WOAD, in *Agriculture*, a plant cultivated in the field for the uſe of the dyers. It is a plant which has a ſtrong thickiſh 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 freſh, 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 tracts extending upon the borders of the different large rivers are chiefly employed for the growth of this ſort of crop; and it has been ſhewn 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 houſes and expenſive machinery that are neceſſary for its preparation may be kept conſtantly and regularly employed in the buſineſs.

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 buſineſs of preparation.

tion. In cafes where the foils are fufficiently dry, only breaking them up early in the month of February; and where the contrary is the cafe, 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-flices may be well turned, laid flat, and nicely jointed, a perfon is employed with a fpade for the purpofe of adjufting them. This prevents the graffy matters from rifing in the feams. When this has been done, the furface is repeatedly harrowed over, to raife a fufficient depth of good mould for the drill to work in; and before the feed 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 fo fine a ftate of mould, or the graffy material fo effectually covered and deftroyed, from which injury may be done to the woad plants in their early growth.

But a method which is equally effectual with the firft, more expeditious, and which has a fuperiority over it, in more completely deftroying grubs, infects, 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 practifed where the fward is rough, and abounds with rufhes, fedge, and other plants of the coarfe kind, but might be had recourfe to on others, with vaft benefit.

Where the latter modes are made ufe of as foon as the feed has been put in, the land fhould be carefully drained by forming grips in fuitable directions, as wherever water ftagnates, the woad plants are liable to be injured or deftroyed.

Seed.—In refpect to the feed, it fhould be collected from ground that has been left covered with the beft plants from the preceding feafon, as they only run up to ftem and form feeds in the fecond year; and in order to have good feed, the leaves fhould not be cropped at all or but once, the ftems being fuffered to remain till the feeds in the huſks become perfectly ripened; which is fhewn by their attaining a browniſh-yellow colour, and the pods having a dark blackiſh appearance. It fhould then be gathered as foon as poffible, by reaping the ftems in the manner of grain, and then fpreading them in rows thinly upon the ground if the weather be fine, when in the courfe of a few days they will be in a ftate to be threfhed out from the huſks or pods. When they are fuffered to remain too long, the pods are liable to open, and fhed the feed. Although the pod in which the feeds are contained is of a large fize, the feeds are lefs than thofe of the turnip. New feed, where it can be procured, fhould always be fown in preference to fuch as has been kept for fome time; but when of the latter kind, it fhould be fteeped for fome time before it is put into the ground.

In regard to the quantity of feed which is neceffary, it muft be regulated by the foil, and the manner in which it is fown. Where the drill is employed, lefs will be required than in the broad-caft method. It has been found that a rood of land, where the crop is good, will in general afford feed fufficient for eight or ten acres; and in fome cafes, in the broad-caft method, five or fix bufhels are made ufe of to the acre. In Kent they ufe ten or twelve pounds to the acre.

Sowing.—The time of fowing crops of this nature muft be regulated, in fome degree, by the mode of preparation that has been employed. Where the firft of the above methods has been followed, it will be much later than in the other cafes. But early fowing is in general to be preferred, as there will be lefs danger of the plants being injured by the attacks of the fly or grub. Where the weather is fuitable, and the land in a proper ftate of preparation, the feed may be fown in the latter end of February or March, continuing the fowings, in different portions of land, till about the middle of May, at fuitable intervals of time to vary the times of cropping the leaves of the plants. The late fowings are commonly executed about the latter end of July, or early in the following month at the fartheft.

With refpect to the manner in which the feed is fown, it differs according to the nature and ftate of preparation of the land. Where it is in a fine ftate of mould, the drill or row method is the method moftly practifed, which is by much the beft, as by it the plants may be kept more eafily clean and free from weeds, becoming more ftrong and vigorous, from the earth being more ftirred about the plants: but where the contrary is the cafe, the broad-caft mode is generally followed; but which does not by any means admit of the plants being kept fo free from weeds, or the mould fo well ftirred about the roots of them.

Where the firft method is had recourfe to, the feed is fown by a drilling-machine, fuch as is ufed for turnips, in equidiftant rows, eight or nine inches apart, covering it in, either by means of a harrow attached to the implement, or by paffing a light common harrow over the ground afterwards, once in a place, raking off any clods that may be prefent to the fides, or into the furrows: but in the latter mode, it muft be difperfed by the hand in as equal a manner as poffible, over the whole of the land, being then harrowed in by a light harrow, fo as to leave the land in as even and level a ftate as poffible. The ground is frequently rolled afterwards, that the furface may be left as even as poffible.

