Reaping, 3s 4d. Threshing 7bar. 11st. 5lb. at 9d. per bar. 5s. 7 $\frac{1}{2}$ d.	0	8	11 $\frac{1}{2}$
September 29, One year's rent,	0	18	0
Total expence, of the horse-hoed acre of wheat, the first year,	2	12	2 $\frac{3}{4}$

As stated by Mr. Baker in his report to the Dublin Society.

1766. The produce of the drilled acre,

	l.	s.	d.
Wheat, 7bar. 1st. 5lb. at 30s. } per bar.	11	7	0 $\frac{1}{4}$
Straw, 39cwt. 1qr. and 22lb. } at 9d. per cwt.	1	9	6 $\frac{1}{4}$
Produce of this acre,	12	16	7
Expences as above,	2	12	2 $\frac{3}{4}$
Profit on this acre the first year,	10	4	4 $\frac{1}{4}$

1767. The second year it was drilled
in double rows and five feet
ridges, with 5 ft. and 2 lb. of
red lammas wheat, the 16th.
of October, 1766, and culti-
vated exactly in the same
manner as the first crop;
weeding cost 8d. reaping 3s.
threshing 8d. per bar. and the
whole expence was,

August 20. The crop was reaped
and produced,

Wheat 5 bar. 12 ft.	}	7	0	7½	2	11	6¼
7 lb. at 25s.							
Straw 29 cwt. 2 qrs.	}	1	2	3¾	8	2	11¼
27 lb. at 9d.							

Profit the second year,

5 11 5 5 11 5

1768. The third year. The culture
was the same as the two pre-
ceding years, and cost 7s. 7¾.
It was drilled the 18th of Oc-
tober, 1767, with 5 ft. and
2 lb. of seed, at 25s. per bar.
cost 5s. 1½d. Reaping, 27
August, cost 3s. 6d. and
threshing, 2s. 0½d. at 8d. per
stone; the total expence,

Produced, Wheat	}	3	16	3	2	7	9¾
3 bar. 1 ft. at 25s.							
Straw, 16 cwt. and ¼	}	0	12	2¾	4	8	5¼
at 9d.							

Profit the third year,

2 0 8 2 0 8

The annual decrease of the crops, deter-
mined Mr. Baker to give up the scheme of
successive crops of wheat, drilled upon five-
foot ridges; and he supposes, that by drilling
a double row upon six-foot ridges, some of the
incon-

inconveniences which he found might possibly be avoided. He then states his objections to drilling on five-foot ridges; and assigns these as the reasons why he did not succeed.

“ His first objection is, that upon poor cold ground the wheat is too late in ripening, especially in so moist a climate as Ireland, and where there is so little sun ”— This objection relates to drilled wheat, which, by the nourishment it receives from the hoe-plough, is somewhat longer in ripening than wheat sown broad-cast; but the difference is not so great as wholly to exclude drilling there, as is intimated in this objection: for, as mentioned above, Mr. Baker drilled one acre; and contiguous to it he sowed two half-acres broad-cast, all of them were sown the same day, viz. the 5th of October. These two half-acres were reaped the 23d of August; and the drilled acre was reaped the 28th of August, which was only five days later: this was so small a difference as ought not to exclude the hoeing culture of wheat, if otherwise the most profitable. Besides, it is to be observed, that this wheat was not sown till the 5th of October; which, had it been sown earlier, would have been earlier ripe: so that this is no valid objection against drilling of wheat in Ireland, even upon so cold land as this was.

2. Mr. Baker objects next, “ that after taking four or five crops in this way, the partitions

“ partitions throw up such a quantity of weeds,
 “ poppies, hog-fennel, &c. particularly upon
 “ poor land, and in a wet season, that no
 “ labour (consistent with profit) can eradicate
 “ them, but fallow and turnips. And that,
 “ if the corn is strong, so that the hoe-plough
 “ cannot operate *after June*, the like weeds
 “ rise wonderfully in the intervals.”——It is
 certainly difficult to eradicate weeds in these
 circumstances. Yet we find that Mr. Tull
 conquered the weeds in his poor land: and he
 advises, when the hoe-plough happens to be
 shut out, to give the land a light hand-hoeing,
 which would keep down the weeds; and this
 hoeing would be well repaid, by the improve-
 ment it would make in the land. Besides, it is
 found, that a good horse-hoeing in June, be-
 fore the wheat blossoms, causes the ears to be
 fuller of grain, than deferring it till after the
 wheat has done blowing; though without
 doubt hoeing then, and also after the blowing,
 do both contribute to improve the crop. But
 admitting that four or five crops can be taken
 of hoed wheat, and there should then be a
 necessity of some intermediate crop to be taken,
 of turnips, beans, &c. to clean the land; the
 following four or five crops may then be drilled
 wheat; as was the case with Mr. Craik; but
 he does not for that reason give up drilling of
 wheat.

3. These ridges were five feet broad; but,
 if made six feet broad, he thought the hoe-
 plough

plough might be introduced oftener, as there would be more room in the intervals: but Mr. Tull's ridges were narrower than five feet, as were those of other cultivators who have succeeded in this culture. "It has, says he, been after the culture of the intervals was finished [after June, as above] that they have shot up, and formed their seed; and which I conceive to be productive of them in the succeeding year," and this may be in some measure prevented as before mentioned.

4. That, in ploughing these five-foot ridges after harvest for the succeeding crop, the stubble mixed with the mould of the intervals; and he says he found by inspection that this was the cause of the third crop being so small. The stubble interfered with the coulter of the drill plough in its passage, and caused the ground to remain hollow about the seed in many places; and the winter's rain, lodging in these hollows, perished the plants; whence, says he, a great diminution of our (third) crop. Six-foot ridges may remove this objection also; because in ploughing the ground for a succeeding crop, the stubble of the preceding one will not be so apt to approach the middle of the new-made ridges, as when the culture is carried on with narrower ridges. Removing the stubble would be a troublesome and expensive business, to clear a large quantity of land, besides robbing the ground of so much manure as the stubble would make.—

The

The two great furrows are thrown up first in a high ridge, the plough going near the rows of stubble, so that the two next furrows do not rise so high, as to make the stubble interfere with the drill plough. Other cultivators have not found this inconvenience upon narrower ridges; nor, it seems, did Mr. Baker find it till the third crop, and therefore was not a sufficient reason for discontinuing this husbandry; the next objection appears to be the principal reason of it.

5. “ Though it seems to have been the
 “ opinion of many writers upon this hus-
 “ bandry, that such constant production of
 “ crops without intermission does not im-
 “ poverish, but on the contrary improves the
 “ ground by the culture bestowed upon it in
 “ this husbandry; but I find this not to be the
 “ case: for certain it is, that the capability
 “ of the ground to feed plants, is every year
 “ less, after it has produced a crop of turnips,
 “ I am afraid this objection will be found in-
 “ contestably true in practice, with five-feet
 “ ridges; how far those of six feet may remove
 “ it, I shall wait until my experience shall in-
 “ form me.”—If this argument was to be
 depended upon, there was no occasion to bring
 any other objection against the New Hus-
 bandry. Mr. Baker speaks here incautiously,
 and opposes his one unsuccessful experiment
 to the continued practice and success of the
 author of this husbandry; and of the other
 gentlemen

gentlemen of character abroad, who have confirmed its principles upon large tracts of land of various kinds. But it is plain that Mr. Baker fell into an error that others have done, by supposing that pulverization and exposure were the same. Mr. Baker should have cultivated his wheat with the hoe-plough, which answers both these purposes: but he substituted cultivators instead of the hoe-plough; these were invented by M. De Chateavieûx, as useful instruments in some particular cases. They are not ploughs, they have neither coulter nor earth-boards; and do not turn the soil and expose a new surface to the air, or atmosphere, as a plough does. M. De Chateavieûx called the single cultivator a *miner*, because it works wholly under ground, raises the mould a little, which sinks down again where it was before as soon as the cultivator is past; but does not turn the mould, nor expose a new surface to the immediate action of the air, which is essential in this husbandry; as this is the principal means whereby the land is recruited of the vegetable food, or nourishment, whereof it is partly exhausted by the growing crop. Breaking or pulverizing the earth makes it lighter and more open, whereby the celestial influences can more easily penetrate into it than when it is close and hard; but the soil is not by any other means so effectually and immediately enriched, as by turning and exposing it to the immediate action of the atmosphere,

as

as we have taken notice of before, and is directed by the author of this husbandry; especially as necessary in cultivating land for successive crops of wheat: for these crops have not any assistance from manure, nor is the land recruited of its fertility by any other means than by pulverization and exposure. Land that is rich, and already much impregnated with the vegetable food, will bear a good crop by good hoeing, or pulverizing only, without much exposure, for a single crop, especially if also manured; this seems to have misled many who were not well acquainted with the principles of the New Husbandry: they generally recommend hoeing and pulverizing the land, and to these they attribute the success of the hoeing husbandry; but though this will do for one crop, it is evident, from the hoeing culture of wheat, that these alone will not do for a succession of crops; but they will gradually decline every year, because the earth is not recruited by pulverizing, unless a new surface be also exposed to the air, or atmosphere. It is this that recruits the earth of the vegetable food: the pulverizing prepares the earth to receive the new vegetable food, when duly exposed to the air. The single cultivator is a triangular hoe, and resembles one of the triangular hoes of the nidget, only larger and longer; the double cultivator consists of two single cultivators placed side by side in a frame: they may be run along in light loose mould,
but

but are by no means proper to be substituted for the hoe plough; and here appears the error of Mr. Baker's culture. His winter or first horse-hoeing, he takes notice, was performed the 20th of November with the hoe-plough, which turned the earth from the rows of wheat. The second horse-hoeing with the hoe-plough was not performed till the 30th day of March, and then the earth was turned back again towards the rows of wheat. The third horse-hoeing with the plough was not performed till the 17th of June, and then the earth was not again ploughed away from the rows, as the author of this husbandry directs, and that the plough should go close to the wheat; but, on the contrary, some loose earth was thrown up from the intervals, the 17th of June, up to the ridges; so that instead of four hoeings with the plough, two of them close to the wheat, here was only one hoeing performed in that manner the 20th of November; and after the earth was turned to the wheat by the hoe-plough, it was no more ploughed and turned from the wheat afterwards, as should have been done; and what other tillage was given in the intervals was wholly performed by the cultivators, not proper to be substituted for the plough.

Indeed the land here was properly horse-hoed only twice, instead of four horse-hoeings that ought at the least to have been given it. Mr. Tull at first gave his wheat six horse-hoeings,

hoeings, and directed so many to be given; and when he had reduced his ridges from six feet broad to four feet eight or nine inches, he found four such hoeings were sufficient to nourish the crop, and enrich the land for the succeeding crop: but directs, that when the hoer finds, by a decrease in his crops, that the land had not been sufficiently improved the preceding season, he should hoe it oftener, or give the rows a dressing of fine manure about the month of February; neither of which was done here, though the crop evidently declined. Yet it was reasonable to have followed the directions of the father of the New Husbandry, who had long experience in it: for no novice in this Husbandry should rashly depart from the rules laid down, from experience, by so able a cultivator. The examples above given are a sufficient confirmation of the principles of this Husbandry, and cannot be invalidated by the ill success of those who depart from the established rules of this culture.

I have been particular in reciting this miscarriage. Mr. Baker acted in a public capacity, was a very accurate experimenter, and had succeeded admirably in raising single crops of different sorts; and it was a misfortune that he deviated from approved rules in the culture of drilled wheat, a plant of so general use; his being so sanguine of success (before he had practised this culture), as appeared from the calculation he had published, and referred
to

to by Mr. Doffie, of the great advantage to be made in Ireland, from successive hoed crops of wheat, compared with the common course of culture there (of a crop of wheat, one of oats, and the third year fallow), his failing of success was very discouraging to others; although the drilled crops he states are not more than may be really obtained in the New Husbandry duly performed. Some, who favoured the drill husbandry, wished him success; but others, as he takes notice, hoped otherwise; and his not succeeding may have some effect in Britain, but has so discouraged most in Ireland, that probably the hoeing culture of wheat will not again be attempted there in a long time.

Since writing the above, I have seen a treatise on Husbandry, entitled *Rural Improvements*, very lately published. The author is a gentleman of practical knowledge, and the work contains many valuable and judicious observations: he has also practised the hoeing husbandry, and recommends it.—The author sets out with this general proposition, that landed estates may be improved to double their present value. “This,” says he, “it seems, has been thought by many an extravagant notion, without any reasonable ground or foundation in the nature and reason of things.”

“Strange as this opinion may seem to many, it is not the mere creature of a
P “warm

“ warm imagination, but founded on a series
 “ of experiments and observations, made on
 “ an extensive scale by the author, who in
 “ numbers of instances could confirm his
 “ doctrine by his practice, and produce the
 “ clearest evidence that those improvements
 “ are capable of being carried much higher,
 “ and to much greater advantage, on the
 “ author’s principles, &c. by the same means
 “ he used.”

