Emergency Hay and Pasture Crops
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Emergency Hay and Pasture Crops

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SECTION OF FARM CROPS

East Lansing, Michigan

Soybeans are the leading high protein emergency hay crop for the dairymen of the lower peninsula. page 4

Sudan Grass is practically the only emergency pasture crop that, if sown during May and June will provide abundant pasturage for horses and cows during the latter part of July and August of the same season. page 6

The Millets have long been considered dependable emergency hay crops. page 8

A mixture of oats and peas has proved one of the most satisfactory emergency hay crops for the northern part of the lower peninsula, and for the Upper Peninsula of Michigan. page 8

A mixture of rye and vetch is one of the best late fall and early spring emergency pasture crops. page 9

Rape is the most satisfactory emergency pasture crop for hogs and sheep. page 10

Corn furnishes the largest amount of food material per acre. page 10

Sorghums may be planted a little later than corn, and sorghum seed is usually available, while dependable seed corn is frequently hard to obtain late in the season. page 10

Sweet Clover, although a two year crop producing the bulk of its growth the second season, may produce sufficient growth the first season, if soil and seasonal conditions are favorable, to supply very valuable pasturage during July and August. page 10

The relative yields of the various emergency hay crops at East Lansing and at Chatham (U. P.) are shown on page 10.

The relative feeding value of a number of the leading emergency hay crops is shown on page 11.

A sequence of crops that provides continuous pasturage for horses, cows, sheep, and hogs is found on page 12.

When clover and alfalfa seedings fail, emergency hay crops become necessary in order that rotations may be held intact, and that suitable roughage may be supplied for the livestock.

When selecting emergency hay and pasture crops, the kind of livestock kept, the type and condition of the soil, and the section of the state in which the crop is to be grown, should be carefully considered.

Emergency Hay and Pasture Crops for Michigan

C. R. MEGEE

When clover and alfalfa seedings fail, emergency hay crops become a necessity on farms where livestock is kept. Furthermore, lack of rain or other adverse conditions causing pasture shortage may render profitable the use of emergency pasture crops. A number of crops can be used for these purposes, but no single crop can be said to be best suited to all conditions. The protein content of the various crops, as shown on page 12, varies considerably, and dairy farmers usually secure better results with high protein crops. The section of the State also influences the choice of the crop. Soybeans may be grown to advantage in many parts of the Lower Peninsula, but are suited to only a limited portion of the Upper Peninsula. On the other hand, peas make a more luxuriant growth in the Upper Peninsula than in the northern part of the Lower Peninsula. Certain crops, such as Hungarian Millet, are well suited to low wet soils and to muck soils, while soybeans make a comparatively good growth on light sandy soils.

Fig. 1.—Soybeans, millets, Sudan grass, sorghums, corn, and other emergency hay crops in comparative tests at East Lansing, Michigan.

Sudan grass is the outstanding one-year emergency pasture crop for horses and cattle, while rape is usually preferred for hogs and sheep. Young alfalfa and sweet clover seedings are very valuable when available and when sufficient growth has been made to justify pasturing.

The time of the year during which land is available for sowing these emergency crops will influence considerably the crop selected. The returns secured are affected greatly by the time of sowing. Some crops, such as oats and peas, should be sown during the early spring, while rape may be sown either in the spring or in early summer season. Sudan grass and soybeans should be sown during the late spring and early summer, while the millets may be sown until mid-summer. Rye and vetch is sometimes used as an emergency pasture crop, and should

be sown during the late summer preceding the year it is to be used. Further recommendations concerning the time and rate of seeding each crop are made later in this bulletin.

SOYBEANS

Soybeans are the leading high protein emergency hay crop for the dairymen of the Lower Peninsula. The hay is very palatable for other kinds of livestock, such as horses and sheep. Under average conditions, soybeans should yield from two to three tons of high protein hay per acre, the feeding value of which compares very favorably with alfalfa and clover hay. Soybeans are less sensitive to soil acidity than alfalfa, sweet clover, or June clover; consequently, the farmer who is not in a position to apply lime at once, and is in need of legume hay, will do well to consider this crop.

