

Soil Judging and Land Treatment
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SOIL JUDGING AND LAND TREATMENT

Soil judging teaches participants how to recognize land capability classes in the field. It can help them select practices for wise land use and conservation.

Agricultural workers use the Land Capability Classification to help people plan and practice wise use of their land. In this system, soils are grouped into eight capability classes—I through VIII. Three subclasses, "e" for erosion hazard or problem, "w" for water hazard or problem, and "s" for a limiting soil condition, are recognized in South Carolina.

Soil scientists must consider a large number of soil characteristics. But most soils in South Carolina can be placed in their proper capability class by systematically examining six key factors: (1) slope, (2) erosion, (3) depth, of surface, and subsoil, (4) surface texture, (5) subsoil permeability, and (6) drainage. The combinations of conditions found under these factors determine the capability class and subclass. These and the practices necessary for good land use on each capability class and subclass are the bases for soil judging.

SOIL JUDGING SCHOOLS AND CONTESTS

Competition heightens interest and achievement in soil judging just as in other activities. In soil judging, a system for scoring has been developed that has been used widely by competing FFA Chapters.

Planning Procedure

This procedure is recommended for conducting soil-judging schools and contests for youth groups:

1. Select a judging committee. Usually this committee is composed of the state agricultural education staff, who serves as chairman and is in charge of all local arrangements; a soil scientist, who leads in determining land capability classes; and a soil conservationist, who leads in determining conservation practices needed for the various fields.
2. The committee selects and numbers four fields before the training meeting or contest. The term "field" as used here refers to a plot of land (usually 100 feet by 100 feet) selected as a uniform sample of the area.
3. A soil profile is exposed in each field so participants can examine the soil depth, texture, subsoil permeability, and drainage. Set up two stakes 100 feet apart in line with the slope of the area considered.
4. The committee gives field conditions to guide contestants in selecting conservation practices for each field.
5. The judges fill out a master score card containing the correct score for each field.
6. Score cards are distributed to participants.

A soil-judging team should consist of four individuals but may have only three. The combined score of the three highest individuals for each field will be the team score. The score for all four fields will be used for high individuals.

Scoring the Contest

Land Class Factors. Part I of Score Card

The judges should agree on the points to be allowed for each factor used to determine the soil-capability class. There is no set rule for determining the score allowed for each factor, but judges should allow higher scores for the factors most affecting the capability class and lesser scores for the less important factors.

If the contestant marks each factor on the score card correctly, a perfect score of 30 points will be made. Judges should reduce the score by the number of points that were set for the factors that are incorrect.

The contestant must show the subclass on all classes except Class I. If the subclass is not indicated, the contestant will receive no score for marking the capability class.

Recommended Land Treatments. Part II of Score Card

In scoring Part II, Recommended Land Treatments, the contestant will place an "x" in the square next to the treatments needed.

A list of practices to choose from is shown on the score card. For instance, if the contestant selects "Terrace and farm on the contour" and "Establish meadow outlet," Treatments 22 and 23 should be marked. Appropriate treatments should be marked until the required number of practices decided on by the judges, as suggested under "Conditions," are selected.

In selecting rotations under Treatments 6, 7, and 8, the contestant will designate the number of years for the rotation. For example, if Treatment 6, Establish strip rotation, is marked, indicate whether the rotation should be 2 years, 3 years, or 4 years. If a 2-year rotation is selected, the figure "2" in the (2-3-4 years) bracket should be circled.

A perfect score of 30 points is made if the contestant marks all the correct treatments in Part II. If a practice or practices other than those designed by the judging committee are listed, the score is lowered. Credit is given only for those practices marked correctly. If more than the specified number of practices is listed, the contestant will receive no score for Part II.

Tie Scores: In case of a tie, use tie-breaker methods. For example, break the tie by determining who made the highest score on Part I of all fields. Or the judges may decide alternate methods of awards in case of ties.

Holding the Contest

The judges should meet before the contest to select the fields, prepare the sites for judging, and fill out the master score card on each field.

