Some Alternative Crops

Amaranth

Description: Amaranth is an ancient crop originating in the Americas. It can be used as a high-protein grain or as a leafy vegetable, and also has potential as a forage crop. Grain amaranths are about 5-7 feet tall when mature, and are related to redroot pigweed and waterhemp, but they have not become a weed problem in fields where they have been grown.

Uses: Grain amaranth has been used for human food in breads, noodles, pancakes, cereals, granola, cookies, or other flour-based products. The grain can be popped like popcorn or flaked like oatmeal. A Minnesota study on amaranth forage indicated a yield potential of 4-5 tons/A dry matter, with crude protein of 19% in the late vegetative stage.

Management: Plant seeds no more than 0.5-inches deep in a fine, firm seedbed in late May or early June when the soil temperature is at least 65°F. Some have had success using the in-furrow insecticide application equipment as a planter. Plant about 1.5 to 2 pounds per acre (about 1,000,000 seeds/A). A suggested maintenance fertilizer recommendation is 75 lbs/A N, 25 lbs/A P₂O₅, and 40 lbs/A K₂O. No herbicides are labeled for weed control. Delayed planting and row cultivation will aid in weed control. Do not plant in fields with a history of lambsquarter and pigweed. A killing frost followed by a week of good drying conditions will aid harvest. Conventional combines can be used if fitted with appropriately sized separator screens. Yields have ranged from 600-1500 lbs/A.

Advantages: Is fairly drought tolerant and could possibly be used as an emergency forage crop. Can add diversification to a farming enterprise.

Disadvantages: Forage amaranths can accumulate nitrates. Markets are not widely available. Companies that have developed grain amaranth products include Health Valley Natural Foods, Arrow Mills, Walnut Acres, Nu-World Amaranth, and American Amaranth, Inc.

Fababean

Description: The fababean is an annual legume which is a small-seeded relative of the garden broad bean. The time from seeding to harvest ranges from 80 to 120 days.

Uses: Fababean plants make high quality silage. It is sometimes grown with oats for an oat/fababean silage. It is also possible to feed the bean to all types of livestock or poultry provided it is cracked or crushed. The fiber is higher and fat lower in fababeans versus soybean meal.

Management: Seed in early April if soil is fit at 160 lb./A in narrow rows or with a grain drill to a depth of 2.5 to 4 inches. Yields in 7-inch rows can be about 4000 lb./A compared to only 2000 lb./A in 28-inch rows. Seed should be inoculated for optimum N fixation, and some N (10-35 lb./A) may improve early growth. Since no herbicides are labeled, select fields with low weed pressure. Swath for harvesting when the lowest two bunches of pods begin blackening.
**Advantages**: Can be a high quality silage for dairy cattle.

**Disadvantages**: Fababeanse are very slow in emerging. Plants are also especially sensitive to hot dry weather.

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**Navy Bean**

**Description**: Navy beans are a type of fieldbean that are available in both bush and vine varieties. Most growers use bush varieties to produce good quality white beans. Fieldbeans are warm season annual legumes that require between 85 and 120 days from planting to maturity.

**Uses**: Navy beans are used in canned pork and bean products or as bagged dry beans for boiling and baking purposes.

**Management**: Seed about mid to late May (generally after soybeans) at 105,000 seeds per acre (60-80 lbs/A) in narrow rows to a depth of 1 to 2 inches. Consider using an inoculant at planting time. Fieldbeans generally respond to some nitrogen fertilizer (30-50 lbs/A). Fertilize for P & K according to soil tests. Many soybean herbicides are also labeled for fieldbeans. To minimize harvest damage, harvest when beans are 18-20% moisture. Because of uneven ripening, windrowing can aid in the harvest. Yields have ranged from about 1,000 to 3,000 lbs/A in Iowa.

**Advantages**: Well managed production of fieldbeans can add diversification and income to a farming operation.

**Disadvantages**: Quality standards for fieldbeans are strict. They are more susceptible to diseases and herbicide injury than soybeans, and harvest can be difficult. They are more difficult to market in Iowa than soybeans. Potential growers should obtain a contract before growing fieldbeans. One potential market in Iowa is Stokely, Inc. in Ackley (515) 847-2643.