Fig. 2.—Soybeans furnish good yields of high protein hay.

Soybeans should be sown the latter part of May or the first part of June and can be grown in any section of the State where corn is grown for grain. Better results are usually secured when they are drilled in 28-inch rows at the rate of from 30 to 35 pounds of seed per acre. On heavy soils, free of weeds, they are sometimes drilled in solid, using 90 pounds of seed per acre. When foxtail and crab grass are abundant, this method is not very successful.

There is a wide range in the yielding ability of various varieties of soybeans. Only a very few of the 800 or more varieties known are adapted to Michigan conditions. A large number of these have been tested at the Michigan Agricultural Experiment Station at East Lansing. Table 1 shows the performance of a few of the leading varieties.

Manchu, Ito San, and Black Eyebrow are the three leading varieties for hay and seed production in the State at present. The Midwest variety is sometimes planted with corn for silage, and also for hay.

Soybeans should be harvested for hay when the beans in the pods are about half grown, and before the lower leaves turn yellow and drop

Table 1.—Average yield of soybean hay over a three-year period at East Lansing.

Variety	Tons per acre
Manchu	2.87
Ito San	2.48
Black Eyebrow	2.27
Medium Green	2.12
Wilson	2.08
Ogemaw	1.14
Mammoth Yellow	1.01

off. For late maturing varieties or when the crop is planted late, the approach of fall may determine the time of harvest. The most serious drawback to the growing of soybeans for hay is that they are ready to harvest for hay during September, a time which is likely to be rainy, and cause difficulty in curing.

This difficulty may be overcome to quite an extent by cutting the soybeans with the grain binder and by curing in long, narrow shocks in the field. Soybeans are not as easily harvested with the grain binder as oats or barley; however, if proper precautions are followed, the practice works very satisfactory. The soybeans should be drilled in 28 inch rows and cultivation should be as level as possible. Annual grasses, such as crab grass and foxtail, are very difficult to cut with the grain binder. Consequently, better results are secured when the soybeans are cultivated a few times during the growing season. The binder should be run lengthwise of the row. If run crossways of the row, considerable jerking results. It may be necessary to adjust the binder so that the bundles will be kicked out more rapidly than in the case of small grain crops.

Soybean hay was cured on the College farm during 1931 by the method described. The weather was warm and unusually rainy. The hay harvested with the binder was practically free of mold and the inside of the bundles was of a bright green color. Soybean hay was also successfully cured under the same conditions by the McNaughton System of curing beans. This consists of building a tall, narrow stack around a fence post. The hay cured in the cock was inferior to the binder and McNaughton systems, while that cured in the windrow and swath was not suitable for use.

Under favorable conditions, soybean hay may be cured in the windrow or cock in Michigan the same way as a heavy crop of alfalfa or clover.

Though soybeans are not used to any considerable extent in Michigan as a pasture crop, nevertheless, a few farmers in the extreme southern part of the State have secured good results by pasturing both soybeans and cowpeas. It is customary to start pasturing when the beans are forming in the pods, which does not usually take place until the latter part of August; hence, the period over which soybeans may be pastured is relatively short.

For further information concerning the inoculation of the seed, fertilization of the seed bed, and the use of soybeans for soil improvement, and with corn for silage, request Special Bulletin No. 100 of Director V. R. Gardner, East Lansing, Michigan.

Fig. 3.—Sudan grass is one of the best crops to furnish abundant pasturage for horses and cows during July and August of the same season sown.

SUDAN GRASS

Sudan grass is used as an emergency hay crop and as an emergency pasture crop. As hay, it has much the same feeding value as timothy, and, as a pasture crop, it is practically the only crop that if sown during May furnishes abundant pasturage for horses and cows during the latter part of July and August of the same season. For hog and sheep pasturage, rape is preferable.

