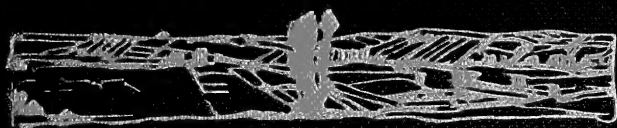


# The BOOK of VETCH



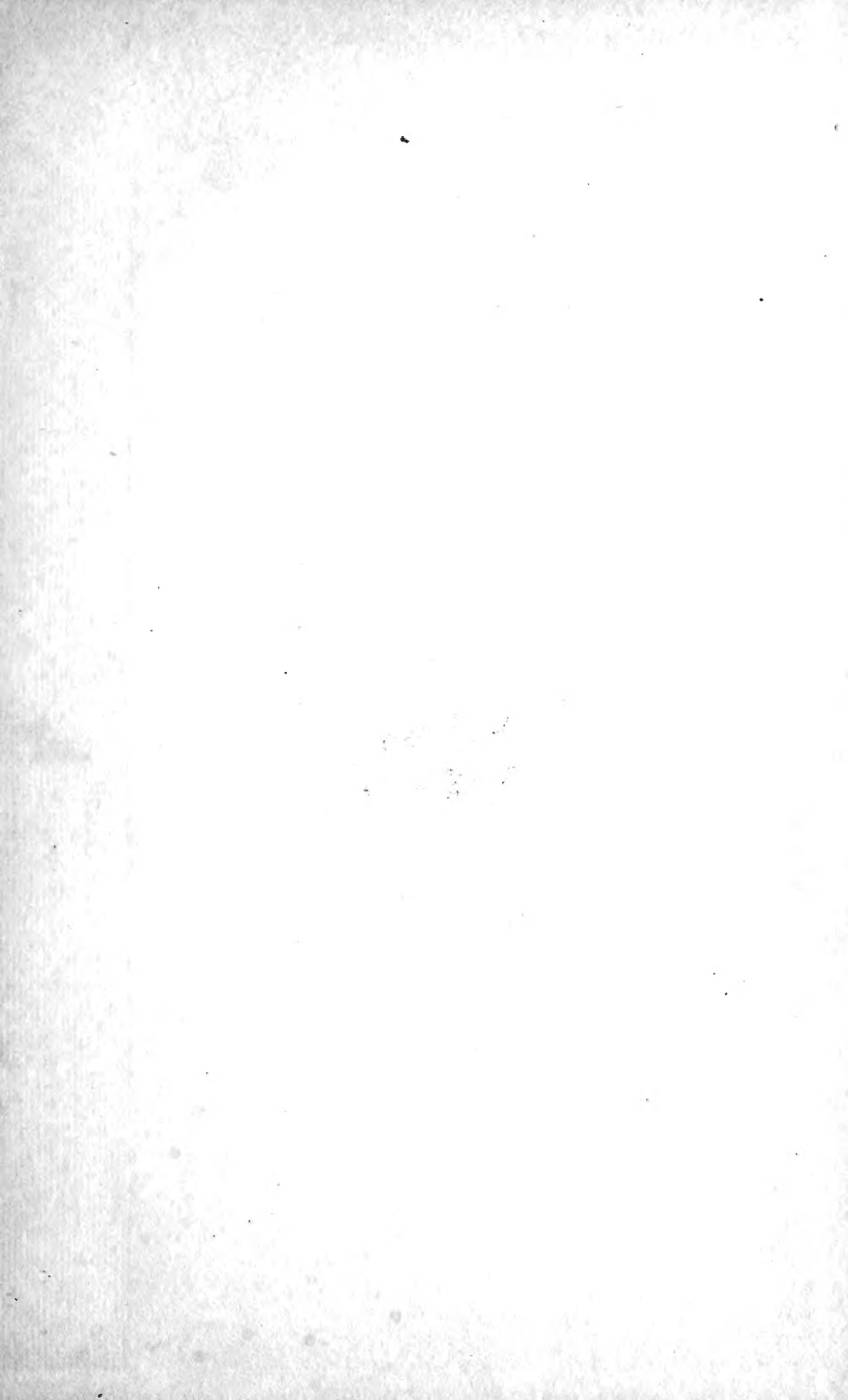


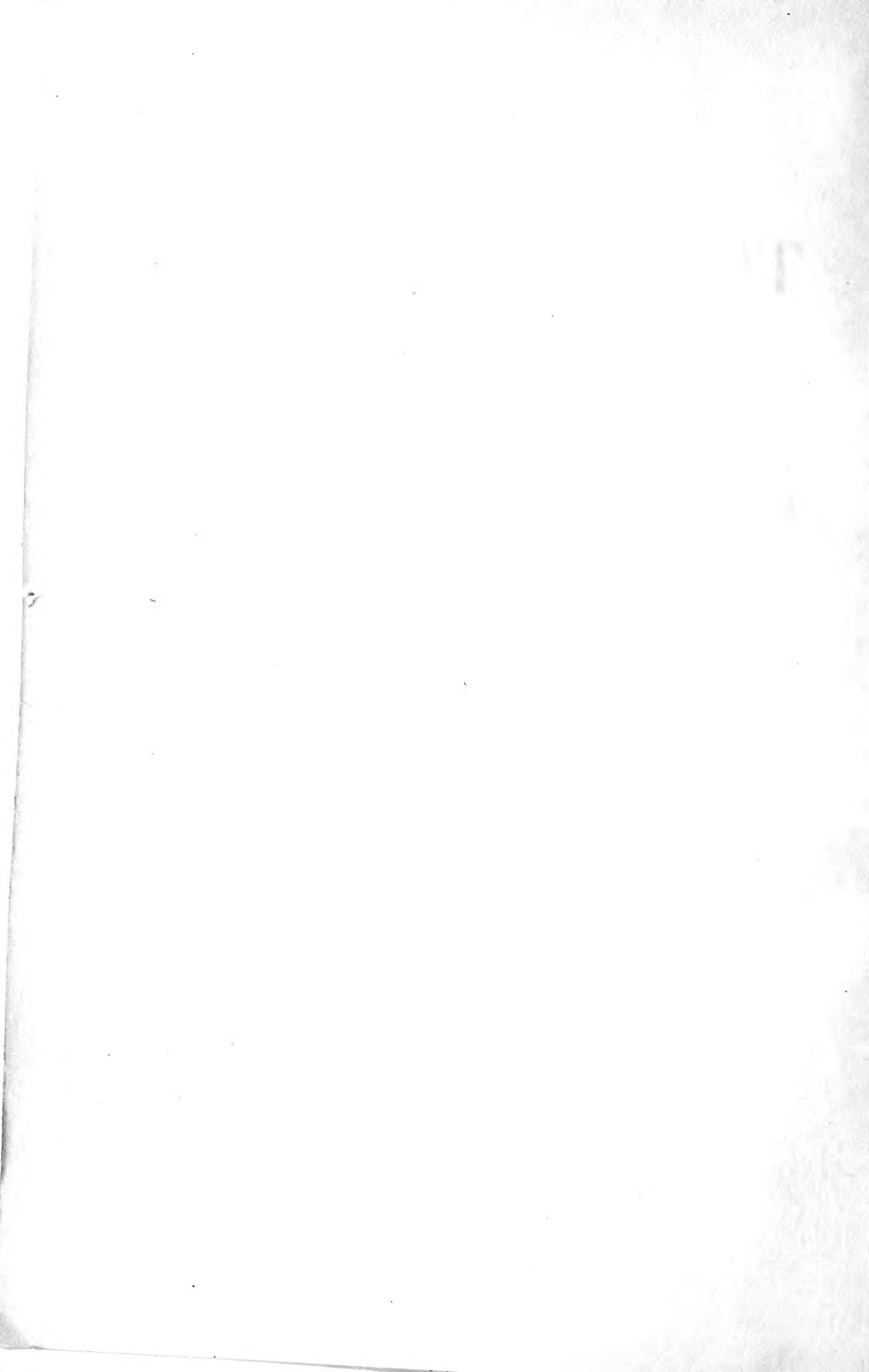
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# The Book of Vetch



History, Varieties and Uses  
Its Value as a Forage, Fertilizer, Cover  
and Green Manuring Crop



God Made All Things to Man's Delightful Use



By  
WILLIAM C. SMITH

Author of "How to Grow One Hundred Bushels of Corn  
Per Acre on Worn Soils"

Illustrated

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Successful Farming

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William C. Smith  
of  
Indiana



### The Birth of Vetch

Nature one day in cheerful mood,  
Conceived, and bore a plant of wondrous good.  
She gave it slender trailing stems,  
Long noduled roots and pedicel racemes.

From bluish tints of soft Italian sky,  
She garnered for its bloom, the purple dye.  
With brush of Fairy build and skilled artistic hand,  
She painted its queenly flower—the fairest in the land.

Into its nature she did impart  
The alchemic soil restoring art.  
Upon her work she gazed bewitched,  
For she had wrought the precious vetch.

It is a strange economy of Nature, that the plants which produce the most food for man and beast, are the ones that feed upon and eventually consume the fertility of the soil.

It is a stranger economy of Nature, that the plants that produce the smallest amount of food for man and beast, are the ones that feed the soil with the elements it needs to make it fertile.

The vetch plant, while producing no direct food for man, yet furnishes succulent fat-producing food for beast, and the most precious soil-building materials in the greatest abundance.

“Give ye ear, and hear my voice; hearken, and hear my speech.

“Doth the plowman plow all day to sow? Doth he open and break the clods of his ground?

“When he hath made plain the face thereof, doth he not cast abroad the fitches, (vetch) and scatter the cummin, and cast in the principal wheat and the appointed barley and the rye in their place?

“For his God doth instruct him to discretion, and doth teach him

“For the fitches (vetch) are not threshed with a threshing instrument, neither is a cart wheel turned about upon the cummin; but the fitches (vetch) are beaten out with a staff, and the cummin with a rod.”

—Isaiah XXVIII 23 to 27 inc.





'A SINGLE HAIRY VETCH PLANT, REPRESENTING ONE MONTH'S GROWTH IN THE SPRING

There Are More Than Thirty Stems to This Plant. No Attempt Was Made to Secure all the Roots of This Plant, as Vetch Roots Are so Numerous, Lengthy and Fine, It is Almost Impossible to Take Them From the Soil.



## INTRODUCTION.

In a fall month in the early forties of the nineteenth century, a sturdy young farmer with his ox team and old-fashioned Pennsylvania covered wagon containing his young wife, two children and a few household effects, drove into the thick woods of that portion of the Indian Reserve afterwards known as Howard County, Indiana, staked his claim and began the pioneer task of clearing a farm and building a home. Time progressed, the clearing grew in size, the log house and barn were replaced with more pretentious frame buildings, and the family circle had grown to ten in number, the youngest being the author of these lines.

In the early part of the first year of the war of the rebellion, this pioneer and his family moved from the farm he had carved out of the wilderness of the great forests of that region, to another farm "nearer town," and the old pioneer home became a tenant farm and for forty-five long years was handled by the "whip and spur" method of farming. Its once fertile acres were so wasted of their fertility, that when in the year 1905 the old pioneer farmer passed into his last sleep and the farm went into the possession of the author and his brother, it was a typical worn-out farm, producing corn at the rate of fifteen to twenty bushels to the acre.

To the author it seemed a disheartening task to retain and undertake the rebuilding of this worn-out farm, although it was his birthplace and the tender memories

of father, mother, brothers and sisters were woven in its every fiber. So when his brother offered to buy his interest he eagerly grasped the opportunity and sold it at a cheap figure, arguing to himself that he could take the money and buy a better farm nearer to his home.

Thus the old home farm passed from his possession, and he set about to invest the money received from it in another farm.

While the author had been near the soil all his life and had farmed a great deal, yet he never had really been "up against" the worn-soil problem until he inherited a portion of the old worn-out home farm, and even then he had not been really initiated, for he had sold his interest in the home farm before he had grown a crop of his own upon it, so that when he cast about to buy another farm, he was not experienced in the worn soil problem. In the purchase of a farm he considered location and cheapness, giving worn soil but very little consideration, so without inquiry he purchased in 1906, at a cheap price, a farm two miles from his home town, nicely located with reference to markets, good roads, etc.

As soon as it became known that the author had purchased this farm, people who were best acquainted with it wondered what possessed the author to buy such a farm. It was freely said that it could not be understood how a man who had been successful in professional life, manufacturing, and who was well posted on farming, would buy a farm which was so well known to be one of the poorest and most unproductive in the county.

Before the first season's crops were all harvested the author realized that there was foundation for such talk, and that he was really and truly up against the

worn-out soil problem, and he was ready to turn over to an abler man the job of building up the worn-out soil of his newly purchased farm. He was really discouraged and sick at heart. But the fighting blood of revolutionary ancestry flowing in his veins must have asserted itself and put fighting vigor into him, for he cast aside his discouragement and heart sickness and said to himself, "I will conquer this worn soil and show these people what can be done with a worn-out farm."

But how was he to do it? And in considering how he should conquer he learned that necessity is the best teacher, that she teaches us lessons of the greatest value.

Realizing that something must be done to save his farm from the doom of the abandoned farm, he was driven to sit at Necessity's feet and learn her lessons on the building up of worn-out soils. He entered into the study of the worn-soil problem with an interest intense and absorbing. He learned the old lesson that there are two classes of plants. The one that feeds the soil, the other that feeds upon and consumes the elements of soil fertility, and that the latter class furnishes the most food for man and beast, and hence are the plants chiefly grown by the husbandman.

He also learned the lesson that the chief need of worn-out soils was drainage, nitrogen and organic matter.

The problem of drainage was a simple one, but the alchemic art of transmuting worn-out soil into "pay dirt" and at the same time make it produce paying crops, became with the author the problem of the hour.

In solving this problem he reasoned that nitrogen, the element soonest farmed out of the soil, is mostly

found in vegetable or organic matter and in the air above the soil; that when worn soil is abandoned, nature restores it to health and vigor by growing upon it those weeds, grasses, plants and trees that furnish large quantities of organic matter, and that have the power of drawing nitrogen from the air; that it was impossible to obtain sufficient quantities of barnyard manure to restore his soil, and that practical experiments had demonstrated that commercial fertilizers alone would not restore soils.

So the conclusion was reached that the remedy was the use of some plant that would grow and mature itself between crops, whose root and branch system would produce a large quantity of vegetable or organic matter and which had the power to grow a large number of root nodules, the homes of the nitrogen-gathering bacteria.

The author by accident found just such a plant. He found it in a simple manner—by the reading of a seed catalogue which described the virtues of the sand, or hairy vetch, and while the description of this plant in this catalogue seemed to be so extravagantly exaggerated, yet the author, spurred on by the necessity of doing something to restore his worn-out farm, was eager to grasp at anything that seemed to have in it any element of relief. He concluded that if this plant had only one-tenth of the soil-restoring powers claimed for it, it was the soil panacea needed by the owners of worn-out soil, so he procured seed of the sand, or hairy vetch, and in the fall of 1906 sowed it upon two acres of his poorest land. This was the beginning of his experiments with, and investigations of, the vetch plant, which has led up to the preparation of this volume.

Within the last few years so much has been written in the agricultural papers about vetch that we feel

that a book on vetch is needed. As to the qualifications of the author to write such a book, he has only to say, that for six years he has grown on his farm and on farms under his control, hundreds of acres of the vetch plant. And upon the old home farm mentioned in the beginning of this introduction, there has been grown by his brother on an average of fifty acres each year for the past five years, which have been closely observed by the author.

The author has also written to growers of vetch all over the world and obtained their experience with the plant, so he feels qualified to write this volume upon so valuable and so little known plant to the agricultural world, and so submits it to judgment.

The growing of the vetch plant has been a pleasing and profitable experience with the author. It has led him into the mysteries and intricacies of the worn-soil problem. Its restoration of the worn soils upon his "Vetchfalfa Farm" and his old pioneer home farm until they produced crops beyond his fondest dreams, have been experiences that have given him the pleasure of doing seemingly impossible things, which is the most pleasing and lasting pleasure that can come to man.

It is hoped that the study of this book will prove so great an inspiration to the reader that he will join the company of those who are seeking the solution of the worn-out soil problem—the most vital question now confronting the American people.

Delphi, Indiana,  
January, 1912.

WILLIAM C. SMITH.

## CHAPTER I.

"Out of names, words, traditions, passages of books and the like, we do save and recover somewhat from the deluge of time."—Bacon.

### Historical Resume.

There is a tradition that vetch was born beneath the soft Italian sky. History does not prove tradition's claim, for the dissemination of vetch has been so wide that its native country is unknown.

Its ancient Latin name "vicia," and the fact that the old Roman agriculturist grew it extensively as a "balance ration" for the feeding of his soil and domestic animals, is some evidence of its Italian origin. However, the "Prophet of the Messiah," Isaiah, who prophesied during the reign of Nebuchadnezzar, one of the early kings of Babylon, wrote of fitch, or vetch.

An old name for vetch was "cicer," or chick pea, which belonged to the legume family, and which grew in Asia, Africa, and the south of Europe. Its nutritious seeds were used in cookery and were roasted and called "parched pulse" and used as food for travelers in the eastern deserts. This was, no doubt, the parched pulse which the young unblemished Daniel and his Israelitic companions requested the prince of eunuchs to give them to eat when they purposed in their hearts not to defile themselves by eating and drinking King Nebuch-





HAIRY VETCH PLANTS GROWN IN NORTHERN INDIANA  
TAKEN FROM SOIL ABOUT MAY 1st.

Note Heavy Growth of Foliage, and the Large Number of Nodules on Roots.



adnezzar's meat and wine, the eating of which pulse, and the drinking of water, made them fairer of countenance and fairer in flesh than those who ate the king's meat and drank the king's wine.

These facts would therefore indicate that vetch was known and cultivated in the region about Babylon from its foundation. And as the Babylonish Empire was founded one hundred and fifteen years after the Deluge, it would therefore follow that the vetch plant was really known to agriculture when Noah and his kin left the Ark and took up again the cultivation of the soil.

Vetch was a favorite with the Roman farmer, for his fields were fertile with it, yet it never gave him any annoyance—it needed no cultivation or manure to make it flourish. The Roman farmer had three seasons for the sowing of vetch; one about the setting of the star Arc-turus; one in January, and one the last of March. The first sowing was for the seed crop, and the last sowing for foliage. With the Romans it flourished best in dry places, but it grew freely in the shade.

The lentils, extensively cultivated in Europe as a food for stock, both herbage and seed being used for that purpose, and so much prized by the Mexicans as food, and used by the Germans as a basis of the "Linsen soup," is a species of vetch.

Certain species of the vetch plant, however, are undoubtedly native to America, like the cow vetch, or blue vetch (*vicia cracca*) having stems two to three feet in length, and found on the borders of thickets or the edge of cultivated fields, and which was undoubtedly the wild vetch found on our prairies.

One of the vetches of agriculture, "*vicia sativa*," or spring vetch, is beyond question a native of southern

Europe and western Asia, and from there was disseminated to all parts of the civilized world.

The name "vik" from which was derived "vicia" dates from a remote period in Europe, for it is mentioned in the language of the Pelasgians who were the early inhabitants of the Grecian Peninsula, and who existed earlier than the fifteenth century B. C., a mighty people, carrying on an extensive commerce, and having a large navy, and who made war with Ramses II, King of Egypt, and conquered lower Egypt.

The vetch plant was also found among the Slavs from whence sprang the Russians, who stand today as one of the greatest growers of vetch, and from whom we receive most of the vetch seed that is imported to this country.

It is said that the vetch plant is distinct and useful enough to herbivorous animals to have received common names from the earliest times.

There was also a species of vetch grown by the ancient Greeks, seed of which has been found in the excavations of Troy. And centuries ago it was cultivated in Spain.

"*Vicia sativa*," or spring vetch, was brought to America about the time of the Revolutionary War, but the American farmer has been indifferent to its great value as a fertilizing and soiling plant. So, for all the years since its adoption to American soil, it has been rarely cultivated except in recent years. This is the common vetch, or tare, (not, however, to be confounded with the tare of Scripture, for that was a different species of plant) which has for ages been cultivated throughout Europe for a fodder for cattle, and which was for many years regarded as a weed in America.

The "*vicia villosa*," hairy, sand, or winter vetch, was brought to America from Europe in 1847. This variety is most commonly called Russian vetch—not because it is a native of Russia, but for the reason that on account of its hardiness and value as a soiling, fertilizing and seed plant, the Russians grow it extensively, and, as stated, export to the United States and other countries large quantities of its seed. This species of vetch has been extensively cultivated in France for more than a quarter of a century.

In the year 1910 there were 593,000 acres of vetch cultivated in France, which was principally grown in the north and west parts of France, common, or spring vetch being chiefly cultivated.

In Germany the hairy vetch is better known and more extensively cultivated, but it is called "Winter Sand Wicken." It is grown in great quantities upon the sandy lands in the vicinity of Berlin and in the north-eastern parts of Germany, where it is highly prized as a cover and green manuring crop.

All of the experiment stations of the United States have some time or other in the past ten years experimented with many varieties of the vetch plant, the result of which experiments will be given in this volume under an appropriate chapter.

From this historical resume it can readily be seen that the vetch plant is of very ancient origin, and that its merits as a soiling and fertilizing plant have been recognized by the inhabitants of the old world from times very remote. That the vetch has not been extensively cultivated in America, does not argue against its value, for America has had for all the centuries that it has been oc-

cupied, so much rich verdant soil that the American farmer, when he exhausted his land by cultivation, had only to move on and preempt newer lands, rich in grazing for his stock, or which grew native feeds and grasses in abundance, and which was rich in all the elements necessary to grow big crops. Now, when the virgin soil has all been preempted, and the American farmer finds himself in the possession of worn soils and no new lands in sight to subdue, he must turn about and conquer his worn soils by the use of the plants with which the inhabitants of the old countries beyond the seas conquered and restored

“Wastes too bleak to rear  
The common growth of earth, the  
Foodful ear.”





HAIRY VETCH PLANTS GROWN IN NORTHERN INDIANA  
TAKEN FROM SOIL IN LATTER PART OF APRIL

The Stems Were More Than Three Feet in Length.  
Note the Large Number of Nodules on the Roots.

## CHAPTER II.

"All sorts are here that all the earth yields! Variety without end."—Milton.

### Varieties and Characteristics—Its Kindred.

Vetch is a member of the botanical pulse family, or that class of plants called the legumes, or plants that bear their seeds in a pod.

Its varieties have been numbered and described as one hundred and twenty, twenty-three of which are found in northeastern and northwestern North America.

The varieties of vetch are mostly climbing plants, possessing long, slender, weak stems, having tendrils at or near the extreme end of each pinnate leaf. The plant generally being of a clinging or climbing nature, it requires support of other plants to hold it off the ground if it is desired to easily harvest it for hay or to save its seed. The branches generally grow from two to five feet in length, yet the author has known the hairy, or sand vetch, sown on rich ground, to produce branches twelve feet long.

A few of the vetches like Narbonne vetch produce erect branches, which will stand up without support and which do not have tendrils.

The flowers of the vetch are borne in clusters on a long stem with many one-flowered lateral stalks, and generally in shape are like the black locust flower. In shade of color they are pink, violet, purple, blue, and white, the prevailing color being a bluish purple.

Upon close observation the color of the bloom of hairy or sand vetch appears to be blue, but when a field in full bloom is observed at a distance the color is distinctly purple.

No good purpose can be subserved in describing the characteristics of each and all the varieties of vetch, as all vetches have similar characteristics, and the purpose of this volume is to deal chiefly with the two vetches of modern agriculture, to-wit: The hairy, or sand vetch (*Vicia villosa*), and the common, or smooth, vetch, or spring tare (*Vicia sativa*).

However, a few of the other varieties of vetch should be given a brief mention.

Stolley's vetch (*Vicia Leavenworthii*) growing wild in the central and western part of Texas, having small leaves and trailing stems, resists drouth, and makes fine early grazing for stock. It is valuable as a cover and green manuring crop.

A vetch (*Lathyrus hirsutus*) similar in characteristics to spring vetch, and grown in the South for fall and spring pasture, is referred to as a winter vetch, which is somewhat misleading, as it is not hardy north of Mason and Dixon's line.

In the South it may justly be termed a winter vetch. It is chiefly cut and cured for hay.

Dakota vetch (*Lotus Americanus*, or *Hosackia*) found in the northwest of the United States, of a bushy nature, is pastured and cut for hay.

The kidney vetch (*Anthyllis vulneraria*) differing from most all varieties of vetch, in that it lives for more than two years and has spreading stems about one foot high that stand erect; the plant being covered with short,



soft, delicate hairs, and having flowers of yellow to a deep red color. This variety of vetch is found in all parts of Europe and Asia. It has the good characteristic of growing well in the poorest soil, especially those soils found in the limestone regions. It was first cultivated in Germany. This plant has been frequently tested by the United States government agricultural stations, but is reported of little value.

The bird vetch, or wild pea (*Vicia Cracca*) called also blue vetch, cow vetch and French pea, is cultivated in Europe, both for soiling and for hay, and is highly prized in Germany for sheep pasture. It is suitable for low meadows and open woodlands. It is found in the meadows of Vermont and has increased so rapidly in that state as to cause alarm. Yet some farmers regard it as a most valuable plant, and have expressed the wish that their meadows were covered with it. But the majority of farmers deem it a weed pest.

It is a distinct variety of the vetch family, having every characteristic of the vetch plant even to the long, trailing stems, clusters of blue blossoms, pea-like pods and nodule-covered roots. It is found in many of the woodlands of eastern America, Kentucky, Iowa, northward and northwest. The author is of the opinion that this is the vetch known as a weed in the great wheat growing districts of the Northwest and Canada, which survives either heat or cold, and resisting all methods of extermination, grows under the same conditions as wheat itself and mixes its seed with the threshed wheat.

In Vermont it is most commonly found in the meadows and fence rows. It grows best on a strong heavy soil, such as is best suited for timothy, and grows vigorously in the Champlain clays.

When it appears in the meadows it grows so luxuriantly that it smothers out other grasses. It is a deceptive plant in that it grows a less amount of foliage than one is led to expect from its appearance. Its hay is relished by stock and has as much feeding value as clover. Its good points are its value as a haying and soiling crop, and its ability to enrich the soil as a nitrogen gatherer. Its bad points are its seeming antipathy for other plants, as it invariably over-tops and smothers them out and is difficult to kill.

The narrow-leaf vetch (*Vicia angustifolia*) is said to be a perennial by N. L. Willet, who has grown it in the South near Augusta, Georgia, and who also says that as a vetch it is priceless. The seeds of this variety are black and about half the size of the hairy vetch. Its seeds do not ripen at once, and as the seed pods that first ripen shatter their seeds before the later pods mature, it is a difficult matter to save its seed and so, commercially, the seed is scarce. One party claimed that he was three years in obtaining three bushels of seed for a government experiment station. This is one of the most valuable vetches grown if its seeds could be procured in sufficient quantities.

There was a wild vetch that grew on the prairies of Iowa and other western states, which was one of nature's nitrogen gathering plants that assisted in storing these rich prairie lands with the great stock of nitrogen found in them when the American farmer brought them into subjection, but which afterward was farmed out of them by his mining system of agriculture.

Common or smooth vetch (*Vicia sativa*), called also English or Oregon winter vetch, or spring tares, came

from the Old World, has violet-purple flowers borne mostly in pairs, and has swelled, puffy, somewhat flattened, gray mottled seeds. It is a stooling plant having from four to six stalks. This vetch is an annual and is usually sown in the spring. But where winters are mild it may be sown in September and harvested the following May. It will not stand severe cold. The minimum temperature it will endure is about ten degrees above zero, although it has stood a temperature of four degrees below zero in the state of Oregon without injury, when grown upon lands that were well drained. It, however, frequently winter kills even as far south as Georgia. This variety of vetch grows to perfection in the beautiful Willamette Valley of the Northwest, where thousands of acres of it are grown for hay and seed. The hay yields from three to six tons to the acre, and seed, giving financial returns of sixty dollars to seventy dollars an acre. Vast quantities of the seed produced in Oregon are shipped to California orchards, where it is grown as a cover crop. Thousands of acres of this variety of vetch are also grown in Georgia and South Carolina, where it stands in high regard as an improver of soil, especially for the improving of cotton lands, and for the profit received for its hay. As this is one of the two true vetches of agriculture more will be said about it in subsequent chapters.

Hairy, sand, or winter vetch (*Vicia villosa*) are three names for one vetch. It is the hardy vetch of agriculture, withstanding the rigors of winter and is grown in some of the most northern states, even in the extreme northern part of Wisconsin, and it is said to stand the winters of that region. The stems of this variety being more slender than any other variety, it has the trailing or climbing habit and must have support or it trails upon the

**ground.** It is a great stooling plant and so sends out a great number of stems at the surface of the ground, as many as twelve to a plant, the stems in full growth reaching a length of from three to twelve feet, the length depending upon the soil where grown. When seed of the hairy vetch is planted and it commences to grow, a slender, weak-looking stem is first sent up to the height of two or three inches. Soon other stems shoot out from the main stem near the surface of the ground which trail upon the soil. If seed is sown early in the fall and there is sufficient moisture to hasten the growth of the plant, the stems will make a growth of a foot in length before winter, and the plants cover the ground like a carpet and remain green all winter. The fall growth never makes any more growth after winter sets in, but a further growth of the plant commencing in the spring is from new shoots coming out of the main plant stem at the ground. The plant does most of its stooling in the spring. The fall growth remains green for a time, then withers and dies. The new shoots come in the spring very early and grow so rapidly that by the middle of May the plants are in full bloom.

A field of hairy, sand, or winter vetch in full bloom is one of the most beautiful of agricultural scenes. Its delicate, bluish-purple flowers are borne in such great profusion that at a distance a field of them seems like a sea of purple, making such a charming landscape picture as to be never forgotten.

The under surface of the plant is covered with a dense coat of gray hairs from which it gets its name hairy vetch. It gets its name sand vetch from the fact that it flourishes upon sandy lands and seems to be especially adapted for sandy soils, although it readily grows

on any land, and especially upon the poor lands, which makes it a valuable plant for worn-out soils. It gets its name winter vetch from the fact that it is the only variety of vetch plant that will withstand the rigors of a severe winter, or a temperature of zero and under. Its seeds are small, round, and bluish black in color, not uniform in size, and comparing in size to number two and number three bird shot. This variety of vetch affords a larger amount of forage than any other variety. Hairy vetch is an annual and like spring vetch, if sown in the fall, makes its growth between the time it was sown and the following May. It freely matures its seed and will reseed itself if harvesting is delayed until some seed pods have matured their seeds, which shatter in harvesting. Generally hairy vetch matures its seeds and dies in June.