P. 47. “ My idea of improvement does
 “ not only comprehend the increased value of
 “ the thing to be improved, but that the im-
 “ provement be more than equivalent to the
 “ expence which attends the obtaining it.
 “ For I can have no idea of any thing being
 “ an improvement which is attended with
 “ loss. Suppose a gentleman possessed of an
 “ estate of 500l. per annum, and that he has
 “ 1000l. in the stocks, which brings him
 “ 40l. per annum. Should he convert his
 “ stock into money, and expend the same in
 “ improving his estate, which when effected
 “ only produced 30l. per annum; this surely
 “ could never be thought an improvement.
 “ But should the expending the 1000l. add
 “ 100l. per annum to the value, it might
 “ then with great propriety be called an im-
 “ provement. And with respect to the tenant;
 “ supposing in his farm he has 100 acres of
 “ land, which are considered as little better
 “ than waste, and not valued to him at more
 “ than

“ than a shilling an acre, and which perhaps
 “ he does not make half a crown an acre of,
 “ being only applied to the run of a few
 “ young cattle in the summer; if a method
 “ could be pointed out, by which such land
 “ might be made to produce 10 s. an acre
 “ besides paying the expence, it is very clear,
 “ the improvement would be in the propor-
 “ tion of four to one, or 400 per cent.
 “ Now this is the improvement we propose,
 “ and have no doubt of pointing out the
 “ means by which it may be certainly
 “ effected.

“ Few Husbandmen have any notion of
 “ improvement, independent of manures of
 “ some kind or other: but, in many places,
 “ they are not to be obtained at any rate:
 “ and many lands are so situated and circum-
 “ stanced, that the expences of manuring (if
 “ manures could be got) would far exceed all
 “ advantages; and therefore would ter-
 “ minate in loss. But I maintain, that
 “ such lands may be improved, independent
 “ of any manure but what may be raised
 “ from the land itself. Indeed there is land
 “ so barren, as to be incapable of any im-
 “ provement; such as absolute bog, before it
 “ is drained; rock, and pure sand; but land
 “ that will bear furze, fern, broom, thistles,
 “ or weeds of any sort, may be cultivated to
 “ useful purposes, without the expence of
 “ carrying manure to the same.

“ I by no means mean to decry the use of
“ manure ; I too well know its value ; and
“ that farmer must be very indolent, or ig-
“ norant, whose lands are not fertile, if he
“ can have it in plenty upon moderate terms,
“ if he neglects it ; but the quantity of it is
“ limited, and not to be purchased in the
“ quantities desired : therefore, if land is not
“ to be improved without manure, some hun-
“ dred thousands of acres can never be im-
“ proved at all.

“ It may be said, attempts of this kind
“ have been formerly made without success ;
“ and that much land, which has been in tillage
“ heretofore, now lies neglected, in the con-
“ dition above represented. This is certainly
“ true, and what I have frequently seen ;
“ but proves nothing against this plan of im-
“ provement, though a forcible impeachment
“ of the avarice or weakness of the occupier.
“ If men will sacrifice all future advantage to
“ a little increased present gain, the fault is
“ their own, and not the lands they possess.

“ Suppose a farmer should spade and burn-
“ beat a tract of such land as above described,
“ and reap a middling crop of wheat the first
“ year, a thin crop of barley the second, and
“ a very poor crop of oats the third, not
“ enough to pay the expences of tillage ; can
“ it be a wonder, that such land should for a
“ long series of years be considered as abso-
“ lutely barren and worthless ? Such a prac-
“ tice

“ tice would beggar any land; and yet this
 “ is the practice commonly pursued. Whereas,
 “ had the farmer contented himself with
 “ one crop of corn, and succeeded that by an
 “ ameliorating crop, instead of impoverishing
 “ and reducing his land to a state of beg-
 “ gary, it might have been in a state of
 “ constant improvement. The art required
 “ is, to raise a tolerably good crop at first;
 “ that being obtained, he must be a poor
 “ manager who cannot keep-on with ad-
 “ vantage.

“ This is not a mere matter of opinion.
 “ I have a moor of 120 acres, which, for
 “ fifty years back, never let for more than
 “ eighteen pence an acre. Some of the old
 “ people there remember its bearing as good
 “ corn and clover as any land in the parish,
 “ though I have some of four pounds an
 “ acre. I have it now in hand, and last year
 “ had a field of wheat of about five acres,
 “ which had been spaded and burnt the sum-
 “ mer before. This produced sixteen bushels
 “ to the acre, which, at five shillings a
 “ bushel, amounts to four pounds; and af-
 “ forded a nett profit of forty shillings an
 “ acre, or near it. The land is now in suf-
 “ ficient heart to produce a good crop of
 “ barley; but that I will dispense with, and,
 “ instead of it, take an ameliorating crop of
 “ turnips, clover, or some hoeing crop, that
 “ may improve it. The raising large crops

“ of corn by dint of manure, at a very heavy
“ expence, comes not within my idea of
“ improvement; and in this the most va-
“ luable part of improvement consists, at
“ least so far as arable lands are the subject
“ thereof.”

The author's method is undoubtedly right, of taking but one exhausting crop from burn-beat land; but, though he is a favourer of the New Husbandry, he does not introduce it here, though very proper to do so; his practice seems to have been more in hoeing single crops of beans, pease, turnips, &c. than in cultivating wheat in successive crops by horse-hoeing, which, in the strict sense, is properly the New Husbandry, and, in the present case, might have been introduced upon this land for the first crop after burn-beating, the land being first well pulverized; and, if the crop had been even less than sixteen bushels, the expence would have been small; and, what is most material, the land would not have been impoverished by a crop of wheat, but would have been certainly improved; and no occasion to think of an ameliorating crop of turnips, &c. to succeed the wheat, but to continue every year to obtain a crop of wheat, which is much more profitable.

Another instance of the author's improvement without manure, is of a general nature, and deserves to be well considered; and here likewise the Drill Husbandry may be of singular

singular use. “ I proceed,” says he, p. 90.
 “ to the consideration of the improvement of
 “ such lands that are so circumstanced as not
 “ to be within the reach of the common or
 “ usual method of improvement. Most large
 “ estates have very large quantities of land,
 “ that lie remote from the farm-yard; some-
 “ times several miles, and often very difficult
 “ of access, on account of steep hills and bad
 “ roads: therefore such lands have no chance
 “ to be manured with dung, ashes, lime, or
 “ any such thing, the carriage of which
 “ would come high: and therefore they are
 “ considered as waste lands, not worth more
 “ than half a crown an acre, and are there-
 “ fore suffered to be over-run with brambles,
 “ broom, or furze, from one generation to
 “ another, though very capable of bearing
 “ very good corn, if proper methods were
 “ pursued. I have, at this time, several
 “ hundred acres exactly thus circumstanced,
 “ which serve to no other purpose, but to
 “ summer a few sheep and young cattle.
 “ These are the uses those lands have been
 “ put to for a great number of years; and, as
 “ their condition is no better than formerly,
 “ no body considers them of more value; and
 “ consequently I can get no more rent for
 “ them. I have therefore taken several of
 “ them into hand, with a determined reso-
 “ lution to improve them, if possible; which
 “ I have not the least doubt of effecting. I

“ cannot convey an idea of my method better,
“ than by an account of the course I am now
“ pursuing.

“ My first essay was on what is called an
“ *over-land* (that is, land without a tenement
“ belonging to it) of above sixty acres;
“ thirty of which lay on the north side of a
“ sharp valley. The descent on one side, and
“ the ascent on the other, are so quick, that
“ it is not practicable to carry any manure to
“ the said thirty acres, but on horses backs;
“ the expence of which would be too great
“ for it to answer. The last tenant had left it
“ in woeful plight; having, as he said,
“ ploughed it as long as he could get two
“ corns for one; miserable condition indeed!
“ The first two years I left it to the manage-
“ ment of my hind, who cleaned it, and
“ sowed it with every sort of grain; but the
“ return was such as left nothing for rent.
“ At length, he told me, it was to no pur-
“ pose to plant it any more, unless I would
“ be at the expence of bestowing a good dres-
“ sing upon it, to improve it. This I re-
“ solved not to do: for I have no idea of
“ any thing being an improvement, that
“ does not pay the extra expence, and increase
“ the nett profit.—Indeed, you may increase
“ the quantity of produce, and put the
“ land into better condition: but if, to effect
“ this, you are at more expence than the
“ improvement will repay, I must call this
“ measure

“ measure the reverse of improvement; for,
 “ though your land may be improved, your
 “ fortune is impaired; this indeed would be
 “ buying gold too dear.

“ I therefore told him, I saw clearly, it
 “ would never answer the expence of carrying
 “ manure into it: I would try another me-
 “ thod, from which I hoped better success
 “ than he had met with: he answered, he
 “ wished I might, with a smile that plainly
 “ denoted his incredulity. So averse are
 “ most of these people to every method they
 “ have not been accustomed to.

“ However, he was to follow my direc-
 “ tions. I said to him, You see, here are the
 “ two upper fields (about eleven acres) have
 “ now lain above a year since the crops were
 “ got off; they have nothing growing upon
 “ them but strong weeds, which are the na-
 “ tural produce of the soil, as thistles, horse-
 “ daisies, brambles, &c. these are first to be
 “ eradicated: therefore set a couple of strong
 “ ploughs to work, six oxen to each, and
 “ plough the two fields deep and well; then
 “ let them, as soon as proper, be well-
 “ dragged, rolled, and harrowed, and the
 “ ploughings, &c. repeated, until the land is
 “ clean, well-opened, and pulverized. This
 “ was repeated at proper intervals through
 “ the winter, and until the following May.
 “ By that time, they were got tolerably clean,
 “ and in good condition. The soil of each
 “ of

“ of these fields were very different, though
“ no larger ; they each consisted of some very
“ dry land, and some altogether as wet. The
“ first was a poor, lean, slatey ground ; the
“ latter a tough, moory, close earth, mixed
“ with an imperfect marle, which held water
“ like a dish. I had a pit sunk in the most
“ depending part, to drain off the water ; and
“ ordered the earth to be spread on the slatey
“ ground at a proper time. As I said, the
“ land was in good order the May following ;
“ I therefore ordered the moist parts of the
“ fields to be sown with rye-grass, and the
“ dry part with trefoil and burnet ; which,
“ as soon as pretty full blown, I ordered to be
“ mowed, made into hay, and set up in a
“ rick, in a corner of the upper field. The
“ fields to be then laid up until October, or
“ until the grass had done growing ; then to
“ turn into the said fields half-a-dozen mares
“ and their foals, which I had at that time,
“ with some young cattle, to have the run of
“ the said thirty acres during the winter. I
“ also ordered a linny, or hovel, to be erected
“ in the most shelterly part of the fields, large
“ enough to shelter a dozen horses under it,
“ for them to go into at pleasure ; a rack to
“ be put up ; and, when the grass was nearly
“ eat up, to cut the rick, and fill the rack
“ once or twice a-day, as might be necessary ;
“ also to carry straw to litter the hovel,
“ which should be cleaned out once in a week
or

“ or ten days, and a dung-heap formed of the
 “ same. In this manner the cattle should re-
 “ main until the end of February, or until
 “ the grass began to spring.

“ Whilst this is doing, another of the fields
 “ should be ploughed and got ready to sow in
 “ like manner the following May. As the
 “ extent of the pasture will be increased, so
 “ may the number of cattle to be wintered on
 “ it; and, at the beginning of the second win-
 “ ter, there will be dung enough to manure
 “ one of the fields, which I would have
 “ spread on the upper field in December or
 “ January at farthest; by which means, I
 “ hope to have another good crop of grass.
 “ Thus are you to go on year after year, and
 “ field after field, until the whole has been
 “ well cleaned, cultivated, and dressed.

“ I do not expect it will answer to let it lie
 “ for grass more than two or three years;
 “ therefore, in the winter after the first year,
 “ I would have dung spread on the field or
 “ fields that were mowed, which will give en-
 “ couragement to the next crop, and leave it
 “ sufficiently in heart to bear a crop of barley
 “ or oats, with which I would have you
 “ sow, either clover, rye-grass, or trefoil, as
 “ best suits the land, taking but one crop of
 “ corn to two of grass, which cannot fail
 “ of improving those lands, as I would have
 “ them constantly fed in the winter as above
 “ directed; and the dung that is made by the
 “ cattle

“ cattle to be used for manuring that land
“ only: for it is a kind of injustice, if one
“ may so speak, to carry the produce off, and
“ not leave the manure that arises from it,
“ and is its natural due; a robbery that is
“ too frequently committed, which keeps such
“ land in a perpetual state of poverty.

“ These thirty acres, in the condition I first
“ found them, were not worth more than
“ half a crown an acre; but, by the above
“ management, are well worth ten shillings
“ at least; and by the same means are capable
“ of much more improvement.—This, in my
“ own opinion, is a species of improvement that
“ deserves the closest attention; as perhaps
“ there is not another to be found, which
“ may in general be made so advantageous and
“ extensively useful. It comprehends every
“ kind of land that is capable of improve-
“ ment; and the distance from the farm-yard
“ is no very great inconvenience, as all the
“ labour it requires on that account is, a boy
“ going once a-day to give the cattle fodder,
“ and spread some litter, and this not until
“ the grass is gone, and the weather severe;
“ then the litter is necessary to increase the
“ quantity of dung, as well as to be of use to
“ the cattle. By such management, land that
“ is very indifferent in its natural state may
“ very soon be made very good corn land, to
“ the great advantage of the owner.”

This

This is an uncommon and very valuable species of improvement, not only in regard to the value of the improvement, which is very great, but with respect to its extensiveness, as there is not a county only, but scarce a parish in the kingdom, but this may be of great use to: and it is here inserted at length, not only for that reason, but also because this method may be improved by the hoeing husbandry.

The author proposes to take a crop of corn, barley, or oats, once in three years, after the land is made clean, well pulverized, and fertilized, with the dung of the cattle fed upon it, and there is no doubt but this may be obtained; but a better crop may be obtained by drilling the seed in equidistant rows a foot asunder, and well hand-hoed; some instances of this have been taken notice of above, and many more might be produced to prove it much superior to sowing broad-cast: for half the seed at least is saved by drilling, the land is cleaned by the hoeing, and at the same time is improved. It might indeed have been expected that the author would have taken some notice of this, as he recommends the drilling and hoeing husbandry much; but his practice seems to have been more in other crops thus cultivated than corn. However, it is certain from experience, that this is a much more profitable method than sowing broad-cast; the clear profit is much greater, after paying the expence of once or even twice hand-hoeing.