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**Pinto Bean**

**Description**: Pinto beans are a type of fieldbean that usually have a prostrate vine type of growth and produce flattened buff-colored seed with scattered brown splashes on the surface. Fieldbeans are warm season annual legumes that require between 85 and 120 days from planting to maturity.

**Uses**: Pinto beans are used directly as baking beans or in canned products. They are also used for retrieth bean paste. Beans which do not meet human food quality standards can be used for livestock feed.

**Management**: Seed about mid to late May (generally after soybeans) at 105,000 seeds per acre (60-80 lbs/A) in narrow rows to a depth of 1 to 2 inches. Consider using an inoculant at planting time. Fieldbeans generally respond to some nitrogen fertilizer (30-50 lbs/A). Fertilize for P & K according to soil tests. Many soybean herbicides are also labeled for fieldbeans. To minimize harvest damage, harvest when beans are 18-20% moisture. Because of uneven ripening, windrowing can aid in the harvest. Yields in Iowa have ranged from about 1200 to 2800 pounds per acre.

**Advantages**: Well managed production of fieldbeans can add diversification and income to a farming operation.

**Disadvantages**: Quality standards for fieldbeans are strict. They are more susceptible to diseases and herbicide injury than soybeans, and harvest can be difficult. They are more difficult to market in Iowa
than soybeans. Potential growers should obtain a contract before growing fieldbeans. One potential market in Iowa is Stokely, Inc. in Ackley (515) 847-2643.

Canola

**Description:** Canola is a name applied to edible oil rapeseed. It is in the mustard family. There are winter annual, biennial, and summer annual types. Spring varieties (summer annuals) take from about 70 to 120 days to mature.

**Uses:** Like soybeans, canola contains both high oil and high protein content. Oil is high in polyunsaturated fatty acids.

When the oil is crushed out, it leaves a high protein feed, concentrate which is highly palatable to livestock. Canola is low in erucic acid. Rapeseed, which is high in erucic acid concentration, is used for industrial purposes and is NOT called canola.

**Management:** Can be seeded in the fall or spring depending on the variety. Winter canola should be seeded in late August. Spring canola should be seeded as soon as the fields are fit to work. Seed at 4-5 lbs/A with a grain drill at 0.5 to 1 inch depth. Use a seeding rate of 7-8 lbs/A if broadcast. Treflan is labeled for weed control. Fertilizer requirements are similar to small grains. At harvest, window when 25 % of the seed has changed from green to the mature color. Yields have ranged from about 500 to 1700 lbs/A in Iowa.

**Advantages:** Increased demand for Canola oil due to perceived health benefits. Can add diversification to farming enterprise.

**Disadvantages:** Yields extremely variable depending on weather. Difficult to time harvest. Difficult to market in Iowa. Markets available in Minnesota and the Dakotas.

Berseem Clover

**Description:** Berseem Clover is a winter annual (southern United States) or summer annual (northern United States) legume introduced from the Middle East.

**Iowa Uses:** Berseem clover has been used in Iowa as an annual forage seeded under small grain. The clover is harvested as a one cut forage crop in fall after the small grain is removed for grain and straw. Berseem clover also could be used as a single-season hay or haylage crop. A newer, more winter-hardy variety of Berseem clover, "Bigbee," offers the possibility of using Berseem clover as a winter annual cover crop similar to Crimson clover (similar winterhardiness). Another possible use in Iowa is as a one-season pasture legume. The first year of swine grazing trial in northern Iowa favored Berseem clover over Crimson clover, but not over Tyfon.

**Management:** As an underseeding with small grain, broadcast or drill 10 to 20 lbs./A of seed 1/4 to 1/2 inch deep in the early spring.

For a single-season forage crop, seed 15 to 20 lbs/A with or without a small grain cover crop. Take the first harvest in about 80 days (but before flowering), and subsequent harvests at about 35-day intervals. In general, harvest early July, mid-August, and late September-early October.

For a cover crop, seed 10 to 12 lbs/A in early August. For pasture, seed 15 to 20 lbs/A with 1 to 2 bu/A oats in early spring. Begin grazing when the stand reaches 10 inches,
graze down to 3 inches, then allow for a 30-day regrowth period.

**Advantages:** High quality legume (18 to 28% crude protein). Fast growing under cool weather conditions. Believed to be non-bloating.

