WOAD, in Agriculture, a plant cultivated in the field for the use of the dyers. It is a plant which has a strong thick fibrous root, which penetrates deep into the soil, and which is principally raised for the use of the leaves, which, after being properly manufactured, are made use of in the art of dyeing to produce a blue colour, as well as the basis of black, and some others.

Soil.—It is evident from the nature of its root that it requires a soil which has much depth or staple, and which is perfectly fertile, such as those of the rich, mellow, loamy, and deep vegetable kind. Where this sort of culture is carried to a considerable degree of perfection, as in Lincolnshire, the deep, rich, putrid, alluvial soils on the flat tracks extending upon the borders of the different large rivers are chiefly employed for the growth of this sort of crop; and it has been shown by repeated trials that it answers most perfectly when they are broken up from a state of sward immediately for it. In some places, it is the practice to take lands of this description at high prices, for the purpose of breaking them up and growing it upon them for two or three years; on the more low rich soils, for four years, but on those of less fertility only for three; and in some, which are more elevated and exposed, two are considered sufficient.

For this sort of culture, people are employed, who move from place to place, and form a sort of colony. Mr. Cartwright, in the above county, has however found, that it is capable of being confined to one spot with equal or greater success, by having a sufficient extent of ground for changing the place of its growth as may be necessary, and for appropriating an adequate proportion annually to the raising of the plant, by which the house and expensive machinery that are necessary for its preparation may be kept constantly and regularly employed in the busineses.

Preparation.—In order to prepare the land for this crop, it is advised by some to plough it up with a good deep furrow, immediately before the winter commences, laying it in high narrow ridges, to have the full effect of the frosts; and early in the spring to give another ploughing in the contrary direction, leaving the ground in the same kind of ridge as before. When it has remained in this state some length of time, and weeds appear, it should be well harrowed down with a heavy harrow, repeating the operation so as to render it perfectly fine and clean. About the beginning of June a third ploughing should be given to the full depth with a narrow furrow, and the land be afterwards well harrowed down as before; the fourth or final ploughing being given towards the beginning of July, in a light manner, leaving the surface as even as possible for the seed. But some take much less trouble in the busines of preparation.
WOAD.

In cases where the foils are sufficiently dry, only breaking them up early in the month of February; and where the contrary is the case, deferring it to a later period, taking care to plough the land in a perfect manner to the depth of five inches, or more: and that the furrow-likes may be well turned, laid flat, and nicely joined, a period is employed with a spade for the purpose of adjusting them. This prevents the gristy matters from rising in the leams. When this has been done, the surface is repeatedly harrowed over, to raise a sufficient depth of good mould for the drill to work in; and before the seed is put in a roller is paffed over the land.

It is probable, however, that this method is inferior to the former, as the land is not brought nearly to so fine a state of mould, or the gristy material to effectually covered and destroyed, from which injury may be done to the wood plants in their early growth.

But a method which is equally effectual with the first, more expeditious, and which has a superiority over it, in more completely destroying grubs, insects, and other vermin, which are apt to feed on the plants in their early growth, is that of paring and burning. This is, however, chiefly attended where the soil is rough, and abounds with rushes, fledge, and other plants of the coarse kind, but might be had recourse to on others, with vast benefit.

Where the latter modes are made use of as soon as the seed has been put in, the land should be carefully drained by forming gips in suitable directions, as wherever water flagrantes, the wood plants are liable to be injured or destroyed.

Seed.—In respect to the seed, it should be collected from ground that has been left covered with the beet plants from the preceding season, as they only run up to flims and form seeds in the second year; and in order to have good seed, the leaves should not be cropped at all, and once or twice, the flims being suffered to remain till the seeds in the flims become perfectly ripened; which is flown by their attaining a brownish-yellow colour, and the pods having a dark blackish appearance. It should then be gathered as soon as possible, by reaping the flims in the manner of grain, and then spreading them in rows thinly upon the ground if the weather be fine, when in the course of a few days they will be in a flate to be threshed out from the flims or pods. When they are suffered to remain too long, the pods are liable to open, and shed the seed. Although the pod in which the seeds are contained is of a large size, the seeds are less of those of the turnip. New seed, where it can be procured, should always be sown in preference to such as has been kept for some time; but when of the latter kind, it should be steeped for some time before it is put into the ground.