It is claimed in the northwestern part of the United States that if hairy vetch is planted about the middle of April it will mature seed the same season. It is also claimed that if hairy vetch is mowed while in bloom it will, like alfalfa, spring up again and from which said second crop seed can be obtained. And one party in Michigan claims that if it is cut when it is in bloom, and not cut too closely, it can be cut as many as three times. The author has never succeeded in obtaining the second crop, although he has experimented along this line several times.

It is also claimed that it can be sown in April and May and mown in the fall and early the next spring will come forth vigorous, making fine pasture or a crop of hay or seed.

## CHAPTER III.

And God said, let the earth bring forth grass, and the herb yielding seed, whose seed is in itself.—Gen. I, 11.

### Seed and Seeding.

The seed of the common or spring vetch has been described as being swelled, puffy, somewhat flattened and gray mottled in color. The seed of this variety is almost universally of the same size.

The seed of the hairy vetch has been described as being ununiform in size and of a bluish black color. Generally they are about half the size of the seed of the spring vetch. Both of these varieties of vetch seed fully and freely, and both have the characteristic of shedding some of their seed before they can be harvested. As many as one thousand seeds have been known to form on a single hairy vetch plant. The seeds are formed in small pods similar in shape to a pea pod. If these vetches are sown in the fall they will mature their seeds in June following, except in the South where they generally mature their seeds in May.

In Oregon, when the spring vetch is sown for seed, it is sown upon the ground upon which a spring grain crop has been grown. The ground is thoroughly disched, and about seventy-five pounds of seed to the acre is sown, although one hundred pounds gives better results. In the spring, if the growth seems to be rank it is pastured





HAIRY VETCH STEMS SHOWING BLOSSOMS AND SOME SEED PODS  
Note the Seeds in the Pods. This Vetch Was Grown in Northern Indiana, Where the Hairy Vetch Freely Seeds.



with sheep for awhile. When the seed has sufficiently matured the plants are cut with a mower early in the morning, raked up and put in a shock as soon as possible, where it is allowed to remain for about ten days and then threshed with an ordinary threshing machine.

This plan could not be worked successfully in a country subject to heavy rains, but in Oregon the seed matures in the dry season, which is from July 15th to August 1st.

If the plants get wet after they are cut the seed shatters very badly when drying. In some cases the seed is sown with oats and the whole cut with a self-binder. The time for mowing is generally when the lower pods are ripe, and in threshing it is customary to remove some of the concaves of the threshing machine and substitute blanks, and run the cylinder more slowly.

When hairy vetch is sown for seed it is necessary to sow with it some plant like rye, barley, or speltz to hold it up so it can be harvested. For if the plant is sown by itself it trails so closely to the ground that it is almost impossible to cut it, especially where forage is very heavy. When sown with rye or wheat it is a difficult matter to separate the vetch seed from it, although a separator has been invented by J. M. Stone of Lodi, California, which separates vetch seed from wheat. The best plant to sow with it for seed purposes is winter speltz, as the vetch seed is easily separated from the speltz seed.

When the seed is sufficiently matured, like spring vetch, hairy vetch can be threshed with any threshing machine. When the seed is sown with rye and threshed, it may be separated from the rye seed by the construction

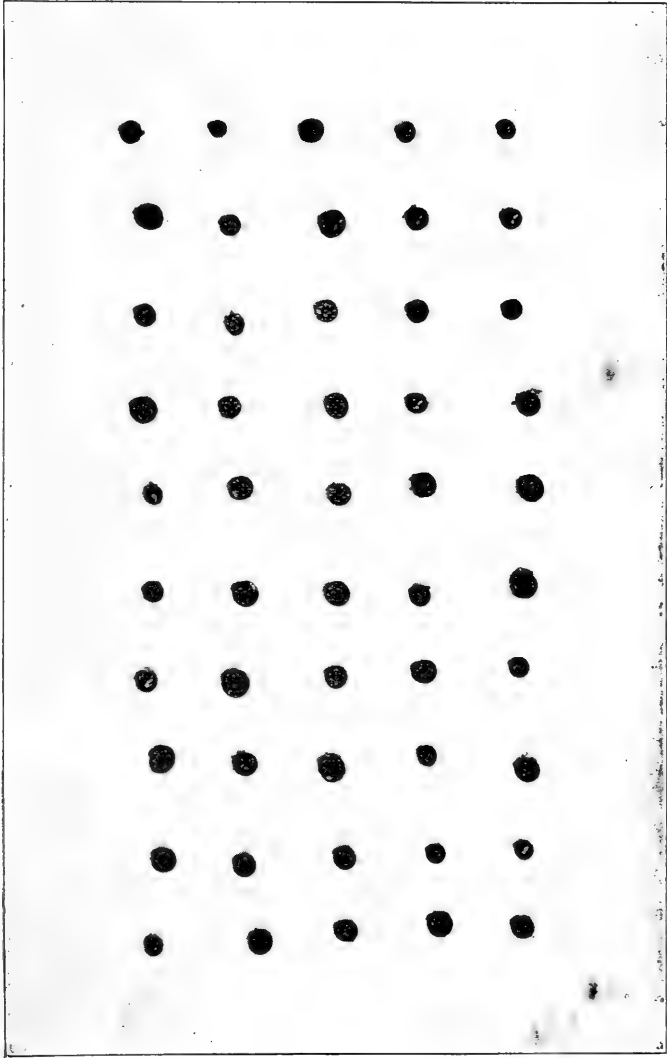
of a heavy belt of canvas about three feet wide and ten feet long, held up at one end at an angle of forty-five degrees with a wooden frame work. The belt should then be turned toward the upper end of the frame work and the mixed seed thrown on it slowly. The sand vetch will roll off the bottom of the belt, while the long rye seed will be caught on the nap of the cloth and carried off at the top. If this separator is properly constructed it will perfectly separate the vetch from the rye seed; but, as stated, if the vetch is sown with winter speltz it can be easily separated with an ordinary fanning mill.

In those localities where rains are frequent at the time the vetch matures its seed there will be some difficulty in saving seed, and if vetch is sown by itself it is likely to decay before it can be threshed. But the author, who lives in a locality where rains are frequent during the harvest of vetch for seed, has found no difficulty in the saving of its seed.

Most of the vetch seed, of both spring and hairy vetch, used in the United States, is imported from Northern Germany and the Baltic Provinces of Russia, which causes the seed to be high priced. The author is informed that in Oregon, which seems to be the natural home of vetch, the seed of both varieties can be easily grown, and where it is profitable to grow it at a price of three cents a pound, that an average crop is fifteen hundred pounds to the acre, although seed crops have been grown that run from sixty to seventy dollars to the acre, gross.

For the past season or so the author has had his own vetch seed grown, having sown it with a mixture of rye and then sowed both rye and vetch without separa-





HAIKY VETCH SEED. NATURAL SIZE

tion. This is a satisfactory plan where you wish to use it for fertilizing purposes only. When sown in this manner the mixture should consist of about one peck of rye and thirty pounds of vetch seed to the acre when sown in corn, or about one peck of rye and fifty pounds of vetch seed if sown in the open.

If farmers would use this method of securing their own seed then the seed could be procured at such a reasonable price that there would be no excuse for not growing it. And if the farmer wishes to secure the unmixed seed it would only be necessary to sow it with winter speltz, and separate, in which event he would not only secure an unmixed supply of vetch seed, but would also obtain some of the speltz straw, both of which are valuable feeds, and are much relished by stock of all kinds.

Prior to 1905 there was a tariff on all vetch imported into the United States, amounting to about thirty per cent of the cost of the seed, or from seventy-five cents to a dollar and twenty-five cents a bushel of sixty pounds. In the spring of 1895 N. L. Willet of Augusta, Georgia, went before the United States Treasury Department and convinced the authorities that they were mistaken as to the classification of vetch seed, and caused them to recognize their mistake and reverse all their former decisions, and allow vetch seed to come in free of duty, which action caused the great saving above mentioned, and for which action Mr. Willet should receive much praise.

One thing has been in the way of procuring vetch seed from the northwestern part of the United States and that has been the excessive freight rates. For this reason the South cannot profitably purchase and ship seed from this region, so they are compelled to buy im-

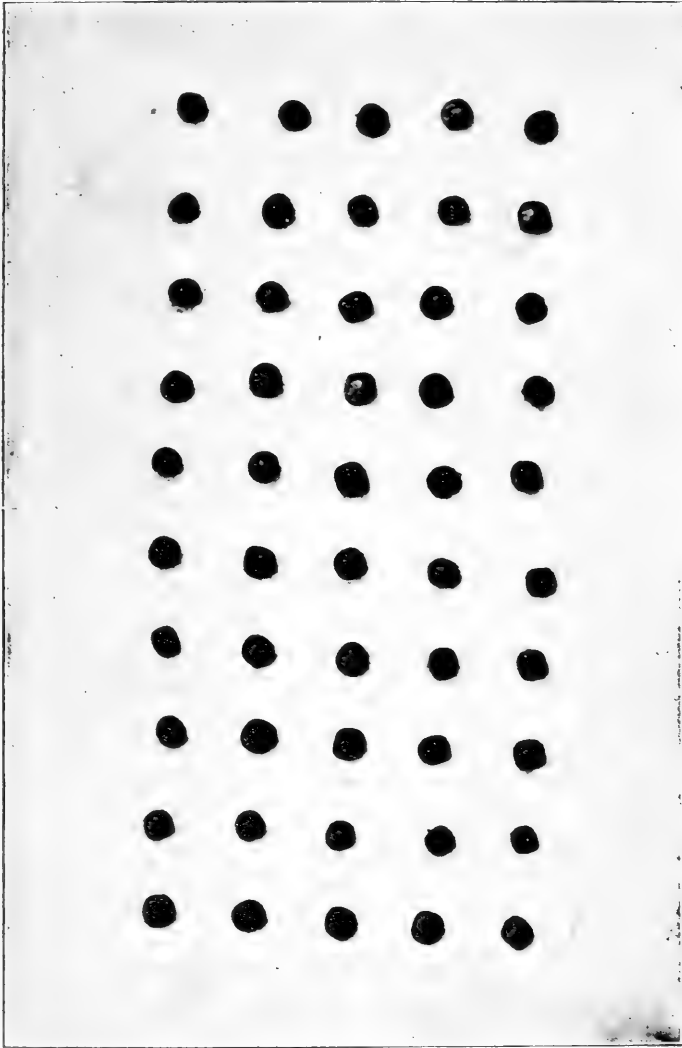
ported seed. Some action should be taken by which proper freight rates could be obtained from the northwest region, for seed of either the spring or hairy vetch can be so easily and cheaply grown in that region. And the author is assured that it would be extensively grown there if they had a market for their seed.

There is no doubt in the mind of the author but what vetch seed can be successfully and profitably grown in all portions of the United States, although some claim it will not seed east of the Rocky Mountains; but this is beyond question a fallacy, as the author knows after seven years' experience with this plant. The author does believe, however, that it is necessary that the seed become acclimated; that vetch grown from imported seed will not produce the same amount of seed as will vetch that has been sown from seed grown in the United States.

It has been found by experiments in the state of Connecticut that after home grown seed had been sown for several times, there was an increase in the quantity of seed produced from year to year. So the author is thoroughly convinced that after vetch has been acclimated it will produce seed as freely as it will in the country especially adapted for the growing of seed.

The Department of Agriculture at Washington in 1911 began to collect samples of hairy vetch seed for examination for adulteration, and out of 303 samples examined found that 187, or 62 per cent, were adulterated or misbranded. Five samples did not contain a single seed of hairy vetch, and the others were mixed with spring and other vetches. Of all the vetch seed purchased in bulk for hairy vetch, only 55.9 per cent was hairy vetch





SPRING VETCH SEED. NATURAL SIZE



seed capable of germination. Considering the fact that in the regions where hairy vetch is threshed for seed it is not grown with spring or other varieties, this disclosure by the Department of Agriculture reveals a practice in vogue among seedsmen that calls for drastic legislation, legislation making it a crime with severe punishment for seedsmen to sell adulterated seed. When one has learned the appearance of true hairy and spring vetch seed, adulteration of hairy vetch with spring vetch seed can easily be detected. But when hairy vetch seed is adulterated with vetches other than spring vetch, detection is not easy. Of course there will be found in hairy vetch seed, or in any vetch seed for that matter, grains of wheat, oats and even small peas, but these are not generally put in for adulteration. Wheat and other grain are sown with vetch to make it easy for harvesting, as the seeds are all threshed together, and as it is a difficult matter to separate the vetch from other grains, there would naturally be some of these foreign grains that would escape separation and so be found in the vetch.

The illustration in this book of hairy vetch seed, actual size, consists of seeds taken from a great number of samples procured from seed houses all over the United States, and it will be noticed that the seeds are all similar, but these seeds were of the true hairy vetch. There is also much danger in securing old seed. It is claimed that vetch seed several years old will not germinate. The author has not been able to procure any reliable data upon this point. In his experience, however, he has sown vetch seed that he himself kept for two years. How old it was when he procured it he does not know. Yet this seed freely germinated and seemed to be as vigorous as

any seed he ever sowed. Much hairy vetch seed of low vitality is also sold.

Vetch seed may be sown either broadcast or with a drill. But as it is necessary that the seed should be well covered, and put into the ground at least an inch or more in depth, the best method of sowing the seed is with a wheat drill. If sown in corn, use the ordinary wheat drill which farmers use for sowing wheat in corn. If sown by itself or in the open, use the ordinary farm drill that is used for sowing wheat. The author has found that the average make of drill with the feed gauge entirely shut off will yet sow hairy vetch seed at the rate of fifty pounds to the acre. If it is found that the drill will not sow the vetch with the feed shut off, the gauge can be easily opened so that it will sow the right quantity. The author has found that when the seed drops from the drill to the ground about one or two inches apart that the right quantity of seed is being sown.

Authorities differ as to the quantity of seed to be sown to the acre. It is the author's experience that when hairy vetch is sown by itself, or in the open, fifty pounds to the acre is the correct amount to sow. If sown in corn about thirty-five to forty pounds is the right amount. Yet it is claimed that good stands of vetch have been procured with less seed to the acre.

Unless the ground is moist when seed is sown vetch seed germinates very slowly, so if an exceeding dry fall, it may be late in coming up, and if some plants are very young and weak, they may not withstand the rigors of winter. So the sowing of the above quantity of seed generally insures a good stand of vetch.

The fact that vetch will come up in fields where it has once been sown for several years afterwards, proves one of two things: Either vetch seed remains in the

ground for a long while before it germinates, or else it is also propagated from root stems that remain in the ground. It is the general opinion that volunteers come from hard seed that is of slow germination, and so remains in the ground a long time before the outer covering of the seed becomes soft enough for moisture to reach the germ.

It is claimed by some authorities that it is necessary to inoculate the soil for vetch. The author has grown hundreds of acres of vetch on all kinds of soil and never paid any attention to inoculation, and so does not hesitate to say that he believes that it is not necessary. He has seen it grow and flourish on the poorest of soils without inoculating, and he has the testimony of men who have had similar experience who say that inoculation is not necessary. He has found upon investigation that the parties that make such a claim never grew any vetch, for if they did and failed, it was not on account of the soil in which they sowed it needing inoculation.

The proper time to sow sand, winter or hairy vetch in latitudes north of the Ohio river, is the early part of August. For late fall pasture it can be sown in early spring. In the South it is sown from September to December.

Spring vetch as indicated by its name is in northern latitudes sown in the spring after danger of severe freezing is past. In the southern states it may be sown as early as the latter part of December.

For the past six years hairy vetch seed has been quoted from six to twelve cents a pound F. O. B. shipping station. The prevailing price in the early part of 1912 was twelve cents a pound.

Spring vetch seed is quoted at about one-half of the above prices.

## CHAPTER IV.

Grow cover crops on worn-out soil,  
And you'll secure reward and recompense for toil.

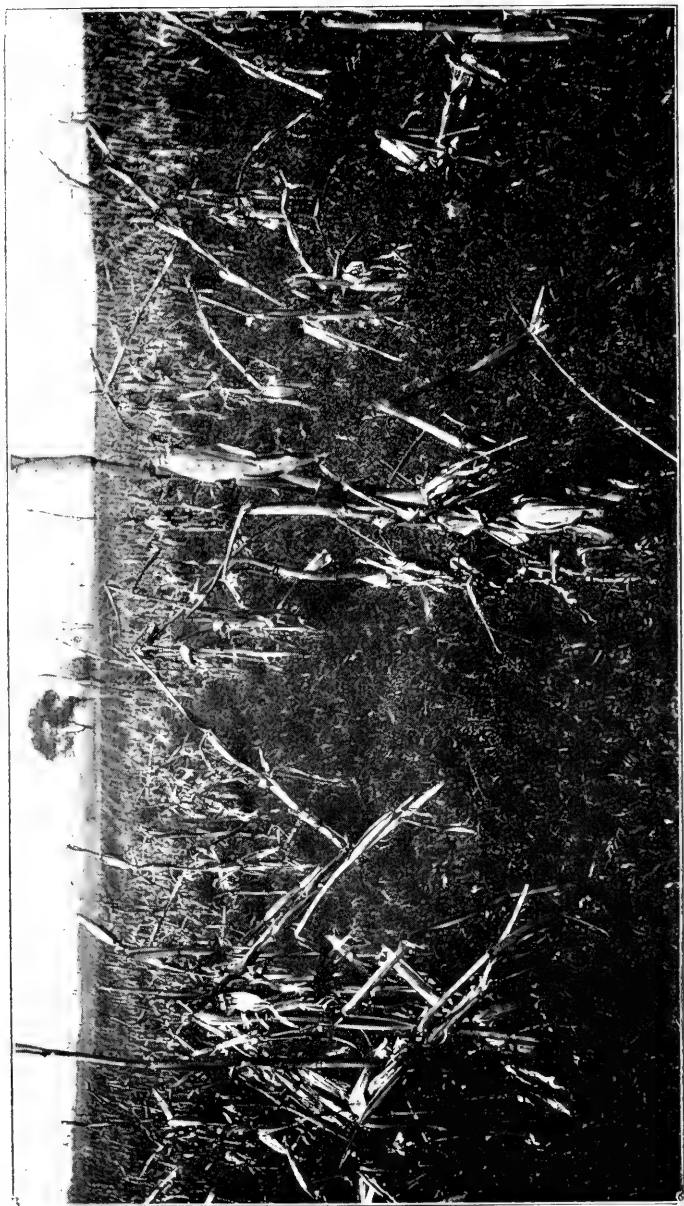
### **Vetch as a Cover Crop.**

No worn soil can be restored to a fertile stage, and the fertility of any soil cannot be maintained without the use or employment of a cover crop. If this may seem to the reader a bold statement, and one of apparent difficulty to prove, consider Nature's way of soil building and how she maintains soil fertility, and you cannot help being convinced that the statement is based on indisputable truth.

When the pioneer preempted this country of ours he found it covered with dense tracts of timber and underbrush and a thick coating of decayed or decaying weeds, leaves, limbs and tree trunks, or the heavy prairie grass and thick sod. This covering had been on the soil for ages and had given to the soil the precious elements necessary to make it fertile, so this soil was brought into subjection by the husbandman, and was made to produce big crops.

For years the farmer tilled it and it yielded unto him its strength, but being deprived of its covering, it was subjected to baking sun, raging winds, and washing rains, and was so leached of its fertility, that it became worn soil—soil that no longer produced paying crops.





HAIRY VETCH SOWN IN SWEET CORN IN NORTHERN INDIANA  
This Picture was Taken the Latter Part of April.

Most of this soil is still being farmed, yielding small unprofitable crops to the husbandman who does not seem to realize what it needs to restore it to fertility. Some of it has been turned back to nature—abandoned. Nature seems to abhor nakedness; so when soil is no longer submitted to cultivation she takes it in hand, covers it with weeds, then grasses, and then the trees of the forests—in fine, she gives the soil a covering which brings to it those elements that make up a fertile soil.

Even while man is cultivating the soil the great variety of weeds persist in growing, which only shows nature's efforts to keep the soil covered.

This theory of soil covering is no new doctrine. It has been known to agricultural ages, but the majority of the American farmers have had for more than a century so much rich virgin soil at their disposal, from which great riches have been mined, that they have not realized that even rich virgin soil could, in a short space of years, be deprived of its fertile elements by the damnable system of husbandry that does not make provision for putting back each year into the soil those elements of fertility that are farmed out of it.

The great majority of American agriculturists have been blind to the fact that soil can be made fertile without the use of manure or commercial fertilizers, by simply covering the soil with "water, stone, plank, logs, chips, brush, rails, cornstalks, straw, buildings of every description and with hay or straw-ricks" or any substance that keeps the soil closely covered. He who wrote the old proverb, "Snow is the poor man's manure," got his idea from the theory of soil covering, for there is no virtue in snow itself as a soil fertilizer. It simply covers the

soil, and like any other soil covering, makes the soil mellow and prevents ammonia wastes, the loss of nitrogen, and available plant food from the soil.

The true theory of soil covering is that the soil should be kept covered as much as possible. During the cultivating season, if the soil is properly cultivated, that is, kept worked up into a fine dust mulch when conditions will permit, no serious damage will occur by its being uncovered, and besides the roots of the growing crops will tend to hold together the fine particles of the soil. But when the cultivating season has ended, then the damage to uncovered soil begins. And to prevent or minimize this damage is the purpose of the cover crop. And so we are confronted with the question, "What is the ideal cover crop?"

As stated, the most serious damage is done to uncovered soil during the fall, winter and spring seasons. These are the seasons that we have our heavy washing rains and soil carrying winds, and the seasons that tramping stock damage our fields. So the ideal cover crop is the one that does its best work during these seasons. A good cover crop is the one that does its best work during these seasons. A good cover crop must be one that will make considerable growth in the fall before winter stops the growth of plants; that will well fill the ground with its root system; that will withstand the severest winter and will commence to grow early in the spring and make a considerable growth before plowing time, and one that is capable of adding other elements of fertility to the soil, as well as dissolving mineral matter from the coarser particles of the soil.

Vetch fills all these requirements of the ideal cover crop. It can be sown in corn at or after laying-by time,



or after wheat has been harvested. It will grow and cover the soil during the fall, winter and spring, and will early in the spring begin to grow, and make sufficient growth to turn under in time to plant the corn crop; besides filling the soil with a store house of riches containing the precious nitrogen and organic matter, thus making quantities of plant and bacteria food that cannot be obtained so cheaply in any other manner, nor in so quick a time.

B. T. Galloway, Chief, Bureau of Plant Industry, Department of Agriculture, Washington, D. C., says that under many conditions hairy vetch is the best leguminous winter cover crop known, and the author has long held this opinion also.

## CHAPTER V.

Give to your orchard the best of care and feed,  
Yet still, in fall and winter, a cover crop it needs.

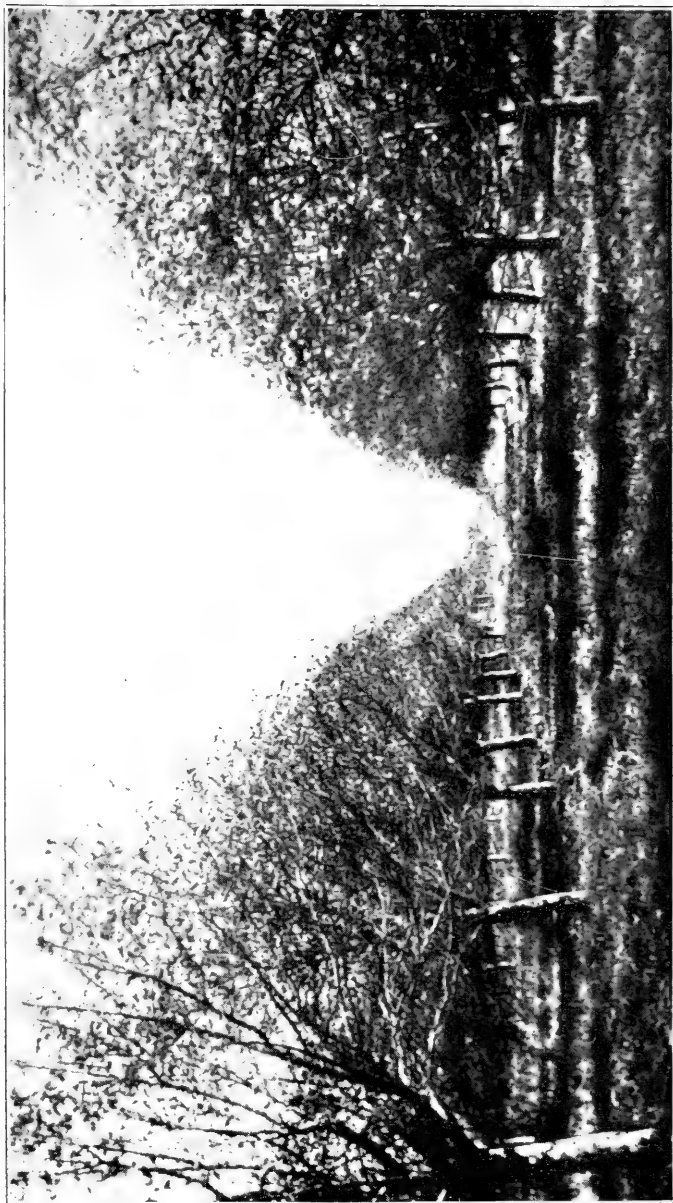
### **Vetch as a Cover Crop for the Orchard.**

It is universally acknowledged by fruit growers that for successful orchard growing, a good cover crop is needed, and that the ideal orchard cover crop must be one possessed of all the good points of the cover crop mentioned in chapter four, as well as being capable of storing large quantities of nitrogen into the soil, and must be able to withstand the tramping necessary at picking time, and also a possible drought.

The successful orchard must be cultivated from early spring up to the time in summer when wood growth should stop, so that the new growth may become sufficiently hardened to withstand the rigors of winter.

At the time when wood growth should stop a cover crop should be sown in the orchard. It should be one that will begin to grow early in the spring, and which will make a considerable growth in time to turn under at the proper plowing time, and one that will, during the growing season, store a large quantity of nitrogen into the soil and furnish, through its root and branch system, a large quantity of organic matter that will rot quickly when turned under by the plow, and then be-





AN ORCHARD WITH A COVER CROP  
The Successful Orchard Must Have a Cover Crop From September to May

come quickly available for plant food for the growing trees.

The clovers have been used for orchard cover crops, but they do not meet the full requirements of a good orchard cover crop, and besides, the orchardists fail so often to get a stand of them that the losses for seed are too great to recommend their use.

As nine-tenths of the writers upon alfalfa condemn the practice of sowing alfalfa in the orchard, claiming that the alfalfa takes all the available moisture to make its growth so that the trees suffer and perish, and even though these writers may be mistaken, as one well known authority upon alfalfa claims they are, yet the use of alfalfa prohibits the cultivation of the orchard which is acknowledged universally to be the need of orchards, because it makes plant food available, and stimulates the growth, without which no true success in orchard growing can be obtained. It therefore can readily be seen that alfalfa must be put out of the list of cover crops for the orchard.

If alfalfa and the clovers do not come up to the requirements of an ideal orchard cover crop, from whence shall we procure the ideal plant for this purpose? The answer to the question, coming from those who have had experience, is winter vetch. This plant is admirably adapted for this purpose, for the proper time for it to be sown is in the early fall, which is the exact time that cultivation and wood growth of the orchard should stop. It makes a fine growth before winter and so covers the soil that leaching by rains, winds and baking sun is prevented. It will endure the tramping necessary while picking the fruit, and withstands a probable fall drought.

It is the first plant in the spring to commence its growth and grows so rapidly that by the time the soil is in condition to plow, it has developed a large root and branch growth that gives sufficient organic matter to turn under which rots quickly and becomes available at once for plant food.

And then its capacity for gathering nitrogen from the air is so great that it stores into the soil great quantities of this precious plant food estimated as high as forty dollars an acre.

It seems that Nature intended that this plant should be used for an orchard cover crop, as she has endowed it with every quality required of an orchard cover crop. Orchard growers are learning of its value and are beginning to use it upon a large scale in California, Oregon and the northwestern states where so many thousands of acres of orchards are grown.

In these states enormous quantities of vetch seed are sown in orchards to produce cover crops, and the common, smooth, or spring vetch (*vicia sativa*) is the vetch mostly sown, as it withstands the mild winters of these states, and in California it is generally sown in October.

In the orchard districts of Michigan, sand, winter, or hairy vetch is being extensively employed as a cover crop, and would be employed by every orchard grower were not the seed so high in price.

It has been found in the use of vetch as a cover crop in Michigan, that the vetch holds the snow and prevents it from being blown away, and thus prevents deep freezing and alternate thawing and freezing, which has occasioned serious losses in many orchards located upon the lighter and more porous soils in Michigan orchards.





PLOWING UNDER HAIRY VETCH IN A YOUNG ORCHARD OF EDWIN RUSSELL, NEAR MANISTEE, MICHIGAN  
Do Not Fail to Read Mr. Russell's Experience With Vetch and Other Crops, Which You Will  
Find in Chapter Twelve, Michigan Division.



The seed should be sown in July or early in August. And good results have been obtained by the sowing of eighteen, twenty-five and thirty pounds of seed to the acre, but the author recommends the sowing of not less than fifty pounds to the acre.

If orchards are grown in states where winters are mild and the thermometer does not fall much below freezing, the common spring vetch may be sown with safety as a cover crop. But generally the author recommends the sowing of sand, winter or hairy vetch.

It is interesting to note that the oldest Roman writer on vetch advised against the use of vetch as a cover crop for the reason that it robs the vines of their sap.

When Prof. John Craig, Horticulturist of Cornell University, was asked what was the best cover crop for the orchard, he replied without hesitation, "Winter vetch."

## CHAPTER VI.

Oh! Emulate the busy tireless bee,  
As she gathers sweets from herb and tree.

### Vetch and Bees.

Whether the bee fertilizes the vetch blossom the author is unable to state with positive assurance, but as the vetch bloom is similar in construction to the alfalfa bloom, it is evident that, like the alfalfa bloom, it has difficulty in fertilizing itself. And the further fact that the seed pod does not develop from more than one-half of the vetch blooms is some evidence that fertilization is very imperfect.