**Disadvantages:** Not as winter-hardy as hairy vetch. May winter kill in Iowa. Not expected to produce well during hot summer conditions. Consistent productivity is largely unknown.

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**Crimson Clover**

**Background:** Crimson clover is a winter annual legume introduced from Europe. In the southern United States, it has been used mainly in winter grazing programs and as green manure cover crops.

**Iowa Uses:** There is some interest in using Crimson clover as a cover crop, and possibly for single-season forage production in Iowa. A major concern for cover crop use is the lack of winterhardiness in Iowa. A new release, "Chief," from University of Kentucky may perform well enough in Iowa.

Another possible use in Iowa is as a one-season pasture legume. However, the first year of a swine grazing trial in northern Iowa did not favor Crimson clover over other forage options of Berseem clover or Tyfon.

**Management:** For a cover crop, seed 10 to 20 lbs./A in early August. Broadcast or drill seed 1/4 to 1/2 inch deep. If it over-winters, it should produce about 1 ton of forage by mid- to late May which could be harvested or plowed down. Plowed down, the clover should contribute about 50 to 60 lbs./A nitrogen to the following crop.

As a single-season forage, seed 15 to 20 lbs./A in April-May. Take first harvest in about 80 days (but before flowering), and subsequent harvests at about 35-day intervals. In general, harvest early July, mid-August, and late September-early October. Should yield 2.5 to 3.5 ton/A of high quality hay or haylage.

**Advantages:** Faster growing than many other clovers, so it will compete well with weeds.

**Disadvantages:** Not as winter-hardy as Hairy vetch. Will probably winter kill in Iowa. Not expected to produce well during hot summer conditions. Berseem clover is expected to be a better annual forage option.

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**Kura Clover**

**Description:** Kura clover is a perennial legume that is indigenous to the Caucasian region of Russia where it grows in a wide range of environments from valley bottoms to subalpine areas. It was first introduced into the USA in 1911 but was essentially unknown until the mid 1940’s. It has a deep, branching taproot, and also produces rhizomes which enable it to spread vigorously. Kura clover crowns are often 12” below the soil surface. This extensive root-rhizome-crown complex gives kura clover excellent persistence.

**Uses:** The greatest potential for Kura Clover is for dairy cattle pastures. Mixed with orchardgrass and a creeping alfalfa, kura clover, will provide a high quality hay crop in the spring and can be pastured the rest of the year.

**Management:** Seed- at 6-10 lb/A in early spring. Seed has been difficult to obtain, but is becoming more available. Some possible
seed sources include: Albert Lea Seed 1-800-352-5247, Premium Seed Co (Shakopee MN) 1-800-752-0407, Olds Seed Co. 1-800-356-7333.

A special inoculant is required. Kura Clover is slow to establish and may take 3 years to reach full forage production potential. Once it is fully established it is very persistent and yields are comparable to alfalfa. It can tolerate frequent cuttings better than alfalfa.

**Advantages**: Kura Clover is a very persistent, high quality, productive forage that can withstand frequent cuttings.

**Disadvantages**: Slow to establish. Seed costs have been high due to poor seed yields resulting in limited availability of the seed.

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**Purple Coneflower**

**Description**: Purple coneflower (Echinacea) belongs to the daisy family and is native to American prairies. Echinacea are perennial herbs that, in a young vegetative state, produce a cluster of leaves about a foot tall. In its first year of growth, one or more flowering stems are produced.

**Uses**: The dried root and rhizomes are the major product used while the leaves are also harvested and extracted. The whole plant is highly regarded as a non-specific stimulant of the immune system, as an anti-inflammatory, and as an aid in wound healing. It is now particularly used to increase resistance to infections. Echinacea was one of the most important plants used medicinally by Native Americans.

**Management**: Seed is sown or plants planted in the spring in rows about 12-16 inches apart with about 12 inches between plants. Transplanting seedlings is recommended because germination of seed in the field can be erratic. Good weed control is essential to achieve acceptable yields of Echinacea. Techniques such as pre-plant spraying should be considered. Mechanical weeding or the use of mulches could be useful.