In regard to the quantity of seed which is necessary, it must be regulated by the soil, and the manner in which it is sown. Where the drill is employed, less will be required than in the broad-ax method. It has been found that a rood of land, where the crop is good, will in general afford feed sufficient for eight or ten acres; and in some cases, in the broad-ax method, five or six bushels are made use of to the acre. In Kent they use ten or twelve pounds to the acre.

Sowing.—The time of sowing crops of this nature must be regulated, in some degree, by the mode of preparation that has been employed. Where the first of the above methods has been followed, it will be much later than in the other. In early sowing is in general to be preferred, as there will be less danger of the plants being injured by the attacks of the fly or grub. Where the weather is suitable, and the land in a proper state of preparation, the seed may be sown in the latter end of February or March, continuing the sowings, in different portions of land, till about the middle of May, at suitable intervals of time to vary the times of cropping the leaves of the plants. The late sowings are commonly executed about the latter end of July, or early in the following month at the farthest.

With respect to the manner in which the seed is sown, it differs according to the nature and state of preparation of the land. Where it is in a fine state of mould, the drill or row method is the method mostly practised, which is by much the best, as by it the plants may be kept more easily clean and free from weeds, becoming more strong and vigorous, from the earth being more thinned about the plants; but where the contrary is the case, the broad-ax method is generally followed; but which does not by any means admit of the plants being kept free from weeds, or the mould so well thinned about the roots of them.

Where the first method is had recourse to, the seed is sown by a drilling-machine, such as is used for turnips, in equidistant rows, eight or nine inches apart, covering it in, either by means of a harrow attached to the implement, or by paling a light common harrow over the ground afterwards, once in a place, raking off any clods that may be incumbent to the fides, or into which the furrows; but in the latter mode, it must be suffered by the hand in as equal a manner as possible, over the whole of the land, being then harrowed in by a light harrow, so as to leave the land in as even and level a state as possible. The ground is frequently rolled afterwards, that the surface may be left as even as possible.

In favourable seasons with good feed, the plants mostly appear in the course of a fortnight, when much attention should be paid to see that they are not destroyed by the turnip-fly, or the broths in those of the more early sowings; as, where that is the case, the land should be immediately re-sown; as in some cases it is not uncommon to sow the greatest part of the crop two or three times over. In the very late sowings, where the crops ride thin on the ground, it is sometimes a practice to give a better plant by forming holes with a hoe in the vacant spots, and directing seeds to be dropped into them by the hand by women or children. This is the case with the later spring-sowings till the beginning of June, or a later period.

Culture while growing.—From much of the goodness of the wood plants depending on the luxuriance of their growth, and the thickness of their leaves, it is necessary to bellow great attention in the culture of the crop while growing. It is advised that the spring-sown crops, as well as those that are sown in the latter part of the summer, should have the first hoeings given them as soon as the plants are fully distinguishable above the ground, as by this means the weeds will not only be prevented from retarding the vegetation of the plants, but these by being thinned out to greater distances be more at liberty to advance and become vigorous in their first or early growth, which is a matter of much confluence to the success of the crop; and second hoeings should be given in the course of four or five weeks afterwards, when the plants should be thinned out to the full distances at which they are to stand, which may be six or seven inches, or more, according to the goodness of the soil, constantly leaving sufficient room to prevent the plants from being in any way crowded. The work is sometimes executed in much the same manner as for turnips, by hand; but in others by small short spuds, used with one hand, while the other is employed in clearing away the weeds; the labourers, mostly women and children, kneeling while they perform the work. When this work has been done, nothing further is necessary till the first cropping of
the leaves has been performed, when the plants should be again immediately well weeded; and after each cropping the fame operation be had recourse to; the extent of crop cleared in the day being, in moff cafes, weedèd before night.

With the late-fown crops, after the second weeding in October, nothing further will be requisite till the spring, about the middle of April, when the work should be again well executed, the mould being completely floured about the roots of the plants, that they may derive the fullest benefit from the operation. This will be sufficient to keep them clean till the taking of the first crop; after which they must be again weedèd, and the fame operation be had recourse to after each cropping of the leaves, as in the above case.