Sudan grass should be sown during the latter part of May or the first part of June at the rate of from 20 to 25 pounds of seed per acre.

Fig. 4.—Harvesting a field of Sudan grass in south central Michigan.

A grain drill set to sow two pecks of wheat will sow between 20 and 25 pounds of Sudan grass per acre.

Sudan grass sown the latter part of May or the first part of June should be ready to pasture by the first of July. If pastured judiciously, it will make a continuous growth until killed by frost in the fall.

Being related to the Sorghums, Sudan grass is just sweet enough to be palatable. Caution should be exercised in pasturing Sudan grass that has been severely injured by drouth or frost, since the injured plants may contain sufficient prussic acid to cause poisoning. The United States Department of Agriculture reports that the danger from poisoning is very slight when reasonable care is used.

Fig. 5.—Sudan grass on a sandy loam soil. An excellent yield of a carbonaceous roughage.

There is a considerable period of time over which Sudan grass may be cut for hay. This period ranges from the appearance of the first heads until the seed is in the soft dough stage. Sudan grass is usually cut with the mowing machine and, after curing for one or two days in the swath, is placed in the windrow. It is somewhat slow in curing, but the leaves do not shatter off easily, nor do a few light rains do much damage.

Usually one hay crop and a second crop for pasture or plowing under is secured; however, in the southern part of the State, two hay crops are sometimes obtained the same season.

Sudan grass is quite superior to the millets for pasture purposes. The root system of the latter is quite shallow, and livestock frequently pull the plants up by the roots. The growth of Sudan grass is much more continuous and luxuriant throughout the growing season than is that of the millets.

MILLETS

Certain varieties of the millets have long been used as emergency hay crops in Michigan. Their dependability, when planted late, has been one of their strong points. In feeding value, they rank somewhat below soybeans and about the same as Sudan grass. The injurious action of the seed on horses necessitates harvesting before seed formation, if the hay is to be fed to these animals. Cattle and sheep do not seem to be affected. However, early harvesting before the seed forms and before the plants become coarse and woody is very desirable for both cattle and sheep, especially for the latter.

There are several varieties of millet; these vary greatly in palatability, yield, and soil adaptation. The Hungarian is exceedingly well adapted to low, moist soils and to muck soils. The German (also called Liberty and Golden, but not the Golden of the West) and Common are adapted to uplands.

Table 2.—Three-year average yield at East Lansing.

Variety	Yield—tons per acre	Quality
German	3.25	Suitable for hay
Japanese Barn Yard or Billion Dollar Grass	3.22	Very coarse, hay, very poor quality
Hungarian	2.48	Quite fine
Common	1.94	A little finer than the German

Millets do better if they are not sown until after the soil has become warm. The first of June is a very good date. They mature in a comparatively short time; consequently, they rank among the best crops for sowing at a very late date for production in the same season. It is customary to sow from 25 to 30 pounds of seed per acre. Millet hay is cured much the same as timothy.

OATS AND PEAS

In the Upper Peninsula and the northern part of the Lower Peninsula of Michigan, a mixture of oats and peas has been one of the most satisfactory emergency hay crops from the standpoint of yield and quality of hay produced. In the Lower Peninsula, a mixture of one bushel of oats and one bushel of peas, sown at the rate of from two to two and one-half bushels per acre, should give a good stand; though in the Upper Peninsula the amount should be increased by two to three pecks per acre. The oat and pea mixture should be sown as early in the spring as a suitable seed bed can be prepared. Hot, dry weather prohibits the growth of peas and, consequently, reduces the yield of the forage produced.

The oat and pea mixture should be cut for hay when the oats are in the late milk stage and the peas are forming in the pod.