Lime soils to a pH of 6-7. Nitrogen rates of about 75 lb/A at planting followed by an additional 50-100 lb/A are common. Phosphorus and potassium at about 50 lb/A each may also improve yields on low testing soils. Plants are harvested in the fall. Tops are cut to about 2 inches above ground level before plants are lifted using a digger that can work to a depth of a foot. Clean roots are essential to meet quality standards. After washing, the roots are dried at 130-140F until brittle. One potential market in eastern Iowa is Frontier Coop. Herbs in Norway.

**Advantages**: Can be a high value, crop and add diversity to a farm enterprise.

**Disadvantages**: Can be very labor intensive and demand can vary greatly from year to year.

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**Lupine**

**Description**: Lupine cultivation is at least 2000 years old and likely began in the Mediterranean. There are many species of lupine. Those cultivated in the midwest are cool-season annual legumes that require about 90-110 days to mature.

**Uses**: Lupines are high in protein and can be fed directly to livestock without heat treatment. It is also used for human food in the form of lupine flour, lupine pasta, and hulls for dietary fiber.

**Management**: Seed in early to mid April to a depth of 0.75-1.75 inches at 255,000 seeds/A.
Yields are higher in narrow rows. Fertility requirements are similar to that of soybeans. It is important to inoculate the seed with the proper inoculum. Herbicides labeled include Prowl and Dual. Harvest when the seed is 15-18% moisture.

**Advantages:** Can be used in place of soybean meal in livestock feed. Can add to diversification of farming enterprise.

**Disadvantages:** Alkaloids can reduce the palatability of lupine meal feed. When livestock graze lupine stubble, a disease called lupinosis can develop. Difficult to market in Iowa. Markets available in Minnesota.

**Cicer Milkvetch**

**Description:** Cicer milkvetch is a long-lived perennial legume that spreads by rhizomes. It is native to the Caucasus Mountains in Asia across southern Europe to Spain, and was introduced into the United States in the 1920's. The plant blooms with up to 50 pale yellow to white flowers.

**Uses:** Cicer milkvetch is used for grazing, hay, and soil conservation in the northern and central Rocky Mountain Region of the United States and western Canada. It is gaining popularity in other regions of the United States because it is more tolerant than alfalfa to acidic or alkaline soils and does not cause bloat in grazing animals.

**Management:** Prepare a firm, weed free seedbed. Control weeds prior to seeding because postemergent herbicide options are limited. The recommended planting rate is 6 to 8 pounds pure, live seed per acre, at a depth of 1/2 to 3/4 inch. Inoculate seed with Astragalus specific Rhizobia bacteria prior to planting. Plant in late April to early May.

Cicer milkvetch requires higher soil temperature than alfalfa for germination and growth. It generally will emerge within 10 to 14 days after planting, but seedling growth is slower than for alfalfa. Don't plant a companion crop since it is not tolerant of shade. It is not tolerant to frequent cuttings. Allow a 5-6 week rest period between cuttings. Forage quality is similar to alfalfa.

**Advantages:** Cicer milkvetch is well suited for grazing because it's non-bloating and it's strongly rhizomanous. It can be productive on soils that lack the fertility to sustain alfalfa.

**Disadvantages:** It yields less than alfalfa, is slow to establish, and does not tolerate shade or frequent cutting. It can occasionally be unpalatable and may cause photosensitization (sunburn) in lightly pigmented cattle.

**Foxtail Millet**

**Background:** Foxtail millet is a warm-season annual introduced from Asia. Its primary use is for bird seed and forage for livestock feed and bedding.

**Iowa Uses:** Use of millets in Iowa is mainly for emergency summer forage when climatic conditions create problems with normal perennial hay production. Foxtail millets are not as widely used for this purpose as Japanese or Pearl millets.

**Management:** Seed 25 to 35 lbs/A in late-May to July (once soil temperatures reach 65 degrees F). Harvest Foxtail Millets as a one-cut forage in heading stage. This is usually 60 to 70 days from planting.

Foxtail Millet landraces (varieties) include: Common, Siberian, Hungarian, and German.
**Advantages**: Foxtail millets produce a finer stem than other millets, which makes for a better hay option.

**Disadvantages**: Forage production is about 2 to 3.5 tons/A. Regrowth potential of Foxtail Millets for multiple cuttings is very poor.

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**Japanese Millet**

**Background**: Japanese millet is a warm-season annual introduced from Asia. Its primary use is forage for livestock feed and bedding.