In favourable feafons with good feed, the plants moftly appear in the courfe of a fortnight, when much attention fhould be paid to fee that they are not deftroyed by the turnip-fly, or the frofts in thofe of the more early fowings; as, where that is the cafe, the land fhould be immediately refown; as in fome cafes it is not uncommon to fow the greateft part of the crop two or three times over. In the very late fowings, where the crops rife thin on the ground, it is fometimes a practice to give a better plant by forming holes with a hoe in the vacant fpots, and directing feeds to be dropped into them by the hand by women or children. This is the cafe with the late fpring-fowings till the beginning of June, or a later period.

Culture while growing.—From mush of the goodnefs of the woad plants depending on the luxuriance of their growth, and the thicknefs of their leaves, it is neceffary to beftow great attention in the culture of the crop while growing. It is adviſed that the fpring-fown crops, as well as thofe that are fown in the latter part of the fummer, fhould have the firft hoeings given them as foon as the plants are fully diftinguifhable above the ground, as by this means the weeds will not only be prevented from retarding the vegetation of the plants, but thefe by being thinned out to greater diftances be more at liberty to advance and become vigorous in their firft or early growth, which is a matter of much confequence to the fuccefs of the crop; and fecond hoeings fhould be given in the courfe of four or five weeks afterwards, when the plants fhould be thinned out to the full diftances at which they are to ftand, which may be fix or feven inches, or more, according to the goodnefs of the foil, conftantly leaving fufficient room to prevent the plants from being in any way crowded. The work is fometimes executed in much the fame manner as for turnips, by hand-hoes; but in others by fmall fhort fpuds, ufed with one hand, while the other is employed in clearing away the weeds; the labourers, moftly women and children, kneeling while they perform the work. When this work has been done, nothing further is neceffary till the firft cropping of the

the leaves has been performed, when the plants ſhould be again immediately well weeded; and after each cropping the ſame operation be had recourſe to; the extent of crop cleared in the day being, in moſt caſes, weeded before night.

With the late-ſown 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 ſtirred 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 weeded, and the ſame operation be had recourſe to after each cropping of the leaves, as in the above caſe.

In reſpect to the buſineſs of gathering the crops with the ſpring-ſown 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, ſeaſon, and climate; but for thoſe put in at a later period in the ſummer, they are often fit to be gathered earlier. This buſineſs 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 goodneſs is ſaid to be expended, and they become leſs in quantity, and of an inferior quality for the purpoſes of the dyer. In favourable ſeaſons, where the ſoils are rich, the plants will often riſe to the height of eight or ten inches; but in other circumſtances 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 beſt cultivators ſeldom take more than two, which are ſometimes mixed together in the manufacturing of them. It is neceſſary that the after-croppings, when they are taken, are conſtantly kept ſeparate from the others, as they would injure the whole if blended together, and conſiderably diminiſh the value of the produce. It is ſaid that the beſt method, where a third cropping is either wholly or partially made, is to keep it ſeparate, forming it into an inferior kind of woad.

Upon an acre of land, when well managed, in favourable ſeaſons, 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 ſix or ſeven, and ſometimes much more.

Seeding-Crops.—With ſuch parts of the crops as are reſerved for ſeed, it is a practice with ſome to crop the leaves two or three times the firſt year, and then leave the plants to run up to ſeed in the following one; but it is a better practice to only remove the ſide-leaves, as in this way the plants are leſs weakened, and the produce of the ſeed much increaſed. The plants are likewiſe ſometimes fed down by ſheep during the winter ſeaſon; 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 ſeveral proceſſes to prepare it for the dyer; but in the improved method it is conveyed in one-horſe carts, ſo contrived 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 hoiſted 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 purpoſe have ſeveral wheels for grinding the plants, which have leſs diameters on one ſide 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 moſt convenient. The materials are preſerved under the grinding-wheels by proper contrivances, which, as ſoon as they are ſufficiently reduced, force it out of the tracks upon the ſtone floors on the ſides; thus making way for new parcels without the mill being ſtopped. The bruiſed woad is then thrown into rooms on the ſides of the mill, deſtined for its reception, by means of ſhovels. In theſe it remains till the juice is ſo much drained off as to leave it in a proper condition for being formed into balls; which is done by labourers, with apparatus for the purpoſe, and then laid upon trays to be conveyed to the drying ranges, in which they are placed upon grating-ſhelves that ſlide on ſledges in the drying-houſes. Theſe are placed on the ſides of galleries, for the convenience of being eaſily depoſited upon them and removed again. It is kept in theſe till it is ſufficiently dried to be laid up in other rooms, until the whole of the crop has undergone the ſame operations, and the workmen are ready to manufacture it.