After instructions, contestants should proceed to Field Number 1. If the group is large, divide it into two or more groups with no more than 25 to 30 people in each. Group 2 might start at Field 2, Group 3 at Field 3, and Group 4 at Field 4. The groups should rotate until each group has visited each field.

When a group arrives at a field, the leader should give the conditions that the judges have prepared for that field. It is important for the contestants to keep the conditions in mind while filling out the score cards.

Allow about 20 minutes for the contestants to score each field. Then turn in cards to the group leader who will send them to a contest scoring committee. The correct factors and land-treatment practices will be announced after all contest cards have been graded.

TERMS USED IN SOIL JUDGING
(As shown on Soil-Judging Score Cards)

PART I - LAND CLASS FACTORS

Definitions

Slope: Slope of land means the number of feet of fall in 100 feet of surface.

Nearly level: From 0- to 2-foot fall in each 100 feet.

Gently sloping: Uniform slopes: 2- to 6-foot fall in 100 feet.

Sloping: 6- to 10-foot fall in 100 feet.

Strongly sloping: 10- to 15-foot fall in 100 feet.

Moderately steep: 15- to 25-foot fall in 100 feet.

Steep: 25- to 40-foot fall in 100 feet.

Very Steep: Above 40-foot fall in 100 feet.

Erosion: The loss of soil by water and/or wind.

None to slight: Less than 25 percent of original topsoil removed. No gullies.

Moderate: From 25 percent to 75 percent of original topsoil removed. With or without gullies. No deep gullies. (A deep gully is one that cannot be crossed with ordinary farm equipment.)

Severe: 75 percent or more of topsoil removed. May have occasional deep gullies.

Very severe: All or practically all of the topsoil removed and up to 25 percent subsoil removed. May have frequent deep gullies.

Depth, Surface, and Subsoil: Depth of soil refers to the combined depth of the topsoil and subsoil, or to that depth to which plant roots penetrate.

Deep: Subsoil and topsoil more than 40 inches deep.

Moderately deep: Subsoil and topsoil between 20 to 40 inches deep.

Shallow: Subsoil and topsoil between 10 and 20 inches deep.

Very Shallow: Subsoil and topsoil less than 10 inches deep.

Surface Texture: The texture of a soil is determined by the percentage of sand, silt, and clay making up the soil. These different soil particles can be identified by the sense of touch—by rubbing a piece of moist soil between the thumb and forefinger. Sands tend to make soil feel gritty. Silt tends to make it feel floury. Clay makes soil feel sticky and slick when wet, but hard when dry. Loam contains sand, silt, and clay but feels neither very sticky nor very gritty.

Coarse: Soils that feel very gritty because they contain mostly sand. This designation also applies to soils that are light-textured in the top 20 inches or more of the profile.

Light: Soils that are mostly sand, but have some silt and clay. Feel mostly gritty (loamy sands and sandy loams).

Medium: Soils containing a mixture of sand, silt, and clay (loams and silt).

Fine: Soils that contain enough clay to make them feel very sticky (clays).

Subsoil Permeability: Subsoil permeability refers to the rate of movement of water through the soil after it enters the soil.

Very Rapid: Sandy subsoils.

Rapid: Loamy sand to sandy loam subsoils.

Moderate: Granular sandy clay loam and clay loam subsoils.

Slow: Soils with heavy clay subsoils.

Drainage: Drainage is the ability of water to move through the soil; it is usually indicated by the color of the subsoil.

Excessive: Sand or loamy sand subsoils with uniform color - yellow, brown, or red.

Good: Subsoil uniform color - yellow, brown, reddish brown, or red. In some soil types the subsoil may be mottled yellow, brown, or red. Gray mottles may be present below 30 inches.

Fair: Upper subsoil (top 10-12 inches) is uniform in color (yellow, brown, or red or is dominantly yellow, brown, or red with a few gray mottles). Many gray mottles are present within 30 inches.

Poor: Subsoil is dominantly gray with mottles of yellow, brown, or red.

Very poor: Surface soil to a depth of 10 inches or more is black or very dark gray. Subsoils are solid gray or gray with a few mottles of yellow, brown, or red.

Importance of Land Class Factors

The combination of conditions found under the six land factor headings determines the land class and subclass. For a given land-capability class and subclass, such as 1e, there can be many possible combinations.