In respect to the buffinæs of gathering the crops with the sprin-fown ones, the leaves will generally be ready to be gathered towards the latter end of June, or beginning of July, according to the nature of the soil, seæn, and cliæme; but for those put in at a later period in the summer, they are often fit to be gathered earlier. This buffinæs should, however, constantly be executed as soon as the leaves are fully grown, while they retain their perfect green colour, and are highly succulent; as when they are let remain till they begin to turn pale, much of their goodnes is faid to be expended, and they become lefs in quantity, and of an inferior quality for the purpofes of the dyer. In favourable seæns, where the soils are rich, the plants will often refe to the height of eight or ten inches; but in other circumftances they seldom attain more than four or five; and where the lands are well managed in the culture of the plants, they will often afford two or three gatherings, but the beft cultivators seldom take more than two, which are sometimes mixed together in the manufacturing of them. It is neceffary that the after-croppings, when they are taken, are continually kept fermentate from the others, as they would injure the whole if blended together, and considerably diminufh the value of the produce. It is faid that the beft method, where a third cropping is either wholly or partially made, is to keep it fermentate, forming it into a inferior kind of woad.

Upon an acre of land, when well managed, in favourable seæns, the produce is mostly from about a ton to a ton and a half. The price varies considerably; but for woad of the prime quality, it is often from twenty-five to thirty pounds the ton, and for that of an inferior quality fix or seven, and sometimes much more.

Seeding-Crops.—With fuch parts of the crops as are refeved for feed, it is a praétice with fome to crop the leaves two or three times the firft year, and then leave the plants to run up to feed in the following one; but it is a better praétice to only remove the fide-leaves, as in this way the plants are lefs weakened, and the produce of the feed much increased. The plants are likewise fometimes fed down by sheep during the winter seæn; but this, from its tendency to weaken them, is equally improper and prejudicial.

Preparation of for the Dyer.—The woad, after it has been gathered, undergoes severall procéfs to prepare it for the dyer; but in the improved method it is conveyed in one-horse carts, fo contrivèd as to be lifted from the axis, and, by folding doors in the bottoms, to discharge their contents upon the floor above the mill, on being hoited up to their proper situation; round this floor holes are formed for putting the plants down through, in order that they may drop under the grinding-wheels. The mills for this purpofe have feverall wheels for grinding the plants, which have lefs diameters on one fide than the other, and are about three feet in width, being constructed with iron bars for crushing the woad. They are wrought by horses, or any other power, as may be the moft convenient. The materials are preferred under the grinding-wheels by proper contrivances, which, as soon as they are fufficiently reduced, force it out of the tracks upon the fime floors on the fides; thus making way for new parcels without the mill being fopped. The bruited woad is then thrown into rooms on the fides of the mill, defined for its reception, by means of shovels. In thefe it remains till the juice is fo much drained off as to leave it in a proper condition for being formed into balls; whic is done by labourers, with apparatus for the purpofe, and then laid upon trays to be conveyed to the drying ranges, in which they are placed upon grating-shelves that slide on fledges in the drying-houfes. These are placed on the fides of galleries, for the convenience of being easily depofited upon them and removed again. It is kept in thefe till it is fufficiently dried to be laid up in other rooms, until the whole of the crop has undergone the fame operations, and the workmen are ready to manufacture it.

It is intimated in the Corrected Lincolnsire Report on Agriculture, that to prepare it for ufe in the art of dyeing, it is neceffary for it to take on a proper flate of fermentation, which is accomplished in the course of seven or eight weeks, and, in the technical language of the art, is termed couging. It is effected by regrinding the balls, in the fame mill as before, to a fine powder, and then spreading it upon the floors of the rooms in which the balls were formed, to the thickenfs of about three feet; where it is then moistenèd with water, fo as to keep it in a proper flow flate of fermentation; and so managed by turning that it may pervade the whole in an equal manner. In this buffinæs, the direcțion of an experienced workman is neceffary. In the turning, it is of much importance that the parts of the materials be perfectly divided, which can only be effected by a nice management of the shovel: and it is added that much advantage has been found in the goodnes of the woad, from the drying and foring of it being performed in a careful manner. When this attention is neglected, the woad will not, on being broken between the finger and thumb, draw out into fine hair-like filaments, or, in the technical language of the manufacturer, beaver well; as the ufe of this fubftance in the blue vats of the dyer, is not merely to afford the colour of the plant, but, by bringing on a very gentle fermentation, excite the indigo in the fame vat to yield its colouring principle more perfectly. This is even neceffary for its own colouring-matter being fully impuritate. The fubftance should, therefore, be fo prepared in the different operations as to produce this effect in the moft certain and perfect manner. When the heat in the proceses of couging has gone too far, the fubftance will be what is termed foog; and when it has not proceeded to a fufficient degree, it will be what is called beaver. If the material be good, it does not foil the fingers on being rubbed between them; but fuch as is heavy does. In the conclusion of the proceses, the cooling is effected in fo gradual a manner, as to render it not fit for taking on the fame proceses; and of course proper for being preferred in calks, or in any other way. It is then ready for ufe.