**Iowa Uses**: Use of Millets in Iowa is mainly for emergency summer forage when climatic conditions create problems with normal perennial hay production. Japanese and Pearl millets are the main millets used for this purpose in Iowa.

**Management**: Seed 25 to 35 lbs./A in June to July (once soil temperatures reach 65 degrees F). Harvest as a one-cut forage in heading stage (usually 70 to 80 days from planting), or harvest at 2 to 2.5 feet tall leaving 8-inch stubble for regrowth in a multiple-cut system. Usually only 2-cuts are achieved with multiple-cut systems. Total yield is similar to Sudangrass, but forage quality is lower.

**Advantages**: Japanese millets produce a finer stem than Pearl millet and Sudangrass for a better hay option.

**Disadvantages**: Stems are still quite coarse (thick) for hay production. Dry-down will be rather slow. Seed shatter could lead to a barnyardgrass weed infestation.

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**Pearl Millet**

**Description**: Pearl Millet is a tall erect annual grass that has been grown in Africa and Asia since prehistoric times. It can grow to 6 to 15 feet tall and has a dense spike-like seedhead.

**Uses**: Pearl Millet is widely grown as a food crop in India and Africa. In the U.S.A. it is used primarily for pasture and as an emergency forage crop.

**Management**: Sow 25 to 35 lbs./A, drilled to a depth of 0.5 to 1 inch, from about May 15 to July 1 when the soil temperature is greater than 65F. Harvest as silage in mid-hard dough stage. Regrowth is slower than forage sorghums, thus silage yields are usually about 1 ton/A less than sorghum-sudan forages. Yields are comparable under grazing management.

**Advantages**: High-yielding emergency forage crop without the prussic acid problem of forage sorghums. Fairly good drought tolerance.

**Disadvantages**: Less yield potential than forage sorghums.

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**Field Pea**

**Description**: Field pea is a cool season annual legume which grows as a prostrate vine with a maturity of 95 to 100 days.

**Uses**: Field peas are used for human food as fresh, frozen, and canned peas and as dried split pea. Field peas are also used as a protein source for livestock. Field pea may also be grown as a forage crop for hay, pasture, or silage. One popular practice is to grow field pea in a mixture with oats, barley, or triticale for silage.

**Management**: Seed field pea with a grain drill to a depth of 1 to 2.5 inches to achieve a
stand of 9 plants per square foot. Seed in early spring as soon as the ground is fit and the soil temperature is 40°F in the upper inch. Fertilize with P and K according to soil tests. Field pea will often respond to 20-40 lb/A of nitrogen. Herbicides labeled for field pea include Treflan, Command, Lasso, and Basagran. Consider a fungicide seed treatment to reduce seed rots. Harvest before all pods are dry to reduce shatter losses. It may be swathed or straight combined.

**Advantages:** Can be used as a high quality silage when grown with oats or triticale. Can add to diversification to a farming enterprise.

**Disadvantages:** Difficult to market in Iowa. Markets available in Minnesota and Wisconsin.

**Sudangrass**

**Background:** Sudangrass is a warm-season annual. Primary use is pasture and forage for livestock feed.

**Iowa Uses:** Use of Sudangrass (and Sorghum-sudan hybrids) in Iowa is mainly for emergency summer forage when climatic conditions create problems with normal perennial hay production.

Some livestock grazing operations use sudangrass (and Sorghum-Sudan hybrids) for a planned summer pasture to provide feed when cool-season grass-legume pasture productivity decreases.

Because of their higher yield potential, Sudangrass (and Sorghum-sudan hybrids) have largely replaced the use of millets in Iowa.

**Management:** Seed 20 to 30 lbs/A drilled or 25 to 35 lbs/A broadcast in late-May to July (once soil temperatures reach 65 degrees F). Apply about 80 lbs/A nitrogen at planting, and about 50 lbs/A nitrogen after each cutting. Harvest when 30 to 36 inches tall, cutting at least 6 inches high. The lower stem is the main site of shoot development for rapid regrowth. Should provide 3 harvests, with a total dry matter production of 3 to 6 ton/A.

For pasture, graze after 18 to 24 inches of growth. Stock heavily to rapidly graze to a 6 inch height in 7 to 10 days. Allow for at least 18 inches of regrowth before grazing again.