But

But there is another advantage, that in some circumstances may be obtained in this way; the land that commonly, and in the Old Husbandry, is thought proper only for barley or oats, will produce good crops of wheat, which is much more profitable than summer corn: this is found true, not only in horse-hoeing, but also in hand-hoeing, if well performed. Land that lies with so great a declivity, as some of these described by the author, cannot indeed be horse-hoed; the plough cannot turn up the furrows against such a steep bank: but all land that can be ploughed and sown broadcast, may also be drilled and hand-hoed, to the great benefit of the occupier. But all land thus circumstanced, worth no more than half-a-crown an acre, and improveable to ten shillings, may in general be cultivated with the hoe-plough, to a greater advantage than they can by hand-hoeing; nor should they be put in the horse-hoeing culture, while worth half-a-crown an acre, but may to good profit when worth ten shillings. If the land is dry and healthy, it may be improved in the author's method with sheep, and their dung saved in winter to dress the land: but in whatever method it is done, the hoeing will make the improvement the more expeditiously, and, by saving the manure from the arable land, will make such improvement more extensive.—

“The great usefulness,” says the author, p. 62, “and benefit of the New Husbandry,
“ is

“ is no where so sensibly felt and experienced,
 “ as in lands that are so situated as not to ad-
 “ mit of manure, but at so heavy an expence
 “ that their crops would by no means answer;
 “ the great advantage of this culture is in this
 “ case self-evident, where a crop, at least
 “ worth from forty shillings to three pounds,
 “ is obtained at the expence of fifteen shillings
 “ bestowed in tillage, and five shillings in
 “ seed: a very handsome return for land,
 “ which, under such circumstances, cannot
 “ be valued at more than five or six shillings
 “ an acre. Immense quantities of land are
 “ thus circumstanced, and by this method are
 “ capable of incredible improvement, provided
 “ the owners or occupiers could provide a
 “ competent number of workmen and horses
 “ for the purpose.”

The number of men and horses, necessary
 for the New Husbandry, are not to be com-
 puted from the number that is necessary in the
 Old Husbandry, for the same extent of land :
 for, whatever number of horses are used in the
 Common Husbandry, one half that number is
 sufficient for horse-hoeing the same land ; Mr.
 Craik used but two horses for hoeing, and Mr.
 Baker but two in his stiff land, except in un-
 commonly hot days : and one man is sufficient
 to drive a team of four horses ; but where only
 two horses are employed, a driver is not ne-
 cessary even in the Old Husbandry, much less
 in the New ; in which the straight ridges guide
 the

the horses to go straight, and are soon brought to it, as I have experienced; nor is more than about half the number of horses necessary for hoeing, as for common ploughing.

“ The New Husbandry is an improvement
“ of the old, and, notwithstanding all oppo-
“ sition, great as it is, it does advance though
“ slowly. Planting beans and peas in rows,
“ and hoeing turnips, is pretty generally
“ practised in many counties; but is not of
“ very long standing in the field culture, at
“ least in many places.

“ The principal intention of this method of
“ culture is to keep the land in perfect tilth,
“ and to keep it clean from weeds. In order
“ to this, the land at first setting off should
“ be deep and well ploughed, harrowed, &c.
“ and made as clean as you can. The in-
“ tervals between the drills I would advise
“ to be of a good width, according to the size
“ of the plant you intend to sow. One is
“ apt to grudge so much ground, which at
“ first appears unoccupied, but, before the crop
“ arrives at maturity, one always finds the
“ spaces too little; this occasions a good deal
“ of trouble and vexation, and prevents your
“ using the horse-hoe so effectually, or so long
“ as you ought. I have drilled beans, peas,
“ wheat, barley, carrots, potatoes, and lu-
“ cerne, and have always found before harvest
“ I wanted more room. For beans and peas,
“ the distance should not be less than three
“ feet

“ feet : for wheat, barley, and potatoes, two
 “ feet and a half; lucerne and carrots, two feet.
 “ I likewise prefer single rows to double or
 “ treble, especially until the land is got very
 “ clean and in good order : for, when planted
 “ in single rows, the horse-hoe may be worked
 “ near the rows, and the weeds displaced to
 “ the bottom ; but, if planted in double rows,
 “ the space between being narrow, the weeds
 “ cannot be displaced without the use of the
 “ hand-hoe, and then not deep enough to de-
 “ stroy them ; and so much of the ground lies
 “ uncultivated. Double rows, I believe, afford
 “ larger crops than single, in beans, wheat,
 “ and barley ; and, when your land is in good
 “ tilth and very clean, double rows may be
 “ practised to advantage ; but, if used before, I
 “ am persuaded your land will never be clean.

“ I have observed before, that the general
 “ opinion is, that the expence of instruments
 “ necessary for this practice is more consider-
 “ able than it really is ; which probably has
 “ in some measure prevented many from
 “ making some trials of its success. I will
 “ therefore enumerate and describe all such
 “ as I have found necessary for this work.

“ Every farmer must be provided with
 “ ploughs, harrows, drags, and a roller, for
 “ cultivating his land according to the old
 “ method : therefore these are not to be con-
 “ sidered as an extra expence, occasioned by
 “ the new practice. All the instruments that

Q

“ are

“ are necessary to this culture are four in
“ number ; and two of these are equally use-
“ ful for the Old as for the New Husbandry :
“ therefore these cannot be fairly charged as
“ and extra expence on the New.

“ The first is a small patent or Rotheram
“ plough, which may very conveniently be
“ worked very near the rows ; and, if the land
“ is in tolerable tilth, one horse, and that not
“ a large one, will be very able to manage
“ such a plough. This is my hoe-plough,
“ and in all respects greatly preferable to every
“ thing I have seen called by that name ;
“ with this you may go six, nine, or twelve
“ inches deep, as you please, and will pul-
“ verize the soil, in which consists the great
“ advantage of this method of culture.—The
“ second is the same plough with two mould
“ boards ; this, in narrow intervals, throws
“ the mould up to the rows of plants on each
“ side at once going. Another use I put it to
“ is, to make clean open furrows of any
“ depth, and at any distance, the grain or
“ roots I have to place, may require. With
“ this instrument I make my drills for beans,
“ peas, wheat, potatoes, or whatever seed I
“ have to sow : with it I can go any depth,
“ from two to eight or ten inches ; and it
“ makes but one furrow at a time, like a
“ common plough ; they may be made at any
“ distance, one furrow from another, that
“ your intended crop may require. This re-
“ quires

“quires no nicety, no ingenuity; any man
 “that can plough a tolerable straight furrow,
 “can do all that is required.” [The author
 seems here to refer wholly to sowing upon
 level ground, and not upon ridges; which
 are in general much preferable to level
 ground to sow upon, or to be horse-hoed.
 The double-board plough here mentioned
 is very proper to open furrows into which
 potatoes are to be dropped by hand, or
 beans; and in such rows as are at a con-
 siderable distance, and require no great ex-
 actness to plant the seed in regard to
 distance and depth; but, where that is re-
 quired, a drill-plough is much preferable to
 sowing seed in these open furrows, and co-
 vering it afterwards, as it must be, by the
 plough, or by a hand-hoe; and the seed
 in this way is not so certainly covered at an
 equal depth, as with a drill-plough. Nei-
 ther can corn or any seed be thus sown
 straight, as of wheat at a foot distance, to
 be hand-hoed. The drill-plough is in every
 respect the best instrument by much to sow
 regularly, straight, at an equal distance
 and depth, and most expeditiously; and
 horse-hoeing wheat, and many other plants,
 is much preferable upon ridges to level
 ground.]

“The third instrument is what the in-
 “ventor [Mr. Baldwin] calls, I think, a horse-
 “hoe; it is little more than an harrow, so

“ shaped as to pass easily between two rows
“ of corn. It is about four feet and a half
“ long, and sixteen inches wide, and the tines
“ are made strong and eight or nine inches in
“ length, with a couple of handles for the
“ ploughman to guide it. It is a very useful
“ instrument to break down and crumble the
“ lumps, and to drag out and clean away the
“ weeds, and may easily be drawn with one
“ horse. It also well prepares the land in the
“ intervals to receive a crop of turnips, cab-
“ bages, or any thing else you may think
“ proper to plant, before you have got the
“ crop off the ground. This is not very often
“ practised, but sometimes may with good
“ success.

“ The fourth and last instrument, that is
“ necessary to this practice, is the drill ; with
“ which I sow in rows the seeds of whatever
“ crops I have to plant ; this requires no more
“ skill, ingenuity, or strength, than to drive a
“ very light wheelbarrow along the furrows
“ the plough with the double mould-board has
“ made. The only care it requires is, before
“ you begin, to set it to the size of the seed
“ you have to sow, and to supply it with
“ more seed as occasion may require : which
“ may be four, six, or eight times in sowing
“ an acre, just as you chuse.

“ This is the whole apparatus that is neces-
“ sary in this method of practice ; the expence
“ of which cannot exceed fifty shillings or
“ three

“ three pounds; which must be allowed to be
 “ a mere trifle, especially if it be considered
 “ that the two ploughs are equally useful in
 “ the old as well as in the new method.”

[It has been observed above, that a pair of wheels are convenient, to mark the intended distance of the rows, or ridges, very straight; a short stone roller likewise, plain or fluted, though not absolutely necessary, is sometimes very useful, to break and crush the large clods in the intervals in very dry weather, especially in strong land. Such a roller in a pair of shafts, and short enough to be drawn along the intervals, will effectually crush these hard clods, without waiting for rain, or hindering the hoeing. One horse is enough for this roller: and, if the earth in the interval lies in a sharp ridge, it will be convenient to open that ridge first, that the horse may walk, and draw the roller after him, in the interval. This is sometimes of great service, as it presently and effectually pulverizes the earth in the intervals; but should be used only when the earth is very dry.]

“ Prejudice and interest, says the author,
 “ frequently warp the judgement, and make
 “ men violent in the defence of one scheme,
 “ to the utter destruction of another; though
 “ perhaps equally useful and desirable, under
 “ different circumstances. The truth of this
 “ observation appears no where in a stronger
 Q 3 “ light,

“ light, than in the contest between the ad-
“ vocates for the Old and New Husbandry.
“ They cannot be contented to use either as
“ circumstances may require, and render fit
“ and useful; but one must be established
“ universally, to the utter extirpation of the
“ other, or all is not right. In the foregoing
“ part of this work, I have shewn that both
“ may be used occasionally to advantage; and
“ that it is very wrong for a farmer to respect
“ either, because it is new or old: the only
“ consideration that should weigh with him
“ is, which is most likely to be attended with
“ superior advantage; and that only should
“ determine his choice. I have known the
“ drill method decried from the smallness of
“ the crop, when compared with the broad-
“ cast on the same land; but that is an erro-
“ neous way of judging. Such a comparison
“ affords no criterion to distinguish the su-
“ perior method; for it is not the quantity of
“ produce, but the *net profit* the farmer
“ should be governed by. One field may pro-
“ duce twenty bushels of wheat to the acre,
“ another but ten; the first may be a losing
“ crop, the latter a gaining one. This I have
“ known happen more than once; and so must
“ many others who reside in counties where
“ a farmer cannot dress and manure an acre
“ properly, for wheat, under four pounds, and
“ where twenty bushels is deemed a good crop.
“ Here, if, in the drill method, a farmer can

“ get only eight bushels by dint of horse-hoe-
 “ ing, without the expence of manure, he
 “ will get more shillings toward the rent of
 “ his land by the latter method of culture,
 “ than he can do by the former.

“ This corresponds with what I observed
 “ of Mr. Craik’s crops, and expences of
 “ tillage: where it was shewn, that eight
 “ bushels of wheat upon an acre were, at the
 “ price of five shillings per bushel, fully suf-
 “ ficient to pay the rent and expences of a
 “ hoed-acre, even reckoning the rent high;
 “ and all above eight bushels per acre was
 “ clear profit. The author allows here that
 “ even eight bushels may be a profitable crop;
 “ which may seem incredible to a common
 “ farmer, though certainly true.

“ I am certain, continues our author, from
 “ experience, that the drill culture may be
 “ practised to a great comparative advantage
 “ in many articles, and under many circum-
 “ stances; and I am sorry to observe, that
 “ some of the opposers of this practice have
 “ treated the memory of the late ingenious
 “ Mr. Tull, to whose labours the world is
 “ much indebted, with great want of candour
 “ and unfriendly reflection. That he did not
 “ die in very affluent circumstances, is no
 “ impeachment of his method of culture, nor
 “ of his honour and veracity. I had not the
 “ pleasure of his personal acquaintance, but I
 “ am acquainted with some that had. I have

“ been informed his estate was much too
 “ small to maintain a family genteely, and
 “ grow rich; besides, continual ill health many
 “ years before his death must help to impair
 “ his fortune. This however is disingenuously
 “ imputed to his obstinacy, in prosecuting a
 “ method of culture, which greatly hurt, if
 “ not ruined him.