OATS AND VETCH

In some sections of the State Hairy Vetch is meeting with considerable favor. It is usually sown with rye during the late summer. When a hay crop is desired, the Hairy Vetch can be sown with oats during the spring, and frequently fair yields of a good quality of hay are secured. It is customary to sow from two to two and one-half bushels of oats and twenty pounds of Hairy Vetch seed per acre. At the Experiment Station at East Lansing the oat and vetch mixture has given about the same yield as the oat and pea mixture.

RYE AND VETCH

This mixture is sometimes used as a hay crop on sandy soils, and is one of the best mixtures for late fall and early spring pasture. Though rye may not be quite so palatable as some other crops, it does make a late fall growth, as well as a quick growth in the spring. The mixture is usually sown the latter part of August, using one bushel of rye and 20 pounds of Hairy Vetch seed per acre. In a few sections, especially the northwestern part of the Lower Peninsula, where the snow fall is rather heavy, vetch may be sown during the latter part of September. In the southern part of the Lower Peninsula, winter killing frequently occurs when vetch is seeded later than the first of September.

Fig. 6.—Rye and vetch may be used for both hay and pasture on sandy soils.

RAPE

Rape is one of the most satisfactory emergency pasture crops for hogs and sheep. It should be sown during the early spring, and, if possible, the field should be divided into at least two parts, and these pastured alternately. The Dwarf Essex variety is preferred, sowing in rows at the rate of from three to six pounds of seed per acre and cultivating usually gives the best results especially on weedy or light sandy soil. When sown with oats, and sometimes when sown alone, the seed is broadcast at the rate of from four to six pounds per acre. Rape is frequently sown in corn at the last cultivation and furnishes additional forage when either sheep or hogs are turned into the field.

CORN

Corn will furnish a larger amount of food material per acre than any other crop. When used as a forage crop, it is generally put in the silo. In case a silo is not available, or in case a dry roughage is desired, corn may be drilled somewhat thicker than it is usually planted, resulting in a much finer forage. The use of from 8 to 10 quarts of seed per acre reduces the size of the stalks materially.

For further information concerning variety descriptions and adaptation, time of planting, seed bed preparation and fertilization, methods of cultivation and harvesting, request Special Bulletin No. 210 "Corn Growing in Michigan," of Director V. R. Gardner, East Lansing.

SORGHUMS

Sorghum usually produces about three-fourths as much forage per acre as corn. It may be sown solid with a grain drill at the rate of 40 pounds per acre or drilled in rows from 36 to 42 inches apart, at the rate of from six to eight pounds per acre. The Early Amber variety is one of the best for Michigan conditions. It belongs to the sweet or saccharine group. The grain sorghums are not so well adapted for forage, nor do they yield as much grain as do other crops under Michigan conditions.

SWEET CLOVER

The ordinary strain of sweet clover is biennial, and produces the bulk of its forage the second year. Nevertheless, under favorable conditions of moisture, fertility, and lime content of the soil, sweet clover seedings made early in the spring frequently supply very valuable pasturage during August and September of the same season. The first season's growth of sweet clover is somewhat more luxuriant than that usually made by alfalfa or the clovers. Sweet clover will stand more pasturing than alfalfa or the other clovers. Particularly heavy pasturing, however, may lead to winter killing.

Relative Yields of Various Emergency Hay Crops in Southern and in Northern Sections of Michigan

The section of the State in which the crop is to be grown should influence considerably the crop selected. Tables 3 and 4 show the relative yields at East Lansing, Ingham county, and at Chatham, Alger county.

Table 3.—Yields of air dry hay at East Lansing. Three-year average.

Crop	Tons per acre
Sudan grass	3.33
German millet	3.25
Japanese barnyard millet or Billion dollar grass	3.22
Soy beans	2.67
Hungarian millet	2.48
Common millet	1.94
Oats and vetch	1.99
Oats and peas	1.78

The crops enumerated do not produce the same relative yields in the Upper Peninsula. Mr. G. W. Putnam, Director of the Upper Peninsula Sub-Station at Chatham, Alger county, secured the results reported in Table 4.