The vetch blooms being numerous, attractive in color, and having considerable fragrance, bees and other insects of like character, frequent them in great numbers.

The author has observed that when the hairy vetch is grown in the vicinity of numerous bee stands, it produces more and more perfect seeds than fields of vetch grown more remote from bees, which is strong evidence that bees aid in cross-fertilization of the vetch bloom.

The blue tufted or cow vetch, the wild vetch found east of the Rocky Mountains and distributed from New Jersey, Kentucky and Iowa northward and northwestward, has a bloom almost identical to that of the bloom of the hairy vetch. Neltze Blanchan in his work on "Na-





A FIELD OF HAIRY VETCH IN FULL BLOOM  
This Field Had Been Pastured With Cattle Until About Two Weeks Before This Picture Was Taken. The Bare Spots in the Picture  
Is Where the Cattle Had Closely Eaten the Vetch.

ture's Garden," speaking of the bees and this species of vetch, says:

"Dry fields blued with the bright blossoms of the tufted vetch, and roadsides and thickets where the angular vetch sends forth vivid patches of color, resound with the music of happy bees. Although the pods of the flower fit closely together, they are elastic, and opening with the energetic visitor's way and movement give ready access to the nectar. On his departure they resume their original position, to protect both nectar and bloom from rain and pilferers. Its pods are not perfectly adapted to further the flower's cross-fertilization. The common humblebee (*Bornbus terrestris*) plays a mean trick, all too sufficiently, when he bites a hole at the base of the blossom, not only gaining easy access to the sweets for himself, but opening the way for others less intelligent than he, but quite ready to profit by his mischief, and so defeat nature's plan. Dr. Ogle observed that the same bee always acts in the same manner, one sucking the nectar legitimately, another always biting a hole to obtain it surreptitiously, the natural inference, of course, being that some bees, like small boys, are naturally depraved."

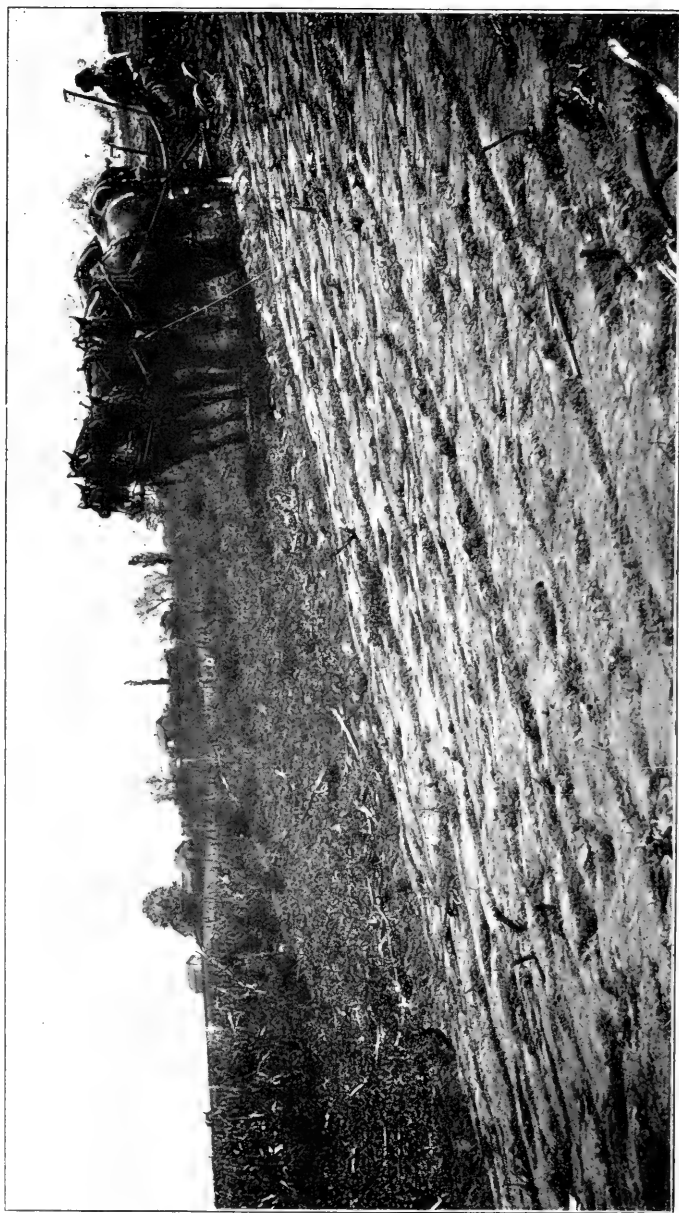
The author has many times noticed the bumble or humblebee working industriously among the bloom of the hairy vetch, but whether he was playing the mean trick mentioned by Blanchan, of biting into the base of the vetch bloom that he might easily steal its sweets, the author does not know, but if he was, he certainly was to be commended for the industry and intelligence by which he "learned how" to obtain his daily bread with the least amount of labor.

Honey extracted from the vetch bloom is white and of fine flavor, and it is said that while the vetch is in

bloom, in its vicinity the bees will deposit from two to three times as much honey as they will at other seasons.

As the hairy vetch blooms early and continues in bloom for a period of more than a month, and as it bears its bloom at a season when the buckwheat and other blooms of plants valuable for honey making are not in existence, this plant is certainly worthy of cultivation by the keepers of bees. If bees fertilize the vetch bloom, the keeping of bees should be encouraged by the growers of vetch seed, and especially the bumblebee should be protected, for he it is that makes it possible to grow clover seed, and who, no doubt, performs the same mission to vetch that he does to clover. It is wonderfully interesting to study the ways that Nature provides for the perpetuation of her children.





PLOWING UNDER HAIRY VETCH IN NORTHERN INDIANA THE MIDDLE OF MAY  
The Vetch is First Rolled and Then Plowed Under With a Double Disc Plow.



## CHAPTER VII.

**“Who learns and learns, but acts not what he knows  
Is one who plows and plows but never sows.”—Unknown.**

### **Vetch as a Green Manuring Plant.**

The American farmer has reached that age in agricultural history when he must make employment of fertilizing plants to restore or maintain the fertility of his soil. Experience has demonstrated that the average farmer cannot secure sufficient barnyard manure for his lands, nor can he rely on commercial fertilizers. So he is either forced to employ the legume plant for fertilization, or see his land pass to the doom of worn-out soils.

Being confronted with this condition he must make a choice as to the proper legume to use—the one best suited to his needs. He is in that condition that he must depend each year on his soil for daily bread for himself and family, and cannot for a single year miss growing a crop for profit or food. So if he can find a legume that can be grown between seasons or between crops which he grows for profit and which will do its work of soil restoration or maintain soil fertility, he has, indeed, secured a legume of untold value.

It must be conceded that the legumes are the best fertilizing plants that can be grown for fertilizing purposes, as they bring to the soil nitrogen, the crying need

of all our soils. Then the best nitrogen gathering legume is the consideration to be weighed in selecting a legume with which to restore or maintain soil fertility.

Our soils today are so deficient in organic matter that they no longer make a favorable environment for soil bacteria, which must exist in abundance in our soils to make them rich and suitable for the growing of profitable crops.

Our soils deprived of a sufficient supply of organic matter have become so compact that ventilation has been shut off and they are dying for want of air. So another consideration to be weighed in the selection of a legume is one that produces organic matter in abundance so that the soil bacteria will find in the soil a home with abundant food and material to work into plant food; and that will give the soil ventilation, without which no plant can grow and be fruitful.

Green manuring was practiced by the ancient farmer. It has been known to all ages. And now, as the new lands are all gone, and the lands in possession of the American farmer have or are becoming worn, the agriculturists of the country are reviving the practice of green manuring, and are using green crops for turning under, as never before in the history of our nation, and it has been found that there is often greater profit in plowing under a crop than from its harvesting.

In comparing green manures with barnyard manures it is said that "it has been found that animals digest and thus destroy two-thirds of the dry matter in the food they eat, so that a ton of clover plowed under will add as much organic matter to the soil as the manure made from three tons of clover fed to stock, even if all the manure is re-

turned to the land without loss from fermentation." But in the use of barnyard manure we lose all the liquids of plants which is saved when plants are turned under green.

Green manures furnish a large amount of organic matter which is the right kind of food for soil bacteria. They increase the water-holding capacity of the soil, aid soil ventilation, utilize soluble plant food that would otherwise escape from the soil, and make use of the minerals that the plant roots bring up from the lower depth of the soil where they exist in greater abundance.

And if legumes are used for green manuring large quantities of nitrogen are stored into the soil. The use of green manures is but a simple imitation of nature's way of soil building and soil restoration.

Important as minerals like potassium and phosphorus are to the soil, yet the author, after years of living close to the soil, studying its needs, makes the bold statement without fear of successful contradiction, that our soils need organic matter a thousand times more than they do the minerals enumerated.

Our soils were rich in organic matter when they were reclaimed from nature. Now they are poor and without organic matter and consist mostly of rock particles. In all this land of ours there is not one foot of our worn or worn-out soils but what is totally deficient in organic matter. Years of sordid tillage without a supply of organic matter being furnished, have farmed our soils to their death. And whenever an abundant supply of organic matter has been brought to them again, they have been restored to a fertile stage, which is proof of the author's statement or position.

Green manuring is the most profitable, cheapest and quickest method of restoring or keeping up the fertility of our soils. The use of green manures will furnish a means by which the rock particles of the soil will be dissolved and thus release the minerals needed for the growing of crops, which exist in these rock particles.

While the value of barnyard manure must be recognized, yet not one farmer in ten produces it in any quantity, and even those who do, do not produce enough to fertilize one-fourth of their farms each year.

It is practicable to grow some kind of green crop for manuring on any soil, and to grow it in abundance. And it is cheaper to grow a green manuring crop than to buy fertilizers, and the green manures give better and more lasting results for they are the fertilizers that nature gave the soils when she constructed them.

To determine the value of a plant for green manuring we must look,

First.—To its capacity to produce through its root and branch system an abundance of organic matter.

Second.—The quantity of mineral matter it will dissolve from the coarser particles of the soil.

Third.—Its ability to assimilate nitrogen from the soil and atmosphere.

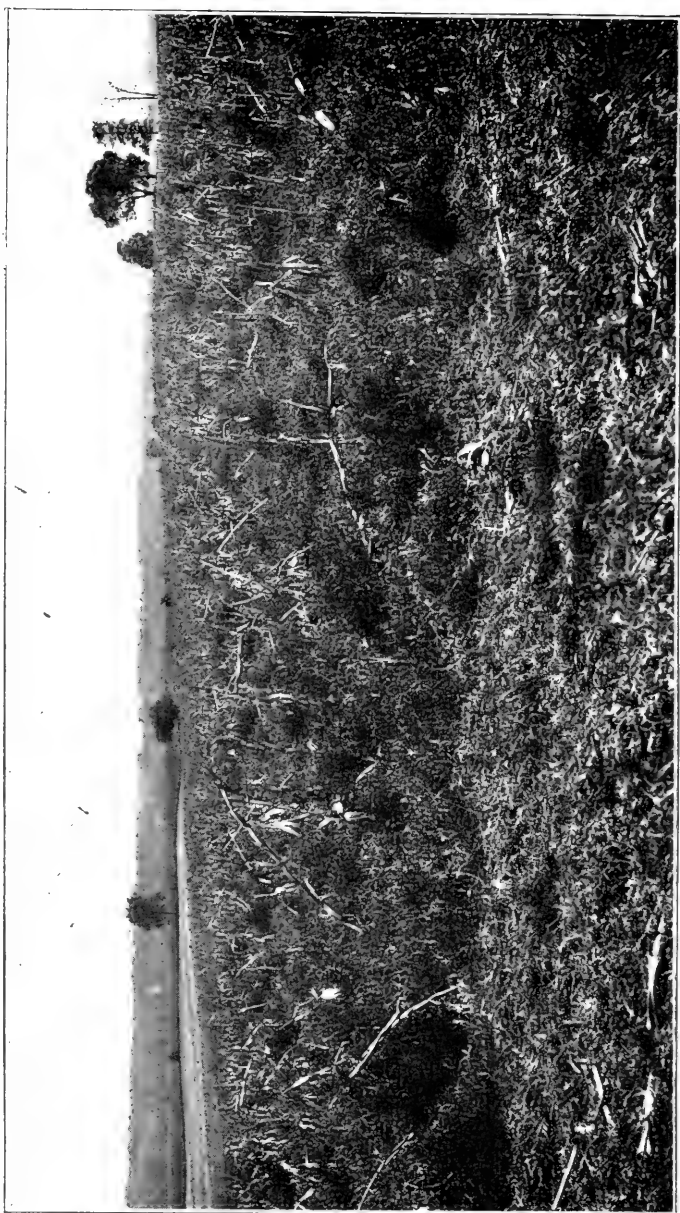
Fourth.—Its resistance to drought, heat and cold.

Fifth.—Its capability of making a quick growth, and of growing between crops grown for profit.

Sixth.—Its capacity for holding moisture when plowed under, and for quick decomposition.

The vetch plant has a large number of long fibrous roots. They completely fill the soil to a considerable depth, so that the soil turns in plowing like heavy sod.





A FINE CROP OF HAIRY VETCH FOR PLOWING UNDER

The branches of the plant are also numerous and of great length, especially in hairy, sand or winter vetch, so that the root and branch system of the vetch plant produces a large amount of organic matter to turn under. There being so many long fibrous roots of the vetch plant, they go out in every direction into the soil, coming in contact with so much of the coarse rock particles of the soil. It can be readily seen that these roots growing in our soils deficient in organic or vegetable matter and containing, as they do, from ninety to ninety-five per cent rock, that these roots covering so large an amount of rock surface, will dissolve and absorb a vast amount of mineral food needed for plant growth. In fact, will secure a sufficient supply of mineral food, as these rock particles of the soil are rich in minerals and contain generally a sufficient supply of minerals to last for a great number of years.

This mineral matter becomes embodied in the vetch plant in its growing, and if turned under and incorporated into the soil, becomes available as plant food for the plants that follow vetch.

Nitrogen is considered the most essential soil element, and without which no plant will grow. It is also the most costly element. If procured for the soil by way of nitrates of soda or commercial fertilizer the cost is burdensome. Therefore, any plant that will furnish nitrogen to the soil is of great value to the husbandman.

All the legumes are nitrogen gatherers, but some have greater nitrogen gathering powers than others. After a careful study and observation of the best legumes for this purpose, the author is convinced that there is but one legume that has greater nitrogen gathering power than vetch, and that is the sweet clover plant.

Many years ago there was solved the mystery of how and from whence the legumes gathered nitrogen. It was an important and interesting discovery, and shows how well Nature provides for the wants of man, and how willing she is to help him if he but shows the slightest disposition to aid her.

In this discovery it was ascertained that in addition to the millions of bacteria in fertile soil which transfer organic matter into nitrates and other substances suitable for plant food, there are other bacteria which are co-partners with the legumes in the manufacture of plant food, and without which the legumes would be of little value as nitrogen gatherers.

Our lands are immersed in an ocean of air, three-fourths of which is nitrogen. These bacteria that enter into partnership with the legumes in gathering nitrogen, make their way into the roots of the legumes and cause the formation of root tubercles or nodules which we see on the roots of legumes, and in which these bacteria establish their homes. These bacteria secure their food from the sugar and other compounds found in the juices of the leguminous plants. They seem to have the power to draw nitrogen from the ocean of nitrogen above them, and from this combination of plant juices and nitrogen substances from the air, they bring to the plant an excess of nitrogen compound which the plant utilizes for the building up of its roots, stems and leaves. We thus have a profitable partnership in that both partners profit and secure the food necessary for their rapid and proper growth. Therefore, the legume that bears the greatest number of root tubercles or nodules on its roots, furnishes the most homes for this bacteria, and there-



fore must be the favorite legume to use in soil deficient in nitrogen.

In all the years that the author has grown vetch he has made extensive examination of the roots of the vetch plant, and with but one single exception, has found the vetch roots to be covered with the root nodules, which no doubt accounts for the great success he has had in growing big crops after vetch on soil deficient in nitrogen. This, taken together with the experience of others in the use of this plant, justifies him in making the statement that as a nitrogen gatherer the vetch plant is the peer of all legumes, unless it be the sweet clover plant which is beyond doubt the king of them all.

The sand, winter or hairy vetch has withstood the winters of some of our most northern states. The author has found that it has never been too hot, too cold or too dry for this plant if it secured some growth in the fall, or where it was grown from seed of strong vitality. True, we have noticed that in some years a small per cent of the vetch plants would apparently winter-kill, and that in mild winters, but upon close investigation we are satisfied that the trouble has been in the vitality of the plants, for why should a certain per cent kill out when the remainder would be strong and vigorous?

Seed selection in vetch is as important as in that of any other plant, and insures complete success. Yet the author has never had a failure in growing vetch, either from seed of weakened vitality or from winter-killing. He has never seen the vetch plant affected by heat or drought. Vetch seed, however, will be slow in germinating if too dry when planted and if it remains dry for any length of time.

As vetch can be sown after corn is laid by or after wheat harvest, and make a large growth for fall and winter covering, and a large growth before time to turn under for corn and will increase the corn yield two fold, it becomes an ideal green manuring plant.

Vetch has great capacity for holding moisture when turned under green. The author has many times turned under immense crops of vetch even in the driest of weather, as stated in another chapter, and it must have held and retained moisture or the crops grown after it would have been failures. These heavy crops of vetch turned under have decayed within a short time.

There is no plant that so completely fills the requirements of a good green manuring crop as vetch. This has been the author's experience as well as that of many others. Considering the experience of Connecticut farmers in restoring their worn-out tobacco land, the farmers of the South in the restoring of their worn-out cotton lands, and the author's experience in the North in restoring worn-out corn lands, all done by the growing and plowing under of vetch, the author ventures the prophecy that the vetch plant will in the near future become the Moses that will lead our worn and worn-out soils, wherever situated, through and out of the wilderness of the criminal mismanagement and sordid, damnable system of farming that has made them "bleak and barren," into the promised land of fertility when they will again become rich in the elements that produce big crops, which means the building up of an empire on American soil greater in splendor and power than any ever dreamed or imagined.

In the cotton fields of the South vetch can be sown at the last plowing and the tramping necessary at pick-





PLOWING UNDER VETCH, RYE, AND CORNSTALKS WITH A SPALDING DEEP TILLING MACHINE ON THE AUTHOR'S "VETCHFALFA FARM."

ing time will not injure it, and then at planting time the following spring the vetch crop can be plowed under. Or the vetch can be sown in early fall and cut for hay the following May and followed with a crop of Early King cotton.

In the tobacco districts of the North vetch can be sown after the tobacco crop has been harvested and turned under the following spring, thus securing the nitrogen for the soil without which a good tobacco crop cannot be grown. It has been estimated that vetch so sown in tobacco lands releases in the ground plant food that would cost, if purchased in the form of commercial fertilizers from \$16 to \$40 an acre.

Mr. Edwin Russell of Manistee, Michigan, in his article on cover crops, found in chapter twelve, Michigan division, struck the key note of soil restoration, and emphasized the position taken by the author in his corn book and in this volume, when he said, that to restore the soil to fertility, "all that is necessary is to sow and plow under, sow and plow under. It is the key to the whole situation."

When the modern American farmers learn well this lesson, and proceed to put it into practice, then and not till then, will worn and worn-out soil and the abandoned farm be eliminated from our agricultural economy, and vetch being one of the best green manuring crops for plowing under, will become a corner-stone in this new adaptation of an old, valuable and neglected system of agriculture.

## CHAPTER VIII.

Sow the seed for forage bread,  
That man, as well as beast, be fed.

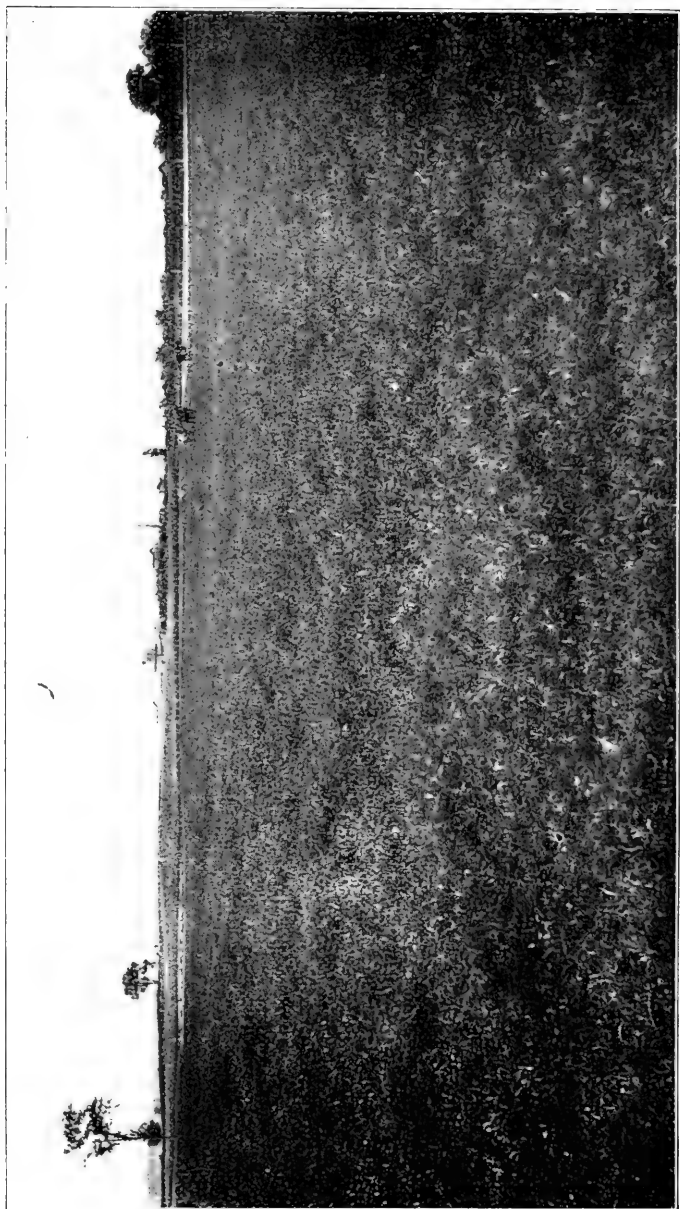
### **Vetch as a Forage Plant.**

Upon the average farm the production of food for domestic animals used for carrying on farm operations and food for the farmer's family, is most generally a serious problem; and if food is needed for animals destined for the market, the problem becomes more serious. So good forage plants are always a boon to the average farmer.

A plant valuable for forage must be one which produces feed in abundance and at seasons of the year when most needed. The farmer is indeed fortunate who possesses good grazing lands not suitable for farming purposes. But most farms consist of lands, all of which are tilled, and such farms at the present high price of farm lands, are not profitable when devoted to blue-grass pasture and the like. They must be made to produce crops that pay, and on such farms the selecting of a proper forage plant that will pay is no small problem for solution.

The forage plant should be selected that not only produces food in abundance, but produces a food of high feeding value, and one that will grow in unfavorable seasons. If possible, a forage plant should be selected





#### HAIKY VETCH PASTURE

This is a View of the Same Field Shown in the Illustration of "A Field of Hairy Vetch In Full Bloom."  
This Picture was Taken About Two Weeks Before the Vetch Began to Bloom.



**which will grow and mature its crop between that of other crops, as the growing of such a plant increases the profit of the farm. And a leguminous plant should be grown for the great benefit which it gives the land.**

Vetch is a suitable forage plant for all animals of the farm, and no animal food grown on the farm is as much relished. According to analysis made, the fattening properties of vetch exceed that of alfalfa, alsike, cowpea vine, crimson clover, Johnson grass, orchard grass, red top, soja bean and timothy hay. There are but three well known hays that exceed it in fattening power, and they only a few points, to-wit: Hungarian grass, red clover and serradelia hay, the clover hay exceeding it but two points. It is claimed that the feeding value of vetch hay is the same as the feeding value of bran and has three times the food protein value pound for pound that is found in timothy hay. As a milk producer vetch is equal to that of any plant. It changes the quality and quantity of the milk, giving it a rich yellow cream and a good taste, and it is said that if this milk is fed to pigs you can actually see the little fellows grow.

In the South dairymen plant thirty pounds of vetch with one bushel of beardless barley and one bushel of rye to the acre, and some plant less amounts. If this barley, vetch and rye mixture is planted early in the fall, the barley can be cut in sixty or eighty days after planting, and in early spring the rye and vetch can be cut together, and the same be followed with two or three similar cuttings later in the season. If this combination is sown late in the winter the three crops can be cut at the same time.

In the North if one-half bushel of winter vetch is sown with one-half bushel of wheat, the whole can be cut

**in the middle of June for hay and splendid cheap feed be obtained.**

In the northern states when winter or hairy vetch is planted for forage it should be planted with a small quantity of rye, winter speltz or wheat to hold it up so it can be cut. Speltz is the preferable grain to use, as it is itself a valuable food for stock. While it is not necessary to sow any of the grains mentioned with vetch when wanted for pasture alone, yet the author advises their use, for a heavy crop of vetch lodges so badly that it is liable to rot when sown alone.

In the North vetch should never be pastured in the fall unless sown with considerable rye, and then should not be pastured too heavy. Stock can be turned on vetch very early in the spring. By the time it has reached the height of eight to twelve inches, which is generally about the middle of April, and from that time until late in June, it will afford an abundance of fine pasture.

If either spring or winter vetch is planted in the spring it will afford an abundance of fall pasture.

A few pounds of winter vetch seed sown with clover or timothy almost doubles the value of these crops for feed. The author has known instances where vetch has been sown with clover and the two crops harvested for hay and stock would eat it clean, which generally they will not do where clover alone is given them.

The following method of using oats, vetch, and clover in the northern states is recommended, which is like killing three birds with one stone: In early spring, after breaking the ground, sow twenty pounds of winter vetch seed to the acre with the usual amount of oats sown to the acre, and also one bushel of clover seed, for four or

five acres of ground. The oats are ready for harvesting before the vetch has attained any size, and the vetch may not be of any size when the clover has gotten a good start. But, however, it will soon come up through the clover and if the season is favorable, there will be a fine fall pasture, and if not pastured too closely, the clover and vetch will make a rapid growth the following spring and a fine hay crop will be secured, and there will be enough vetch in the clover to make it easy to handle with a hay fork. You will have a crop of hay that will be entirely consumed by your stock, as the vetch seems to be a seasoning or sauce to the clover hay, making it much relished by stock. When vetch is grown with timothy stock will first pick out and eat the vetch and leave the timothy to the last.

The author always prepares his alfalfa ground by sowing and turning under vetch, and for several years, in the first crop of alfalfa cut each season, he has a large amount of vetch. This he finds a splendid addition to his alfalfa hay, making it easier to handle with the hay fork, while the stock seem to relish the mixture better than they do the alfalfa hay alone.

Winter vetch can be sown in corn at or after laying by time and the stalks rolled down after corn has been gathered. If you will allow no stock to pasture same you will have by the middle spring following, excellent pasture and can obtain from a month to six weeks or more of pasture before time to turn under for corn; thus obtaining the benefit of winter soil covering, a fine crop of organic matter for turning under, besides considerable valuable pasture for stock. If it is desired to sow the land in alfalfa you can pasture the vetch up to

**July** and then plow the ground and same will be inoculated for alfalfa to be sown in August, or the same can be plowed and planted in the spring to oats and clover.

Rye is a valuable and cheap forage plant and if cut with a mower about the time its heads begin to form it will make a vigorous second growth. So, in northern sections, if thirty pounds of vetch seed and from one-half to three-fourths bushels of rye are planted to the acre in the latter part of August, this mixture will afford two cuttings. If it is not pastured too heavily in the spring and a mower is run over same when the rye is not eaten off by stock, before it begins to head, and stock is taken from it for a short time, the pasturing of this mixture can be prolonged for a considerable period.

Hogs pastured on vetch and rye and fed twice daily with the usual amount of corn and some clover and soy-bean hay, have made a gain of fifty-three pounds in thirty days. It is the author's experience that hogs do fine on pasture obtained from vetch alone, and when once they obtain a taste of green vetch will attempt to break through almost any fence to get to it.

It is said that an abundance of pasture can be had from vetch the entire summer and fall by sowing same at intervals of two or three weeks apart.

While vetch stands pre-eminent as a fertilizing plant, it is not to be despised or rejected as a forage plant. Enough has been written to show its great value for this purpose. The author's own personal experience leads him to say that it cannot be too highly recommended for forage purposes.





HAIRY VETCH SOWN IN FIELD CORN  
Vetch and Cornstalks Make an Ideal Soil Covering and Furnish an Abundance of Organic Matter for Plowing Under

## CHAPTER IX.

Experience is of no value unless it is made to illuminate the path we are yet to tread.

### **The Author's Personal Experience With the Vetch Plant.**

The author's personal experience with vetch has extended over a period of six full years.

In the introductory chapter of this book he told how he came to grow the plant and that his first experience was with two acres. This two acres was planted with hairy vetch upon rolling, sandy ground, occupied by a young orchard.

The ground was broken up in the early part of August, and the vetch seed was sown broadcast and well harrowed in. The plants came up quickly and covered the ground with a considerable growth before winter, affording an excellent winter covering that held the snow, and thus afforded an excellent orchard cover crop.

The plants were not affected in the least by the severe winter that followed and early the following spring began to grow. The growth was so rapid that by the middle of April the plants were more than a foot in height. By the first of May they had reached the height of about three feet and began to show buds for blooming. By the first of June the plants were from three to four feet in length and were in full bloom, affording a pretty picture.

As no crop was planted with this vetch to support it, of course the vetch lodged very badly. It was decided to cut the crop for hay, and an attempt was made to cut it with a mowing machine, but owing to the vine-like character of the plant and the fact that they had lodged so badly, it was impossible to run the machine through it. So it was mowed, not, however, without difficulty, by a mowing scythe, and after being sufficiently cured, was raked up and taken to the barn and mowed away. It made a most excellent feed and was more relished by the author's horses and cattle than timothy, Hungarian or clover hay, or any other feed.

It was thought that after this first crop had been mowed that the second crop would appear, but such was not the case.