“ From all accounts, he was a man of un-
 “ doubted veracity: he tells us, he practised
 “ the drill husbandry upon a large scale; hav-
 “ ing sometimes one hundred acres of wheat
 “ in a year; that he followed the practice
 “ upon some lands twelve or thirteen years;
 “ that his crops were larger at last than at
 “ first; and his land not only in finer, but in
 “ richer condition than when he began the
 “ practice. Struck with his success, and the
 “ advantages of his method, and convinced
 “ and satisfied by the reasonableness of his prin-
 “ ciples, many persons of great note and re-
 “ spectable characters have been induced to
 “ make trials of his method; which, in num-
 “ berless instances, succeeded beyond the most
 “ sanguine expectation. These are the late
 “ Lord Viscount Townshend, Sir Digby Le
 “ Gard, M. Duhamel, M. De Chateavieux,
 “ Mr. Miller, and Mr. Baker a gentleman
 “ of Ireland. This is a very short list to
 “ what might be given, but is surely abun-
 “ dantly sufficient to outweigh interested ex-
 “ periments, though made by thousands. Ex-
 “ periments

“periments made on the poor narrow scale of
 “a rood of ground are unworthy of the
 “name; indeed they have little else, and can
 “serve no other purpose but to talk about, in
 “the ample spacious field of a most heavy
 “voluminous work.” [Meaning Mr. Young’s,
 as elsewhere mentioned].

“I cannot on this occasion help taking no-
 “tice, of the most unwarrantable partiality,
 “exercised by some writers, in constantly re-
 “ferring and appealing to such paltry experi-
 “ments, as to the touchstone or standard of
 “truth. I would beg leave to ask all such, if
 “the pretended experiments of one, who
 “manifestly wrote with interested views,
 “ought to be set in competition with, or can
 “be deemed evidence of equal force with,
 “those of the respectable disinterested gentle-
 “men above mentioned? Were the experi-
 “ments made by Lord Townsend, on the cul-
 “ture of turnips, true and genuine? or were
 “they fraudulent and deceitful? Were the
 “extensive experiments made by Sir Digby
 “Legard honest and fair, or were they in-
 “tended as impositions on the public? I re-
 “peat the same questions with respect to the
 “rest of the gentlemen, particularly Mr.
 “Miller (whose veracity I think equal to any
 “man’s); and Mr. Baker, whose experiments
 “were very numerous, extensive, and con-
 “ducted with great skill and care. If these
 “gentlemen’s veracity stand unimpeached,
 “how

“ how dare any man place the single testi-
“ mony of an interested hasty writer in oppo-
“ sition to them, and make his conclusions the
“ test of truth? If they are impeached or
“ suspected of dishonest practices, let the ac-
“ cuser stand forth, and make good his charge
“ against them. Until that is done, no re-
“ gard ought to be paid to conclusions, de-
“ duced from experiments, which in many
“ instances militate against, and invalidate each
“ other.

“ Notwithstanding all that has been said to
“ the contrary, by the interested experimenter,
“ and by those who on certain occasions en-
“ deavour to support him; it is a most certain
“ truth, that there are few plants or vegetables
“ cultivated in England for the use of man or
“ beast, but receive great encouragement and
“ benefit from the earth in which they grow
“ being well pulverized and broken; and the
“ most effectual way to do this, is by the horse-
“ hoe, or hoe-plough, whilst they are grow-
“ ing; and this is not to be done unless the crop
“ is planted in drills or rows.—These articles
“ are not a few; lucerne, and all the various
“ kinds of cabbages, beans, pease, the turnip-
“ rooted cabbages of both sorts, carrots, par-
“ snips, potatoes, and I will venture to add
“ turnips; and I am clearly of opinion, that
“ sainfoin and burnet will in time be found
“ to be of the number.”

We have given such a number of authentic instances of the success of the New Husbandry, that it appears unnecessary to give more particulars from this author, or from the foreign gentlemen he mentions, who were the disciples of Mr. Tull, and do him great honour; their experiments were extensive and very accurate, and much might have been taken from them; but it was thought most suitable to give principally the experiments made in Britain, and such as were extensive, and made in a great variety of different kinds of land. These experiments demonstrate the great advantage of the New Husbandry, and will direct those, who are desirous to learn it, to the successful practice; and this more particularly than they will find elsewhere in one view.

Those who are desirous to be informed of the practice of this husbandry, as conducted by several ingenious persons abroad, may consult M. Duhamel's Husbandry [a very curious French gentleman], who has collected their experiments, and published them together with his own; whereof some have been translated into English, by the ingenious John Mills Esq; and Mr. Miller author of the Gardeners Dictionary. These experiments were numerous and accurate; but neither so extensive, nor of near so long continuance, as these I have recited. And it is further to be observed, and will be obvious to those who shall peruse this treatise, that M. Duhamel and
his

his correspondents were not fully masters of the New Husbandry : as they were acquainted only with the first part of Mr. Tull's work ; but had not seen the latter parts that he published afterwards, containing several improvements of importance, that he made in the course of his practice ; yet were they so sensible of the advantages of his Husbandry, and so much surpris'd at the effects of hoeing and good tillage, that many societies have, in consequence thereof, been established in France, for the encouragement of agriculture ; and these gentlemen have particularly recommended the New Husbandry, which had succeeded with them much beyond their expectation, which they have very fully acknowledged.

The great advantage of this culture has been experienced, not only in Britain, Ireland, France, and Italy, but has been introduced likewise into America, whereof we have an instance from the ingenious Dr. Elliot of New England, in the culture of maize, there called Indian corn, which he relates as follows :

“ The land,” says he, “ being previously prepared, and the corn come up, we plough a furrow off from the corn on each side, and the next time plough up to the corn ; so that this tillage is nearly the same as is proposed for wheat, or whatever we would plant : only, by the way, I would observe, that the ploughing between the rows of Indian corn is so shallow, that
“ one

“ one would be apt to think it intended for
 “ nothing more than merely to kill the grafs
 “ and weeds ; whereas it is found by ex-
 “ perience, that, though there be neither
 “ grafs nor weeds, the ploughing and hoeing
 “ will make the corn grow ; and that the
 “ more the land is ploughed and hoed, the
 “ better and longer it will resist the drought,
 “ and yield the better crop : and, what is still
 “ more remarkable, if the Indian corn be well
 “ tilled, the next crop, whether it be oats
 “ or flax, will be proportionably greater and
 “ better : so that the land must have gained
 “ strength and richness. If it were not so,
 “ why did not the Indian crop exhaust and
 “ and spend the strength of the land, espe-
 “ cially when we consider how large that
 “ corn is made to grow by good tillage ? But
 “ we find the contrary ; the better the crop
 “ of Indian corn, the better the crop will be
 “ of oats. There is no sort of Husbandry,
 “ wherein the superior force and virtue of
 “ tillage doth more evidently appear, than
 “ in the raising of Indian corn : for if you
 “ should plough and harrow the best land,
 “ and sow or plant the corn, and never do
 “ any thing more to it, there will be less
 “ corn, than if you should plant poor land,
 “ and cultivate it well : the poor land well
 “ ploughed and hoed shall bring a greater
 “ crop than the rich land. We hereby see
 “ the efficacy and advantage of this repeated
 “ tillage,

“tillage, which falls in successively according to the exigency and want of the plant in its several degrees of growth; and keeps the land in a proper state. Why should it not have the same effect upon wheat, and every other plant, that is susceptible of the like culture?”

Here it is to be observed, that maize or Indian corn is very generally cultivated in North America, and particularly in New England, where it is esteemed to be a great impoverisher of land; yet we see, that the Hoeing Husbandry not only improves the crop, but the land also, to such a degree, that it is so far from being impoverished by this corn, as in their Common Husbandry, that it is enriched so much by the hoeing, as to produce a better crop of maize, and likewise a better subsequent crop of oats or flax. This is the more extraordinary, as the hoeing was so shallow, and but once repeated; and shews, that successive crops, even of this exhausting plant, may be obtained in this Husbandry; as we have shewn, that successive crops of wheat have been obtained in Britain for a long course of years, though found impracticable in the Common Husbandry. It is likewise justly observed here by the Doctor, that this culture may be applied with success to other plants: for, “why,” says he, “should it not have the same effect upon wheat, and every other plant, that is susceptible of the like

“ like culture ? ” And, in fact, it is found to have the same effect upon wheat and other plants, upon beans, pease, cabbages, turnips, potatoes, carrots, &c. and, if properly applied, would have the same upon many others, as hops, madder, &c. and upon several plants, to great advantage, hitherto wholly appropriated to garden-culture ; as I may hereafter have an opportunity of shewing.

It may indeed seem unaccountable to many, who are not well acquainted with this Husbandry, that it has not made greater progress in Britain ; which has been owing to several causes. It could not be expected that common farmers would come into it, till informed of the principles, and convinced of its utility, by the experience of gentlemen fully shewn them. It was opposed at first by some prejudiced persons, who had an interest in so doing ; and has been much prejudiced by several modern writers on Husbandry, who neither understood it, nor had practised it with judgement and perseverance. To shew how strangely it was opposed may be seen in Mr. Miller’s Gardeners Dictionary, under the article *Triticum*, where he says, that “ the
 “ Horse-hoeing Husbandry, which was prac-
 “ tised by Mr. Tull, has been almost univer-
 “ sally rejected by farmers in every country,
 “ it being so opposite to their accustomed
 “ practice.—And indeed, by the absurdity of
 “ the author in a few particulars, he has dis-
 “ couraged

“courage^d many from engaging in it,—but,
“upon finding Mr. Tull positively asserting,
“that the same land would nourish the same
“species of plants, without changing the
“crops, for ever, and this without manure,
“which, being contrary to all experience,
“led them to believe his other principles had
“no better foundation. And he practised
“this method of sowing the same species
“upon the same ground, till his crops failed,
“and were much worse than those of his
“neighbours, who continued their old me-
“thod of Husbandry.”

The practisers of the New Husbandry find, that manure is not in general necessary for wheat, even upon ordinary land, if well and sufficiently hoed: for, if both well hoed, and also manured, the wheat would grow too rank and lodge. But, in cultivating turnips, cabbages, and such as are intended for feeding cattle, manure is useful, and contributes to enlarge the crops to advantage, and without danger from their luxurancy.

Mr. Tull took the first hints of his Husbandry, as he mentions himself, from the low vineyards in the south of France, where the vines have been cultivated for ages by hoeing only, and without manure; which Mr. Miller had not well considered, or he could not have supposed a succession of the same plants without manure, to be contrary to experience; and he too implicitly believed
the

the reports industriously spread against this Husbandry, and of Mr. Tull's ill success, which was void of foundation, as he might have known upon enquiry. Yet Mr. Miller very much recommends the Hoeing Husbandry, and gives instances of wheat-crops thereby obtained, much greater than any mentioned by Mr. Tull.

But notwithstanding the vulgar prejudices against this husbandry, it now gains ground, even among some farmers, who will undoubtedly adopt it more generally, as it is their interest to do, when made more fully acquainted with it, of which it is the intention of this treatise to inform them, and by what follows to render the practice of it easy and familiar to them, not only in the culture of wheat, but of many other plants.

The above experiments, and successful practice of this husbandry, will, it is presumed, be acceptable to our readers; and they, who desire to know the history and progress of it from the beginning, are referred to Mr. Tull's work above mentioned, whereof a new edition will soon be offered to the public.

A late writer, and favourer of the common husbandry, has nevertheless owned, “that it
“must be acknowledged, that even the Old
“Husbandry has received no small improve-
“ment by the discovery of the genuine prin-
“ciples of the New. The advantages of
“meliorating and pulverizing the earth are

R better

“ better understood, and I believe more ge-
 “ nerally practised than formerly; and the
 “ grand principle of all, that of frequently
 “ stirring, exposing, and enlarging the super-
 “ ficies, in order to supply in some measure
 “ the place of dung, is a discovery of vast im-
 “ portance.—And, says he, the memory of
 “ Mr. Tull ought to be held in the highest
 “ reverence by every husbandman, for his
 “ improvement of the art of agriculture. It
 “ is from him we have learnt the great benefit
 “ of frequent plowings to pulverize the soil,
 “ which in some situations supply the place
 “ of dung. To him the farmer owes the ad-
 “ vantages arising from cleansing and pre-
 “ paring his ground by sowing turnips, and
 “ improving them by hoeing. It was Mr.
 “ Tull who first introduced the drilling of
 “ peas, beans, vetches, sanfoin, &c. into field
 “ culture, and shewed the advantages of hoe-
 “ ing, and keeping them clear from weeds;
 “ and it is from him that the whole kingdom
 “ have learnt to raise more corn from less
 “ seed than ever was thought possible before
 “ he set the Example. These are solid and
 “ substantial advantages, which have intro-
 “ duced an universal reform in husbandry.”

These and other great advantages are owing
 to this great Husbandman, who has raised a
 spirit of improvement upon a rational system
 of agriculture, unknown to former ages. He
 has rescued this most valuable art from the
 darkness

darkness and errors of ignorant rusticks, and established it upon such clear principles, that those of the first rank in his own and other countries of Europe are now convinced of its great utility, and are emulous to advance improvements, that before his time were neglected, or thought below the notice of gentlemen. Such is the merit of the Father of the New Husbandry, whose memory deserves to be celebrated, not only by the curious, but likewise that a statue should be erected for him by his grateful country.

A P P E N D I X.

IN the foregoing treatise, the methods of several eminent practisers of the New Husbandry are recited, which differing in several circumstances may render this husbandry obscure to a beginner, especially in cultivating wheat by the horse-hoe. I have therefore added this Appendix, to guard him against mistakes in that culture, and bring into one view the method that he may depend upon at his entering upon the practice.