Slope is one of the most important factors in classifying land, mainly because it controls the speed of runoff. With the same cover conditions, soil erosion usually becomes greater as slope increases. This is because the carrying capacity of runoff water increases rapidly as its speed increases. It is estimated that doubling the speed of water increases its ability to move particles 64 times, its capacity to carry material in suspension 32 times, and its total erosive power 4 times.

Erosion. The erosion of the land affects what can be grown. The amount of soil loss that has already taken place indicates the type of control measures needed to prevent further erosion damage. Land with considerable topsoil remaining is more productive than land with little or no topsoil. Subsoil is less productive than topsoil but much more productive than the underlying parent materials. No erosion to slight erosion is best. Alluvial or colluvial deposits are not always desirable. Sometimes poor materials are deposited, and the land is harmed. Erosion is considered a hazard (major factor) on all "e" land and on "s" land with a slope more than 6 percent.

Depth of the combined surface and subsoil (true soil material) is important. This influences the volume available for root growth and support of higher plants and also the degree of soil loss that can be allowed without serious consequences. Deep soils have the greatest capacity for root growth and development and provide greater support for large plants. Parent materials are generally infertile and more subject to erosion than the true soil materials that have formed above them.

Surface texture affects the rate of water intake into the soil, the ease or difficulty of tilling the soil, and how much a soil erodes. A light or medium texture is the most desirable. Coarse soils are generally easy to work but may require special treatment to keep the soil fertile and to control erosion. Fine-textured soils take in water slowly. They are harder to cultivate than soils with coarse, light, or medium surface texture.

Subsoil permeability refers to how fast water and air move in the soil. Several characteristics affect subsoil permeability: texture of the subsoil, type of subsoil structure (shape and size of soil aggregates), or presence of pans or cemented layers.

Moderate subsoil permeability is most desirable. This permits water and air to move readily in the soil. The supply of available water in the root zone is most favorable in soils with moderate subsoil permeability.

Soils with slow subsoil permeability cannot absorb heavy rainfall. Water accumulates on the soil surface and runs off as soon as the surface soil is saturated. This increases the erosion hazard on sloping land. Also, with slow subsoil permeability, the surface soil may become waterlogged during a prolonged rainy period and be unfavorable for root development and plant growth.

Drainage. The soil must have the right amount of water and air for favorable plant growth. Soils with good drainage are the most desirable. Poorly drained soils have too little air and warm up too slowly in the spring. The gray mottling in fair to very poorly drained soils indicates unfavorable conditions for plant growth. Excessively drained soils generally lack enough moisture for good plant growth.

Land Capability Class Definitions

Capability classes are groups of soils that have about the same degree of hazard or limitation. The risks of soil damage or limitation in use become progressively greater from Class I to Class VIII.

Land Suited to Cultivation and Other Uses

- Class I Soils in Class I have few limitations that restrict their use.
- Class II Soils in Class II have some limitations that reduce the choice of plants or require moderate conservation practices.
- Class III Soils in Class III have severe limitations that reduce the choice of plants or require special conservation practices or both.
- Class IV Soils in Class IV have very severe limitations that restrict the choice of plants, require very careful management, or both.

Land Limited In Use (Generally Not Suited to Cultivation)

- Class V Soils in Class V have very little or no erosion hazard but have other limitations impractical to correct that limit their use largely to pasture, range, woodland, or wildlife food and cover.
- Class VI Soils in Class VI have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture, range, woodland, or wildlife food and cover.
- Class VII Soils in Class VII have very severe limitations that make them unsuited to cultivation and restrict their use largely to grazing, woodland, or wildlife.
- Class VIII Soils and landforms in Class VIII have limitations that prevent their use for commercial plant production and restrict their use to recreation, wildlife, or water supply or to esthetic purposes.