The following season this orchard was broken up and planted to potatoes and a fine crop of potatoes was procured.

The following season the orchard was planted to alfalfa and since that time it has been in alfalfa, producing four large crops each year.

The author's second experience with vetch was with twenty-four acres planted on rolling, sandy land, and upon land that for twenty years had never produced to exceed thirty bushels of corn to the acre. And in most years corn had been an entire failure upon this land.

The hairy vetch was sown and it was drilled in with an ordinary wheat drill during the last days of August, the ground having been broken and harrowed. The vetch made a rapid and a large growth before winter set in, and early the following spring began to grow, and grew so rapidly that by the middle of May it was from three



**to six feet in length, completely covering the soil with a heavy mass of vegetation.**

The spring had been so wet that plowing could not be done until the latter part of May. And when the plows were taken into twenty acres of this vetch the vegetation was so heavy that the ordinary walking or riding plows would not turn it under without the plows so choking up that two-thirds of the time was spent in unchoking the plows. It began to look like an impossible task to plow under this great mass of vegetation, so the author decided to try the double-disc plows. And one was brought into the field, and after the discs were made as sharp as possible, four horses were hitched to the plow and it was started. The plow did the work remarkably well. It only choked up occasionally, and the vetch generally was well turned under, only a bunch now and then sticking out of the ground.

As fast as the vetch was plowed under it was well rolled and dragged and then harrowed. The soil was completely filled with the vetch roots and so turned over like heavy sod. The field, after it was prepared for planting, presented only a fair condition as a considerable number of bunches of vetch stuck out of the ground, and some difficulty was experienced in planting the field to corn with the corn planter.

The corn was planted the third and fourth of June, which is considered a very late time to plant corn in the locality in which this field is situated. The weather turned dry after this corn was planted, yet the corn came up promptly and grew to a height of three or four inches and then seemed to cease growing, and stood in this condition for a week or more. And as it had been predicted

by the neighboring farmers that this heavy mass of green vegetation turned under would absorb all the moisture in the soil and kill the corn, it began to look as though this prediction would be verified, and the prospect for a corn crop did not look very inviting to the author. But suddenly the corn began to grow, and never in all the experience of the author, has he seen corn grow so rapidly as this did.

As stated, this was rolling, sandy land and there were several ridges of considerable height running through the field, yet the corn in all parts of the field was of identically the same height, color and appearance.

This field of corn during its growing season became the talk of the neighborhood, and its fame extended even for miles. The fact that there had never been a good crop of corn grown on this field for many years, and this crop having such an exceptionally fine appearance, it of course attracted much attention, as it lay along the roadside. And it attracted the attention of strangers, because on the opposite side of the road a neighbor had a field of corn upon identically the same kind of land which was of such poor quality that the contrast between the two fields was so great that no one could help but notice it.

Dry weather set in when this corn began to silk and tassel and there were seven weeks of dry weather, yet during all that period this corn showed no evidence of the severe drought, and not a single stalk could be found that was fired, while the neighbor's corn across the road, mentioned above, was fired above the ear and did not make twenty bushels to the acre.

At harvesting time the corn was gathered, hauled to

the market and made seventy-three bushels an acre by weight.

The remaining four acres of vetch that was not plowed up and planted to corn, was pastured by milk cows from early spring until the vetch ripened and died. Quite a few of the stalks of vetch that escaped the grazing of the cattle bloomed and seeded and enough seed fell on the ground to reseed the field. So a disc was run over the field and a good crop of vetch came up for the next season.

The author's third year's experience with vetch was with fifty acres sown upon worn-out river bottom and upland soil. The bottom land was typical Wabash bottom soil that had been farmed for years without the addition of any leguminous or other crops to restore or build up the soil. Even the cornstalks had been burned each year. The upland had been subjected to the same treatment.

All of this land was in corn and the crop was exceedingly poor, much of it not exceeding four or five feet in height and produced not over forty bushels of corn to the acre.

The vetch seed was sown in the early part of August in corn with a one-horse wheat drill. Before winter set in the vetch on the upland had made a splendid growth. Much of that upon the bottom land was weak and small when it went into winter and quite a good deal of it winter killed.

The following spring there was, however, a fair stand of vetch which commenced to grow very rapidly and very early, and within a short time completely covered the ground.

The vetch on both bottom and upland was turned under along in the early part of May and planted to field corn, sugar corn and potatoes, there being potatoes planted on both the upland and on the bottom land.

That portion of the bottom land planted to corn which had been producing at the rate of about forty bushels to the acre, produced that season an average of ninety bushels of corn to the acre. And that portion of the bottom land planted to potatoes produced at the rate of 250 bushels to the acre, and as fine potatoes as ever grew.

The potatoes planted on the upland, which was exceedingly poor soil, produced at the rate of 150 bushels to the acre.

Since this third experiment with vetch upon the author's "Vetchfalfa Farm," he has planted each year on an average of forty to fifty acres of vetch seeded by itself, and quite a number of acres of vetch and rye mixed, the vetch and rye mixture having been grown upon a farm of the brother of the author.

The largest acreage ever grown by the author was seeded in the fall of 1910 upon 165 acres of rented land that was in sweet corn. And the vetch was planted in the month of August at the rate of about thirty-five pounds to the acre and was seeded with a one-horse wheat drill.

This vetch did not make a very large growth before winter, and in some portions of the fields it did not look as if there was sufficient vetch for a stand. All this 165 acres of vetch was allowed to grow until about the first of May before any of it was turned under. At that time three double-disc plows were started to work turning it

under, commencing in that portion of the fields where the vetch was the largest.

This 165 acres was in two fields, one of ninety acres and the other seventy-five acres. And it so happened that the vetch was the largest in one end of the ninety-acre field. So plowing was begun at this end, and the vetch was two feet or more in height at the time the plowing commenced. The vetch was turned under as deeply as possible with a disc plow, and as fast as plowed under, was followed with roller, drag and harrow. And as fast as the ground was put in condition it was planted to sweet corn. This process of plowing, preparing the ground and planting the sweet corn was continued until the whole 165 acres were finished, and the planting was completed about the middle of June. And during most of the entire time of plowing and planting there was no rain and almost the entire seventy-five acre field was apparently without moisture. The ground plowed up so dry that it did not look as if it were possible for anything to grow in it, and the vetch on this field was from three to six feet high when turned under. Yet, notwithstanding the dryness of the soil and the immense amount of organic matter turned under, the corn seemed to come up promptly and grew as well as though it had sufficient moisture. A good rain, however, came in due season and upon this 165 acres there was as fine a sweet corn crop as the author ever grew. The yield was at least one-third larger than he had ever produced upon this land.

In the fall of 1911 the author sowed about eighty acres in vetch and rye, and about thirteen acres of pure vetch which went into winter in good shape.

It has been the practice with the author to sow all

his corn land at or after laying-by time in vetch one year, and the next year with rye, and then plow under the entire crops of rye, vetch and cornstalks the following spring, and to allow no stock to pasture same at any time. This method affords an excellent cover crop and gives an abundance of organic matter for plowing under.

The author has plowed under heavy crops of vetch the latter part of May, grown upon worn-out sandy soils, plowing to the depth of twelve inches, contrary to the advice of farmers who claimed that they had had much experience with these kind of lands, and that it was positively injurious or fatal to plow them to so great a depth. But, however, upon these lands so treated by the author, crops of corn have been grown producing seventy-five bushels to the acre.

The illustration of "Rye After Vetch," found on a subsequent page, shows a picture of a six-acre field on the author's "Vetchfalfa Farm" that was sown to hairy vetch one fall, and then in the following spring was pastured with several head of milk cows up to about two weeks before time for the vetch to bloom (see illustration "Hairy Vetch Pasture"), when cattle were taken off and in two weeks the vetch was in full bloom (see the illustration, "A Field of Vetch in Full Bloom"). After the vetch had ripened its seed the field was plowed and in August planted to rye. Both rye and vetch came up and furnished an abundance of pasture from September until snow fell. The following spring the rye came on early, also some vetch, which afforded fine pasture until the rye not eaten by the stock began to head. Then all stock was taken from the field and a mower was run over the field, and in a short time a heavy crop of rye was in head

which was cut for hay when the rye was in the milk, the time of cutting being about the middle of July. The field was immediately plowed and sown to Hungarian which was harvested for hay in eight weeks from time of sowing, and made a large amount of most excellent hay. After the Hungarian was cut for hay it sent out a short growth which afforded considerable late fall pasture. The field was planted to potatoes in the summer of 1912. This experience shows the possibilities of combining vetch, rye and Hungarian for pasture and a hay crop.

## CHAPTER X.

How oft apparent evil in the things about,  
Becloud our vision, intensify our doubt.  
Yet the seeming bad in everything revealed,  
May, after all, be but the good concealed.

### The Bad Points of Vetch.

No plant grown upon the farm is without its bad points. Therefore, it would be strange indeed if something bad could not be said of vetch.

In all the author's experience, and from the experience of others whom he has interrogated, he has only been able to search out the following alleged bad points, if such they can be called, which have been urged against the growing of vetch, to-wit:

Cost of seed.

Its liability to escape cultivation and become a weed.

The necessity of inoculating the soil to secure its growth.

Its liability to freeze out in winter.

For the past seven or eight years vetch seed has cost from six to twelve cents a pound. Sowing fifty pounds to the acre would make a cost of from three to six dollars an acre. Several years ago, in writing on vetch, the author made the statement that if it should cost ten dollars an acre to sow vetch, it would yet be a profitable fertilizer to use. In the light of experience obtained since







THE J. M. STONE GLOBE SEPARATOR FOR SEPARATING  
VETCH SEED FROM WHEAT

The Mixed Seed Are Dumped in Top of Machine and Separation Is Done Automatically  
by Gravity, No Belts, Pulleys or Power Being Required.

the time of making that statement, the author has found no occasion for modifying it.

How much manure or commercial fertilizer could one put on an acre of land for three to six dollars, and what result would you obtain for that amount expended? The author has expended, and he has seen others expend six dollars an acre for commercial fertilizer from which practically no results were obtained.

Prof. T. S. Hunt, of the Cornell Experiment Station, from analysis of the vetch plant found that three months' growth of hairy vetch produced 6,824 pounds of air-dried forage to the acre, which contained 240 pounds of nitrogen, 53 pounds of phosphoric acid and 52 pounds of potash, a total of 345 pounds to the acre of the most valuable fertilizing elements that can be put into the soil. The commercial value of the 240 pounds of nitrogen alone at fifteen cents per pound, which is a conservative price for nitrogen, is worth thirty-six dollars an acre. It cannot be said that this nitrogen was already in the soil and that the vetch plant simply utilized nitrogen that was already available in the soil, for the vetch being a legume, it obtains this nitrogen, as heretofore explained, from the air through the working processes of the nitrogen-gathering bacteria.

But some scientists reading this statement regarding the phosphoric acid and potash found in this vetch by Prof. Hunt, will boldly proclaim that these two mineral elements were already in the soil and were extracted from it by the vetch plant in its growth, and therefore there was no addition to the soil of these two elements.

The author concedes that the phosphoric acid and potash were already in the soil, but were they available

for the use of plants before the vetch was grown? Was not the vetch the means of releasing these elements and rendering them available for the future crops? If these elements were in the soil they were in rock particles of the soil, and it was necessary for some plant, with its prolific root system, to cover these coarser rock particles of the soil and absorb and take from them the minerals contained in them. This, no doubt, the vetch roots do. And so these elements were stored into the vetch plant during its growth, and, if the vetch was plowed under and incorporated with the soil, these elements would become available for the food of future plants grown in the soil.

The author has demonstrated, and it has been demonstrated by many others, that vetch will make sound merchantable crops and increase their yield from forty to fifty per cent. Say that it will only increase the yield twenty per cent, and that your average crop of corn heretofore has been forty bushels an acre, you would have an increase of eight bushels, which, at fifty cents a bushel, would be four dollars an acre.

Most of our lands are in such condition that we must build them up or abandon them and turn them back to Nature for her slow process of restoration. But we cannot do this and live. We must apply to our lands that which the manufacturer applies to his manufacturing establishment to increase its efficiency. He does not hesitate to expend any amount of money when he can increase the efficiency of his plant even five or ten per cent. He finds that this expenditure is worth the price it costs. If we run our farms upon the same principle we

will find that whatever increases the efficiency of our soils is worth the price it costs.

In the chapter entitled "The Author's Experience With the Vetch Plant," he shows how he increased the efficiency of his land by the use of vetch; but the author desires that under the chapter of "Vetch Experiments by Experimental Stations and Individuals," the reader consider the experiments of the Connecticut Experiment Station, in which they say that the fertilizing elements gathered by vetch releases in the ground plant food that would cost from sixteen to forty dollars an acre if produced in the form of commercial fertilizer; and the experiments of A. D. Shamel of Connecticut, who points out the great benefits that have been secured from the use of vetch upon the poor worn-out tobacco lands of Connecticut; how they have added the necessary nitrogen to these soils and how it has furnished the ideal cover crop, enabling the tobacco growers to cut down the heavy expenses of fertilizers, and how it is enabling their lands to endure droughts; and how, by the use of vetch upon corn land, in the year 1907, a field of corn planted after vetch plowed under, won a world's record for yield to the acre; and that the same thing has been done since that time by the plowing under of vetch; and that he has not seen a single instance where great benefits have not been secured for the following corn crops where vetch was plowed under.

Go to that part of said chapter showing the experiments with vetch in the state of Georgia and read how the worn-out cotton lands of the South have been restored by the use of vetch. Read the statements of James T. Gardiner of Augusta, Georgia, wherein he says that

the vetch plant is destined to become the savior of the long mismanaged soils of the sunny Southland, so that they will become as productive as any on earth, and then say that it is not profitable to grow vetch with the present price of its seed.

So the author does not believe that he made a wild statement when he said that if vetch should cost ten dollars an acre it would yet be a profitable fertilizer to use; and, in the light of all these experiences with the vetch plant, it certainly cannot be urged that the cost of seed is a bad point against the use of vetch.

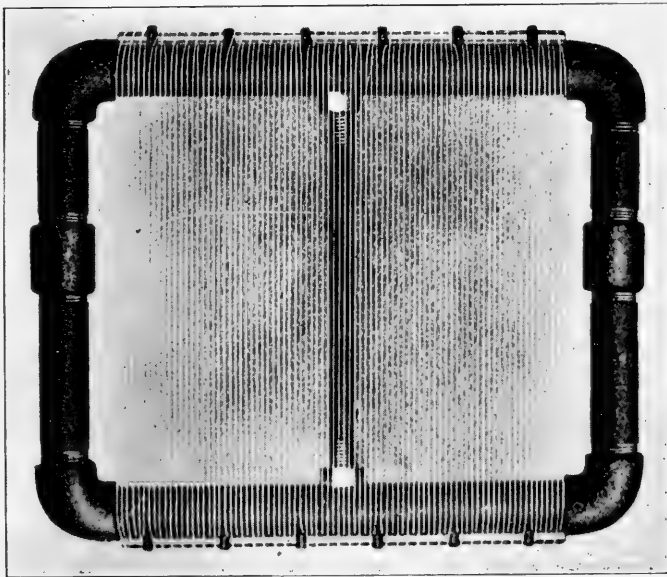
If we have reached that point in our agricultural history where we are confronted with worn-out soils, what are we going to do about it? Shall we continue to farm them and procure low yields of crops that do not pay the cost of production? Or shall we pay the price and restore them? We must pay the price or perish.

The author does not consider the objection of the liability of vetch to escape cultivation and become a weed as worthy of much consideration, yet something should be said about this. If there is but half the truth in the experiments and statements of Prof. T. S. Hunt, then would not vetch be a valuable weed to have upon our farms?

A fertile soil produces weeds in abundance and the husbandman must ever combat the weed proposition. He cannot escape it unless his soils are so worn out that weeds will no longer grow upon them, and in that condition he certainly would wish for weeds in abundance.

God, when he pronounced sentence upon the first man for his sin, said, "Curst is the ground for thy sake. Thorns and thistles shall it bring forth to thee and thou





SCREEN

Style of Screen Used in the J. M. Stone Patent Globe Separator  
for Separating Vetch Seed From Wheat.



shalt eat thy bread in the sweat of thy face." Since that sentence was pronounced upon man, the soil has ever brought forth thorns and thistles and the weeds, and man must ever contend with them as long as the soil is capable of producing food for man. So if our soils are fertile there is no escaping the weed proposition in some form or other. Then why not grow valuable weeds that return some beneficial elements or some soil-building materials to the soil? The author has always contended that weeds were a benefit and were placed in our soils for some purpose. But supposing that vetch did escape cultivation and become a weed, it would grow up in our fence corners and highways, and certainly would be more beautiful than the weeds found in these places. The author has shown that vetch is a benefit to clover, timothy and alfalfa, and it could not possibly injure any other crops unless it would be wheat, and wheat it will injure in this respect.

It is characteristic of vetch to remain in soils for a series of years after it has been once planted. Why this is, the author has never yet been able to ascertain. Whether the plants that grow the succeeding year after vetch is once grown come from seed that do not germinate the first year they were planted on account of their hard covering, and thus remain in the soil for the succeeding year, or whether the plants are propagated from live roots of vetch that remain in the soil, has not yet been ascertained. It is a fact, however, that when vetch is once sown upon soil, that the plants will continue to come from year to year for several years thereafter. And if wheat is sown in these lands after vetch has once been grown upon them, there will be enough vetch come up

with the wheat which will ripen its seed at the same time that the wheat ripens its seed, and thus the two become mixed in threshing. And until recently there has been no separator invented that would separate the seed, so that vetch seed would mix with wheat, causing a dock of the wheat at the elevator. This has become a serious problem in the wheat regions of the Northwest and in Canada. In these regions there seems to be a wild vetch similar in every respect to the hairy vetch that mixes with the wheat. The seed of this vetch is a flat, black disc, the side faces of which are slightly curved. The diameter is about the same as the length of the grain of wheat and the thickness of the two is also nearly the same. So, therefore, it has been impossible to separate this vetch from wheat by the ordinary method of screening, as any screen large enough for the wheat to pass through would also permit the passage of the vetch seed. If the two seeds are ground up into flour it makes the flour dark, heavy and bitter, and in fact, wholly unfit for use. This same condition would be true in any region where vetch of any variety was mixed with wheat. The author has personally known of experiences where vetch had been so mixed with wheat that elevators would not purchase it, and the wheat was totally unfit for grinding into flour. Of course this mixture of vetch and wheat would be ideal for sowing for fertilizing purposes or for a forage crop. So if any farmer wishes to grow wheat the author desires to warn him that he must be careful with the growing of vetch upon his farm so as to prevent this mixture of wheat and vetch, and this mixing of vetch with wheat is really the only bad point that vetch possesses. However, there has recently been invented a seed separator

that will perfectly separate vetch and wheat, an illustration of which is shown in this book. This machine was invented and patented by J. M. Stone of Portland, Oregon, now of Lodi, California, and the right to use this patent in Canada alone, was sold for \$50,000.00. This screen or separator is a very simple proposition. It simply consists of screens made in the shape of a square frame of pipe over which is wound piano wire. The seeds are dropped on these screens inclined, and when they strike the wires they bounce back like balls dropped on a spring mattress. The vetch seeds being heavier, bounce higher and continue to bounce until they bounce off the edge of the screens. But the wheat, which is lighter, falls between the wires. It is not necessary to operate these separators with either pulleys, belts, chains, scrapers or fans, as the seed is simply poured into the top of the machine and the grains pass rapidly through the screens and separation is done automatically. These machines are made so as to separate all kinds of grains, and its invention and being placed on the market solves the question of separation of vetch from wheat, and therefore removes the only serious objection or bad point ever urged against the growing of vetch. These separators are made for both elevator and farm use. Those made for the farm separate from thirty to fifty bushels of grain an hour, and vary in price from \$30 to \$60 each. They not only separate vetch from wheat but other grains also.

As to the necessity of inoculation, the author has already stated in this volume that in all his experience with the growing of vetch he has never had to resort to inoculation, and a great number of vetch growers have given similar testimony. Yet there are some reputable auth-

orities who claim that they have found it necessary to inoculate.

The author believes that it can be safely stated that most any lands will grow vetch without inoculation; that the proper bacteria for inoculation is already in the soil and that if vetch fails to grow upon any soil that we must look for causes other than want of inoculation.

As to the last objection, the author has already stated that he has found the vetch plant to be one of the most hardy grown on the farm; that he has grown it where it has been subjected to a temperature of from seventeen to twenty degrees below zero, and has had many acres to stand under water and ice for several months without injury; that it has withstood the test of winters in states in the extreme North. However, there is no question but what hairy vetch winter kills, that is, some of the plants winter kill. And the author has already stated that he believes that the cause of this is that the plants were grown from seeds of weak vitality. He is of the firm opinion that if vetch is grown from the genuine pure hairy vetch seed or seed that has been acclimated, that there will be little danger of winter killing. Some authorities recommend a heavy seeding of vetch so that if some of the plants do winter kill, there will yet be a sufficient stand.

It should not be forgotten that hairy vetch can be sown in the spring and a good forage crop obtained in the fall from same, or it will be large enough to plow under in the fall, so if planted in this way the freezing feature would be eliminated.

Of course the freezing objection does not obtain as to spring vetch, as it is always sown in the spring.

B. T. Galloway, Chief of the Bureau of Plant Industry, Agricultural Department at Washington, says of the hairy vetch: "This is a comparatively new crop adapted to use over a large part of the United States and under many conditions it is the best leguminous winter cover crop known. It is unfortunate that the more general use of this plant should be restricted not only by the high price of the seed, but by the fact that it is adulterated and of low vitality." In a preceding chapter we have shown the extent of this adulteration, and does this not explain why so many have had their hairy vetch to winter kill?

## CHAPTER XI.

The death blight fell upon the source of Ireland's  
bread,  
Famine stalked in place of hunger satisfied—Erin's  
hosts were dead.

### Vetch and Potatoes.

The author has had a large experience in the growing of potatoes, and finds them a profitable farm crop when a yield of seventy-five or more bushels to the acre can be obtained. As it costs the same expenditure of money and labor to grow fifty bushels an acre as it does to grow two hundred or more bushels an acre, then it certainly behooves the grower of potatoes to obtain the conditions that will produce the larger crop.

It is a waste of time and money to attempt to grow potatoes on land deficient in organic matter. No amount of commercial fertilizers of any kind or character applied to land deficient in organic matter will produce a profitable crop of potatoes. If commercial fertilizers are applied to soil in which there is an abundance of organic matter it will be of some aid to the crop.

Organic matter applied to potato land in the shape of manure is not desirable because manure has the tendency to produce scab on potatoes.





POTATOES AFTER VETCH

This Field Was Worn Soil. Yet the Potatoes Planted After a Heavy Crop of Vetch Was Turned Under, Yielded 250 Bushels Per Acre of Fine Potatoes. They Averaged in Size to Those Held in the Hands of the Author.



The ideal organic matter for potatoes is some green manuring crop that fills the soil with its roots, thus giving an abundance of organic matter, other than the tops of the green manuring plant, that becomes available as plant food at once and which has the capacity of loosening up the soil.

Among the green manuring crops best for the potato soil are the red and crimson clover, rye and vetch. Vetch is one of the best. Its growth in the fall and its covering the soil in the winter makes the soil loose and friable, and the early spring growth fills the soil with an abundance of organic matter and nitrogen, which with the large top growth, makes the most favorable environment for the potato when the soil is plowed deep, and no potato ground should be plowed less than ten inches in depth.

The author has already told how he has grown fine crops of potatoes after vetch. In the spring of 1911 he plowed under deep a heavy crop of vetch and cornstalks, rolled and harrowed same until the soil was like a rich garden and planted it to late potatoes in the month of June.

The potatoes were planted four inches deep with a potato planter. They were harrowed four times between planting time and the time they had reached the height of one inch, after which they were given two deep cultivations and then cultivated shallow all summer until too large to run a cultivator between the rows. The summer was the driest experienced for years, yet these potatoes made a large yield, and not one of the author's neighbors, who planted as ordinarily planted, produced enough potatoes for home use.

While deep plowing, the selection and proper treat-

ment of seed for diseases, the proper cutting of seed, depth of planting, proper cultivation and spraying have much to do with the growing of a profitable potato crop, yet the putting of the soil in that condition that will make it a favorable home or environment for the growing potato is after all the chief essential. No successful potato grower has failed to notice that the best potato land is the loose soil full of vegetable or organic matter. As vetch brings about the loose vegetable-filled soil it is therefore one of the greatest aids to successful potato growing. At least the author has found it so.

## CHAPTER XII.

### VETCH EXPERIMENTS BY EXPERIMENTAL STATIONS AND INDIVIDUALS

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#### Arizona.

But little vetch has been grown in Arizona. The experimental station reports that no vetch tested proved at all satisfactory. But the station also reports that many of the legumes which grow successfully in other parts of the world do not succeed in Arizona.

#### Colorado.

Vetch is grown to some extent in Colorado, but only for experimental purposes. The experimental stations have grown some for seed purposes, but their methods of handling the crop and threshing for seed have not as yet been worked out.

#### Connecticut.

On account of the large amount of tobacco grown in Connecticut, and from the fact that it has been ascertained that vetch is one of the best plants for renovating and building up soils for tobacco, vetch has been extensively grown in Connecticut.

The horticulturalist of the Storrs Agricultural Experiment Station at Storrs, Connecticut, says that their sta-

tion has not conducted any very extensive experiments with vetch, except to ascertain its value as a cover crop for orchards; that they have found that the ordinary hairy, sand or winter vetch is very suitable for orchard cover cropping, especially on the heavier soils; that they have found that it is very difficult to harvest the seed on account of rain, but that occasionally they harvest in good shape, and especially if grown with rye.

At the experiment station at New Haven they have made quite extensive experiments with vetch to ascertain its value as a cover and fertilizing crop for tobacco fields, and they report that their experiments indicate beyond question that the sand, winter or hairy vetch is admirably adapted to this purpose; that they sow the vetch immediately after the tobacco crop has been harvested so as to protect the soil from washing, or a loss of fertility in other ways; that it has been their experience that after tobacco has been harvested, which is generally in August, there is a considerable loss of plant food from the soil by leaching and drifting of the surface soil, and the heavy fall and spring rains on sloping land which badly wash and gully the fields on account of it laying bare nearly nine months; that heretofore rye has been used for a cover crop, which did not prove wholly desirable, although it gathers up and holds the soluble plant food in the soil where it grew, but that it added nothing to what was already in the soil; that sometimes it winter kills badly, and at other times it dries out the soil very much, especially where it was allowed to get too high in the spring; that it did not decay quickly when turned under, particularly if it was turned under after it had made a large growth, when it impaired the capillary action of

the soil, leaving it too dry and loose for the young tobacco plants, and yielded up its plant food to them too slowly; that they tried many kinds of clover and other leguminous plants without much success because they winter-killed even after a good stand was secured; but that generally it was impossible in that region to obtain good stands of them in the fall, and for the further reason those crops require two seasons to reach their full development which of course was unsuited to their needs, hence, they found the hairy vetch plant exactly suitable for their purpose, because it was a nitrogen gathering crop; that its habit of growth of spreading out its plants on the surface of the ground and covering it completely with its dense foliage, made it an ideal cover crop which protected the lands from washing and leaching. The fact that the tobacco lands were poor in nitrogen, which was the most costly element of plant food, the vetch supplying this nitrogen, made quite a saving in dollars and cents, as they were compelled to pay sixteen cents and more per pound for nitrogen obtained in commercial fertilizers.

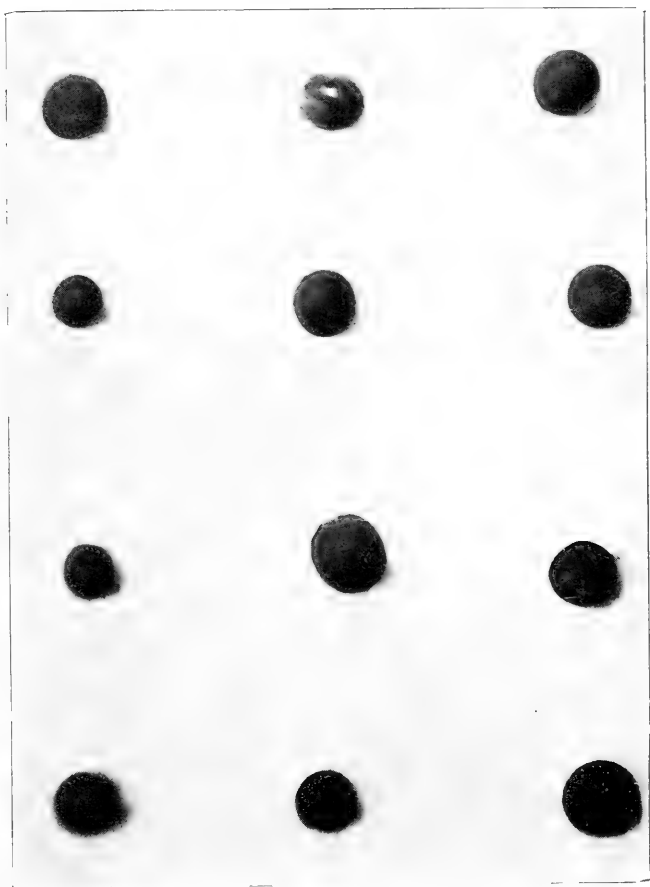
This station in its experiments also learned that hairy vetch requires moisture during the first few weeks of growth, but after it became established it was one of the best drought-resistant forage plants grown; that it withstood the cold, heat and drought, but did not do well where water stands in the soil or covers the land; that its fine small roots entered the soil in every direction and when the plants were turned under they rapidly decayed and gave up their plant food to the succeeding crop.

This station began a series of experiments in October, 1904, which was a month later than desirable, and

several fields in this state on which tobacco had been harvested were sown to Russian or hairy vetch. In some cases the fields were plowed and the vetch sowed with rye, while in others the vetch was sowed alone. In some instances the vetch was sowed on plowed ground and harrowed in with spike tooth harrow, while in others it was sowed on the surface of the ground immediately after the tobacco plants had been harvested and disced in with an ordinary disc.