The late Sir Digby Legard, who was an eminent husbandman, and extensive improver, near Scarborough in Yorkshire, practised the New Husbandry for eight or nine years, cultivating barley and wheat upon a field of seven acres: he likewise cultivated in other fields most of the other common plants in this method; for, besides wheat and barley, he cultivated in that manner oats, beans, pease, turnips, potatoes, and lucerne; and communicated the result of his practice for a course of years in several letters to the London Society of Arts, and concludes his last letter, of the 12th of May 1768, with a recommendation of the drill and horse-hoeing husbandry, as follows, viz. “ I
 “ can say with truth, that, after ten years con-
 “ stant and very extensive practice, after the
 “ experience of a great variety of soils and
 “ seasons,

“ seasons, I can recommend the drill and
“ horse-hoeing culture, as founded on reason
“ and on truth. I have constantly attended, with
“ all the impartiality I am master of, to the
“ peculiar advantages, inconveniencies, ex-
“ pences, and benefits, both of the Old and
“ New Husbandry, and I cannot avoid giving
“ my verdict in favour of the latter.”

He had before given his opinion, with re-
gard to the farmers practising this husbandry, in
the following judicious manner. “ That the
“ old method, says he, with assistance of the
“ more modern improvements, by turnips and
“ clover, and by the alternate use of the le-
“ guminous plants, which require hand-hoeing,
“ is very advantageous, I allow. Perhaps the
“ farmer, who pursues this method in its
“ greatest perfection, judges wisely, in pre-
“ ferring a system he is master of, and can
“ confide in, to another, whose principles may
“ be just, but the practice of which is totally
“ different from his own. But the farmer,
“ who is ignorant of these modern improve-
“ ments, surely ought not to hesitate to adopt
“ the drill culture, which a few years prac-
“ tice would render habitual, and which he
“ would find to be much more beneficial. For
“ it is certain, that this is less expensive than
“ the old method, and, when once adopted,
“ easier in the execution.”

This culture has made hitherto but a slow
progress; the great farmers cannot adopt it in

general, as their servants are not acquainted with it: but the little farmers might more easily come into it; they do great part of the husbandry work themselves, and the whole is under their immediate direction; so that, after they have attained to the knowledge of it, they could easily put it in practice; and the little farmers in the neighbourhood would readily adopt it likewise, for it is not only more easily performed, but it is likewise more profitable than the common husbandry.

Suppose, for example, such a farmer rents nearly 80 acres of land, for which he pays 50*l.* a year; it has been usual to reckon, that a farmer ought to make three rents, one for his landlord, one to pay the expences necessary to be laid out upon the farm, and the remaining third to pay the expences of house-keeping, &c. and to save some for his family. But, as this has been the general estimate a long time, and before clover became so general, and the hoeing culture of turnips so well understood as it is now; likewise before the modern practice, of the most skilful farmers, of introducing hoed crops of beans, pease, cabbages, &c. instead of a fallow, whereby the expence of fallowing every third or fourth year is saved, and a hoed crop obtained every fallow year; these are so great improvements in the common husbandry, that now it is reckoned the farmers make a greater profit of their arable lands than three rents; and

2

some

some have reckoned it so high as four rents; which it may be in some particular cases and situations, though in general not so high.

This profit includes all that is made from the crops of corn and grass, cattle, dairy, hogs, poultry, and every other produce of the farm; for, with regard to the crops of corn, and other vegetables generally cultivated, they fall much short of these estimates.

Sir Digby Legard, being fully satisfied of the advantage of the New Husbandry, from experience, compares the same with the common Husbandry; observing, that a letter in the 3d. volume of the *Museum Rusticum*, p. 232, signed Y, reckons the clear profit of land in tillage, near Bury in Suffolk, at about 15 s. per acre. He then gives the course of husbandry frequently observed by farmers in his neighbourhood, where the fields are inclosed, and let for fifteen shillings an acre, tithe-free; the course for four years being, first year turnips, second barley, third clover, and fourth wheat. The total produce in four years is 12 l. 18 s. and the total expences in four years is 8 l. 6 s. 6 d. and the clear profit of an acre in that time 4 l. 3 s. 6 d. or near a guinea an acre clear profit a year. Whereas the clear profit a year, upon the acre cultivated by himself in the New Husbandry, is 1 l. 18 s. 0 d.; where it is to be observed, that he reckons the profit of the New Husbandry, from barley cultivated in that method; which he acknowledges is not so pro-

fitable as wheat so cultivated, also that, he had supposed the fourth crop in the old way to be wheat; whereas, says he, “ it is much
 “ more common hereabouts, where the land is
 “ not perfectly adapted to the culture of wheat,
 “ for the farmer to sow oats, or some other
 “ spring crop, after the clover; and thus is
 “ the profit reduced,” of the common Husbandry in that neighbourhood. But he proceeds to compare his barley crops in the New Husbandry with an estimate in the foreign essays on husbandry, p. 322. where M. De L’Harpe estimates the clear profit of one acre in Swisserland at one pound seventeen shillings; this is from crops of sainfoin and clover, with intermediate crops of corn; which, Sir Digby says, is certainly the highest calculation of any he ever met with; yet even that is not so profitable as Sir Digby’s barley crops in the New Husbandry, and would be still more inferior to his wheat crops cultivated in that manner. It is likewise to be observed that this calculation of M. De L’Harpe is upon a supposition that only half the land is under corn, and the other half is every year clover and sainfoin, which is a large proportion of the land in cultivated grasses, besides meadow and pasture.

Sir Digby was so far from being partial in favour of the New Husbandry, that, as he writes in his first letter to the London Society, “ I
 “ am the more inclined to communicate to you
 “ these experiments of last year, because I think

“ the comparison less favourable to the New
 “ Husbandry in that than any other years
 “ wherein I have made experiments. For I
 “ would allow every advantage to old customs,
 “ that they can naturally or reasonably claim.”

And, agreeably to this, he reckons the profit of his horse-hoed crops as above, not according to those crops that he obtained after he had experience in that method of Husbandry, but his first crops are also included, though much inferior to those he had afterwards from the same land : for he committed several errors at first, as he frequently mentions : “ My former
 “ experiments, says he, began in 1763, and
 “ ended in 1765, and they were confined to
 “ the culture of barley. But, I think, it will
 “ set the advantages of the horse-hoeing, or
 “ Tullian Husbandry, in a clearer light, if I
 “ give you the produce of the same field,
 “ cultivated during eight successive years (in-
 “ cluding the three I before gave you an ac-
 “ count of), according to the principles of
 “ the New Husbandry, without dung, or any
 “ other amelioration but what the plough
 “ alone has obtained. In communicating to
 “ you my first attempts, I am sensible, that
 “ my inexperience will appear to be the cause
 “ of much loss. Nevertheless, my errors may
 “ serve as lessons to others ; and, in calcu-
 “ lating the profit of a certain portion of land,
 “ at a medium of eight years, as I include the
 “ first and least profitable ones, I shall be scarcely

“ suspected of any prejudice in favour of the
 “ horse-hoeing system.”

Sir Digby cannot indeed be charged with any partiality in this respect, and without doubt his stating the errors of his first practice of this Husbandry was giving a fair and candid account of his success; yet, in a comparative view of the Old and New Husbandry, it is much to the disadvantage of the New, to include these imperfect beginnings; for, as the Old Husbandry is stated in the best and most approved methods of that husbandry, the best method in the New should likewise be stated, the errors having been seen and rectified in the future practice of it. “ This field, says he,
 “ (the seven experiment acres) has never been
 “ manured, as I observed before, since my
 “ experiments were begun, nor for many
 “ years preceding. It may be remarked, that
 “ that the first crops were not the best; but,
 “ on the contrary, a regular improvement for
 “ some years kept pace with its cultivation, and
 “ the value of the four last crops is almost
 “ double to the former ones. The greatest
 “ fault committed at first was the sowing
 “ too little seed. The land seems yet in perfect heart; and though the product of last
 “ year was less than in former ones, it was
 “ well known that the wheat crop failed all
 “ over England.”

By this it appears, that, by a few years practice, this method of Husbandry was so much improved,

improved, so well attained to, that the profit was almost doubled in four years; and therefore the crops of the first four years, before the method was well understood and practised, should not be included in a comparative example of these two methods of Husbandry, where one was so imperfectly practised, and the other performed in the best manner; and an impartial comparison of both, where both are well performed, is still more in favour of the New Husbandry, than appears in the above state of them.

There is likewise another circumstance, greatly in favour of the New Husbandry, arising from another error in the practice of this gentleman; for Mr. Tull, the author of this Husbandry, in his first practice of it, gave his wheat six horse-hoeings, besides once plowing the land, to form it into ridges before the seed was drilled; and he recommends six horse-hoeings as necessary: this was when he drilled wheat in two, three, or four rows, upon six-feet ridges; but upon further experience he found that narrower ridges, viz. those of four feet eight or nine inches broad, and only two rows of wheat upon each ridge ten inches asunder, was better than the six-feet ridges with more than two rows; and also, that four horse-hoeings of these narrower ridges, and deeper hand-hoeing between the double ten-inch rows, produced him as good or better crops, and at a less expence, than the six-feet ridges;

ridges; the practisers therefore of this husbandry have adopted his latter method in the breadth of their ridges, and number of horse-hoeings. Sir Digby takes notice that four horse-hoeings were the number proper to be given to a hoed crop of wheat: “ After the first
 “ year, says he, that is, when the land is reduced into fine order, one horse is generally
 “ sufficient to turn a furrow either to or from
 “ the rows: and as a man and horse can with
 “ ease horse-hoe four acres in a day, it cannot cost more than one shilling to hoe an
 “ acre, even including the repairs of the instruments; nor are more than *four* hoeings
 “ commonly required. So, if we reckon four
 “ shillings for ploughing the ground *once over*,
 “ or forming fresh ridges, four shillings more
 “ for horse-hoeing, two shillings and six-pence
 “ for hand-hoeing, two shillings for weeding,
 “ and six-pence for drilling, thirteen shillings
 “ is the whole expence of managing an acre
 “ in the new method. Such therefore being
 “ the case with which this celebrated method is performed, so great the improvement of the land by it, and such the extraordinary effects produced by merely stirring the earth; one would think every husbandman should be induced to give a fair
 “ and candid trial.”

Here Sir Digby states the proper tillage at once plowing, to form the new ridges, and four horse-hoeings afterwards, which are agreeable

able to Mr. Tull's latest practice and direction; yet it appears from Sir Digby's account of his tillage, that, in forming the new ridges, he ploughed the land twice, and gave it afterwards but three horse-hoeings. It does not appear why he thus deviated from Mr. Tull's practice and directions; but it seems pretty evident that this deviation was the cause of lessening the crops: for Sir Digby, describing the quality of his land, says, "the soil is
 " light, deep, and dry, a hazle mould, excel-
 " lent for barley, but generally thought not
 " of sufficient tenacity for wheat, and worth
 " in this neighbourhood fifteen shillings per
 " acre, tithe-free."—Not of sufficient tenacity for wheat, this was the opinion of the farmers there, who were probably right in their opinion concerning this land, as cultivated in the Old Husbandry; but in the New it was otherwise: land is seldom too dry for wheat, if well and frequently horse-hoed; for that pulverizes the land, and opens it to admit the dews, which keep it moist, an advantage it has not in the Old Husbandry. Sir Digby says,
 " wheat, barley, or oats, have usually yielded
 " me a third more from random sowing, than
 " if drilled and horse-hoed; that is, if three
 " quarters may be produced from one acre in
 " the common Husbandry, the same ground
 " will, *cæteris paribus*, produce no more than
 " two quarters when drilled and horse-hoed." He says, he had some years two quarters of
 wheat

wheat (nine gallons to the bushel) per acre drilled and horse-hoed; but that he judged, “ that twelve bushels of wheat upon an acre “ is about the medium quantity to be obtained “ from moderately fertile ground, during at “ least six successive years, without dung. Now, “ if this be a true position, I think it will “ not be difficult to prove, that the drill cul- “ ture is more beneficial to the farmer, than “ any other method hitherto invented.”

Sir Digby is undoubtedly right, that twelve bushels per acre is very profitable to the farmer, who can obtain so much from moderately fertile ground without any manure, as in this instance; but much more may be obtained per acre in such land, by the New Husbandry, than twelve bushels of wheat; and from thence we may conclude with certainty, that there was an error in his culture of wheat by the New Husbandry.

To shew this, it might be sufficient to refer to Mr. Tull’s success, who had commonly much more than twelve bushels of wheat per acre from land that could not be properly called moderately fertile ground, but was really poor ground, as described by himself, and by others who viewed it on purpose to know the quality of his land, which lying on chalk is very dry, and, besides its poverty in quality, is also most of it a shallow soil, so that it appears to be much inferior to Sir Digby Legard’s land, upon which he cultivated

vated barley and wheat by the New Husbandry : yet Mr. Tull, by an actual trial, had near four quarters, or thirty-two bushels (nine-gallon measure), of wheat per acre upon his best land ; and upon about eighty acres, he had near twenty bushels of wheat per acre upon an average, of his ordinary land, most of it inferior to Sir Digby's seven experiment acres. Others have since had nearly as good crops of wheat in the hoeing culture, as have been obtained the same years in the neighbourhood in the Old Husbandry, where the land has been of equal goodness, and the hoeing culture skillfully performed, in the manner directed by Mr. Tull, and according to his latest practice.