Capability subclasses are groups of soils within a class that have the same major conservation problems. The subclasses recognized in South Carolina are as follows: subclass e, subclass w, and subclass s. These subclasses may occur in all classes of land except Class 1. The letters indicating the subclass have a definite meaning: "e" represents erosion, "w" means wetness, and "s" indicates a sandy or stony soil condition. The subclass indicates the major kind of limitation or hazard. If two or more hazards or limitations exist that are essentially equal, the "e" (erosion hazard takes precedence over "w" or "s" conditions, and "w" takes precedence over "s" conditions in deciding the subclass.)

Description of Land Capability Classes and Subclasses

- Class I: This land is nearly level and deep, with light or medium surface-layer texture, moderate permeability, good drainage, none to slight erosion, or with colluvial deposits. This good, productive land can be safely cultivated with ordinary farming methods. It can be cultivated every year and kept in good condition by adding the needed fertilizer, lime, and organic matter. This land is not subject to overflow.

"E" SOIL CLASSES

- Subclass IIe: This land is gently sloping, deep or moderately deep, with no erosion to slight or moderate erosion, moderate or slow permeability, coarse, light, or medium surface-layer texture, and good or fair drainage. An occasional galled spot may be present. It requires terraces or contour strips, contour tillage, meadow outlets, and crop rotations when used for cultivated crops. Not over half of this land should be in row crops during any 1 year (2-year rotation).
- Subclass IIIe: This land is gently sloping with severe erosion, or sloping with no erosion to slight or moderate erosion, deep or moderately deep with moderate or slow permeability, coarse, light, or medium surface-layer texture, and good drainage. More galled areas occur than in subclass IIe. The plow layer is often a mixture of topsoil and subsoil. It requires terraces, contour cultivation, meadow outlets, and crop rotation when used for cultivated crops. Erosion is the main problem on this land. Not over one-third of this land should be in row crops during any 1 year (3-year rotation).
- Subclass IVe: This land is gently sloping with very severe erosion or strongly sloping with no erosion to slight or moderate erosion, deep, moderately deep, or shallow with moderate or slow permeability, and good drainage. This subclass is best suited to pasture or trees. When it is necessary to cultivate this land, not over one-fourth of the area should be planted to row crops in any 1 year (4-year rotation).
- Subclass Ve: There is no subclass Ve recognized in South Carolina.
- Subclass VIe: This land is sloping with very severe erosion, strongly sloping with severe erosion, or moderately steep with no erosion to slight or moderate erosion, deep, moderately deep, or shallow with moderate or slow permeability. Much of this land is in trees and should remain in trees. If it is cleared, it should be plowed only to prepare a seedbed for a permanent sod.
- Subclass VIIe: This land is strongly sloping with very severe erosion, moderately steep with severe or very severe erosion, or steep or very steep with any degree of erosion. This soil may be deep, shallow, or very shallow. It is best suited to trees. Some conditions may justify pasture or perennial legumes.
- Subclass VIIIe: There is no subclass VIIIe recognized in South Carolina.

"W" SOIL CLASSES

- Subclass IIw: This is nearly level or flat land with fair drainage, moderate or slow permeability, and deep or moderately deep soil. It requires some drainage for crops and pasture, and it requires the same rotations as Class I land. Bottomlands subject to occasional overflow may occur in this subclass.
- Subclass IIIw: This is nearly level or flat land with poor drainage, rapid, moderate, or slow permeability, and deep or moderately deep soil. It requires drainage for crops and pasture. Drainage is the main problem in using this land. Bottomlands subject to occasional overflow may occur in this subclass.

Subclass IVw: This is nearly level or flat land with very poor drainage, rapid, moderate, or slow permeability, and deep or moderately deep soil. Water stands at or near the surface for long periods of time, and it may be subject to frequent overflow. It is best suited to pasture, hay, or trees. If used for pasture or hay, drainage is necessary.

Subclass Vw: This is flat, very poorly drained land. Because of location and soil conditions, it is not feasible to drain and use this land for crops. It may be subject to frequent overflow. It is best suited to pasture or trees. Special drainage is required for the development of productive pastures.

Subclass VIw: This is nearly level or flat, wet land with water at or above the surface for very long periods of time. It is best suited for pasture or trees. Intensive drainage is required for the development of productive pastures.

Subclass VIIw: This is flat, permanently wet, swampy land that is covered with water most of the time. It is not practical to drain this land. It is best suited to cypress and hardwood trees and wildlife areas.