In some parts of the fields inoculated seed was sown, and in others seed that had not been inoculated. The stand on all these plots was made thin on account of not having sufficient seed, yet a good stand was obtained and the plants grew thrifty in the fall and bore the severe winter that followed. The vetch stood the winter better than the rye, which was mostly killed. The tests showed that in one field which was covered with ice for several weeks, the vetch survived and was not injured; that the roots of the plants of the inoculated seed bore many tubercles or nodules, some being as large as corn kernels; that from the seed that was not inoculated, the roots did not have as many nodules as the inoculated seed and the plants did not seem as vigorous; that when the plants were plowed under in May they were from four to eight inches high and, where the seed was sufficient, completely covered the ground. They learned from these experiments that the seed should be sown as soon as possible after the tobacco is cut, and at the rate of one and one-half bushels of seed to the acre when sowed broadcast, and three-fourths to one bushel to the acre when sowed in drills; that the best time for sowing was between August 1st and





HAIRY VETCH SEED MAGNIFIED SEVERAL TIMES



September 15th. It was also learned that the fertilizing elements gathered by vetch are in best form for use by the succeeding crop, and that the crop of vetch plowed under by the first of May might, under favorable conditions, release in the ground plant food that would cost from sixteen to forty dollars an acre if purchased in the form of commercial fertilizer; that in addition to this fact the vetch had a high nutritive ratio, and is one of the most valuable forage crops known; that when it is sown for forage it cannot profitably be mowed and cured for hay unless sown with some plant that will hold it up; but that it made excellent pasture.

This station also recommended the use of this plant upon large areas of land in the Connecticut valley which were hardly farming land at present, but upon which sweet and Indian corn crops could be profitably grown if some crop was used to bring the soil into proper condition for the growing of these crops without any great expense; that it was their opinion that the growing of vetch and plowing it under would bring these lands into the proper condition for growing the crops mentioned.

A. D. Shamel, who has been making experiments with vetch since 1903 in Connecticut says that the benefit of growing vetch as a cover crop for tobacco lands has been definitely determined; that it improves the tilth, fertility and general soil conditions, and protects some lands from waste; that the chief factors that stand in the way of its further use are high cost of imported seed and the imperfect and unsatisfactory methods of seed production in this country; that there is needed a more reliable source of seed at a reasonable price; that he wonders whether some of the grain regions of the North or West

might not prove to be suitable for the growing of vetch seed; that he has in the past years received hundreds of letters from farmers inquiring about the vetch plant, source of seed, etc., which shows the interest that is being taken in the plant. He also says that in his experimental work with tobacco breeding in the Connecticut valley he found that the tobacco crops which were harvested in September from lands that were left bare through the fall, winter and spring, that rains washed away considerable soil; that during the dry seasons heavy winds carried the top soil and piled it up into drifts along the roadways or against other obstructions; that from fifty to one hundred dollars an acre was annually spent by growers for commercial fertilizers and manures, mostly for the nitrogen contained in these fertilizers; that it was clear to him that if it be possible to grow a cover crop on these lands it might be possible to prevent this great waste of soil, and that if a legume cover crop could be used it would be the means of reducing the great expense incurred in fertilizers for these soils; that he interested with him Dr. B. T. Galloway, Chief of the Bureau of Plant Industry, and it was suggested that a trial be made of the vetches, which was carried out during the season of 1904. They tried several varieties and obtained seed of the hairy vetch from the office of the seed and plant department, which had obtained it from Russia; that the seed of all varieties was sown in a large plot on tobacco lands after harvest the latter part of August and the fore part of September; that good stands were secured and all entered the winter in good condition. In the spring it was found that the most of the plants of the hairy vetch had lived through the winter,

and with the first days of spring began to grow rapidly ; that when the fields were plowed in May these plants were several feet long, and the roots turned up and exposed by the plow, were found to be literally covered with white nodules. Some patches that were well set with plants were allowed to grow for seed production in an effort to acclimatize this variety of vetch and adapt it to use as a practical cover crop for tobacco lands. As these plants were not sown with any grain to hold them up they laid on the ground, and the season being wet, most of the flowers and seed pods rotted and only about enough seed was obtained to sow an acre the following year. This seed was sown with a thin seeding of rye, and the second season the rye and vetch plants were cut with a mower about July 4th, when a majority of the pods were ripe, and piled in small cocks until thoroughly dried. As no threshing machine could be secured at that season the seed was threshed with a flail and about ten bushels of vetch seed and fifteen bushels of rye were obtained from this acre. As they could not separate the vetch seed from the rye with the ordinary screen and fanning mill, a home-made separator was constructed, consisting of a heavy belt of muslin about three feet wide and ten feet long, held up at one end at an angle of about forty-five degrees with a wooden framework. The belt was turned toward the open end of the framework and the mixed seed thrown on it slowly. The sound vetch rolled off the bottom of the belt, while the long rye seed caught on the nap of the cloth and was carried off at the top.

He states that the tobacco growers who have used this acclimated hairy vetch seed have found that it so

improved the soil that it enables them to cut down the heavy expense of fertilizers, and that crops grown on the vetch lands are more thrifty and endure droughts and wet spells of winter better than crops grown in the adjacent fields where no vetch cover crops had been grown; that the vetch has been found to be superior to rye, barley or other cover crops tried for the same purpose, and that many growers have had great success even with the imported seed.

Mr. Shamel also says that during the course of these experiments he conceived the idea of sowing vetch in cornfields at the time of the last cultivation, and so on the farm of H. Brewer, Hartford County, Connecticut, who was experimenting with him in the breeding of a new variety of corn for New England, in 1907 a field of ten acres of this dent corn was used for this experiment, and about July 15, 1907, the acclimated vetch seed was sowed broadcast by a man in this field. The sower covered three rows at once, and the horses were hitched to a light harrow that could pass through two rows of corn, and the seed was lightly harrowed in; that a good stand was secured, and by the time the ground was frozen, completely covered it with a perfect mass. In the following spring the vetch began to grow as soon as the soil warmed up, and by the time the field was ready to plow for corn, a heavy growth of vetch was developed and was easily turned under; that the corn crop on this field won a world's record for yield to the acre. And he has done the same thing again since that time with the grain after successive crops of vetch; that during the dry weather the corn plants on this vetch field did not suffer, while adjoining fields were seriously injured by the

drought. This field was visited by hundreds of people, as well as other fields where vetch has been used as a cover crop and they have been amazed by the beneficial use of vetch. He says that in many other cases since that time that he has observed the use of vetch for cover crop purposes in corn fields, and that he has not seen a single instance where it has not been of great benefit to following corn crops, and he has outlined these benefits as follows:

1. The cover crop protects the soil that is liable to waste from washing or other causes.

2. The extensive fine root development tends to break up the surface of the subsoil, thus improving the tilth of the soil. The rains and melting snows follow down these roots, and in this way definitely increase the water holding capacity of the soil.

3. The vetch plants, through the root nodules, increase the nitrogen contents of the soil. In experiments covering three years our bureau estimates that on tobacco lands this nitrogen gain is equal in value to about twenty-five dollars an acre, or, in other words, takes the place in value of that much nitrogen fertilizer which would have to be applied but for the use of the vetch cover crop.

4. The mass of vetch plowed under in the spring rots quickly, and adds to the humus contents of the soil, thus enabling the crops better to resist drought and make a more vigorous, healthy growth. Tobacco crops grown on vetch land are healthier, less liable to "mottled" or "mosaic" leaf, and to certain fungus diseases than crops grown in neighboring fields where no vetch crop has been grown.

In the light of his experience he urges wide-spread trials of this legume cover crop, vetch. He also states that in South Carolina he has seen trials of hairy vetch as cover crops in both corn and cotton fields with profitable results, and he recommends that a bushel of the hairy vetch seed be sown to the acre in corn fields; that in his opinion it is not safe to sow a less amount. He has seen good results by adding ten to twenty pounds of rye seed to the acre, especially on light soils where it is desirable to add to the amount of forage to be plowed under; that the seed should be sown as soon after the last cultivation of corn as possible.

In plowing under he recommends the use of a heavy chain to help push the plants in the furrows and aid in their covering by the plow; that he has experienced no difficulty in turning under the crop, and as the vetch rots so quickly it does not interfere in any way with the plants or cultivation or any other process; that he has also observed that all kinds of farm animals and poultry thrive on vetch when they become accustomed to it; that it is one of the most valuable foods grown.

He cautions the purchasers of vetch seed to use care in securing the proper variety, which is hairy or winter vetch, as in some cases he has found that seed houses have sold to purchasers seeds of other varieties for the hairy vetch.

He also states that he has been conducting some experiments in California among the citrus growers, who having grown it recognize the great value of vetch as a cover crop and who are now sowing thousands of acres of orchards annually to summer or spring vetch, which is adapted to warm climates and where the value of this

crop as a fertilizing plant and cover crop stands in high regard.

He says that the large seed of vetch makes it a much more certain grower than the small seeded legumes like clover, etc., which have been used for fertilizing and cover crops.

### California.

G. W. Shaw, of the Agricultural Experiment Station of the University of California, says they have done considerable experimental work with vetch with much success. The vetches are especially adapted to southern California, to the coast sections and next to bottom lands in the interior valleys. In this state they are not at all adapted to the uplands. They are not grown to any extent at the present time except as fertilizers to be plowed under in citrus orchards in southern California.

Vetches in this state should be planted preferably in October, and not later than the middle of November to secure the best results. The *vicia sativa* is the one which has given the best results.

### Georgia.

Milton P. Jarnagin, of the State College of Agriculture, Athens, Georgia, says that their station has grown vetch in areas of from forty to one hundred acres for the past four years; that at the time he came to the Georgia State College of Agriculture the farming land had been rented out to negro croppers for a part of the crop; that the land, which is naturally rolling in character, and with the slipshod methods of farming in use, had been much depleted of its fertility, and was in a worn and washed condition; that the principle work on the farm had been

to try and reclaim these soils, and that, everything considered, vetch had been the most valuable crop that they had used for the building up and reclaiming of these soils; that the fact that it could be seeded after the corn crop had been taken off in the fall, and then turned under in time to plant the land back to cotton the following spring, made it the most economical of all the leguminous crops, and so they have used it freely; that on some of the better lands they had gotten as much as three thousand pounds of hay from an acre after having gotten considerable grazing off of it early in the season; that they grazed it with both beef and dairy cattle, as well as colts and hogs; that the combination for seeding which they preferred for thin land was one bushel of rye and fifteen pounds of hairy vetch seed and ten pounds of crimson clover seed to the acre; that they found that the English or spring vetch winter-killed quite often with them, though they had the hairy vetch to freeze out; that they made a practice of mixing both the English or spring vetch with the hairy vetch in smaller lots to be used as calf pasture; that the English or spring vetch comes on earlier and makes a more vigorous growth; that they count on getting considerable grazing on it the latter part of November, December and part of January; that it usually kills by this time, and the hairy vetch comes on in the same territory later in the season; that during the year 1911 they threshed hairy vetch for the first time. It was seeded with rye and left until the vetch was thoroughly ripe. The rye was a little too ripe and shattered quite a bit in harvesting; that they put it through an ordinary threshing machine and had no trouble in threshing the clean seed; that they then

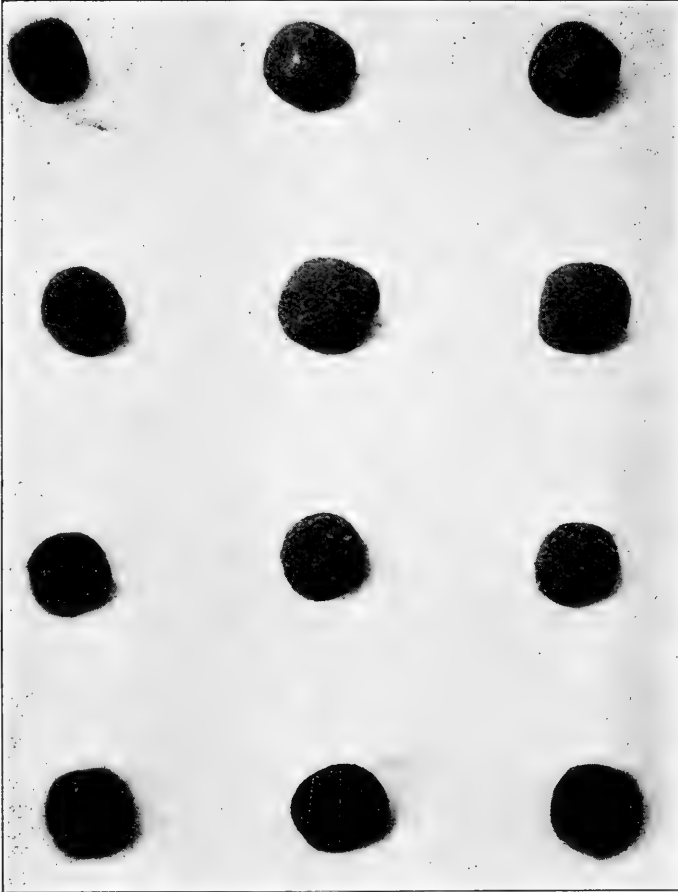


run a disc harrow over the land where it was grown and believed that they would get a good stand of rye and vetch on this land. He also says that he is very enthusiastic about the use of vetches in this territory.

Jas. T. Gardiner, of Augusta, Georgia, manager of the Moore farm near Augusta, Georgia, says that this farm was the pioneer in introducing vetch in Georgia some twenty-five years or more ago; that ever since then this farm has grown vetch, making a specialty of vetch hay; that in and around Georgia are bought every year thousands of bales of this hay and several thousand acres are grown to vetch; that the farmers recognize the great improvement in the soil after a few crops of vetch, to say nothing of the profit in growing of vetch for hay; that it makes first-class hay and sells for two to four dollars a ton more than other native hays; that there are three varieties of vetch grown, the native vetch (*vicia angustifolia*), English or spring vetch, and hairy or sand vetch; that it is almost impossible, however, to obtain the seed of the first named, and so as a vetch it is losing out; that most of the seed of the other two varieties are obtained from Russia; that they do not grow very much of the northwestern United States vetch on account of the high freight rates, but that the hay produced from these northwestern vetches ranks high as forage for stock; that the growing of vetches adds nitrogen to the soil and adds immensely to its permanent fertility; that the vetch crops can be harvested in the spring in time to follow with cowpeas, and so two legume crops can be grown on the same land within a year; that they find the vetch and the peas give more benefit to the crop than the clover or any other legume crop grown; that

the feeding value of the hay crop is greater than that of clover; that the value of a vetch and pea crop grown on the land in the same year is greater by one-half or two-thirds than the value of two clover crops; that it is a common saying with vetch growers near Augusta that if you make your land rich enough for the maximum crop of vetch, the vetch will keep it permanently rich enough for everything else; that the soil best suited for the growth of vetch is one that is loamy and well drained; that a soil with some clay is preferred to an excess of sand; that sandy soils have produced good crops of vetch; and lands that will make the best pea crops will also make the best vetch crops; that on the Moore farm they plant forty-five pounds of spring vetch with two quarts of cleaned oats to the acre, the latter to help hold up the former; that both seeds are sown with a disc grain drill after first going over the land twice with a disc harrow, or more if on hard sod fields. For the hairy vetch they use twenty-five pounds of seed to the acre to the two quarts of oats. After the seeding is all over, a careful man on horseback sows two quarts of late crimson clover, and if the season is favorable, this crop in early May will be the most beautiful one ever seen, with its wealth of purple, pink, and crimson blooms and its many shades of green. It is truly a delight to the eye, standing up from three to four feet high. Many of the stalks of the hairy vetch measure nine feet long. He says that vetch averages one ton to the acre of dry hay; though many fields will make twice that amount; that the hay of the spring vetch as a rule is preferred to that of the hairy vetch for the reason that it does not grow in such a tangled mass and it is therefore easier to cure, and so a better grade





SPRING VETCH SEED MAGNIFIED SEVERAL TIMES:

of hay is secured from the spring vetch. The seed of this variety is about one-half cheaper in price. Some growers plant as much as from seventy-five to a hundred bushels of spring vetch each season. He advises the planting of both varieties if grown for hay, as the hairy vetch ripens about two weeks later than the spring vetch, giving time to save one crop before the other is ripe; that both these varieties of vetch stool very freely, there being from five to twelve stalks of vetch to the seed of the hairy vetch and four to six of the spring vetch. Not all the vetch fields near Augusta are planted with the oats mixture, as many of them are planted with the pure vetch; that the hairy vetch is hardier than the spring vetch. He says that the time of planting is from September to December for the spring vetch, and that the seeding of the hairy vetch may be continued two weeks longer. However, they aim to get all planted by November 1st. Mr. Gardiner says that he thinks the vetch plant is destined to become the saviour of the long mismanaged soils and will ultimately make the soils of the sunny Southland become as productive as any on earth; that vetch stores up more nitrogen in the soil than cowpeas.

He says that a good series of crops is to plant early in September vetch and beardless barley together, graze or cut the barley in the winter, cut the vetch, say in April, and then plant to cowpeas for summer hay cutting. The added value to any soil of these two legumes with or without barley should be in one year six to eight dollars an acre; that vetch hay and pea-vine hay have three times the food protein value, pound for pound, than found in timothy hay.

Mr. Gardiner also says that both varieties of vetch

cut green are used freely by the dairymen in and about Augusta, and that this feed changes both the quantity and quality of the milk, increasing the quantity and giving to the milk a rich yellow cream, and a good taste; that when this milk is fed to spring pigs you can actually see the little fellows grow; that some dairymen plant one bushel of beardless barley and a half bushel of vetch and one bushel of rye to the acre, some in less amounts; that if this mixture is planted quite early in the fall the beardless barley can be cut within sixty or eighty days from planting. Then in early spring the rye and vetch are cut together, and this cutting can be followed by two or three similar cuttings later in the season. If this combination, however, is sown late in the winter, the three crops can all be cut at the same time; that the vetches furnish a wealth of bloom in the spring which affords a great feeding ground for bees which, during the time of its bloom, deposit three times the amount of honey that they will in other seasons, and that the honey is white and of an especially good flavor; that the feeding value of vetch hay is the same as the feeding value of bran; that in all Augusta territory there is now growing wild and increasing in amount each year a half dozen or more varieties.

Mr. Gardiner states that the greatest mistake that the Southern farmer makes in the management of his soil is when he allows it to remain bare of crops throughout the winter, thus letting the rain wash through the soil and rob it of its fertility, and that this custom of relying on commercial elements to restore his soil makes it a very bad and unprofitable business. The planter could, by using a winter crop of small grain mixed with vetch, save

the fertility already in the soil, as well as increase the fertility which vetch and these small grain crops will give.

He states that experiments prove that the vetch plant stores more nitrogen in the soil than cowpeas or any other legume. Comparing the feeding value of the different kinds of hay with vetch, he finds the vetch hay to exceed in value the entire list.

The best time for planting vetch in the South is from December 15th to January 15th. Some are planted as late as March 15th, but maximum crops resulted from plantings made from December 15th to January 15th. February planting was not nearly so good, and a March planting was almost a complete failure.

In the cotton fields vetch should be sown at the last plowing and then the whole crop turned under at cotton planting time. The vetch planting could be done in early fall or Christmas time and turned under in the spring. When the vetch is planted and the vetch hay crop cut the latter part of May, a crop of Early King cotton, or corn, or cowpeas could be planted down.

The N. L. Willet Seed Company of Augusta, Georgia, say that they will not any longer list the variety known as *vicia gracca*; that it is a perennial vetch which grows too small to be of use. They claim that their native vetch called *angustifolia* is the best vetch they have there, but that the seed is too hard to obtain. They say that Augusta is a great vetch growing center and that the *villosa* and the *sativa* are grown very heavily for hay purposes only.

## Hawaii.

The College of Hawaii reports that while they have experimented with various legumes for cover crops, yet they have never included vetch in their experiments.

## Indiana.

The experiment station at Purdue has made some experiments with vetch, mostly in small plots. And in their report they say that they have sown it about the first of September at the rate of sixty pounds to the acre, and it was sown with about one and one-fourth bushels of rye to the acre; that they had also sown it in corn at the last cultivation or later. They claim that the plant did not make a heavy growth in autumn and that the winter season seemed to be so hard on them that many were winter-killed, and that those which survived the winter began growing very slowly in the spring, but that, however, when they did begin to grow, they grew rapidly, and by May 1st had made a growth of eighteen inches or more. They state that when vetch was sown with rye the mixture did not seem to grow well together, as the rye grew more rapidly than the vetch and rather over-topped it. They noticed in some spots of the rye the vetch would have a good growth, while in other parts it seemed to be on a standstill and did not do much good; that the proportion of vetch to rye of green weight when cut about May 1st was about twenty-five to thirty per cent; that the green weight of rye and vetch to the acre will run about six tons, equivalent in dry hay to two and a half tons; that they highly recommend this vetch and rye mixture for green feed for dairy cattle, but are of the



opinion that wheat and vetch would make a better combination as the wheat makes slower growth than the rye and the two plants would come along more nearly together. They recommend vetch for turning under as soil improvement, either sowed alone or with a rye mixture. They observed that the roots were well supplied with nodules. They were of the opinion that the seeding ought to be rather heavy so as to make allowance for plants that were winter-killed, in order to get a good stand from the plants that were left over, or which survived the winter. They, however, recommended the use of clover, cowpeas and soybeans as a soil improver rather than vetch, stating, however, that if vetch would succeed and would not kill out, and was sown in the autumn in time to make sufficient growth in the spring, that it would be of great value turned under as a fertilizing crop. It is their opinion also that there is danger of the plant escaping cultivation and becoming a weed; that the vetch would mix with wheat, and not being easily separated from the wheat, and so would cause a dock at the elevator. Owing to the high price of seed they state that they did not like to highly recommend the use of vetch generally by farmers.

T. M. K., of Indiana, who does not give his name in full, writing for an agricultural paper, states that he has always had success in raising vetch; that it had many advantages over crops of similar use; that it not only had some properties of clover, but that it could be made to grow where clover would not do well; that it was valuable as a winter cover crop; that he sowed it from the last of September to the first of October, pasturing it in the spring, and turned it under at plowing time for corn. He

states that it was perfectly hardy and stays green throughout the entire winter season; that it did well in any soil and made excellent growth on poor sandy soil, and also on clay or heavy loam; that it could be sown in the spring and would furnish an early green crop for soiling purposes; that when sown in mid-summer it made an abundance of fall pasture. He recommends sowing fifty pounds of seed to the acre. He says that when harvested for seed it could be threshed with a threshing machine, and a good load of it would thresh six bushels of seed; that for hay it should be cut when in full bloom; that he recommends sowing thirty to fifty pounds of vetch with a bushel of rye to the acre; that the hay was splendid feed for sheep, cattle and hogs; that it produced three or more tons to the acre.

Another Indiana farmer, writing under the initials D. W. B., for a farm paper, states that a trial of vetch in his locality gave splendid results when followed with a corn crop, as it increased the yield quite largely; that he sowed a half bushel of vetch seed with three quarters of a bushel of wheat about September 10th and it was plowed under for corn the following season, and while this was not sandy soil, the corn crop following proved to be the best corn crop on the farm in a yield of sixty bushels to the acre. He claims that vetch will do well on any good corn ground.

Another Indiana farmer, writing under the initials N. P. W., near Richmond, Indiana, states that he has had some experience with vetch and found it to be a very valuable forage plant; that no farmer need have any fears of vetch ever becoming a troublesome weed as all kinds of stock are very fond of it and will eat it

down to the ground the first season if they are allowed to pasture it close. He sows twenty pounds of vetch seed to the acre, mixing the vetch seed with oats, at the same time sowing one bushel of some red clover seed to four or five acres of ground; that the vetch will not show until after the oats are harvested, and after the clover has a good start the vetch will peep up here and there above the clover, and if the season is favorable you will have the finest fall pasture any one ever saw. He recommends to not pasture this too close, and that next spring you will be surprised what a rapid growth the vetch will make; that it will be far ahead of the clover, and when you cut the crop for hay you will have no trouble in getting a hay-fork to hold it, and in feeding the hay in winter, you will not have a manger full of hay for bedding as is often the case in feeding clover hay. He says try it and be convinced of these facts.

An Indiana farmer, writing under the initials of G. B., says that when winter vetch is sown on well prepared soil from August 1st to September 15th, it will supply a heavy crop of foliage for early spring feeding, but claims that the soil should be inoculated and that sandy, gravelly and well drained soils are best adapted to it; that the winter or hairy vetch will reseed itself from year to year if given a chance; that the growth of this variety on suitable soil has been so immense in some patches that neither man or beast could have waded through it without great difficulty, and that the roots were a mass of nitrogen-bearing nodules capable of drawing from the air one hundred pounds of nitrogen to the acre, worth not less than seventeen or eighteen dollars, besides furnishing a large supply of organic matter, and that

when Prof. John Craig, Horticulturist at Cornell University was asked what was the best orchard cover crop, he replied without hesitancy, "winter vetch."

Another Indiana farmer, writing under "A Reader," states that vetch does the best on good soil, but has the rare property of making a good growth on poor soil, especially on poor sandy soils; that the seed germinates slowly, but that when the plants begin to grow it extends its roots into the soil, bringing up the plant food from below and storing it in the foliage, which, when turned under for green fertilizer in the spring, leaves it in the surface soil, where it may be easily utilized by crops which follow; that it makes rich pasture and is liked by all kinds of live stock, but is more useful as fertilizer turned under in the spring; that it stands the coldest winter weather, comes out early in the spring and quickly covers the ground, making it moist and mellow for the corn crop; that where it has been grown on land that formerly produced forty bushels of corn to the acre, the following year after it was turned under the same land produced double the number of bushels and a better quality, which shows it to be one of nature's greatest nitrogen-gathering and humus-producing plants; that he had noticed an abundance of root tubercles upon its roots; that the seed should be planted early during August.

J. W. Simon, of Indiana, writing for an agricultural paper, says of vetch that fifty pounds of seed is the right amount to plant in corn; that the seeding should be in August or early September; that he plows the same under in the spring and follows with corn again; that following this practice for the past three years it has doubled the

yield of corn on his land; that it is a wonderful plant to bring the nitrogen from the air to the soil and to produce humus which so much helps to hold moisture in the soil; that it is the greatest crop, before the corn crop, he ever tried; that for grazing purposes it furnishes splendid nitrogenous food when grazed in spring; that it matures about June when it may be cut for hay; that if left on the ground uncut a small seed crop will mature in autumn; that some sow it late in spring, but he prefers August or early September sowing.

I. M. Edgington, of De Long, Indiana, has been sowing vetch for four or five years on his bottom land with timothy and says that it makes a fine hay, and that his cattle will eat the vetch instead of the timothy. This gentleman has been making a living for a large family for the last fifteen years off of a forty-acre tract of land and has educated all his children and has been to very heavy expense at several times for doctor bills.

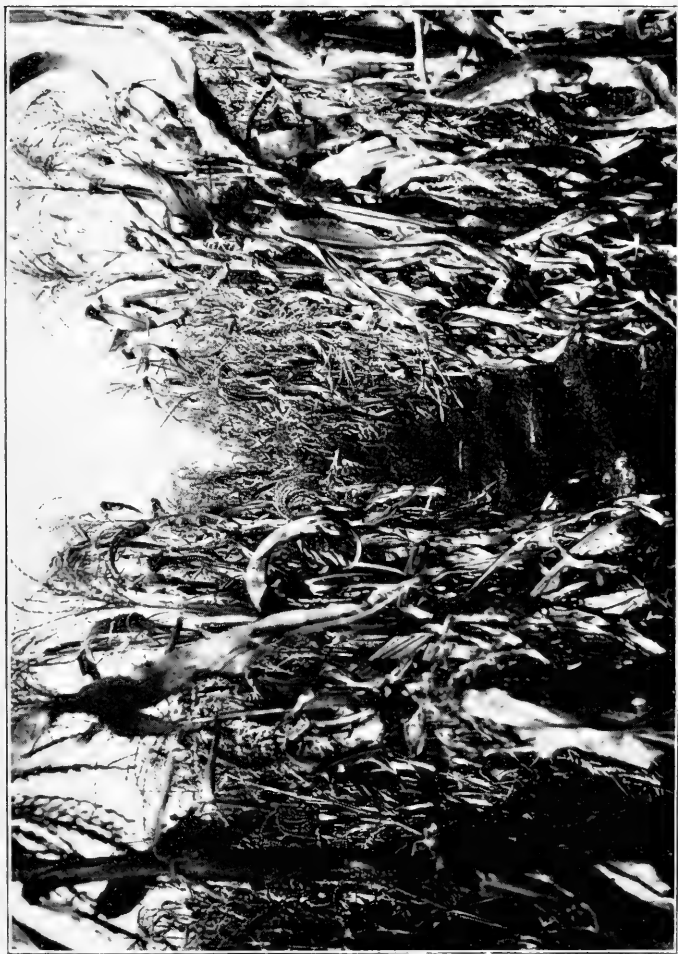
### Iowa.

Vetch has not been extensively grown in Iowa. One writer states that it is an interesting plant which in the future will be grown more than it is now; that at present the cost of seed and the liability of the plant becoming a weed, has prevented the more extensive growing of vetch in corn-fields; that his reasons for thinking that the plant will be grown more in the future are that it possesses more of the good qualities of clover, and alfalfa; that like them it brings down large quantities of nitrogen from the atmosphere and fixes it in the soil; that it has been found that vetch was superior to clover and alfalfa in this

respect; that from the fact of its being an annual the roots do not go quite so deep as clover and alfalfa and consequently its roots did not have the beneficial effect which is received from those plants which go into the soil deeply and changes the physical condition of the subsoil, and in bringing up the mineral soils from below; that for pasture purposes it was similar to clover, alfalfa and other legumes, except that the vetch is superior even to alfalfa in muscle-building material. Each hundred pounds of the hay contains eleven and nine-tenths pounds while alfalfa contains eleven and one-tenth pounds and red clover about seven pounds, but that the fact that vetch is an annual means that it will never become a perfect substitute for either clover or alfalfa; that he had seen vetch plants which sent out vining stems in all directions from the central crown for a distance of six or eight feet; that it had been found that winter vetch gave better satisfaction as a rule than spring vetch; that at present the high price of seed was the chief obstacle in the way of growing vetch; that one of the objections for growing a vetch crop for seed was that it has no definite period of ripening, but that it is continually growing and producing seed; that from the best investigations it was learned that from ten to twelve bushels of seed to the acre could be obtained, which, at two dollars a bushel, would be a paying crop.