The reason that Sir Digby did not obtain better crops of wheat in the New Husbandry was his giving his wheat but three horse-hoeings, and one of them a very shallow one, instead of four deep horse-hoeings : for no novice in this Husbandry should bestow fewer hoeings than Mr. Tull gave and directed, but rather more, and as deep and near to the plants as he did, for he was perfect master of the New Husbandry particularly in the culture of wheat. The wheat plants, when upon tolerable land, branch much when well horse-hoed, and for that reason three pecks of seed wheat is generally sufficient to drill : neither Mr. Tull, nor any of the most expert cultivators drill more, even if the seed is planted late ; but if
planted

planted early in the season, and upon good land, about two or between two and three pecks is found enough. If more is drilled, the wheat being too thick is apt to lodge; and hence likewise appears a defect in Sir Digby's method of hoeing; for he drilled a bushel of wheat upon an acre, which was certainly too much upon such good land, if the culture had been performed in the best manner: for then his wheat would have been apt to lodge.

What has been said with regard to Sir Digby's culture of wheat, is not by any means intended to depreciate that gentleman's practice of agriculture, who was an excellent husbandman; but to guard the farmer from falling into an error which he might be led into from a mistake of that eminent cultivator. And if, as he has shewn, twelve bushels an acre is more profitable than the Old Husbandry, how much greater must the farmer's profit be, who can raise from sixteen to twenty bushels an acre, from ordinary land, without manure, and at the expence of only fifteen shillings an acre, for the culture bestowed upon it in the New Husbandry? And that, upon good wheat land, he may, in that Husbandry, raise from twenty to thirty bushels and upwards per acre, without the expence of manure, and with very little more expence of culture than in ordinary land?

The

The little farmers, having but small capitals to begin farming, must be content with small farms; and it is of great consequence to them, to obtain such as do not require much money to stock them. In this respect the New Husbandry is peculiarly suitable to them, as that requires much less stock than the common husbandry, which, for a farm of fifty pounds a year, may require four or five horses to cultivate it. These are a heavy expence upon them; horses being very expensive to keep: for which reason many of them find it necessary to employ their horses in carrying timber, stone, or other articles, for hire, and to bring dung or other manure for their land, though several miles distant, which employs themselves and horses a considerable part of their time: and the article of manure in particular is so indispensably necessary, that, without a large quantity of it, many suppose that no success can be expected in farming, and to procure enough of it becomes a heavy expence upon the poor farmers in particular. This is a matter of great importance, as the little farmers are extremely useful to the community in many respects; and a method of culture, that will be greatly assisting to them, is on that account particularly valuable.

It may seem incredible to many, that the New Husbandry can be carried on at a less expence than the Old. The necessity of so much hoeing, of men and cattle often in the

field at work, after the work in the Old Husbandry is finished, has made many conclude, who are unacquainted with the New Husbandry, that the tillage is much more expensive in the New than in the Old; and several modern authors have supposed it so, and others have roundly asserted it, though entirely contrary to fact and experience, and though it plainly appears that they neither had experience in this husbandry, nor understood the principles of it.

But admitting that, in a course of crops in the common husbandry, the land is ploughed twice only for each crop at an average; and that each successive wheat-crop in the hoeing-culture requires also twice ploughing, once to form the new ridges, and four horse-hoeings afterwards, which are equal to another ploughing; the whole tillage in the new way does not exceed, in labour and expence, two common level-ploughings of the land, which is therefore nearly equal to the tillage usually given to land in the old way: and thus the tillage may seem equal in both methods; but is really very different, because the land in the New Husbandry, if properly cultivated, is always in high tilth, kept loose, light, and open, by the repeated hoeings; so that half the strength of cattle is sufficient to till such land as the farmers use in common ploughing: for, if the land is strong, and usually ploughed with four horses, two such horses
are

are sufficient to till the same land in the hoeing husbandry; and in light land, which is ploughed with two horses, it is hoed with one: and thus in general the hoeing husbandry is performed with about half the strength, or half the number of the same horses that are commonly employed to plough the same land; which greatly reduces the price of the hoeing tillage.

In the common husbandry, a ploughman, driver, and four horses, usually plough an acre of land a day; but in the New Husbandry for wheat, a ploughman horse-hoes four acres a day with two horses without a driver. Sir Digby Legard usually ploughed four acres a day of his light land with one horse.

There is, besides, another saving in this respect; a ploughman and driver is commonly employed with every plough team, of three or more horses, in the usual way of ploughing land; but in the hoeing-husbandry a driver is not necessary: for in the New Husbandry, wheat is drilled upon ridges (being much better than upon level ground, more conveniently horse-hoed, and keeping the wheat dry in the winter); and cattle, horses, or oxen, after a very little use, are very tractable in hoeing, being guided by the ridges to go straight without a driver. The saving in this respect, and only half the number of cattle employed in hoeing as in common ploughing, renders the tillage a great deal cheaper in the New, than in the Old Husbandry.

Some of the practisers of the New Husbandry having, as we have seen, deviated from the most successful method, and some of those who oppose or do not understand it having obscured it; a farmer, who is desirous of practising this husbandry, may be at a loss to know the best method, and upon which he can rely: the following description may therefore be of use to such, and is offered to those who desire to practise it with success, particularly in the culture of the wheat, which is the farmer's principal crop; and those who can cultivate wheat well in the hoeing husbandry, may soon attain to the best culture of other crops, in the same manner.

The farmer is advised to begin at first with a small extent of ground; an acre or two laid up in ridges to be horse-hoed, about the same quantity to be drilled in equidistant rows upon level ground, and another piece to be sown broad-cast; all these pieces of land to be contiguous to each other, to be as near as possible of the same quality, and sown at the same time, and with the same seed: these different methods will not only be amusing, but of real use to the cultivator.

It may be proper to winter and summer fallow the whole, and is the best method of extirpating the weeds, and making the land very clean; this is absolutely necessary for the piece to be horse-hoed, for that must be made very clean, and brought into good tilth, before
it

it is drilled with wheat. If this is omitted at first, it cannot be made clean nor kept so afterwards but at a great expence, especially land that is sowed with a double row, for it will be extremely difficult to get the weeds and natural grass out of a double row of wheat.—The best way of fallowing, is to lay the land up at first in high narrow one-bout ridges. By laying the land up in this manner, it is exposed to the immediate influences of the weather, and is easily ploughed, and at a small expence, at one bout; or a double mould-board plough will split these narrow ridges in the middle at one draught, and form new ridges. If they are harrowed down level between the ploughings, the weeds will soon come up; and being ploughed again into these narrow ridges, to remain so a few weeks, and alternately ploughed down and harrowed fine, the land may be thus exposed to the atmosphere, the weeds harrowed out, and the young weeds destroyed; by which means the land will also be brought into fine tilth in a winter and summer; nor will the expence be so great in this as in the common way of fallowing, but much more effectual for the purposes intended.—The land for these trials should be of a middling quality, not very rich, nor poor. The ploughings should be performed when the land is dry; and no dung should be laid upon it, nor any other manure,

When the ridges are leveled the last time, harrow the land fine, the contrary way to the intended bearing of the ridges to be horse-hoed; then with a pair of light narrow wheels, set to the distance of the ridges (as of four feet ten inches), mark the breadth of the ridges; which the wheels will plainly do, if drawn across the harrowing: the marks will guide the ploughman to make the ridges of that breadth, and very straight, which they should be made. Ridges of the common height are proper to be drilled; but in very strong land they should be laid up high, to throw off the rain water, and keep the wheat dry, which is necessary. Ridges of four feet ten inches broad give room to drill a double row of wheat at ten inches distance upon the middle of each ridge (called the partitions), and intervals of four feet between the double rows, to be horse-hoed, four feet being a proper distance, and room for the hoe-plough to work and turn the earth to or from the rows.

The tops of the ridges should be smoothed with light harrows before the wheat is drilled; and the horse or horses that draw the harrows should walk in the furrows between the ridges.

The farmer, who intends to practise the hoeing husbandry, should have a drill-plough to sow the seed, for that is the most exact way of doing it. Sir Digby Legard had Mr. Tull's

Tull's drill-plough made with wooden feed-boxes, which performed well, and cost fifty shillings. But if he has not a drill-plough at first, he may mark two parallel channels upon the top of each ridge very straight, and upon the middle of each ridge, and ten inches distant. The drill-plough makes the channels, drills the seed (about three pecks to an acre), and covers it about two inches deep, all at one operation; but, if there is no drill plough, the seed may be sown thin into the channels by hand, and covered with a rake or light short-toothed harrow, about the same depth, two inches; and when the wheat comes up, and probably will be too thick, the plants should be thinned to about an inch distance, with a very narrow sharp hand-hoe; but it is much the best way to do this by hand, and as regularly as can be done.

It is usual to brine and lime seed-wheat, to prevent the crop being smutty, which some years it is very apt to be, and to damage the crop. If the seed is very clean, sound, and from a good change, it will not produce a smutty crop: but brining is the surest way to prevent it. Full plump wheat is the most apt to produce a smutty crop: for which reason, farmers prefer thin small-bodied wheat for seed, particularly the burn-beat wheat. The small seed, if sound, produces as full-bodied wheat as any: for the crop is not large-grained wheat from the size of the seed, but from the goodness of the land, and the tillage.

The intervals should be horse-hoed in November or December, before the frost sets in, and the earth ploughed away from the rows of wheat; the hoe-plough to be brought within about three inches of the rows: if any earth runs over the left side of the plough upon the rows, the wheat must be uncovered; but where it runs only upon the three-inch narrow slips, it should remain there till the next hoeing in the spring; for the fine earth which falls upon these slips will give shelter to the wheat in winter.

The second hoeing is to be given the beginning of March, or as soon as the great frosts are gone off. The hoe-plough is, at this hoeing, to go in the same furrows as it did at the first hoeing, but deeper and nearer to the wheat: this loosens the earth next the wheat, and, the furrows being at the same time made deeper, gives the roots of the wheat liberty to extend every way, the effect of which will be soon visible: the wheat will grow more luxuriant, and of a deep green colour. The plough should at this second hoeing go deep and very near the rows of wheat, and cannot be brought too near, so as it does not displace or tear out the plants. Several, who have practised this Husbandry, have been afraid to hoe so close to the rows, lest the wheat should be injured by the plough breaking or tearing off the roots of the wheat: but this is a great error. Hoeing so close does not injure the wheat; but is
a great

a great benefit to it, breaking off the ends of the roots, causes new roots to spring out at the broken ends in much greater numbers than before, and these young roots being porous absorb more vegetable nourishment, so that the plants are fed more plentifully. The earth is likewise by the deep ploughing opened and made penetrable to the roots, to a greater depth than it was before ; and the bank next the rows left there at the first hoeing, being hardened by the weather in winter, confines the roots that they cannot so easily spread and extend side-ways till that crust of earth is removed by the plough ; which, when the earth is in a fit temper for this hoeing, may be done near the rows, even within about an inch of them, especially if care has been taken to drill the rows very straight, and upon the middle of the ridges.

In about ten days or a fortnight after this hoeing, the earth is to be hoed back to the rows ; but if the mould should be so crumbly and dry as to fall down, and expose the plants too much, the earth should be immediately hoed back to the rows to support them, and the earth being now all well tilled and loosened next to the rows, the roots will freely spread and extend therein ; and though some may doubt the cause, none can disbelieve the benefit and effects of these hoeings, who may see, in a short time after they are performed, that the wheat will grow remarkably luxuriant,
and

and of a healthy deep-green colour, in consequence of them.

The partitions or narrow ten-inch spaces between the two rows of wheat, should be well and deeply hand-hoed, and also the narrow slips on the outsides of the rows; which may be done before the intervals are horse-hoed, or before the earth is turned back to the rows, according as the weeds are more or less advanced; and at the same time the weeds and natural grass should be carefully drawn up out of the rows by hand. Once hand-hoeing the partitions is generally sufficient to keep down the weeds, and the wheat growing up and spindling shades the weeds so much, that they cannot make much progress afterwards. It is, however, a matter of importance to keep the land very clean, and that the weeds should never grow up high, much less should they ever be suffered to run to seed; to prevent this, it may be adviseable, when weeds grow fast, to give the partitions a second deep hand-hoeing, with a common hand-hoe, and another hand-weeding of the partitions, and the narrow slips may be hoed with a Dutch hoe, which is called scuffling, and kills the weeds by cutting them off near the surface of the ground.—A second hand-hoeing is of more advantage to the crop and to the land than the expence of it, and particularly if deeply hand-hoed, for that loosens, turns, and improves the ground betwixt the rows, which has no other assistance during the growth of the crop; but the intervals between

tween the double rows have the benefit of hoe-ploughing, which improves the land, and subdues the weeds there.

The time to give the third hoeing is not limited; only the farmer should be careful not omit hoeing till the earth becomes stale and hard, and till the weeds get a head and grow luxuriant. It is likewise necessary to observe the state of the land; that it be dry, and will break into fine parts by the hoeing, which should not be done when the earth is wet. A good horse-hoeing is very serviceable when the wheat begins to blossom, or a little before; for this strengthens the plants and blossoms, so that they produce more grain than if not assisted at this critical time: for ears of wheat are formed at first to produce above double the number of grains that are found in them afterwards; as may be seen, if examined, when they begin to blow, either by the eye, or better by a magnifying glass; and by this examination it will be plainly seen that more than half the blossoms are abortive for want of nourishment, and that this happens even after the grains begin to be formed: it is therefore of great importance to assist the plants by a good and deep horse-hoeing when they begin, or a little before they begin, to blow. It is not necessary that this hoeing should be performed by turning the earth towards the rows, for the plants are nourished by turning the earth to or from the plants, as we shall see below.—

The

The horse-hoeing is necessary at this time for another reason, viz. that, in some years and in some climates, the weather may become rough and boisterous after Midsummer, and when the wheat-ears become heavy; for then the straws bend, and are sometimes so disordered, that the wheat cannot then be safely horse-hoed, and its missing of a hoeing then will be an injury to the crop and to the land; but this will not be so injurious, if it has been well hoed at the time of its beginning to blossom.