Table 4.—Yields of air dry hay at Chatham, Alger county, Upper Peninsula.

Crop	Tons per acre
Oats and vetch	3.56
Oats and peas	2.71
Sudan grass	1.80
Common millet	1.80
Hungarian millet	1.30
Soy beans	0.90

Oat, peas, and vetch mixtures gave rather high yields in the Upper Peninsula, and are also good yielders in the northern part of the Lower Peninsula; soybeans gave rather low yields in the Upper Peninsula, but produced satisfactorily in the southern part of the Lower Peninsula.

RELATIVE FEEDING VALUE

The emergency hay crops vary greatly in feeding value. Roughages which are low in protein and which may be used as a part of the ration

Table 5.—The relative feeding value of several emergency hay crops. (Henry and Morrison's "Feeds and Feeding.")

Dried Roughage	Digestible nutrients in 100 lbs.				Nutritive ratio 1 to
	Crude protein	Carbohydrates	Fat	Total digestible nutrients (fat x 2.25)	
Soy beans	11.7	39.2	1.2	53.6	3.6
Alfalfa	10.6	39.0	0.9	51.6	3.9
Sweet clover (white)	10.9	38.2	0.7	50.7	3.7
Oats and peas	8.3	37.1	1.5	48.8	4.9
Oats and vetch	6.9	37.0	1.4	47.1	5.8
Millet—German	4.8	49.7	1.7	58.3	11.1
Sudan grass	3.7	45.7	0.9	51.4	12.9
Corn fodder	3.0	47.3	1.5	53.7	16.9
Sorghum fodder	2.8	44.8	2.0	52.1	17.6
Oat straw	1.0	42.6	0.9	45.6	44.6

for wintering horses are frequently not at all suitable for milk production. Millets, Sudan grass, and corn stover are low, and soybeans are very high in protein; high quality soybean hay is equal in feeding value to alfalfa and clover hay. Hay from mixtures of oats and peas and oats and vetch is somewhat higher in protein than hay made from Millet, Sudan grass, or corn stover.

An Emergency Pasture Throughout the Growing Season for Horses and Cows

Occasionally, it is necessary to provide emergency crops that will supply pasturage for horses and cows throughout the growing season. The following chart suggests a sequence of crops that may be used for this purpose, with date and rate of planting, and duration of pasturage.

Crop	Rate	Time of sowing	Begin pasturing	Duration
Sudan	25 lbs.	May 20: June 10	July 1	Until killed by frost
Rye and vetch	Rye, 1 bu.—Vetch, 20 lbs.	August 15	October 1.	
Barley or	6 pks.	Early spring	May 5	June 1
Oats	2 bu.	April	June 1	July 1

An Emergency Pasture Throughout the Growing Season for Hogs or Sheep

Rape is the crop most frequently used for this purpose, and should be sown during the spring or early summer. The field should be divided into at least two parts, and these pastured alternately.

Soybeans may be used for pasturage for a short time during late August and early September, while oats and peas provide pasturage for a short period during early July. Corn is hogged off during the fall. This, however, is usually handled as a fattening process, rather than for pasturage. If alfalfa, clover, or sweet clover seedings are available, and have made a luxuriant enough growth to warrant their utilization, they aid materially in supplying additional pasturage.

Soiling Crops

Soiling crops are cut and fed direct from the field as green feed to supplement the pasture during dry weather.

For early summer green feed, a mixture of oats and peas is usually satisfactory while for late summer and early fall feed corn is the most productive green feed that can be grown in a single season. Sorghums may sometimes be used to advantage for this purpose, especially for planting just after corn planting, on land where other crops have failed and when suitable seed corn is not available.

Quite a few farmers are increasing their acreage of alfalfa to a point where they feel justified in using a portion of the crops for soiling purposes. Alfalfa is very desirable for this purpose since it is very high in feeding value as well as being very palatable and with a little planning as to date of cutting will provide green feed throughout the growing season. When available, it is the outstanding crop for this purpose.