It is ſtated in the Corrected Lincolnſhire Report on Agriculture, that to prepare it for uſe in the art of dyeing, it is neceſſary for it to take on a proper ſtate of fermentation, which is accompliſhed in the courſe of ſeven or eight weeks, and, in the technical language of the art, is termed *couching*. It is effected by regrinding the balls, in the ſame 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 thickneſs of about three feet; where it is then moiſtened with water, ſo as to keep it in a proper ſlow ſtate of fermentation; and ſo managed by turning that it may pervade the whole in an equal manner. In this buſineſs, the direction of an experienced workman is neceſſary. 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 goodneſs of the woad, from the drying and ſtoring 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 uſe of this ſubſtance in the blue vat 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 ſame vat to yield its colouring principle more perfectly. This is even neceſſary for its own colouring-matter being fully imparted. The ſubſtance ſhould, therefore, be ſo prepared in the different operations as to produce this effect in the moſt certain and perfect manner. When the heat in the proceſs of couching has gone too far, the ſubſtance will be what is termed *foxy*; and when it has not proceeded to a ſufficient degree, it will be what is called *heavy*. If the material be good, it does not ſoil the fingers on being rubbed between them; but ſuch as is heavy does. In the concluſion of the proceſs, the cooling is effected in ſo gradual a manner, as to render it not fit for taking on the ſame proceſs; and of courſe proper for being preſerved in caſks, or in any other way. It is then ready for uſe.

The preparation of woad for dyeing, as practiſed in France, is minutely deſcribed by Aſtruc, in his Memoirs for a Natural Hiſtory of Languedoc. The plant puts forth at firſt five or ſix upright leaves, about a foot long, and ſix 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 into a ſmooth paſte. If this proceſs was deferred for ſome time,

they would putrefy, and ſend forth an inſupportable ſtench. The paſte is laid in heaps, preſſed cloſe and ſmooth, and the blackiſh cruſt, which forms on the outſide, re-united 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 ſolid in wooden moulds. Theſe are dried upon hurdles: in the ſun, they turn black on the outſide; in a cloſe place, yelloviſh, eſpecially if the weather be rainy: the dealers in this commodity prefer the firſt, though it is ſaid the workmen find no inconſiderable difference betwixt the two. The good balls are diſtinguiſhed by their being weighty, of an 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 lixivia: rubbed on paper, it communicates a green ſtain. 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 ſlacked, 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.

Aſtruc 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 fecula 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 haſtily, 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 or ſtain 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 glaſs took its denomination; though others derive both *glaſs* and *glaſtum* from the Britiſh *glaſs*, 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 compoſe the divers caſts or degrees of woad, from the brighteſt to the deepeſt.

WOAD, in *Botany*. (See ISATIS.) There are four ſpecies.

The broad-leaved woad is cultivated in ſeveral parts of England for the purpoſes of dyeing, being uſed as a foundation for many of the dark colours.

Some feed down the leaves of woad in winter with ſheep; a practice which Mr. Miller condemns.

Woad grows wild in ſome parts of France, and on the coaſts of the Baltic ſea: the wild woad, and that which is cultivated for the uſe of dyers, appear to be of the ſame ſpecies.

Beſide the plant properly ſignified by the name woad, which dyes a blue colour, we have two others known in our Engliſh herbals under that name, as alſo that of *wold* or *weld*. Theſe are both called by the common people *dyer's weed*, and are the *luteola* and the *geniſta tinctoria*.

The ancients confounded all theſe three plants alſo under the ſame names. Paulus Ægineta ſeems to make them all the ſame plant; and Neophytus, ſpeaking of the *iſatis*, or our woad, properly ſo called, ſays, that it was called by the Latins *lutum*. This *lutum* has been by ſome underſtood to mean the *luteola*, and by others the *geniſta tinctoria*; but the latter opinion only is right, for it is deſcribed to us by the ancients as having leaves like the *linum*, or flax, and flowers like the broom.

WOAD-*Mill* and *Houſe*, that ſort of mill and houſe which is neceſſary and proper for preparing and fitting this kind of ſubſtance for the uſe of the dyer. The repreſentation of a mill and excellent apparatus for effecting the preparation of the woad plant, which is made uſe of by Mr. Cartwright, with much ſucceſs and advantage, in Lincolnſhire, may be ſeen in the ſecond volume of the "General Dictionary of Agriculture and Huſbandry."