If the earth is ploughed from the rows at blossoming, the hoe-plough should go close to the rows, as close as at the second hoeing: this may seem too near, and so Mr. Tull himself thought at first; but, upon further experience, he found that his wheat throve the better for bringing the hoe-plough close to the wheat at every hoeing from the rows.—The third hoeing, given when the wheat begins to blow, will be of great service, in causing the ears to produce a greater number of grains.—And if the wheat stands fair, the next hoeing after the wheat has done blossoming will also be very serviceable, to nourish the wheat well then, and causing the grain to be large, plump, and full of flour.

It was before observed, that Mr. Tull's latest practice was, to give his wheat four horse-hoeings: the first was before winter from the wheat; the second was in the spring also from the wheat, only deeper, and nearer to it; the third

third hoeing was to fill the grain, turning the earth towards the rows; and the fourth and last hoeing turned the earth from the wheat, and the hoe-plough was then brought close to the rows, as close as at the second or spring hoeing.—It is very remarkable, that ploughing the earth away from the wheat while it was ripening should then nourish and ripen it; but he was very clear, from full experience, that it did so; and I have seen wheat hoed in this manner with success, the earth ploughed away from the wheat and remaining so till harvest. It is not, however, necessary to hoe the earth from the rows the last time, and in general it is not so convenient as turning the earth towards the rows at the last hoeing; because, if the next crop of wheat is drilled upon the former intervals, as is commonly done, more ploughing is necessary to form the new ridges; for which reason I would advise the young farmer to hoe the earth the last time towards the wheat, and in this way he will hoe three times from the rows, and twice towards them, which may be called five hoeings; but the second or spring hoeing from the rows, being only to deepen the winter furrows, and bring the hoe-plough about two inches nearer to them, is not properly a full-hoeing; and, not reckoning that, the whole is only four hoeings.—I am sensible that the spring hoeing from the rows is usually reckoned; but the great error of those who have tried this Husbandry unsuccessfully

cessfully, having been their hoeing too superficially, and giving but three instead of four or more hoeings, the Farmer, when he begins this Husbandry for wheat, should give it five hoeings as above; and when he has experience in the practice, and finds his land in order for it, he may then abate one hoeing: however, even if five hoeings were continued, the expence of one hoeing is but a trifle and will be no loss, for the wheat will tiller or branch more, and the less seed will do.

From the beginning of March to about Midsummer is the principal time for the spring and summer hoeings; which being liable to be obstructed by accidents of rainy and rough weather, the farmer should not omit the proper opportunities of performing them about once a month when the earth is dry; their not attending to this has been the cause of several beginners not succeeding well, for there is no loss in often hoeing, but an advantage both in the crop and land; and after the land is brought into good tilth, once or twice hoeing extraordinary costs but a trifle; and is no damage, unless they make the corn too luxuriant, which happens most commonly by sowing too much seed, or the plants standing too close.

It is not easy to determine the most proper quantity of seed; for if drilled too thick, or it branches very much, it will be apt to lodge, for the same reason that wheat sown broad-cast is apt to
do

do so ; namely, its standing so thick as to exclude the air and sun from the roots and stems, whereby the stems become weak and spongy, unable to stand upright against wind and rain, and fall down to the ground before they are loaded with the weight of the ears, and even before the ears are filled with grain ; but, if the drilled wheat is not too thick, it will generally stand and the ears not touch the ground, though by their weight they hang down and bend the straw that supports them in a manner not common to any other but the horse-hoed wheat ; the distance to which the plants are to be thinned at first depends upon the quality of the land and the hoeing.

Brining and liming the seed is useful, to prevent the smut, but is attended with one inconveniency, that the land should be moist when sown or drilled ; for steeping the seed, especially if done as frequently directed for many hours, causes the corn to swell and imbibe so much moisture that a vegetation commences ; and if then sown in dry earth, and no rain falls soon, the vegetation is checked, which kills or much weakens the seed. Other seeds in general, both in farming and gardening, are sown when the earth is dry ; and the reason that wheat is an exception to this, is its being so long steeped in brine ; for which, however, there is no necessity, for it is the smutty powder adhering to the seed-corn that causes the crop to be smutty. If no such
powder

powder adheres to the seed, the crop is generally free from smut; or if the smutty powder is washed off the seed by briskly stirring it with a stick in fair water only, and all the smutty powder skimmed off the top of the water, this will prevent the smut, as has been found by experience, and the smutty powder is by the same means still more easily separated from the corn if it is briskly stirred among brine and well skimmed; in either way, there is no necessity to let the seed lie soaking any time, but may be taken out of the liquor and dried, and sown immediately after it is dry, which is much better than sowing it wet, and if the seed is from a good change and free from smut, it may be sown without being steeped at all and while the land is dry, it then is not forced, but vegetates gradually and according to the order of nature.

If the crop should happen to be smutty by very unkind seasons or otherwise, it is a damage to the crop, and lessens its value at market, and for this the farmer has no remedy when sown broad-cast; but when the seed is drilled, the crop may be intirely cleared of the smutted corn before it is reaped. For horse-hoed wheat, having large ears, full of heavy grain, bends and turns downwards before harvest; but the smutty or blighted ears, being light, stand upright, and are easily distinguished, and may then be all clipped off by a woman, and carried away in a bag at a trifling expence;

expencc; the crop being thus freed from smut, will sell at a full price, being as fit to make bread as any other, only not so proper for seed to be sown without being washed in brine, as some of the smutty powder may have been blown upon the sound corn before the smutty ears were cut off.

There is a great advantage in keeping all crops clean from weeds, and particularly hoed wheat crops; for horse-hoed wheat, being supplied with abundance of nourishment till it is fully ripened, is usually several days later in ripening than sown wheat, for which reason it is adviseable to drill wheat early, as suppose in the beginning or by the middle of September, for by that means it will be the sooner ripe. Some seasons are early, and some so late, that it may not be proper to drill so early as the beginning of September; but when the weather is suitable and the land in order, it is most adviseable, to drill early; the early sown has another advantage besides its ripening early, it tillers or branches before spring; and its roots being thus multiplied, it is the better able to resist the cold and frost in winter.

Many farmers, however, do not choose to sow early, because they say the wheat grows winter-proud, that is, shoots up before winter so luxuriantly, that the plants are liable to be killed by the frost; but though the blades are sometimes killed, yet the roots survive (if the land is dry and healthy), and they produce

new and strong shoots after the frosts are over, as has been frequently observed, and produce a good crop; whereas, if the wheat has but few and weak roots, it is liable to be totally destroyed by great frosts. In the long and severe frost in the year 1740, much of the wheat above ground was killed; and many farmers, thinking their wheat was wholly destroyed, ploughed it up, and sowed the land with spring corn; but others, finding upon examination that the roots of the wheat was alive, suffered it to remain, and it shot up again, and in many places produced great crops.

A remarkable instance of this is mentioned by Mr. Tull, p. 262. “ It happened once, “ says he, that my *white cone* being planted “ early, and being very high, the blade and “ stalk were killed in the winter; yet it grew “ high again in the spring, and had the same “ fortune a second time; it lay on the ridges “ like straw, but sprung out anew from the “ root, and made a very good crop at harvest; “ therefore, if the like accident should happen, “ the owner need not be frightened at it.”

Lammas wheat is as hardy as cone, if the ground is dry; and it does not often happen to be hurt by the cold in winter; and, if the danger was greater than it is, there are such advantages in sowing early, that the farmer should not neglect it when the season is favourable.

It was customary formerly to let the wheat grow till it was very ripe, as then it makes most measure, and parts more freely from the straw; but of late years several good farmers cut their wheat sooner, and while the knots of the straw are green, for such wheat looks fair to the eye, handles well and slippery, and coming sooner to market sells at a good price. Wheat, cut before it is dead-ripe, is smooth, and the grains lie close in the bushel; so that it weighs as much per bushel as wheat that stands till it is thorough-ripe, but more grains go to fill the bushel, and it is more difficult to thresh out clean. These inconveniencies are, however, answered by the advance in price.—Cone wheat is not usually cut till full-ripe.

Drilled wheat should be reaped low, that the stubble may not obstruct the hoeing of the next crop; it stands so fair to be cut, and no weeds, that it is reaped at half the price of broad-cast wheat, and being clean from weeds it is soon fit to be carried home.

It is usual to raise the new ridges for the succeeding crop upon the former intervals, which is also most convenient, because the mould, whereof these new ridges are composed, is in fine tilth, and the new ridges are made at once ploughing. In hoeing the earth up to the ridges the last time with the hoe-plough, if done as it should when the earth is dry, some of the dry mould will be apt to run back into the interval, after the hoe-plough is past; and

then a plough with a double mould board may be used, to clear the interval of the loose mould. This is best done sometime after the last hoeing with the hoe-plough; for if any weeds should in the mean time spring up there, the earth raised by the double board plough will be thrown to the right and left up to the ridges, and will cover and smother these young weeds, will quite clear, widen, and deepen the furrows in the intervals, and by that means the new ridges will be deeper in fine loose mould. The double mould board plough is very convenient to be used for this last operation, but should not be made use of instead of the hoe-plough, as some do for the greater dispatch; but this is an argument against the use of it at other times, for it is essential to expose the earth for some time to the influences of the atmosphere, which is not done so fully when it is turned up at once to both ridges by the double board plough, as it is when turned up in two furrows separately, and at different times by the hoe-plough, by using which constantly the surface is more enlarged and exposed, and the land more improved, than by using any other instrument, cultivators, or any others, that have been hitherto substituted in the room of the hoe-plough.

The stubble is a guide to the ploughman, to make the new ridges straight, and if brought near the rows of stubble, the plough;

at two large furrows, will raise the middle of the new ridges high enough to be above the stubble, when that is turned to the ridges, at two furrows more: this should be carefully attended to, that the stubble may not obstruct the drilling of the seed. Four furrows are commonly enough to plough all the mould, and form the new ridges; but, if the ploughman finds any difficulty in making the middle of the new ridges properly at two large furrows, he may raise them at four; taking care that they are high enough, and that the stubble does not rise so high as the top of the ridges, and obstruct the drilling. When three or more rows were drilled upon each ridge, it was found necessary to raise the ridges high, in order to obtain a greater depth of mould, for the benefit of the middle rows: but ridges of the common height are most proper, when only a double row is to be drilled on each ridge,

These ridges are to be drilled, and the wheat cultivated, in the same manner as in the first year; and thus every succeeding year the land will produce good crops, so long as it is thus cultivated, without manure or fallow. But if any of the hoeings should happen to be omitted, or the wheat seems not vigorous enough in the spring, let some fine manure, as ashes, foot, malt-dust, &c. be sprinkled upon the rows in February, which will strengthen the plants.

The foregoing account of the hoeing culture of wheat, being particular, may to some appear tedious ; but to those who intend to practise the New Husbandry, will, it is presumed, be acceptable ; as not only the best method, but the reasons also, in most cases, are here assigned for the rules laid down ; which was the more necessary for a learner, as most of the modern accounts tend more to perplex, than inform, a beginner. Drilling wheat in equally-distant rows, and hand-hoeing it, is a method that farmers like much better than horse-hoeing it, and, though more advantageous than broad-cast sowing, is not by much so profitable as horse-hoeing. The hand-hoeing does not improve the land so much ; and the wheat-crops cannot be repeated every year in succession, upon the same land, even with the assistance of manure. The land is, however, improved by hand-hoeing ; and there is a considerable saving in seed, for a bushel of wheat is the proper quantity to drill upon the level in equidistant rows, and one foot distant. This leaves room for the hand-hoe between the rows ; which is performed in the spring, and the weeds cut down, before the wheat spindles, for then the hoe is shut out. But as the hoeing both improves the land, and destroys the weeds, twice hoeing would improve it more than once, or deep hoeing, and a scuffling, to which the only objection is the expence.

If

If the wheat is drilled upon the level, in rows, at two feet distance, it may be hoed with a small plough, and will produce better crops in that way, than by hand-hoeing; and if, at the last hoeing, the plants are earthed up by the hoe, they will the better stand upright against the storms of wind and rain. Large crops may be obtained in this method; but there is no other, besides the horse-hoeing of wheat upon ridges, by which constant annual crops are obtained so cheap, and without manure or fallow.

Most farmers will think that more than two rows of wheat may be planted to advantage upon a ridge, and the author of this Husbandry was at first of that opinion: for which reason he then drilled four rows, and for some years three rows, upon each ridge, at seven inches distance: but, when three only are drilled, the roots do so entangle and interfere with each other, that the crop of the two outside rows are lessened, and the middle row so much stunted, that it does not grow near so tall, nor produce half the crop of either of the two outside rows, occasioned by the obstruction of its roots, and that the seven-inch partitions cannot be hand-hoed so well and deep, as the ten-inch partition between the double rows; and therefore no more than two rows should be drilled upon a ridge. It would indeed be better to drill only one row upon a ridge, and then the wheat

might be horse-hoed to the row on both sides, which is much more beneficial than hand-hoeing. Ridges of four feet broad would be broad enough, if only one row was planted: but common wheat, in single rows at so great distance, would not produce a sufficient crop; and four feet is the proper breadth to hoe the intervals well with a plough: and though an instrument might be contrived to hoe intervals of a less breadth than four feet, yet the farmer is advised, not to drill his wheat, to be horse-hoed, closer than with ten-inch partitions, and about four feet intervals, these having by long experience been found the proper distance for wheat; and the hoe-plough the proper instrument for obtaining good successive crops of wheat. When the farmer has learned to raise good crops in this manner, he may try to improve, beginning with small experiments; for otherwise he may fail of success, as has happened to some persons, who attempted improvements before they were acquainted with this Husbandry, and to others, who have used some foreign instruments, instead of the hoe-plough.