Subclass VIIIw: This is salt water marsh suitable only for wildlife.

"S" SOIL CLASSES

Subclass IIs: This land is nearly level or gently sloping, deep or moderately deep, moderate or slow permeability, none to slight erosion, good drainage, and coarse surface layer texture that is 20 to 40 inches thick. This subclass includes soils that are nearly level and deep with slow permeability, slight to no erosion, and coarse or light surface layer texture less than 20 inches thick. It requires special soil- and moisture-conserving practices as well as fertilizer practices. This subclass is subjected to blowing in dry windy seasons and to leaching. Not over half of this land should be in row crops during any 1 year (2-year rotation). NOTE: Terraces are not recommended on subclass "s" land. Use parallel strips, contour cultivation, and meadow outlets in draws.

Subclass IIIs: This land is nearly level or gently sloping, deep with rapid permeability, coarse surface layer texture, slight to no erosion, and fair or excessive drainage. This subclass includes sloping soils with a sandy surface layer 20 to 40 inches thick, moderate or slow permeability, and good drainage. It requires more intensive soil- and moistureconserving practices than IIs. The subclass is subject to blowing in dry seasons and to severe leaching. Not over one-third of this land should be in row crops in any 1 year (3-year rotation).

Subclass IVs: This land is nearly level or gently sloping, or sloping with rapid or very rapid permeability, coarse surface layer texture, slight to no erosion, and excessive drainage. This subclass also includes gently sloping, very stony land with slight to no erosion, and moderate permeability. Row crops are not recommended; best suited to trees, perennials, and pasture.

Subclass Vs: There is no subclass Vs recognized in South Carolina.

Subclass VI: This land is strongly sloping with rapid or very rapid permeability, coarse surface layer texture, slight to no erosion, and excessive drainage. This subclass also includes sloping or strongly sloping, very stony land, with slight to no erosion. Suitability is limited to pasture, trees, or wildlife cover.

Subclass VII: This land is moderately steep, steep, or very steep, very sandy and droughty, or very stony. Suitable only to trees or wildlife.

Subclass VIII: This includes rock outcrops, extremely stony land, and beaches. Suitable for wildlife, recreation, and commercial purposes.

PART II- RECOMMENDED LAND TREATMENTS

Mark Number 1, 2, 3, 4, or 5 to indicate how each field should be used (row crops, pasture, perennials, forestry, or wildlife). Always select one of these for each field and then indicate the supporting treatments. In some cases, the condition sheet may indicate that the use of the land is already determined. In such cases, the major use factor should still be indicated and only the appropriate supporting treatments should be indicated on the score.

Use

Number

1 Row Crops - This will be used when the farmer desires to put this acreage in row crops or rotated row crops with soil-conserving crop.

2 Permanent Pasture - This is recommended on land not suitable for row crops due to soil condition, slope, or erosion; also where pasture could be used to a better advantage than a hay crop or timber products. The area may be ideally suited for pasture due to location or needs of the farm.

3 Perennials - Use this practice on land where soil is not suited for row crops due to soil condition, erosion, or slope; also where a hay crop would be more practical than pasture or where pasture grasses are not adapted.

4 Trees - This practice is recommended where the area is not suited for row crops due to slope, erosion, or soil condition; where pasture or hay is not adapted or needed; and where trees are adapted—also where erosion control is the primary objective and intensive treatment is warranted.

5 Wildlife Area - This is recommended where the area is small and/or is in a desirable location for wildlife.

Vegetative

6 Establish Strip Rotations (2-3-4 years) - Use this on sloping cultivated fields of Class II, III, or IV soils in subclass e or s where row crops are to be grown on a field over 40 acres in size. Indicate the length of rotation by circling 2, 3, or 4. A 2-year rotation with one-half of the strips in soilconserving crops applies to Class II land; a 3-year rotation with two-thirds of the strips in soil conserving crops to Class III land; and a 4-year rotation with three-fourths of the strips in close-growing crops to Class IV land. Ordinarily, Class IV land should not be cultivated.