Another writer states that there is a wild vetch growing in some places in Iowa, and in abundance, attaining a height of three feet, and that stock seem to be fond of it, it sometimes being used for hay. This Iowa wild vetch was found in great quantities upon prairies before they were brought into cultivation.





THE AUTHOR'S METHOD OF SOWING VETCH IN CORN  
The Vetch Can be Noticed in the Open Row.



## Idaho.

The Experiment Station at Moscow, Idaho, reports through Prof. W. H. Wicks, that when in charge of the Oregon station he had observed the growing of vetch to a large extent; that at one time they were testing some ninety-six different kinds for the government; that as to Idaho very few orchardists were acquainted with it, but that he was talking it quite generally among them as a shade or green manure crop; that alfalfa was not satisfactory to use in orchards for this purpose.

L. F. Childers, Agronomist, Idaho Experiment Station at Moscow, says that he has had considerable experience with vetch in Idaho; that he has never seen a failure resulting from seeding this crop; that it is grown both for cover crops and orchards and as a forage; that in the first instance nothing is seeded with it and it makes a rank growth, completely covering the ground; in the second instance it is seeded with wheat or some other crop to hold it up. In this case it does not make as heavy a growth as when seeded alone; that in Idaho vetches are something of a weed and when seeded on the ground persist for a long time afterwards, but that Idaho farmers do not consider this a bad habit and prefer it to ordinary weeds.

## Illinois.

I. E. Ingram, of Marshall County, Illinois, says that some years ago he sowed one-half bushel of hairy or sand vetch in corn before the last cultivation. The next year the land was put in oats and the vetch grew around on top of the oats so that it was very difficult to handle the

binder. The land was fall plowed and sowed to millet. The next year the crop of millet was a very heavy one and no signs of vetch were seen. The land was again fall-plowed and sowed to oats and Canada field-peas which were cut for hay. Some vetch grew in the oats and peas, and the land was again fall plowed and put to corn the next season. The vetch again came up voluntarily, and last year this piece of land was put in oats again, and again the binder was bothered in cutting the oats, and lots of the vetch seed had ripened. Vetch seems to be a persistent grower as the seed seemed to grow after laying over in the ground for several years. He says he found vetch very troublesome in oats.

Albert N. Hume, University of Illinois, says there are two kinds of vetch which have been at different times experimented with in the middle western states. At any rate the writer has knowledge of experiments with both kinds in Illinois.

One kind is known as summer vetch and the other variety is known as winter vetch.

Summer vetch is not a plant of much utility in this part of the country. It is possible that further experiments might be tried with it to some advantage, but it is hardly worth while for practical farmers to undertake to grow it.

Winter vetch does better, but even that is rather an uncertain crop. In several years' trial at the Illinois Experiment Station, winter vetch on well fertilized, well drained land only made one good crop of hay or seed. So much for the cropping value of vetch. As to its value as a green manure plant one may say that no doubt some

of the claims made for it are warranted, but it would seem that the claims are somewhat over-enthusiastic.

Vetch is a leguminous plant and would, therefore, when properly grown, add nitrogen and organic matter to the soil. Unquestionably such additions would increase the following crops. It is hardly likely that the yield of corn would increase from an average of fifteen bushels to the acre to an average of eighty or one hundred bushels to the acre. Although it is possible that such a change would in some instances and in some years take place.

The only thing which the use of vetch as a green manure would add to the soil is nitrogen and humus. Neither vetch nor any other green manure will add mineral elements to any soil. Therefore it is not a very good comparison to say that the plowing under of vetch is equal to the putting into the ground sixteen dollars to forty-five dollars worth of commercial fertilizer, for commercial fertilizers contain mineral elements, or at least should contain them. Green manure adds only nitrogen and humus to any soil. The amount of benefit which would accrue from turning under a crop of vetch as a green manure would probably be less than the minimum usually suggested.

It hardly seems necessary to enter more fully into the methods of handling vetch as a crop, because it does not seem likely that it will be very generally adopted as a part of the rotation systems in the Middle West. Where clover is not generally grown soybeans are more likely to take its place than vetch.

### **Kansas.**

C. W. Nash, of the Kansas State Agricultural College, says: "So far as I have been able to find, nothing has been published on vetch at this station, and but very few trials have been made of it here. The work that has been done with it, in brief is as follows: In the fall of 1904 a small plot of vetch was seeded with rye. The vetch was a poor stand but survived the winter and made a tall growth. No yields are reported. In the fall of 1910 vetch was sown alone and also with rye at different rates. The vetch came up and lived through the winter, but was smothered out on all the plots where it was seeded with rye. On the plots where it was seeded alone, a fair growth was obtained, but the yield an acre was not determined. In the spring of 1905 two plots were seeded to winter and spring vetch. A good stand was received of each. But the spring vetch dried up when about a foot high. The winter vetch grew to two feet in height and made 290 pounds of hay. As the area of the plot was not recorded it is not possible to give the yield to the acre. Spring and winter vetch sown this spring gave some results. The spring vetch died early in the season, and the winter vetch lived and matured some seed, but not making a very heavy growth the result obtained would indicate that vetch has only fair promise for this section.

"It is planned, however, to continue the test so as to get accurate data as to its value as a crop for our conditions."

### **Kentucky.**

H. Garman, of the Agricultural Experiment Station of the State University of Kentucky, says: "I have

grown both the winter and spring vetches on the experiment farm for a good many years and find no difficulty in growing either of them. The winter vetch does particularly well. It does not, however, seem to be suited for forage unless grown with some other crop, such as oats or rye in good soil. Our farmers are not making very much use of the vetches at present, but are becoming interested in them and will doubtless find a place for them in some rotations."

In the Fifteenth Annual Report of the Kentucky Agricultural Experiment Station, on page 42, we find the following on Russian or hairy vetch: "This is a trailing plant with weak stems and soft gray-green foliage that has done remarkably well wherever planted on the farm. It is an annual, but when left to itself sends up a profusion of plants from seeds dropped the preceding summer. It produces large numbers of lobe tubercles on the roots and is thus an active nitrogen gatherer. From its trailing habit it is not an easy plant to cut, and it is probable it will be found better as a catch crop to turn under than for anything else. Its vigorous growth is a pleasure to see when other plants are suffering from unfavorable weather. To keep it from the ground it may be sown with some small grain, such as wheat, oats or rye. It may be planted either in the spring or fall, using about one bushel of seed to the acre."

In Bulletin 98 of the Kentucky Agricultural Experiment Station, published in 1902, speaking of tubercles, or root nodules, on vetch, they say: "On hairy vetch (*vicia villosa*) they are variously lobed, young galls frequently consisting of three or four rather slender processes loosely attached to a rootlet, and older galls having numerous

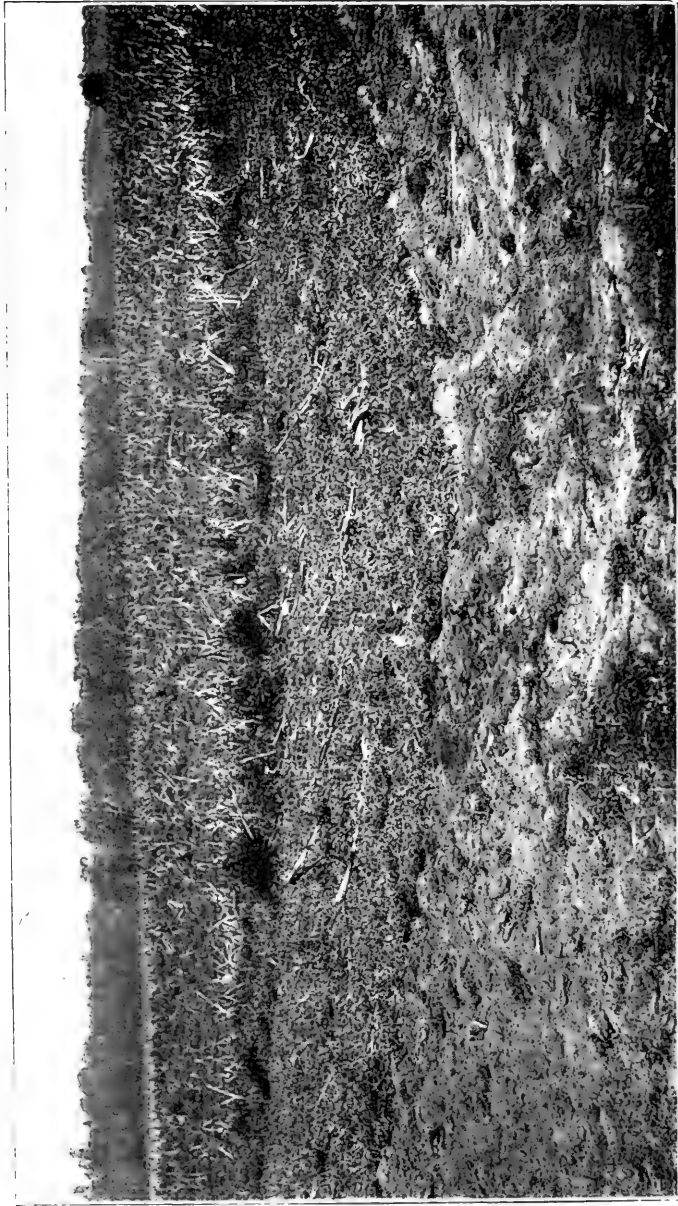
lobes, making the general surface very uneven. The diameter of some of those observed in our plots was 5-16 inch."

The analysis of the different plants as made by this station shows that the kidney vetch in comparison with the different clovers, rape, field peas, English blue-grass, Florida beggar weed, Johnson grass, dwarf rape, Essex, etc., is higher in nitrogen free extract than most of the other plants mentioned; that the Russian or hairy vetch, as compared to red clover, was higher in water, ash, protein, fiber and nitrogen free extract content; that the Russian vetch was higher in water, ash, protein, fiber and nitrogen free extract content than the whole plant of the soybean, except the fiber and the nitrogen free extract content, which was slightly higher in soybeans than it was in Russian vetch.

And the analysis of the average digestion co-efficients of the vetch plant as compared to alfalfa hay, alsike clover hay, cowpea-vine hay, crimson clover hay, Hungarian hay, Johnson grass hay, orchard grass hay, red clover hay cut in bloom, red top hay, serradelia hay cut in bloom, soybean hay, soybean meal, timothy hay all trials, timothy hay cut in bloom, timothy hay cut soon after bloom, contained a higher per cent of dry matter than any of these plants except the soybean meal, and contained a higher per cent of protein than any of these plants except the soybean, and a higher per cent of fiber than any of the above mentioned plants except the Hungarian grass hay, Johnson grass hay, orchard grass hay, red top hay, soybean hay and timothy hay cut in bloom.

In nitrogen free extract the vetch plant was of the same per cent as alfalfa hay, and contained a higher per





A HEAVY CROP OF HAIRY VETCH PLANTED IN SWEET CORN, BEING PLOWED UNDER THE LAST OF MAY. The Foreground of This Picture Shows the Condition of the Ground After the Vetch Was Plowed Under. The Middle Ground Shows the Vetch Rolled Down Ready for the Plow, and the Background Shows the Vetch Climbing to the Cornstalks and Before It Is Rolled.



cent than any of the above mentioned plants except alsike clover hay, cowpea-vine hay, Hungarian grass hay, red clover hay cut in bloom, soybean and soymeal.

The fat parts of each one hundred parts of these feed stuffs as shown by analysis, developed the fact that the vetch plant contained sixty parts of fat, which was nearly double that of the alfalfa hay and more than any of the aforementioned plants except Hungarian grass, seradelia hay and the meal made from soybean hay. There were only two parts more of fat in red clover hay than there was in vetch.

#### **Louisiana.**

The Agricultural Experiment Station of the Louisiana State University reports as follows: "We have planted the hairy vetch and Oregon vetch here for a number of years. We find they do pretty well here but they are not entirely satisfactory as a pasture plant, and the seed has been so expensive that we have not found it an economical plant to grow, as we have other plants that are as valuable that can be cultivated at a less expense." They also report that they discussed this vetch plant in their Bulletin No. 72, which bulletin is exhausted and cannot be obtained.

#### **Missouri.**

The Agricultural Experiment Station of the University of Missouri reports on vetch as follows: "We regret to say that Missouri has printed no matter up to the present time on the production of vetch, and in fact the crop is but little beyond the experimental stage in this

state. We have found the chief objection to the crop to be the securing of pure, germinable seed and the high cost of securing a good stand. It usually costs from \$2.50 to \$5 an acre to get a good stand. Where the crop was gotten in late the growth the plant made before winter was not sufficient to cover the ground to any extent, or make any great amount of winter pasture. Where vetch was seeded early enough in late summer, so that a good growth could be had before frost, it has been found to be a paying crop. But these cases are so few and far between that we recommend the crop only in an experimental way and then very cautiously."

#### **Massachusetts.**

The Experiment Station of the Massachusetts Agricultural College reports on vetch as follows: "We are sending under separate cover a copy of our Bulletin No. 133 and also a copy of our Fifteenth Report. You will see that we have tried the winter wheat and sand, or hairy vetch, particularly for forage purposes and have succeeded very well with same. We have also grown the winter vetch by itself as a cover crop with excellent results. We have not tried it for seed. In earlier years the spring vetch was also grown in connection with oats for forage purposes with very satisfactory results. If the vetch is grown by itself, and especially if it is seeded thickly, it lodges and decays before ripening its seed. We presume this could be avoided if the plant was sown not too thickly in drills. Our chief objection to the use of vetch has been the cost of the seed. Of late years we

have been obliged to pay as high as six or seven dollars a bushel for it."

In Bulletin No. 133 of this station they state that the most desirable legumes for green forage are the field pea, soybean, clover and alfalfa; that the vetch closely resembles the pea in its habit of growth and general appearance; it has, however, finer stems and leaves. There are two species used for fodder purposes—the spring vetch (*vicia sativa*) and the sand or winter vetch (*vicia villosa*). The vetches and peas are used chiefly for green forage, to be grown together with the cereal fodders, the latter plant furnishing a desirable support."

And they recommend wheat as the most desirable non-leguminous forage plant to be sown with certain legumes for forage purposes, saying: "The land should be plowed and one and one-half bushels of wheat and one bushel of vetch to the acre sown broadcast about September 1st, and covered not too deeply with a wheel or other harrow. A good growth may be expected before cold weather but should be left uncut as a mulch. Cutting should begin just as the wheat-heads show themselves, which in our locality is the last of May. This green crop will remain in feeding condition for twelve to fourteen days. If more of the fodder mixture has been produced than can be fed green, the balance may be made into hay. The yield will vary from six to ten tons of green fodder to the acre, depending upon the fertility of the soil, rainfall, and spring temperature. Immediately after the removal of the crop the land may be planted to Hungarian, barnyard millet or corn. In one season, from the same piece of land, we have secured at the rate of ten tons of green wheat and vetch and 17.6 tons of fod-

der corn to the acre, containing nutrition equivalent to five tons of well cured hay. The wheat and vetch mixture is hardy, and will contain approximately 3.4 per cent of protein, equal to twelve to fifteen per cent in air-dried material. Because of the cost of the vetch seed it is doubtful if the ordinary dairyman can afford to grow the mixture; but the milk producer in the vicinity of private markets may find it of value as an early green feed.

"Vetch sown by itself is not satisfactory for forage as it is recumbent in its habit of growth and rots badly, especially if the weather is moist. It has been highly recommended by Shamel as a cover crop to follow tobacco. Sown broadcast about September 1st at the rate of one and one-half bushels of seed to the acre it grows rapidly and makes a good covering before winter. We have grown nine to ten tons of green material to the acre, cutting June 2d, equivalent to some one hundred and twenty pounds of nitrogen. This plant appears to be valuable as a forage crop grown together with a cereal, and likewise as a cover crop and producer of humus for sandy land and as a gatherer of nitrogen. The green crop that would naturally follow wheat and vetch is clover, or grass and clover."

This station also states that the approximate time of seeding wheat and vetch is September 1st and the approximate time of cutting is from May 25th to June 8th. And in their tables showing percentages of composition and digestibility of forage crops the vetch plant seems to make a better average than any of the other legumes.

In Public Document No. 33 of the Fifteenth Annual

Report of the Hatch Experiment Station of the Massachusetts Agricultural College, they give the following report of vetch and winter wheat:

#### Summer Forage Crops.

##### (a) Winter Wheat and Sand or Hairy Vetch.

This mixture of a non-legume and legume has been tried for a number of years at the station, and has proved to be an early and desirable spring green fodder. The only objection to be found is the present cost of the vetch seed—\$5 or more a bushel. This excessive cost is due to the fact that the vetch is a poor seeder, and frequently sheds its seeds before they can be harvested.

History of the Several Trials.—The first planting of this mixture, Aug. 1, 1898, winter-killed, in all probability, owing to the fact that the seed was sown too early.

The second planting, made Aug. 25, 1899, in the proportion of two bushels of wheat to one and one-half bushels of vetch, wintered well, and made a fine spring growth. Cutting began May 31, and the yield was at the rate of ten tons to the acre.

The third planting was made Aug. 24, 1900, with equal quantities of wheat and vetch seed. The autumn of that year was extremely dry, and the wheat killed out to some extent, so that the vetch predominated. The following spring was wet and cold—a condition which appeared to favor the growth of the vetch at the expense of the wheat. At the time of cutting, May 30, the vetch had completely covered the wheat in spots, and had lodged badly. The vetch roots were full of the characteristic

nodules. The weight of the entire yield was not obtained, but a conservative estimate places it at six to seven tons to the acre.

The fourth planting (1-3 acre), made Sept. 3, 1901, at the rate of one and one-half bushels of Rural New Yorker No. 6 wheat and one bushel of vetch to the acre, wintered well, and cutting began May 28th, at which time the mixture was from two and one-half to three feet high. At that time the wheat was about ready to show the head, and scattered vetch blossoms were noticed. When in full bloom the mixture stood from three and one-half to four feet high. The total yield was 6,545 pounds, equivalent to 9.5 tons to the acre.

Further Use of the Land.—Immediately after the removal of this crop the land was plowed, a light dressing of manure applied, and seeded with Longfellow corn. A yield (the past season) of 35,362 pounds (17.68 tons) of fairly well-eared green fodder to the acre was secured. The land was light and the rainfall excessive, which conditions were favorable, excepting the lack of heat, for fodder production. The total product of this piece of land for one year (first sown to wheat and vetch, and followed by corn) was at the rate of 8,622 pounds of dry matter to the acre, being equivalent to fully five tons of well-cured hay. It is not to be expected that such quantities could be obtained yearly under average conditions, for the land could not be as fully utilized. It is interesting to note, however, the quantity of fodder that may be secured from an acre of land in an average state of fertility, when climatic conditions are favorable and the land is occupied the entire season.

Best Method of Growing Wheat and Vetch.—The

land should be plowed, harrowed if necessary, manure spread at the rate of four to six cords to the acre, harrowed in; a mixture of one and one-half bushels of wheat and one bushel of vetch sown broadcast about September 1st, and covered, not deeply, with a wheel or other harrow. Cutting should begin just before the wheat heads appear, which in this locality is the last of May. The green crop will remain in feeding condition for twelve to fourteen days. If more of the fodder mixture has been produced than can be fed green, the balance may be made into hay. The vetch seed may be procured of New York seedsmen.

### Composition of Wheat and Vetch

	Green Fodder		Dried Fodder	
	No. 1	No. 2	No. 1	No. 2
	Per Cent	Per Cent	Per Cent	Per Cent
Water .....	83.40	79.60	11.90	13.70
Ash.....	1.50	1.76	7.97	5.22
Protein .....	3.25	3.14	17.07	10.93
Fibre .....	5.13	5.98	28.38	29.51
Extract Matter.....	6.24	8.92	32.52	38.70
Fat .....	.48	.60	2.16	1.94
	100.00	100.00	100.00	100.00

The percentage of protein in the mixture is dependent to an extent upon the quantity of vetch present. In case of sample No. 1 of both the green and dry fodder,

the vetch predominated. In case of sample No. 2 of the dry fodder the wheat was probably in excess. In fodder combinations it is difficult to secure an even distribution of the several plants. The mixture of one and one-half bushels of wheat and one bushel of vetch to the acre is satisfactory, does not lodge, and will show from 12 to 15 per cent protein in a thoroughly air-dry condition.

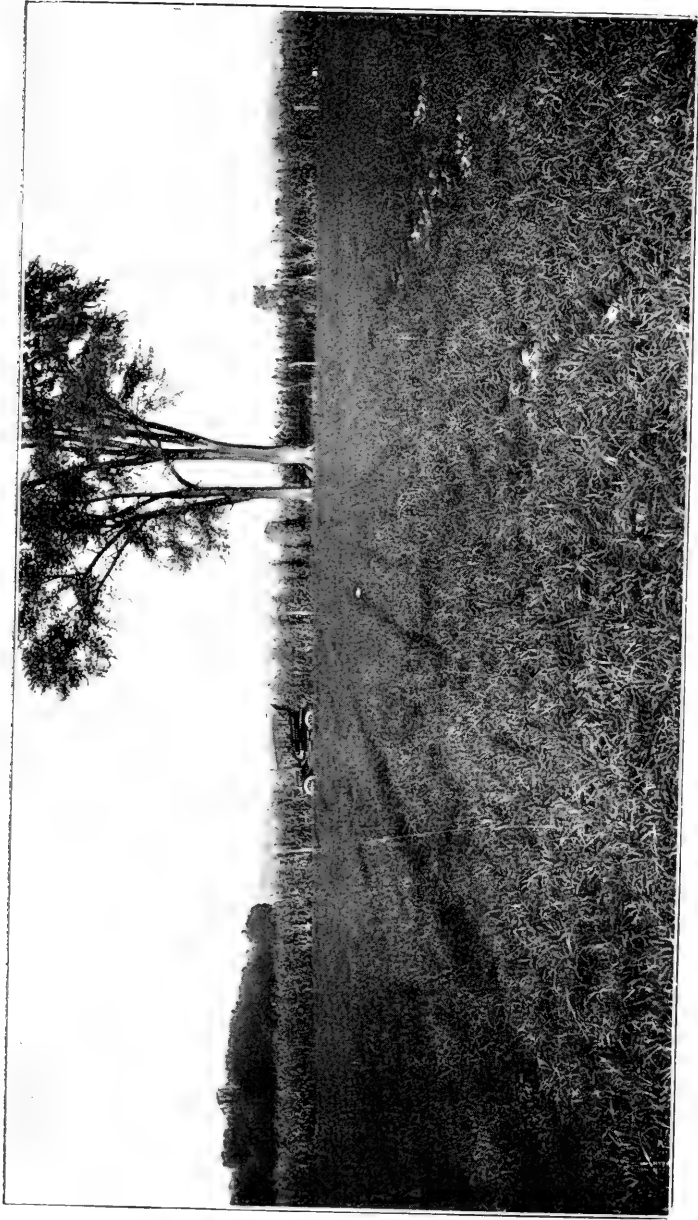
Digestibility of Winter Vetch and Sand Vetch.—  
Five digestion trials have been made with two different samples of green fodder, and six trials with two samples of the dried material:

Series		Number of Trials	Dry Matter (Per Cent)	Ash (Per Cent)	Protein (Per Cent)	Fibre (Per Cent)	Ext. Matter (Per Cent)	Fat (Per Cent)
VI	Wheat and Vetch (green) ..	3	64.54	42.47	76.27	66.05	71.13	55.65
VII	Wheat and Vetch (green) ..	2	70.13	43.59	70.92	70.50	75.05	57.92
	Average .....	5	68.58	42.92	74.13	67.83	72.70	56.56
VII	Wheat and Vetch (dry) ...	3	63.33	59.41	76.86	64.47	69.71	63.46
	same as Series VI (green)							
VII	Wheat and Vetch (dry) ....	3	64.50	35.20	70.77	64.59	66.75	63.75
	Average .....	6	66.42	47.31	73.82	64.53	68.23	63.61
	Dent fodder corn (milk), for comparison	9	70.00		61.00	64.00	76.00	78.00
	Oats and peas (bloom), ....	5	70.00	49.00	74.00	64.00	72.00	64.00
	for comparison							

The several digestion trials make it clear that the wheat and vetch mixture is as digestible as either fodder corn or oat and pea fodder. They also show this fodder when dried under normal conditions to be as digestible as when fed green.







**RYE AFTER VETCH**

See Latter Part of Chapter, Nine for, Author's Interesting and Profitable Experience With This Field.

### General Conclusions.

1. Wheat and sand vetch is a hardy fodder mixture.
2. When sown the previous autumn, it will be ready to cut the last of May, and is considered preferable to rye.
3. It will yield about ten tons of green material to the acre under average conditions, and in composition, digestibility and feeding value it fully equals peas and oats, and similar crops.
4. Because of the present cost of vetch seed, it is doubtful if the ordinary dairyman can afford to grow it; but the milk producer in the vicinity of profitable markets, who cultivates intensively, may find it a satisfactory source of early green feed.
5. Wheat seeded by itself in early September makes a fairly satisfactory early soiling crop, and is to be preferred to rye.
6. The dried wheat and vetch fodder, if cut when in bloom, is preferable to ordinary hay for milk, but, on account of the increased cost of production, it would hardly be considered profitable as a hay substitute.

### Minnesota.

The Experiment Station of the University of Minnesota reports as follows: "We may say that vetches are not grown extensively in this state. They are grown in small patches in some places for forage, and are occasionally used as green manure crops. We have tried them at the station for the above purposes, but have found the Canada field-pea a more satisfactory crop for either, but that seed is high in price and sometimes difficult to get. We have no published information on the

subject, and all we can say is that vetches grow very well in most parts of the state, and have considerable value as forage and as a fertilizer, but that other crops are more popular and satisfactory."

### Michigan.

In Bulletin 199 of the Michigan State Agricultural College Experiment Station, in a summary of legumes, it says that "Winter vetch, seeded in the spring, makes excellent fall pasture, but remains green through the winter.

"Winter vetch as a substitute for clover has been grown best by seeding in the fall, using a half bushel of wheat and a half bushel of vetch, cutting the whole in the middle of June for hay."

And in speaking of legumes it says: "The cowpea, soybean, and winter vetch have so many prominent characteristics as soil renovaters and stock feeds that they promise to be generally adopted as economical forage and green manuring crops for the state of Michigan."

A glance at the analysis of these legumes and a number of our other common crops grown for the same purpose in the table given will at once give the reader an idea of their economic importance. They also say: "Experiments to determine the digestibility of cowpeas either as green feed, silage or cured hay, show it to rank higher than the average of forage crops. The winter vetch is slightly more digestible than cowpeas, and soybeans more than vetch."

In speaking of winter vetch the station says:

(*Vicia villosa*).—This interesting legume has appeared under a great variety of names. It is often called

hairy vetch and sand vetch. Some have called it Russian vetch, probably because it originated in Russia.

The seeds of this plant are small, black, hard spheres, resembling sweet-pea seeds. The growing plant also bears a close resemblance to sweet pea up to the time it blossoms, when a field of vetch appears as a sea of beautiful, bluish-purple clustered flowers. The plant is a branching, climbing vine, a great many of its branches attaining the length of seven to ten feet.

A full-grown crop, even in three-foot rows, forms a dense mat, completely covering the ground to the depth of one to two feet. When grown with a crop of wheat, rye or other strong growing plant, it is kept entirely above ground.

If the seeds be sown in early spring, when the ground is moist and the conditions generally favorable for growth, the plant will develop rapidly. By the middle of August, it will be in full blossom, although it will continue to grow and remain green until the ground freezes in the winter. A few seeds will be formed in the late fall, but spring sowing is not advisable if one wishes to harvest a crop of seeds.

If the seed is sown in the fall, that is, any time between the first of August and the first of October, it will make some growth before winter sets in, but in the following spring will continue a marvelous growth, developing blossoms by the first of June and ripen seeds by the middle of July. The fall sowing is the more desirable for producing seeds. One of the principal objections urged against the growing of this crop is the great expense for seeds which are this year quoted at about \$7.00 a bushel, while former advices have recom-

mended using as high as a bushel and a half to the acre. We find that the seed can be readily grown in this state by sowing in the fall, and harvesting about the time of winter wheat.

It is found too that the quantity of seed necessary can be economized by sowing with some other crop. A mixture of half oats and half vetch for spring seeding and a similar mixture of wheat or rye with the vetch for fall seeding have proved to be successful combinations for soiling and for hay. Our observation leads us to recommend the use of winter wheat instead of rye for fall seeding, because the latter will ripen too early and not give the vetch sufficient time for mature growth. When sown with winter wheat for hay, the crop makes an excellent substitute for red clover and is ready to harvest as hay by the middle of June. A piece of this on light, sandy, loam soil on the college farm the past year from a seeding of one-half bushel Dawson's Golden Chaff wheat and one-half bushel winter vetch gave, on June 19th, 4,300 pounds of cured hay to the acre. The hay was greedily eaten by all kinds of farm stock, and its feeding value was especially high as will be seen by the following analysis:

Moisture, 17.70; Crude Protein, 12.47; Ash, 5.72; Ether Extract, 2.20; Crude Fibre, 24.47; and Carbohydrates, 37.42.

Circular No. 6, Division of Agrostology, recommends ensiling it in alternate layers with corn. Considering its high protein content, this practice certainly ought to be desirable. A yield of nine tons of green feed to the acre is recorded in Circular No. 20, Division of Agrostology.

In Alabama Experiment Station Bulletin No. 105, hairy vetch is recommended as an especially valuable forage plant for the South. Analyses were made at various stages of growth, resulting as follows:

### Yield and Composition of Hairy Vetch Cut at Different Dates.

(Alabama College Station Bulletin No. 105.—J. F. Druggar)

Date	State of growth	Hay						
		Yield per acre	Moisture	Crude Protein	Carbo-hydrates	Fat	Crude Fibre	Ash
		Lbs.	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
Apr. 19	Just before bloom...	3,117	20.72	23.45	26.25	2.22	20.24	7.12
Apr. 26	5% bloom showing..	3,705	22.83	18.97	29.06	2.11	20.44	6.59
May 2	In full bloom .....	5,789	20.30	17.15	32.12	2.14	22.50	5.79
May 9	Seed pods formed but not filled.....	5,463	22.48	18.71	29.50	2.35	19.92	7.04

The analysis of vines, roots and stubbles to determine the fertilizing value develops the fact that the nitrogen content increases with the stage of maturity, while the percentage of potash and phosphoric acid changes but little as the crop matures. These results, however, do suggest the advisability of postponing plowing under the crop for green manure until as late in the life of the plant as practicable.