The preparation of woad for dyeing, as practiced in France, is minutely described by AFRUC, in his Memoirs for a Natural History of Languedoc. The plant puts forth at first five or fix upright leaves, about a foot long, and fix inches broad; when these hang downwards, and turn yellow, they are fit for gathering; five crops are gathered in one year. The leaves are carried directly to a mill, much resembling the oil or tan-mills, and ground to a smooth paste. If this proces was deferred for some time,
they would putrefy, and fend forth an insupportable stench. The paste is laid in heaps, pressed close and smooth, and the blackish crust, which forms on the outside, reunited if it happens to crack: if this was neglected, little worms would be produced in the cracks, and the woad would lose a part of its strength. After lying for fifteen days, the heaps are opened, the crust rubbed and mixed with the inside, and the matter formed into oval balls, which are pressed close and held in wooden moulds. These are dried upon hurdles; in the sun, they turn black on the outside; in a close place, yellowish, especially if the weather be rainy: the dealers in this commodity prefer the first, though it is said the workmen find no considerable difference between the two. The good balls are distinguished by their being weighty, of a agreeable smell, and when rubbed of a violet colour within. For the use of the dyer, these balls require a farther preparation: they are beat with wooden mallets, on a brick or stone floor, into a gross powder; which is heaped up in the middle of the room to the height of four feet, a space being left for passing round the sides. The powder, moistened with water, ferments, grows hot, and throws out a thick fetid fume. It is shovelled backwards and forwards, and moistened every day for twelve days; after which it is stirred less frequently, without watering, and at length made into a heap for the dyer.

The powder thus prepared gives only brownish tinctures, of different shades, to water; to rectified spirit of wine, to volatile alkaline spirits, and to fixed alkaline liquor: rubbed on paper, it communicates a green taint. On diluting the powder with boiling water, and after standing some hours in a close vessel, adding about one-twentieth part of its weight of lime newly flaked, digesting in a gentle warmth, and stirring the whole together every three or four hours, a new fermentation begins, a blue froth arises to the surface, and the liquor, though it appears itself of a reddish colour, dyes woollen of a green, which, like the green from indigo, changes in the air to a blue. This is one of the nicest processes in the art of dyeing, and does not well succeed in the way of a small experiment.

A text proposes the manufacturing of fresh woad leaves in Europe, after the same manner as the indigo plant is manufactured in America; and thus preparing from it a blue secula similar to indigo, which from his own experiments he has found to be practicable. Such a management would doubtless be accompanied with some advantages, though possibly woad so prepared might lose those qualities which now render it, in a large business, preferable on some accounts to indigo, as occasioning greater dispatch when once the vat is ready, and giving out its colour less histrically, so as to be better fitted for dyeing very light shades. Neumann's Chem. by Lewis, p. 437, &c.

The ancient Gauls and Britons used to dye flax in their bodies with this plant, and were probably led from this application of it to use it for dyeing cloth.

Some hold that it was from this plant glastra took its denomination; though others derive both glas and glastra from the British glafs, which to this day denotes a blue colour. See Glass.

A woad blue is a very deep blue, almost black; and is the base of so many sorts of colours, that the dyers have a scale, by which they compute the divers casts or degrees of woad, from the brightest to the deepest.

Woad, in Bulmary. (See Isatia.) There are four species.

The broad-leaved woad is cultivated in several parts of