For large plants to be horse-hoed, single rows upon a ridge are most adviseable; as for turnips, cabbages, potatoes, &c. for these may be hoed alternately, and produce much better crops than double rows, because they may be hoe-ploughed very near the plants on
both

both sides. This is to be understood, when it is intended to take successive crops, and to improve the land: for when only a single crop is intended to be taken, a double row of plants may, in some cases, produce a larger crop than a single row: but, in general, the farmer will find it most for his interest to plant the larger plants in single rows, both on account of improving the land, which is a consideration of great importance, and likewise to keep the land clean, which is easier done with single rows, and at a less expence, than when the rows are double: and in all cases it is proper to leave an interval between the rows, whether single or double, of about four feet, that breadth being necessary to hoe them properly with a hoe-plough.

There is one advantage peculiar to the horse-hoeing Husbandry, which the common Farmer cannot obtain, and deserves to be well considered. When a crop of broad-cast wheat is harvested and carried home, the land is become stale, and not in order to be sowed with wheat for a second crop; but the land must be ploughed and winter-fallowed, to prepare it for a crop of summer corn: but, if the hoeing farmer is desirous to change his crops, he is not under the necessity of winter fallowing, but may save that expence, and also obtain another crop before the spring seed-time. Most sorts of common cabbages, and likewise the turnip-cabbage and turnip-rooted

rooted cabbage, planted in Autumn, will grow and produce a profitable crop in winter and spring, will then be good food for his cattle, and save hay. This is a matter of much importance to all farmers, many of them being distressed to find sufficient food for their cattle in winter and spring: for this purpose much land is employed to obtain a good crop of turnips; whereof, however, the farmer is too often disappointed by the fly in summer, and the frost in winter; and if the land is very strong, it is not the most proper for turnips: but the hoeing farmer may raise a sufficient quantity of the cabbage kinds on a small spot of ground and a very little seed, as an ounce or two will produce plants enough for an acre of ground; and being transplanted in autumn will furnish a great deal of good food for his black cattle, sheep, and hogs, in the winter and spring. Land that is well hoed is always in good tilth to receive such plants; which, if planted upon ridges, may be horse-hoed in the winter, and produce good crops on light land, or strong; and the hoeing will not only keep the land in heart, without impoverishing it, but will also, keep it in fine tilth for the succeeding crop. When this is considered, the health of his cattle, for fattening them, and for the dairy; likewise the great quantity of good manure that may be thus raised; it will be evident to every experienced farmer, that this is an advantage of great

great consequence to him, and cannot be so easily obtained in any other way, as it may by the New Husbandry.

In this husbandry there is a saving in seed and in labour; but the principal article saved in cultivating wheat is in manure. We have shewn above how necessary manure is in the Common Husbandry, and how great dependance farmers have upon manure for wheat, their principal crop: as this is the case in the Common Husbandry, a method of culture wherein this expensive article may be saved, must be of great consequence to every farmer, who is at the expence of no less than from fifty shillings to five pounds for every acre of wheat, and is wholly saved in the New Husbandry, which in general requires no manure for wheat, except a light hand-dressing in the spring; and this only in some particular circumstances, where there has been some neglect in hoeing, and is not necessary where the culture is duly performed. Now if a farmer raises annually twenty five or thirty acres of wheat, and he saves only three or four pounds an acre in manure, it will be an article of great consequence to him; but when it is considered that the manure saved in his wheat enables him at the same time to dress his other lands with it, either for his crops of turnips, or others for feeding his cattle, and to dress his cultivated grasses, meadows, and pastures; every experienced farmer must be
sensible

sensible how highly beneficial the New Husbandry is to those who practise it with skill and perseverance.

The latest accounts of the practice of the New Husbandry, related in Mr. Dossie's memoirs of agriculture, are the experiments above-mentioned, made by Sir Digby Legard and Mr. Lowther; and he concludes, page 377, "There are, says he, however such accounts
" of experiments already made, which have
" been laid before the public, or the Society
" for the encouragment of Arts, &c. as gives
" the greatest room to believe, that through
" the increase of produce in quantity or value,
" or the diminution of expence, the profit
" of tillage may, in a term of several years
" taken together, be rendered a third greater
" or perhaps even doubled to the farmer, by
" the substitution of the drill culture in the
" place of the common or broad-cast. This preference appears from experiments also in
" some degree to hold good of indifferent, as
" well as rich soil; and of other kind of
" cultivated plants as well as corn, and to
" have many other advantages."

If such are the advantages from this Husbandry when executed imperfectly, how much greater will it be to the Farmer, who performs it in the best manner; and according to the directions of the Author of it? He had near four quarters of wheat by measure, upon twenty-five acres of his best land; and about twenty bushels,

bushels at an average upon his whole farm, nine gallons per bushel. The extensive practice likewise of Mr. Dean, continued many years, and of Mr. Craik, in a soil and climate unfavourable to the New Husbandry, shew plainly the profit of it much beyond what Mr. Dossie has said; and what may be expected, when performed with the same care and judgement, as the industrious Husbandman bestows upon his land in the Common Husbandry.

This has been proved by experience by that eminent husbandman Sir Digby Legard, who has shewn the New Husbandry to be more advantageous, not only than the common husbandry in his neighbourhood, but also to the most improved modern husbandry here or abroad; and, upon a full view of both, he concludes as follows. “ But the farmer,” says he, “ who is ignorant of these modern
 “ improvements, surely ought not to hesitate
 “ to adopt the drill culture; which a few
 “ years practice would render habitual; and
 “ which he would find *much more beneficial*.
 “ For it is certain, that this is *less expensive*
 “ than the old method; and, when once
 “ adopted, *easier in the execution*.”

Lately published, Price 3 s. sewed,

(A NEW EDITION, CORRECTED,)

The ORIGIN of PRINTING; in Two Essays!

1. The Substance of Dr. MIDDLETON's Dissertation. With Remarks, by W. BOWYER and J. NICHOLS.
2. Mr. MEERMAN's Account of the first Invention of the Art: With an Appendix, on the first-printed Greek and Hebrew Books; the early Polyglott Bibles, &c. &c.

Also, (Price 1 s. stitched in Blue Paper,)

1. CRITICA SACRA; or, A Short Introduction to Hebrew Criticism: In which, 1. The correspondent Passages of Scripture are disposed under proper Heads; and, 2. The Method of discovering and correcting thereby the various Errors of the printed Text is set forth and illustrated. By Dr. HENRY OWEN.
2. A SUPPLEMENT to CRITICA SACRA, Price 6d.
3. SELECT DISCOURSES: 1. Of the Correspondence of the Hebrew Months with the Julian; from the Latin of Professor Michaelis. 2. Of the Sabbatical Year; from the same. 3. Of the Years of Jubilee; from an Anonymous Writer, in Maffon's *Histoire Critique de la Republique des Lettres*. Price 1s. 6d.
4. A Short HISTORY of the ISRAELITES: with an Account of their Manners, Customs, Laws, Polity, and Religion. Being an useful Introduction to the Reading of the Old Testament. Translated from the French of Abbé FLEURY, Author of the Ecclesiastical History, by ELLIS FARNEWORTH, M. A. Price 3s.
5. The Second Edition of OCCASIONAL DISCOURSES in the ROYAL NAVY, in the Years 1756, 1757, and 1759; to which is added, One on the Peace in 1763. By the Reverend MICHAEL PHILIPPS, Chaplain of His Majesty's TERRIELE. Price 2s. 6d. sewed.
6. A Journal from Grand Cairo to Mount Sinai, and back again. Translated from a Manuscript, written by the Prefetto of Ægypt, in Company with some Missionaries *De propaganda fide* at Grand Cairo. To which are added, Remarks on the Origin of Hieroglyphics, and the Mythology of the ancient Heathens. Dedicated to the Society of Antiquaries, London. By Bishop CLAYTON. Second Edition, 8vo. Price 2s. 6d.
7. EDWARDS's Paraphrase on the ROMANS, 5s.

BOOKS printed for W. BOWYER and J. NICHOLS.

1. A SUPPLEMENT to Dr. SWIFT'S Works; being the TWENTY-FOURTH Volume of the Collection, and containing Miscellanies in Prose and Verse, by the Dean, Dr. DELANY, Dr. SHERIDAN, Bp. HORTE, Dr. DUNKIN, and others, his intimate Friends. With Explanatory Notes on the whole XXIV Volumes, and an Index, by J. N. Price 7s. sewed.
 2. The SEVENTH Volume of SWIFT'S Works in 4to. A new Edition, corrected.
 3. The EIGHTH Volume, 4to, published by DEANE SWIFT, Esq.
 4. The NINTH Volume: with a copious Index, and Historical Notes, by J. N.
 5. SWIFT'S LETTERS, Four Volumes in Quarto.
 6. Dr. SWIFT'S Works, COMPLETE, in Twenty-four Volumes, Large Octavo.
 7. His Works in Small Octavo, Twenty-four Volumes.
 8. A very cheap Edition, in a small Pocket Size, in Twenty-four Volumes.
 9. The latter Volumes of the Works, in *any* of the Sizes, may be had separately, to complete Setts.
 10. The Original Works in Verse and Prose of W. KING, LL.D. Advocate of Doctors Commons, Judge of the High Court of Admiralty, and Keeper of the Records in Ireland, &c. With a fine Head of the Author. Now first collected into three volumes, with Historical Notes, and Memoirs of the Author, by J. N. Price 10s. 6d. sewed.
 11. Dr. BENTLEY'S Dissertation on the Epistles of PHALARIS, &c. a new Edition, with several Additional Observations. Price 5s. sewed.
 12. Elements of the History of ENGLAND, from the Invasion of the Romans, to the Reign of George the Second. Translated from the French of Abbé MILOT, Royal Professor of History in the University of Parma, and Member of the Academies of Lyons and Nancy. By Mrs. BROOKE, Author of *Julia Mandeville*, *Emily Montague*, *The Excursion*, &c. *The second Edition*, 4 vols. 12mo. Price 10s. sewed, 12s. bound.
 13. Dr. Wotton's Method of studying Divinity, Price 6d.
 14. Clarke's Paraphrase on the Four Evangelists, 2 vols.
 15. Anson's Voyage round the World, 4to. 8vo. 12mo.
- * * * The QUARTO CUTS may be had separately.

BOOKS printed for W. BOWYER and J. NICHOLS.

16. The Connexion of the Roman, Saxon, and English Coins; deducing the Antiquities, Customs, and Manners of each People to modern Times, particularly the Origin of Feudal Tenures and of Parliaments; illustrated throughout with Critical and Historical Remarks on various Authors, both Sacred and Profane. By the late William Clarke, A. M. Chancellor of the Church of Chichester, Residentiary of it, and Vicar of Amport, Hants. 4to. sewed.
17. Pegge's Essay on the Coins of Conobelin, 4to. 5s.
18. M. Tullii Ciceronis ad Q. Fratrem Dialogi Tres de Oratore. Ex MSS. emendavit, Notisque illustravit, Z. Pearce, Episcopus Roffensis, 8vo.
19. Saunderfon's Elements of Algebra, 8vo.
20. Thomson's Works, complete, 4 vols. 12mo.
21. ——— Seasons, 12mo.
22. Young's Works, a new Edition, 3 vols. 12mo.
23. Salmon's Gazetteer, a corrected Edition, 12mo.
24. Somerville's Chace and Hobbinol, fine Cuts, small 8vo.
25. Schrevelii Lexicon Manuale, Editio nova, Pret. 7s.
26. EURIPIDIS Drama SUPPLICES MULIERES, ad Codd. MSS. recensitum, et, VERSIONE correctâ, NOTIS uberioribus illustratum. Accedit, De Græcorum Quintâ Declinatione Imparisyllabicâ, et inde formatâ Latinorum Tertiâ, QUÆSTIO GRAMMATICA. Curâ JER. MARKLANDI, Coll. Div. Petr. Cant. Socii.
27. An ESSAY ON SPIRIT, by Dr. R. CLAYTON, Bp. of CLOGHER, Price 2s. 6d.
28. Letters between the Bishop of Clogher and Mr. William Penn, concerning Baptism. Price 1s.
29. Some Thoughts on Self-love, Innate Ideas, Free-will, Taste, Sentiments, Liberty, and Necessity, &c. by Bp. CLAYTON. Price 1s.
30. A Vindication of the Histories of the Old and New Testament, by Bp. CLAYTON. Price 5s.
31. PIECES written by Mons. FALCONET and Mons. DIDEROT, on Sculpture in general, and particularly on the celebrated Statue of PETER THE GREAT, now finishing by the former, at St. Petersburg. Translated from the French, with several Additions, by W. TOOKE, Chaplain to the Factory at St. Petersburg. And illustrated by a beautiful Plate of the Statue, designed by PETER FALCONET, a Son of the ingenious Statuary, and engraved in a masterly Style by BASIRE.

6 M 127. A

University of California Library
Los Angeles

This book is DUE on the last date stamped below.

Phone Renewals
310/825-9188

NON-RENEWABLE

ILL-COF
JUL 14 2004

DUE 2 WKS FROM DATE RECEIVED.

UCLA ACCESS SERVICES
Interlibrary Loan
11000 University Research Library
Box 51575
Los Angeles, CA 90035-1575

SEP 14 2004

3 1158 01108 9561

UC SOUTHERN REGIONAL LIBRARY FACILITY

A 001 107 514 0