The winter vetch is rapidly gaining favor as a cover

crop for orchards. For this purpose it should be sown in July or August, and if the seeding is followed by favorable growing weather, a very satisfactory crop will be present to mulch the soil when winter sets in.

Mr. E. W. Hutchinson of Shelby, Mich., has for several years grown winter vetch for various purposes and writes as follows:

"I would say that with us winter vetch can be grown successfully either for seed or as a feeding plant, or for plowing under as a fertilizer, and when sown on good corn or potato ground, it will grow a big crop. I have seen a space of six feet square covered with the vines from one root.

"If sown in early fall, it will be ready to commence to cut in early summer for green feed; and if cut when it begins to bloom, or is in full bloom, and is not cut too close, it can be cut as many as three times.

"Should it be wanted as green feed for late fall or early spring, it should be sown in the spring, but should it be wanted for seed or dry feed, it should be sown in the fall. Should it be wanted to feed as hay, we find it is well to sow about twelve pounds of rye and fifteen pounds of vetch seed to the acre, but when the vetch is sown alone, we sow about twenty pounds to the acre. By sowing rye with the vetch, it holds it up the better, for cutting and curing. We find it one of the best plants for sowing on light land to plow under.

"I do not just remember how much seed we got to the acre, but I do know that it was a good paying crop at the price we had to pay for seed, viz: \$4.00 a bushel."

Mr. C. H. Estes, Bates, Mich., in giving his experience with winter vetch pronounces it one of the most



promising new legumes for northern Michigan. As a substitute for red clover he believes that it is a success. His most interesting experience with it was from some seedings made in the spring which he used for fall pasturage. Some of the plants which were left through the winter were found in the spring showing above the snow and his cows when offered them, although having had roots once a day all winter, would eat this vetch in early March, seeming to like it. Even the fowls relished this green feed in the early spring.

Mr. James Mills of Mancelona, Antrim county, sowed some winter vetch on sandy soil broadcast May 1, 1901. He writes: "I tried it for green manure (top dressing) in orchard. It commenced to bloom in August and continued until frost in the fall, and there was a good covering on the land at the end of the season. It did not, however, seem strong enough to withstand the June grass."

In Circular 13 issued July, 1911, by the Michigan Agricultural College Experiment Station, they say of winter vetch as a cover crop in Michigan orchards as follows:

"Most of the successful orchards in Michigan are plowed in the spring and cultivated until mid-summer. This season is the natural one for trees to make a growth of new wood and the plowing and cultivating make the plant food in the soil available and stimulate the growth. After the cultivation ceases, the new growth will ripen, become hard and in a condition to pass through the average winter without injury, which it could not do if growth continued late in the fall.

"At the last cultivation, it is desirable to sow some-

thing that will make a 'cover crop' on the land during the fall, winter and early part of the spring. If nothing is sown, weeds will make a 'cover,' but they will not make a uniform growth nor will they result in any benefit to the land and they may become a serious annoyance.

"Many desirable features will result from having a cover crop in an orchard or vineyard, some of the more important ones are:

"1. Their growth helps to check the tree growth and ripen the new wood.

"2. A cover of vegetable growth over the soil, supplemented by the root system will prevent, to a very large extent, the washing of the valuable top soil by the heavy fall and spring rains. This feature is especially valuable on knolls and hillsides.

"3. A cover crop will catch and hold the leaves as they fall from the trees. They contain some fertility and afford some protection.

"4. The cover crop itself will make a blanket over the soil and by holding the snow from blowing away, this feature will be more effective, as it will largely prevent deep and severe freezing of the roots and the alternate freezing and thawing, all of which causes serious losses in many Michigan orchards, especially those located upon the lighter and more porous soils.

"5. One of the most valuable results from the use of cover crops is that they add humus and plant food to the soil. Certain plants commonly used for cover crops as clover, vetches, peas and beans, possess the power of gathering nitrogen from the air, storing it in the plants and later it becomes available in the soil.

"Some of the advantages of the cover crop that might

be mentioned are: That they encourage the deep rooting of trees; they make the fall and spring operations in the orchard more comfortable and they improve the physical condition of the soil.

"A plant suitable for an orchard or vineyard 'cover crop' must meet some unusual demands. It must make at least a fair growth during late summer and fall; it must be able to stand the tramping necessary at picking time; it must be able to withstand a possible drought; in most cases in Michigan, it must live over winter and grow vigorously in the spring; it must be hardy and it should have power to gather nitrogen from the air and hold it in the roots.

"The experiment station has been carrying on tests in orchards and vineyards in different parts of the state to determine the best plant for a cover crop under Michigan conditions. At this time, winter vetch (*vicia villosa*) promises to be especially valuable for this purpose. The plant is sometimes called hairy or sand vetch. It was imported from Europe many years ago and has long been used, in the Southern states especially, as a forage crop. An appreciation of its value for orchard cover crop purposes is comparatively recent.

"When sown as late as the middle of August, it makes a fair growth before winter; it will stand tramping well; it is not difficult to get started; it is hardy and will withstand the possible drought of fall and cold of winter; it grows vigorously in the early spring; it adds a large amount of nitrogen to the soil; it will succeed on a variety of soils and especially well on sandy soil.

"Michigan fruit growers who have not tried this plant for a cover crop are urged to do so. Seed should be

ordered at once as practically all that is used in this country is imported from Europe and the supply is limited.

“For cover crop purposes in Michigan, the seed should be sown during July or early August, usually at the time of the last harrowing.

“If the seed is sown broadcast about 25 to 30 pounds to the acre is required and it should be harrowed in. Good results have been secured by drilling 18 pounds of seed to the acre.

“A quick growth or ‘catch crop’ can be secured by sowing a bushel of oats or rye with the vetch. Since the vetch does not make a large growth in the fall, this combination is often desirable.

“There will not be any difficulty in turning under the vetch if the orchards are plowed at the proper time in the spring. Where the growth is extra large, a chain or rolling coulter may have to be used on the plow.”

Chas. H. Hilton of Benton Harbor, Michigan, writes of vetch as follows: “We have grown vetches for cover crop purposes in orchards and vineyards for seven or eight years. We grow no seed. Do not believe it will be profitable here. Neither do I believe we can grow seed of as good quality or vitality as the foreign grown seed. I am much interested in the subject both as a farmer and a handler of the seed. This season we have handled 30,000 pounds of seed.”

Robert A. Smythe of Benton Harbor, Michigan, writes as follows: “I have never grown vetch for seed, but see no reason why we could not. My land is all in fruit and we use the vetch as a cover crop to plow under for the great benefit it does the land. I grow the winter

or hairy vetch. We sow the seed the last of July or early August. We broadcast it and disc it in thirty pounds to the acre. My vetch is looking fine now (Sept 10, 1911). There are large quantities of the seed sold here and there would be a good deal more used if the seed was not so expensive."

C. H. Estes of Bates, Michigan, writes as follows: "Some six or seven years ago or more I bought some vetch seed and commenced to experiment with it. . My health failed me and I had to turn my farm over to my son and son-in-law. They said it was a nuisance and would not continue what I had begun. So my experiments are not large. I sowed two and a half acres and threshed 27 or 29 bushels of seed. I did not sow anything with it to hold it up, and it only podded on top. Then I let it be until dead ripe and raked it with a horse rake and lost a lot of seed in so doing. I use it some for fertilizing. I never cut it for hay. I cut it and fed a lot of pigs on it one season, cutting the ground over twice, and used it as a cover crop in my peach orchard and was well pleased with it in every respect. The vetch has come up every year in my peach orchard and has been such a fine thing for it that my son and son-in-law have changed their minds about it and they are sowing it this fall, and so are eight of our neighbors. There has not been any raised in this neighborhood only what I sowed years ago, but I am sure that as soon as its value is learned, it will be raised largely. I think it is the cheapest, quickest and surest way to fertilize a poor piece of ground of any way, outside of barnyard manure. We are having a great deal of trouble to get clover on account of dry springs and grasshoppers, and the vetch will grow, wet

or cold, hot or dry, and the grasshoppers do not trouble it, and farmers have got to substitute something."

W. H. Burke of Three Rivers, Michigan, writes of vetch as follows: "I have recently received from farmers in many states interesting suggestive reports concerning two great legumes—the hairy vetch and the soybean, and I know of no better way to encourage farmers to adopt new lines of work than to give the results secured by practical farmers. I present in summarized form the information thus furnished me:

"The hairy vetch is said to be one of the best fertilizers for light soil. In my experience no inoculation was necessary, the proper bacteria being in the soil. I have examined the roots of many legumes, but have never seen the nodules in such abundance on any other, thus showing the value of the hairy vetch gathering nitrogen from the air. It is now conceded that those legumes which have the greatest number of nodules on their roots are the best fertilizers, and this should remind us carefully to examine the roots for these little nodules, and if they are not found, then to inoculate with the proper bacteria.

"Hairy vetch is a winter annual and is sown with rye in the latter part of August, at the rate of one-half bushel each to the acre. This year I mowed and raked the vetch and rye and ran it through the threshing machine, immediately after oat threshing was finished, and without any change in the machine. The vetch and rye were nicely threshed, and the rye and five bushels of marketable seed were thus secured from less than one acre. The seed can be harvested in this way so cheaply that every farmer can grow seed for his own market.

"October 3, I weighed seventy-seven shoats which averaged 103 pounds. November 3, they were again weighed and showed an average gain of forty-two pounds each. December 3, they averaged 188 pounds, making a gain of forty-three pounds each for that month. At this time they were turned into a two-acre lot of vetch and rye that had not been pastured, and given the usual amount of corn twice daily, with some clover and soybean hay. January 5 they were again weighed, averaging 241 pounds, a gain of fifty-three pounds from December 3."

An unknown Michigan writer writes of Michigan sand vetch as follows:

"Michigan sand vetch is a very valuable forage plant and is rapidly becoming popular as year after year the farmers of this country are learning more of its true value. It is noted for its extreme hardiness, is highly valuable in the North as a winter cover crop to prevent leaching, is also valuable for forage and fertilizing purposes. It withstands hard winters, being hardier than wheat. It is an annual, but drops its seed freely and will come up year after year on the same ground. It does well on nearly all soils and is especially recommended for poor land, where it thrives and improves the soil wonderfully as it is very rich in nitrogen. It belongs to the pea family but the vines are nearly twice as long and leafy as peas. It may be sown in the spring or fall with any crop of grain. It remains green all winter and is valuable for early pasturing as well as for fertilizing. It is extremely early and has enormous value for feeding purposes. Drought, heat, and cold do not affect it. It is eagerly eaten by all kinds of stock. The Washing-

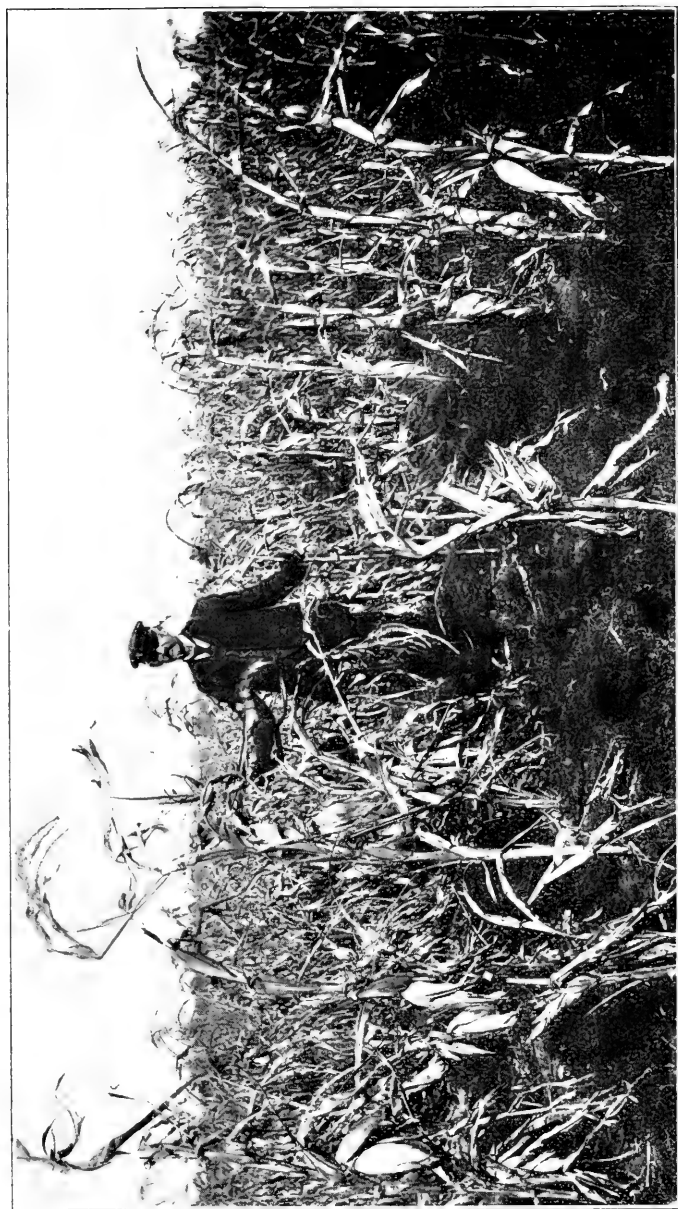
ton Department of Agriculture estimates the value of an acre of this vetch plowed under as equivalent to putting into the ground twenty to forty dollars worth of commercial fertilizer. When sown in August or September it covers the ground before winter sets in and prevents washing of the soil during winter and early spring, which saves a great portion of mineral fertilizers contained in the soil which otherwise would wash out. When sown in April or early May it can be cut in July, the second growth affording excellent pasture during the summer. The yield of green forage runs from twelve to twenty tons to the acre. It is suited to any soil and is valuable in this respect, as it produces good crops on poor sandy soil, while on good land it grows to a height of four or five feet and produces enormous crops. Every farmer in the United States who raises any stock should have a field of it, as it is much more nutritious than clover and can be fed to any kind of stock with perfect safety. It is a rapid grower and thrives on little moisture. If raised for hay it should be left standing until some seeds have become well formed. Sow thirty to forty pounds of seeds to the acre, either broadcast or in drills. To get the best results from it sow about one-half bushel of rye or oats to the acre with it, to furnish support for the vine."

An unknown Michigan writer writes of vetch as follows:

"Crops for cut-over and stump lands.—Observations of the sandy jack-pine cut-over lands in Michigan, Wisconsin, and Minnesota have been continued and work has begun in the growing of hairy vetch as a seed and forage crop suitable for these lands. Large quantities of hairy vetch are now grown throughout the Atlantic Coast







**HAIRY VETCH SOWN IN FIELD CORN IN NORTHERN INDIANA**  
This Picture Was Taken in October. The Land Upon Which This Corn Was Planted is Typical Worn-Out Clay Soil.  
The Corn Averaged Less Than Twenty Bushels to the Acre.

and southern states as a soil-improving, forage, and winter cover crop, the seed for which is nearly all imported. The light, sandy soils of the North promise to be well adapted to this crop."

Edwin Russel, President Manistee County Horticultural Society, of Manistee, Michigan, says:

"At the time I decided to plant forty acres of light Michigan sand to fruit trees there was a very prevalent opinion that such soil was valueless for agricultural or horticultural purposes. The idea may have been local and was the result of frequent failures on the part of those who had neither capital nor brains to invest in the business. The old notion that any one can be a successful farmer has been cast into the scrap heap of discarded ideas. Farming is a business, often a serious one, and to succeed in it one must be alert, intelligent, progressive and ambitious.

"The soil which I selected for my orchard was similar to thousands of acres along the east shore of Lake Michigan and about as light as nature makes it. The cut-off pine had been followed by a thick growth of oak which made clearing difficult and expensive. The first season I cleared and plowed twenty acres and sowed it to winter rye. Late that fall and in the spring following I cleared another ten acres which was plowed about the same time I turned under the rye on the twenty acres cleared the year previous. This gave the twenty-acre field the advantage of a crop of rye that the other ten acres did not have, and that lead has been maintained to the present time. Both pieces have had exactly the same treatment ever since, but the ten could never overtake the twenty and the difference has been very noticeable.

I turned down the rye when it began to show the heads and at once sowed the thirty acres to mammoth clover, securing a good catch. Somewhat to my surprise, I found that the soil was inoculated with clover bacteria, the nodules came early and were thick all along the roots of the young plants. Subsequent observation and experiment show that nearly all our sand soils are similarly inoculated. This is an important aid in building up the soil. There was a good growth of clover but it was much heavier on the twenty acres where the rye had been turned under. Early the following spring I set the thirty acres to fruit trees, mostly apples and peach, using peach as fillers. The trees were set in clover. This was unavoidable as setting could not be deferred till the clover had reached a suitable condition for plowing down. The best time to do this is just as the plants are ready to bloom. Growth will then be at its maximum and conditions right for supplying the greatest possible amount of humus. After turning under the clover there was a period of clean cultivation, then early in August I drilled the whole piece to winter vetch, about forty pounds to the acre. The stand was good, as is nearly always the case with vetch, and the growth rapid. But again, there was the same noticeable difference between the growths on the ten and twenty-acre tracts. This was still more marked when it was plowed down in May and June of the following year, which was in 1911. Another period of clean cultivation followed until August when a cover crop of rye was drilled in. The main reason why I seeded to rye instead of a legume was because the trees on the twenty acres were making such a heavy growth that it seemed advisable to add less nitrogen than would be sup-

plied by a leguminous crop. Many of the peach trees had sent out branches over a yard in length and the apples were not much behind them. Yet I was told not to plant apples on this soil. Peaches might do fairly well if well cared for, but apples would be a complete failure. The results which I have secured show conclusively that this belief is unfounded and erroneous. There is no question but our light sand soils can be made immensely productive, far more so than the heavier clay lands which have heretofore been considered much superior. Sand is the best foundation in the world upon which to build. Always clean and always workable. No artificial fertilizers need be applied, no expensive manures need be hauled. All that is necessary is to sow and plow under, sow and plow under. It is the key to the whole situation. One must not begin to take from the soil at once after it is cleared. Put under a crop or two. Lay by a little surplus. Build up to a point of high productiveness. When this has been reached it is easily maintained through subsequent years of cropping. Whatever crop is grown, one must not lose sight of the fact that the cost of production is regulated by the quantity produced. A hundred bushels to the acre every other year with a crop or two turned under in alternating years will return a larger annual profit than two successive yearly crops of fifty value of the land. *Vetch is, undoubtedly, one of the most reliable and valuable fertilizing crops. It is a rank growing legume and contributes a large amount of humus rich in nitrogen. It seems especially adapted to light soils where it is sometimes found growing wild. It may do equally well on heavier lands, but my experience with it has been confined to the sand soils of Michigan.* When

one can get a good stand of mammoth clover it is equally as good, but it is not as certain, being much more easily affected by weather conditions soon after sowing. On light soils I would always sow rye for a first crop after clearing. It never fails to grow and furnishes a liberal amount of humus which, in addition to its value as a fertilizer, fills the porous soil, conserves the moisture and makes an excellent, stimulating foundation for the clover or vetch which should follow. Every year's additional experience and observation strengthens my belief that the green crop, properly rotated and turned under, completely answers the question of how to maintain soil fertility. Without exception, the most productive soils are those which contain the largest amount of humus. The most casual observer cannot fail to notice that, on hilly lands, the valleys are far more productive than the hills. The reason is because the rains and melting snows annually rob the hills of their humus and deposit it in the valleys. For centuries, Egypt was the 'granary of the world' because annually enriched by humus deposited by the overflow of the Nile. The prairie soils of the West contain little beside decomposed vegetation, and, while they may be and have been exhausted, yet they produce more successive good crops than any other soil. When depleted, they may again be made productive by the addition of a fresh supply of humus.

"One of my farms of forty acres was originally placed on the government map as 'swamp land.' That does not necessarily imply that it was all swamp, but that the low wet places were numerous and extensive. When timbered, these were cedar bogs or marshes, always filled with water. In order to fit them for cultivation I ran

tile underneath and dried them. The soil was a deep deposit of humus that had been accumulating for ages. In these dried marshes I have never used any fertilizer but have applied it liberally on the higher lands adjoining. They are cropped annually with corn, potatoes, onions, cauliflower, cabbage, cucumbers and small fruits. It matters not what the crop may be, the yield is double that of the higher lands adjoining, and the quality far superior. All of which is convincing proof that humus supplies the plant with all the food necessary for the perfect development of itself and fruit.

“As a rule, we who till the soil, work our bodies too much and our brains too little. We do not observe, investigate, reason and interpret as we ought. We use too little sense and too much theory and never discover how inconsistent theories often are. I had a rather amusing illustration of this at the time I sowed my first rye in the orchard. A neighbor, who had seen more years of farming than I, happened along and the following conversation ensued:

“‘Good morning. What you sowin’?’

“‘Rye.’

“‘Rye, eh; well, I don’t expect you’ll git much of a crop on that sand.’

“‘Oh, I don’t intend to harvest the crop; I’m sowing to plow under in the spring.’

“‘Plow under, eh; now there’s where you make a mistake. You ought to sow peas or clover. Rye’s no good.’

“‘What makes you think rye is no good?’

“‘Why, it never puts back any more than it takes out. You don’t gain anything, it just quits even.’

“See here neighbor, you are on the wrong track. I’ve got more sand in that twenty acres than I need and a lot less humus than I want, so I’m dropping a few million grains of rye into that twenty-acre laboratory to work out a little problem in chemistry, and when they have completed the work I’ll have less sand and more humus, and if I could continue the chemical transformation long enough, I’d bury that sand a foot deep with the richest plant food on earth. Those grains of rye are going to do business. They are wonderful workers and they’ll convert some of that unavailable quartz rock into nutritious food that trees and plants can use. Don’t tell me rye is no good, its a magician that converts grains of sand into Elberta peaches.’

“‘Wall,’ said my neighbor, ‘mebbe so. I hadn’t thought of that.’ And he drove away.”

### **Maine.**

The Experiment Station of the University of Maine reports that “The College of Agriculture at Orono has had no experience with the vetch plant. We regret exceedingly that we are unable to give you any information on this subject.”

### **North Carolina.**

The Experiment Station of the College of Agriculture of North Carolina reports that they have done considerable work with vetch and bur clover. They write concerning vetch as follows: “Vetch with us is chiefly grown with oats. Also frequently with rye or wheat. Usually two to three pecks of vetch are seeded with a



bushel and one-half to two bushels of oats, all being put in with a drill or broadcast. Usually the best time for seeding is during the latter part of August or early September. Frequently, however, we can secure good results if the seeding is delayed as late as the middle of October or later."

In their bulletin on Co-operative Experiments they say:

"Realizing the great value of the different legumes, the cowpea, the different varieties of clovers, soybeans, (also known as Japan peas, soja beans and in some of the eastern countries as stock peas), alfalfa, vetches, etc., on account of their ability to get nitrogen from the air through certain bacteria infesting the roots of these plants, and their importance to the farmers of North Carolina, the State Department of Agriculture desires to stimulate the growth and cultivation of these crops as much as possible, and to this end is co-operating with the National Department of Agriculture in planning co-operative experiments as rapidly as conditions will warrant.

"To grow any of these crops successfully there are certain soil requirements or conditions that must be met, otherwise the crop will be a failure.

"One of the conditions required by every legume is bacteria, the kind peculiar to the particular crop to be planted. The department will be glad to give any definite information along this line at its command.

"There are many varieties of vetch, but the ones used mostly for soil improvements are the hairy or sand vetch (*vicia villosa*), and the so-called spring vetch (*vicia*

*sativa*), which also needs to be sown in the fall months in North Carolina, to make a successful crop.

“To succeed with vetch the soil needs to be inoculated the same as for crimson clover, except it must be inoculated with soil coming from a field that has grown vetch of some kind. Soil from a place that grows wild vetch or partridge pea is as good as that from a field where the cultivated vetch is grown. Also, soil taken from a place that grows English or garden peas will inoculate vetch, as they belong to the same family.

“Vetch makes a fine quality of hay, but when planted for that purpose it is well to sow it with wheat or oats, to hold the vetches up. Sow half a bushel of wheat, half a bushel of oats that will ripen at the same time the wheat will ripen, and half a bushel of vetch to the acre, in September or early October according to location. If vetch is sown alone, sow one bushel of seed to the acre, or when sown with wheat three pecks of wheat and half a bushel of vetch; or one bushel of oats and half a bushel of vetch to the acre. If vetch is sown alone it can be put in at the last cultivation of the crops or at any time from then until October. If vetch and oats are sown together, sow in September. Vetch will reseed itself when the pods are allowed to ripen on the land. The seed should be covered from one to three inches deep, according to the nature and condition of the land.”

### New Jersey.

The Experiment Station of the Agricultural College of New Jersey reports as follows:

“Would advise you that we have no special publications on winter vetch. We have had, however, consider-

able experience with this crop as a green manure. It is the rule at the College Farm to seed in our corn, at the time of the last cultivation, a cover crop mixture consisting of forty to fifty pounds of winter wheat, eighteen to twenty pounds of winter vetch and five to six pounds of crimson clover. A similar mixture, consisting of one bushel of winter wheat or rye, and one-half bushel of winter vetch is used as a cover crop for seeding in the corn, or after early potatoes, in Middle and North Jersey. Occasionally the mixture consists of winter wheat, winter vetch and mammoth clover. Winter vetch is also used to a considerable extent by fruit growers in the state. It is then seeded either alone or together with barley or oats. The barley or oats die in the late fall, while the vetch continues its growth and the entire cover crop is plowed under the following spring."

#### **Nevada.**

The Experiment Station of the College of Agriculture of Nevada reports as follows:

"We have experimented with the vetch plant very little at this station. We have grown it at times as a cover crop, but have not kept any data on the crop."

#### **North Dakota.**

The Experiment Station of the North Dakota Agricultural College reports on vetch as follows:

"Our publications on vetch growing are scattered through a number of reports, all of which are now out of print. We have not attempted growing winter vetch and have had only fair success with the spring and sum-

mer vetch. From the struggle that all of the field grains have here to survive the winter, I have not expected that there was a chance of winter vetch surviving."

#### New York.

Prof. T. S. Hunt, of the Cornell Experiment Station, found that three months' growth of hairy vetch produced 6,824 pounds of air dried forage to the acre, which contained 240 pounds of nitrogen, fifty-three pounds of phosphoric acid and fifty-two pounds of potash. Calling the nitrogen fifteen cents a pound, it is plain that the vetch was a most efficient fertility gatherer.

#### Nebraska.

The Experiment Station of the University of Nebraska reports on vetch as follows:

"We have no published results on this plant though a few plats have been sown from time to time. The variety used has been the ordinary hairy vetch (*vicia villosa*). I remember on one or two occasions it has cut about two tons of hay to the acre."

#### Ohio.

We have no official reports from the Experiment Station of the Agricultural College of Ohio. Joseph E. Wing, an authority on alfalfa, living in Ohio, writes of vetch as follows:

"As to vetches, I have not seen them much used as far north as this, although I believe they have much merit and some day will be more employed than they are now. The winter vetches are assuredly hardy and make large

growth when well established, but without inoculation they amount to very little. For soil building I should sow them in the corn at the time of last cultivation or after oats or wheat, thoroughly disking or plowing the ground and mixing with them a light seeding of wheat or rye to help hold them up. A bushel of vetch seed is required for an acre. The seed must be inoculated, being mixed with soil taken from a successful vetch field or else a larger quantity of the soil may be drilled in where the vetches are to be sown. As vetch seed is worth now about ten cents a pound it occurs to me that there might be good profit in growing it."

The Livingston Seed Company of Columbus, Ohio, say: "We have been using this plant quite liberally on our grounds for several years with most satisfactory results." And in a circular on sand or hairy vetch, which they are sending out to the trade, they say regarding this plant as follows:

"As our country grows older our lands become more and more impoverished by constant cropping, the accumulated humus of past ages is used up, the land becomes hard and unfriable, will not hold moisture, and as a result we are reaping small crops, and occasionally a total failure.

"Even when we reap moderate crops, it has been at a heavy cost of time and labor, and the result unprofitable as well as unsatisfactory, all because we have failed to note nature's methods. We think this condition can be improved upon if we would take advantage of some of the more modern methods, and use one or more of the lately introduced leguminous plants; at present we have in mind sand or hairy vetch.

"This plant was introduced originally from Russia, where it seems to be a native, and has been used as a hay and fertilizer crop for a great many years. Since its introduction a few years ago it has steadily grown in favor wherever tried as a cover crop, especially for winter covering.

"The plant belongs to the pea family, is very hardy and can be grown throughout the United States. Creeping in habit of growth, when young especially, the tendrils hug the ground very closely, and are tiny and spindling at first, but later grow very rapidly, and will throw up eight to a dozen or even more runners from each plant, that often reach a length of six to fifteen feet, where plants have been well grown. Each runner produces numerous side shoots or tendrils that run from two to five feet in length, these being so twisted and entwined that it is next to impossible to take a single complete plant from the mass.

"As its name implies, the sand vetch seems to be especially adapted to light sandy soils too poor to produce good crops of cow peas, soybeans or crimson clover, but of course will respond much more liberally on stronger and better lands.

"The vetch, like clover, alfalfa and other legumes, is a nitrogen gatherer and will respond much more liberally after the land has become inoculated with the bacteria peculiar to this plant.

"The seed-bed for vetches should be made fine and then well firmed before sowing. This is not usually very difficult as they nearly always follow a hoed crop of some sort. As a cover crop, we have used them on our Kirkville farm after potatoes, corn, tomatoes, or any other

cultivated lands that we wished to cover for winter, to be followed by a hoed crop the following year.

“We sow any time from August 1st to October 15th (would, however, prefer not later than October 1st), and use from thirty to forty-five pounds to the acre.

“The growth that it will show in the fall will depend very largely on the time of sowing, the nature of the land, and the amount of rainfall. We have had the seed lay in the ground all winter and then make a fair crop to turn under by May 10th, so rapid is its growth in the spring.

“Where conditions of soil, time of sowing, and rainfall have been favorable, it will make from ten to fifteen tons of green top to turn under by the first to the fifteenth of May, or in plenty of time for a crop of corn or other late planted crops.

“The root system is quite heavy and like all leguminous plants, bears, to a greater or less extent, nitrogen galls or nodules according to the season, land and inoculation. Where the crops are heavy it will be found advantageous and often necessary to use a sharp rolling cutter on the plow in order that all the top be turned under.