**Advantages:** Faster initial growth and regrowth than millets, and a higher yield potential.

**Disadvantages:** Difficult to produce hay because of their coarse (thick) stems. Need to manage the potential development of prussic acid and nitrate concentrations.

**Sunflower**

**Description:** Sunflower is an annual, erect, broadleaf plant with a strong taproot. The flower head is made up of 1,000 to 2,000 individual, flowers. Sunflower is one of the few crop species that originated in North America. It was probably a "campflower of several western Native American tribes who domesticated the crop around 1,000 B.C. It was introduced to Europe, where high oil lines were developed in Russia. Most of the sunflower crop is raised in the Dakotas and Minnesota.

**Uses:** Most of the value of the sunflower crop is in the oil. The primary use is as a salad and cooking oil or in margarine. Sunflower meal is sometimes substituted for soybean meal in livestock rations. Sunflower seed is also used for birdseed and in human diets as snack
food. It can also be grown as a silage crop for livestock feed.

**Management:** Plant in early May to a depth of 1 to 2 inches in rows 30-36 inches wide. Plant stands of 17,000 plants per acre for non-oilseed and 23,000 plants per acre for oilseed are recommended. Common fertilizer recommendations are for 60 lb/A of nitrogen after a soybean crop and 80-100 lb/A after a corn crop. Fertilize for P and K according to the soil test. Early season weed control is important. Several herbicides are labeled for sunflowers. Seeds should be below 12% moisture at harvest for temporary storage and below 10% for long term storage. Commercially available sunflower headers are available for combining.

**Advantages:** Can add diversity to a farm enterprise. Organic sunflowers for human food may be a niche market in Iowa.

**Disadvantages:** Limited market available in Iowa. Diseases are more of a problem in Iowa than in drier regions of the country. Birds can also be a serious pest.

### Forage Turnips

**Description:** Forage turnip is a root Brassica crop that has been a popular livestock fodder for 600 years. It is a member of the mustard family. It is a biennial which forms seeds the second year or late the first year if early planted.

**Uses:** In the late 1970's researchers began to demonstrate the potential of turnips as pasture. Forage turnips can provide grazing at any time during the summer and fall. A promising use may be for late fall grazing. Livestock eat the stems, leaves, and roots of the plants.

**Management:** Turnips should be planted at corn planting time (when the soil temperature is about 50F). It can be seeded into a prepared seedbed, or into sod if the sod has been killed or suppressed. Nitrogen rates of 80-120 lb/A are commonly used. Requirements for P and K are similar to small grains. One common insect pest is the flea beetle, which can be controlled with a planting time soil insecticide. Turnip plants are ready for grazing or green-chop when the forage is about a foot tall. Graze to about a 5 inch stubble, and then allow plants to recover.

**Advantages:** Forage turnips produce a high-quality forage during the summer and fall.

**Disadvantages:** High levels of glucosinates (which can cause thyroid enlargement in young growing sheep and cattle) can be a problem in older plants. Nitrate toxicity can also be a problem.

### Hairy Vetch

**Background:** Hairy vetch is a winter annual legume introduced from Europe.

**Iowa Uses:** Hairy vetch has been used throughout Iowa as a cover crop. It offers fairly rapid establishment in fall and has good winterhardiness.

**Management:** Seed 10 to 15 lbs./A with 1 Bu/A winter rye mid-August to early September. For Hairy vetch alone, seed 20 to 25 lbs./A. Overseed in soybeans when lower leaves of soybeans are yellowing. Hairy vetch should provide 50 to 70 lbs./A nitrogen to the following crop.

Seeding rates are reduced if ground cover, and not nitrogen contribution, is the priority. Nitrogen contribution is reduced if the spring crop is tilled under earlier in spring.
**Advantages:** Winter-hardy and fairly easy to establish. Good nitrogen producer.

**Disadvantages:** Seed cost has been rather high. As with all cover crops in a dry spring, the cover crops remove much needed moisture for spring planting. If killed early in spring to avoid this problem, nitrogen contribution and weed competition of the cover crop is greatly reduced.


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Cooperative Extension Service, Iowa State University of Science and Technology, and the United States Department of Agriculture cooperating.