“If the crop is to be used for hay it will be well to sow forty-five to sixty pounds of vetch, and with it one-half bushel of rye to the acre, the nurse crop in this case helping to hold the vetch upright and off the ground, making it much less trouble to harvest.

“We have faith in this plant and we believe those of our customers who have tried it have also, as our sales last season were more than three times that of the year before. We would suggest if you are located some distance from a large city or where stable manure is hard

to secure, that you should by all means try vetch to replenish your failing supply of humus that is so essential to growing crops, and also save much valuable time and labor, that is now spent in hauling manure."

### Oklahoma.

The Experiment Station of the Agricultural College of Oklahoma says of vetch as follows:

"We can find no records of the experiments which have been conducted here with vetch. We can find frequent statements regarding this crop, but are unable to get any definite information regarding yields, hardiness, etc. Vetch does not offer any great possibilities in this state. Of the different varieties the hairy or winter vetch is the best. It is, however, so inferior to cowpeas and other leguminous crops which can be grown here that the subject is dismissed without much discussion."

### Oregon.

The Oregon Agricultural College and Experiment Station reports on vetch as follows:

"Publications on vetch are out of print at this time—will have a new bulletin out this winter. Vetch is the most commonly grown hay crop of the Willamette Valley! The *vicia sativa*, smooth vetch, is the variety used altogether here, and since it endures our mild winters perfectly, it is seeded nearly altogether in the fall, as it gives a heavier yield. We drill the seed in any time from September 1st to December 1st at the rate of a bushel of vetch to the acre, mixed with a bushel of either oats, rye or wheat. It is mixed with rye where the earliest



possible crop of green feed is desired the next spring or where it is desired to have a cover crop to be plowed under as green manure in the spring. It is mixed with oats where it is to be used for cow hay and with wheat where it is to be used for horse hay. It yields from three to six tons of hay to the acre. Thousands of acres are devoted to this crop as it produces excellently on our heaviest and poorly drained land where the red clover will not prosper. We also produce thousands of bushels of the vetch seed, which is one of our most profitable crops, giving returns of \$60 or \$70 an acre.

"The seed crop is generally handled and threshed much as any other crop, such as peas, for instance. It is mowed when the lower pods are ripe, cocked and allowed to cure, then hauled to the thresher and threshed by removing some of the concaves and substituting blanks and running the cylinder more slowly, much as is done for peas.

"The great features of this crop here are, its value as a cover crop, a rich green manure, and early and exceedingly palatable and nutritious green feed, an excellent and very heavy yielding cow or horse hay, a very profitable and easily handled seed crop, and last, a first-class legume in short rotations especially adapted to our poorest, heavy, wet land."

They also report that the smooth vetch (*vicia sativa*) is very much superior in mild winters in western Oregon to the hairy vetch, outyielding it and being free of hairy covering, which makes it much more palatable. The hairy covering, which makes it much more palatable. This smooth vetch, however, will not stand the winters in eastern Oregon, where they must use the hairy vetch.

Park B. Beatty writes of Oregon vetch as follows:

"I live in the heart of the Willamette Valley, the natural home of the vetch, and we are raising vetch and clover seed quite extensively. And the only thing that prevents us going into it more so, is the want of a market for the seed. Some years we have received as much as \$3.50 for one hundred pounds of vetch. Last year (1910) it was slow sale at \$2.00 to \$2.50. At about \$3.00 for one hundred pounds, F. O. B., there is very good money in raising the seed. If the seed could be laid down in the Mississippi Valley for around four cents a pound and we were assured of a steady market for the seed, we could supply any amount of seed.

The kind of vetch principally grown here (Halsey, Oregon) is *vicia sativa*. It has been grown principally for hay and green forage. Has not been used extensively as a green manuring crop, but where it has been plowed under, the improvement of the soil is very marked indeed. Our lands have not reached the point yet where such practices seem necessary, but are fast reaching that point. Our principal market for vetch seed has been for the cover crop in California orchards, and in the cotton states, where it is used somewhat as you are using it in restoring the impoverished cotton land.

"The variety *vicia villosa* is not grown extensively here, but we could grow it quite as well as the other variety. All varieties of vetch grow to perfection here and are hardy on well drained land. Ten degrees above zero is about the minimum winter temperature here, but it has been as low as four degrees below without injury to vetch, except where the land was full of water, or winters are open—no snow to speak of.

"The usual process of sowing for seed is to disc in

on ground where spring grain has been grown, about seventy-five pounds of seed to the acre. One hundred pounds is better. Pasture it off with sheep in the spring if growth seems too rank, cut with a mower early in the morning and rake and shock at once. Thresh in about ten days or more with usual grain thresher. This plan would not work in a country liable to heavy rains, unless covers were provided, as it sheds rain very poorly in the shock. This is our dry season—July 15th to August 1st—so it can be left out safely. If allowed to get wet after cutting, it will shatter very badly when drying.

“Some sow with half oats and can cut with a binder on light land. On very poor land a dressing of fifty pounds of land plaster to the acre, evenly distributed, will about double the yield of hay or give a considerable increase of the seed.

“I believe there can be something done in arranging to have just the seed grown you need for your country if it could be thoroughly understood just what is wanted and the quantity that could be handled. Twelve hundred to fifteen hundred pounds is considered a good crop of seed here, but I am not posted on the yield of seed on hairy or sand vetch. Our seed is ready for market about August 1st.”

The Star Flouring Mills of McMinnville, Oregon, write of vetch as follows:

“The vetch is a species of the field-pea. It has been crossed with a number of different varieties at different times, until it has become a splendid stock food. It makes splendid hay for all kinds of stock, and is cultivated to a great extent in the Willamette Valley. It is either sown in the fall or in the spring.”

S. E. Hamilton of Newburg, Oregon, writes of vetch as follows:

"The name of the vetch that is grown here is Oregon vetch and is the fall or winter variety. It is planted in the fall with wheat or oats, so therefore it is the cultivated vetch. We have a wild or sand variety which makes good pasture for stock."

J. P. Logan of King's Valley, Oregon, writes of vetch as follows:

"The vetch that we have here is the cultivated kind, both spring and winter, being sown as a forage crop, it being considered the best hay for cows that this part of Oregon produces.

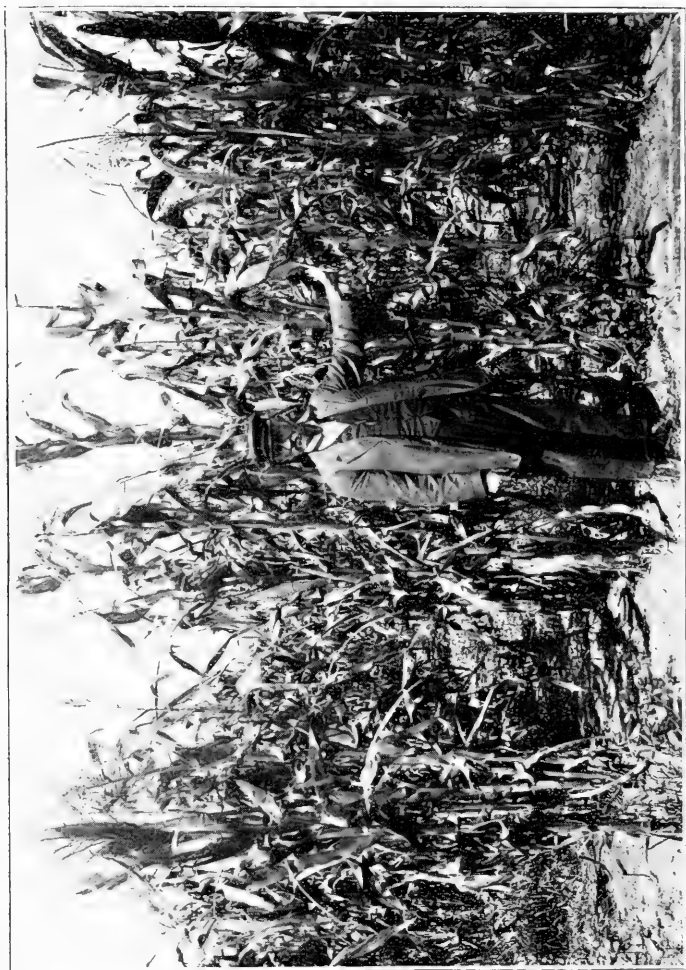
"Oats are nearly always mixed with the vetch as otherwise the rank growth of the vetch would cause it to break down, and even with the support of the oats it often lodges badly, it being a very rank grower. Two tons of cured hay to an acre are often cut here."

Eugene Mills & Elevator Company, of Eugene, Oregon, say that the only vetch grown in their vicinity is the German winter vetch.

D. W. Crites of Lynn county, Oregon, states that vetch seed is grown in the Willamette Valley very successfully, the average crop of seed grown being one thousand pounds or more; that the seed ripens from the 15th to the 25th of July; that the spring vetch is grown exclusively and fifteen bushels of clean seed to the acre is considered a fair yield; that they can furnish vetch seed F. O. B., Des Moines, Iowa, in car lots for \$2.50 a bushel.

J. M. Stone, Lodi, California, inventor of the Globe Separator, for separating vetch seed from wheat, oats, etc., says that the large brown vetch imported from Scot-





FIELD CORN AFTER VETCH ON WORN SOIL

A Heavy Crop of Hairy Vetch Was Turned Under Twelve Inches Deep on This Field the Last of May and Corn Planted the First of June.  
The Yield of Corn Was Seventy-five Bushels Per Acre. Corn Crops Grown on This Field for Ten Years  
Prior to This Never Averaged Forty Bushels to the Acre.

land grows the largest plant and the best one for forage; that there was a man in the Oregon Willamette Valley that paid for his farm in two crops of vetch.

Prof. H. S. Jackson, of Oregon Agricultural College, says: "I would say that the vetch to which you refer in this state as causing trouble in wheat fields is the hairy vetch (*vicia villosa*) and is hence an escape from cultivation."

Prof. G. R. Hyslop of the Oregon Experiment Station, Corvallis, Oregon, says:

"We are very much interested in the various vetches in this section and there are quite a number of them which make a very good growth here. There are some wild vetches which make quite a vigorous growth in the hill and mountain land and also down in the section immediately adjacent to the coast. These wild plants that I have observed are frequently quite large and vigorous but thus far I have never identified them, but I think they are not vetches which have escaped from cultivation. The plant which you refer to as coming up in the wheat fields and mixing with the wheat is the common hairy vetch (*vicia villosa*). This vetch is troublesome in various places since the seed has a diameter which is just about equal to the smallest diameter of the wheat grain, so that it is almost impossible to separate these vetches from the wheat; then, further than this, the hairy vetch disperses its seed before the grain is harvested and the seed may live in the soil for a number of years and then germinate at some subsequent time when conditions are favorable. So that these things make it rather difficult to eradicate in certain sections of our state where crop rotations are not used.

“Mr. Byron Hunter, of Walla Walla, Washington, told me of a spiral arrangement on which the vetch and wheat were poured and the wheat sliding down this spiral would not gain momentum enough to be thrown off the sides, while the round seeds of the hairy vetch would acquire enough momentum that they would gradually be thrown away from the center by centrifugal force to such an extent that they would be thrown off the spiral altogether and a fairly good separation of seed could be made in this way. Personally, I have never seen this machine.

“We have tried out quite a number of different varieties of vetch at the station, but thus far have not found any which is superior to the common vetch (*vicia sativa*). A few others have shown considerable promise but mainly from the standpoint of green manuring and cover cropping vetches.”

#### Rhode Island.

The Experiment Station of the College of Agriculture of Rhode Island says: “While we have grown winter vetch as well as summer vetch here in the past we have not experimented with either to such an extent as to issue a bulletin on the subject. So far we have found they will thrive here and the hairy, or winter vetch, will endure our winters well.”

#### South Dakota.

The Agricultural Experiment Station of the College of Agriculture of South Dakota reports as follows: “This college has raised some vetch, especially as a fertilizing crop, but not very much has been done with it and we



have no results as yet for publication. It is probable that we will have some sometime, but we must complete our experiments first."

#### **South Carolina.**

The Agricultural Experiment Station of the College of Agriculture of South Carolina reports: "Vetch has given excellent results in this state."

#### **Utah.**

The Experiment Station of the College of Agriculture of Utah reports as follows:

"This station has had but very little experience in growing vetch and has no published data regarding the same. Our trials have been somewhat fragmentary and have been merely to see whether the plant would grow in this locality. The crop, so far as we know, is not grown to any extent commercially in the state, but our few experiments here show that it will grow fairly well under our conditions."

#### **Vermont.**

The Experiment Station of the College of Agriculture of Vermont reports as follows:

"This station has made no investigations touching the growth of vetches that are of any importance. Twenty odd years ago we grew them in a small way as a cover crop in orchards. We studied the wild vetch, which is a semi-weed in this state, but further than this we have issued nothing which we think would have any bearing on your subject. We have never grown it for

seed. The wild vetch stands the winters very well in this locality. I have not enough data to enable me to say certain whether the tame vetches do or not."

In the Fourteenth Annual Report of the Vermont Agricultural Experiment Station issued in 1900 and 1901 they say of wild vetch the following:

"The Bird Vetch or Wild Pea.

(*Vicia Cracca*)

"This plant occurs frequently in the meadows of Vermont, and in some places it is increasing so rapidly as to cause alarm. Frequent inquiries are made of the experiment station regarding its qualities. Farmers hold widely different opinions regarding it. The majority consider it to be a troublesome weed, but some regard it as a desirable forage plant. One man said he wished his entire meadow was covered with it, while another correspondent says that in his experience this vetch rivals witch-grass for the first place as a weed pest.

"Description and occurrence.—It is a member of the pea and clover family, with clusters of numerous small blue blossoms, followed by small pea-like pods. It is a close relative of the cultivated vetch (*vicia sativa*). Like all the clovers and vetches it has root tubercles, which indicate its ability to utilize atmospheric nitrogen and so enrich, rather than exhaust, the soil on which it grows. It passes under a number of popular names—bird vetch, blue vetch, wild vetch, wild pea, French pea. It is a native of the woodlands of Eastern America, but as it now occurs in Vermont it is most common in the meadows and fence rows, and thus appears like an introduced plant. It likes best a strong heavy soil, such as favors timothy, and develops most luxuriantly in the

Champlain clays of Addison county. In such soils it establishes itself in meadows and forms tangled circular patches where it smothers out the clover and timothy and each year extends the area of its dominion. In such a patch the growth is most luxuriant at the margins. It spreads by means of creeping stems, and it is this habit which makes it difficult to eradicate. Since it is a member of the clover family it might naturally have qualities to commend it. The agrostologists of the Department of Agriculture state that this species is cultivated in Europe, both for soiling and for hay, and that it is prized in German sheep pastures. Evidently basing their opinion upon European practices, they recommend its cultivation in low meadows, and especially in open woodlands.

“From our own observations and the opinions of farmers it has seemed worth while to learn more accurately its value as a forage plant under Vermont conditions, since it frequently happens that a plant economically valuable in one country is not so in another. To do this it was necessary to determine its yield, composition, palatability, relation to other foreign plants in mixture and ease of eradication.

“There was quite a quantity of vetch growing with timothy in 1900 in a field adjacent to the experiment farm. By marking out plots in different parts of the field there was opportunity to compare yields and shrinkage by drying, both of timothy and of vetch, under the same conditions of soil and weather. The plots selected appeared to be almost pure vetch, before cutting, but, as indicated in the table below, the plant is deceptive both in appearance and yield. Plot IV was pure

timothy, plot II before cutting appeared to be nearly pure vetch, but when cut was found to be fully one-half timothy, the vetch having so overrun the timothy as to hide it until cut. Plot I contained the most vetch, but as it was wet when cut the green weight is not strictly accurate. There was less vetch in plot III. All were cut on the morning of July 10.

"The conditions found are represented below in tabular form:

PLOTS	I	II	III	IV
Actual area .....	13 sq. rods	6 sq. rods	14 sq. rods	1 sq. rod
Composition of crop .....	75% V, 25% T	50% V, 50% T	30% V, 70% T	100% T
Yield per sq. rod, green .....	43 pounds	66 pounds	53½ lbs.	58 pounds
Yield per sq. rod, dry (hay) .....	12 pounds	25½ lbs.	34 pounds	34½ lbs.
Per cent loss in drying .....	72%	61%	36%	40%

"In the line stating composition, V indicates vetch, and T indicates timothy.

"Our observations coupled with these results justify the following conclusions:

"The vetch is a deceptive plant, the yield, green weight, is much less than the appearance of the growing plants would lead one to expect, and the shrinkage in drying is great. Where the vetch occurs in timothy fields it reduces the yield by a large amount, viz: 30 to 60 per cent in our plots. Moreover, in the places where it occurs, it forms such a thick mat above that it smothers the leaves below, and at the same time holds moisture. As a result, in a vetch-covered area the lower por-

tions of the plants, both of vetch and of clover that may be growing with it, are black and musty, and this injures both quality and appearance of the hay. Farmers who use the hay tedder complain that the tangled masses of vetch become a nuisance.

"These objections would not hold against it as a pasture plant, but it rarely if ever occurs in Vermont hill pastures. The lower, heavier soils where it does occur in quantity are, of course, rarely pastured, so that we have no basis for opinion as to its value for pasturage.

"Composition and palatability.—The universal testimony of farmers having the vetch in their hay is that it is relished by stock and that it appears to be in no wise objectionable in the hay, except as noted in the last paragraph. Some say that they consider it as good as clover for feeding. The hay made from the plots cut in 1900 was fed to cows at the experiment farm in comparison with mixed timothy hay. It was relished by the stock, did not appear to give any bitter taste to the milk, and was considered good hay by those in charge of the feeding.

"A sample of the vetch hay which was taken from that cut on July 10, 1900, was given to the station chemist in February, 1901. The composition was found to be as follows: (For purposes of comparison the composition of an average quality of clover hay is given also.)

	Original substance		% Crude ash	% Crude protein	% Crude fiber	% Nitrogen free ext.	% Ether extract	% Nitrogen	% Phosphoric acid	% Potash
	% Water	% Dry matter								
Bird vetch hay .....	7.30	92.70	6.33	12.92	29.83	48.72	2.20	2.06	0.42	1.90
Red Clover hay ...	15.30	84.70	7.32	14.52	29.25	44.98	3.90	2.33	0.45	2.60

“Its weedy habits.—The thing that is most against the record of vetch is its weedy habits. It does not mingle peacefully with neighboring plants, but tends to overtop and smother them. This is decidedly to its discredit as compared for example with the related clovers and alfalfa. Moreover, it spreads by underground root-stocks and it has the reputation, especially in Addison county, of being difficult to eradicate. Probably this depends somewhat on soil conditions, and still more upon the method of crop rotation.

“There was considerable vetch in two fields of the experiment farm when the land was bought. This soil is a heavy clay loam, and it had lain in grass for a long time. These fields have since been brought under a system of short rotation of corn, oats and grass, and the vetch has been subdued without special effort.

“Conclusions.—Our conclusions regarding this vetch as it occurs in Vermont may then be summarized as follows: It is of frequent occurrence in meadows, especially in clay soils. It is a member of the clover family, has root tubercles, and therefore, tends to enrich the soil where it grows. It is a deceptive plant, since it ap-

pears to form a dense growth<sup>o</sup> and to promise a heavy yield of hay; whereas it actually gives a much smaller yield than pure timothy, and, of course, still less than the clovers. It tends to make the hay dark colored and musty, and because of the tangled masses bothers with the hay tedder. Where well cured it makes excellent hay, comparable to the clovers, both in palatability and composition. It spreads quite rapidly both by seed and creeping rootstalks, especially in clay soils, and smothers the timothy and clover. It is said to be difficult to eradicate in some soils, although on the experiment farm it was promptly and easily killed where short rotation and clean cultivation were practiced. On the whole we rate it as a weed rather than as a useful plant, and recommend its eradication rather than its encouragement."

### Wyoming.

The Experiment Station of the Agricultural College of Wyoming reports as follows:

"There has been but little experimenting done at this station with the vetch plant, and there has been no literature published upon the same. The last two years vetch has been grown in sufficient quantities to show that both the winter and spring vetches are a success here. Our method of threshing is with the small separator, threshing about the same as we would thresh peas. The winter vetch appears to stand the winter very well in this locality. We are intending to make use of both winter and spring vetches, growing with oats in our next year's crop for hay."

## Wisconsin.

The Experiment Station of the Agricultural College of Wisconsin reports as follows:

"We have not as yet issued any bulletins upon the growing of this crop, although we have carried on more or less experimental work during a series of years. We have found one of the best uses of vetch is to grow it with rye as a pasture crop. The vetches do well in Wisconsin even to the extreme northern part of the state. The sand or winter vetch grows luxuriantly. We are recommending several methods of handling vetches. One in particular is to sow the latter part of August as a nurse crop. We usually use one and one-half bushels of rye and thirty pounds of vetch to the acre. The rye and vetch come on nicely in the fall and afford a good late fall and winter pasture. They can also be pastured well down into the spring and then used for hay. The rye acts as a good support for the vetch, keeping the same from the ground. When the vetch is in full bloom the rye and vetch are cut and cured in the same manner as clover hay. We also proceed as above for sowing rye and vetch on sandy land. After pasturing in fall and winter it is left to grow in the spring until several inches high, then the rye and the vetch are both turned under and the ground used for corn or potatoes. Where we have grown the vetch for seed we do not get sufficient to warrant continuing the practice; also where we grew vetch for hay alone we found that the vetch would fall over on the ground and rot on the under side. This would give the hay an exceedingly bad smell and it was a hard task to cure it. Another detriment we



found and that was where we grew vetch the plants would continue for years to act as a weed. When wheat, barley or oats were grown on the land which had been seeded to vetch a goodly number of the vetch seeds would get mixed with the grains. The vetches are great nitrogen gatherers and enrich the soil in which they are grown. They appear to develop the nodules readily in Wisconsin."

A party, under the initials of W. F. A., in Wisconsin, writes on vetch as follows:

"Our First Acre of Vetch.

"Having experienced a little difficulty in keeping a small tract of rather inaccessible land in the required state of fertility, we tried vetch, both spring and winter varieties. The seedsman instructed us to grow it with a nurse crop of oats.

"We were told that vetch would not thrive in our Wisconsin latitudes, and for a time we were willing to believe it. The vetch we started with oats did not get a start at all, although the season was comparatively moist.

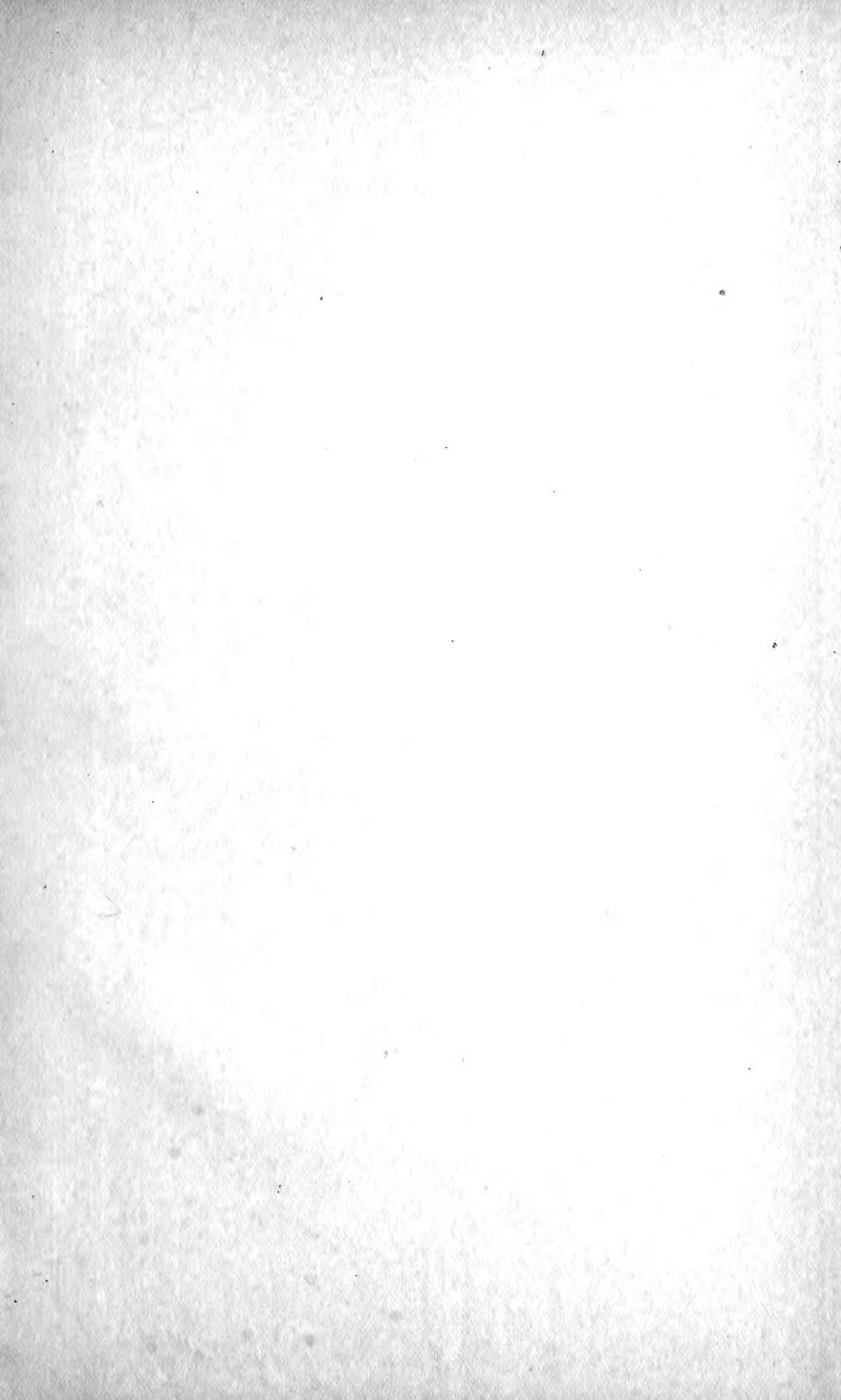
"However, one despised acre, an experiment on our own part, which we had planted to a mixture of clover and winter vetch, finally rounded in shape. It had lingered long, when suddenly both clover and vetch took a notion to grow.

"In August there was a magnificent stand of forage, all of which was plowed under. Thus, although we lost a season's crop from that acre, the improvement of tilth and fertility resulting, amply repaid the loss. Next spring we will put in more vetch and clover."

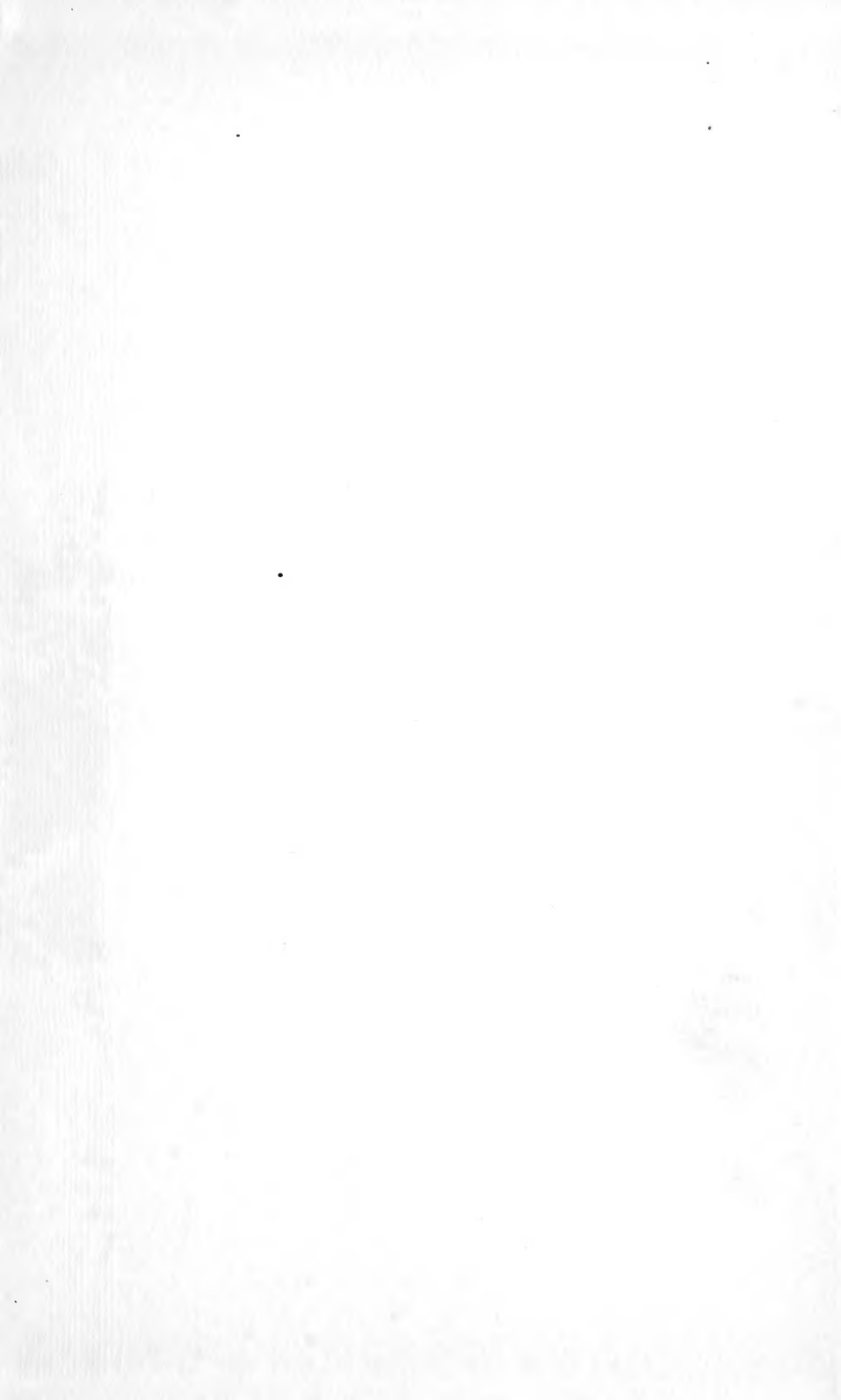








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