7 Establish Rotation Within Fields (2-3-4 years) - This is similar to No. 6, except it is used where the field is from 20 to 40 acres in size.

8 Establish Field Rotation (2-3-4 years) This is similar to No. 6, but it is used where the field is less than 20 acres in size. The entire field is planted in the same crop in any 1 year.

9 Plant Row Crops Each Year With Winter Residue Cover or Winter Crops - Use this on Classes I, IIw, IIIw, and IVw land planted in row crops. Winter cover could be residue management or cover crops where insufficient residue remains.

10 Establish Strips for Wind Erosion Control - Use this on sandy fields where wind erosion is a problem, where the open area is 40 acres or more in size, and/or where crops are not adapted to conservation tillage (tobacco, truck crops, etc.).

11 Do Not Burn Crop Residue - Burning crop residue is always discouraged.

12 Conservation Tillage - Use minimum tillage equipment to provide protective cover by leaving crop residue of any previous crop as a mulch on or mixed in the surface plow layer of the soil. The practice includes no-till and minimum-till, and the purpose is to prevent erosion. Use this on all e and s subclasses planted to row crops, except those crops not recommended or adapted to conservation tillage (tobacco, truck crops, etc.).

13 Plant Wildlife Food Strips on Field Borders - Use this practice on ditches, roads, and along edges of fields. In addition to providing food and cover for wildlife, it provides turning space for equipment, reduces erosion from row and terrace drainage, and discourages farmers from having turn rows up and down the hill.

14 Re-establish Pasture - This practice is recommended on permanent pasture or perennials where the present grasses are not desirable species. Re-establishment may be done by plowing and reseeding or by killing existing vegetation with herbicides and reseeding using conservation tillage method.

15 Mow or Spray Pasture or Perennials for Weed Control - This practice is required on new pastures and perennials, and is also used on established pastures and perennials where weeds or brush (less than 2 inches in diameter) are found. Brush and trees that are larger than 2 inches in diameter can be controlled by spraying with chemicals and/or using machinery.

16 Topseed Winter Annuals on Pasture - This is often recommended on permanent summer grasses where additional winter grazing is needed.

17 Seed to Thicken Sod- Use this where a sod of permanent grass has become thin and where it is desirable to thicken the sod. This can be accomplished by harrowing and seeding or by conservation tillage method.

18 Control Grazing - This system of grazing will maintain or improve desirable vegetation in pastures. It includes cross fencing and rotational grazing. This practice also includes protection of trees less than 10 feet in height in areas where livestock control is needed or practical.

19 Harvest Trees Selectively- This is practiced when the stand needs thinning to encourage growth, to remove damaged or diseased trees, or where part of the stand may be economically mature and should be cut to prevent loss.

20 Clear-Cut – Clear-cutting is an operation where all the trees are cut on an area that is to be regenerated. Clear-cutting is recommended in the following stands: (1) even-aged containing mature or over-mature trees; (2) undesirable species that should be replaced by desirable ones; (3) trees of any age that are beyond recovery because of damages caused by fire, insects, ice, or other causes. Clear-cutting is not recommended on steep lands subject to water erosion.

Mechanical

21 Farm on Contour- This practice is to be used on all cultivated land not requiring terraces but with a 1- to 6-percent slope, or on a deep sand that is not to be terraced.

22 Terrace and Farm on Contour- Use this on cultivated land in Classes IIIe and IVe that are used for row crops.

23 Establish Grassed Waterways - This is used where land is farmed on contour or requires terraces.

24 Establish Drainage System - This may be either open-ditch drainage or tile drainage. Drainage is recommended on all “w” classes of land used for row crops, permanent pasture, or perennials.

25 Provide Water Facilities for Livestock - Use this practice when there is no water available in the pasture.

26 Establish Fire Breaks - Use this where the tract of woods is in a high fire hazard area, for example, railroad, high traffic road, incinerator area, etc.

27 Control Brush or Trees - This is used in pastures or perennials and also in stands of timber to remove brush (greater than 2 inches in diameter) or cut trees that are preventing the growth of more desirable plants. This may be done by spraying with chemicals and/or using machinery. It improves the desirable vegetative cover by removing or killing undesirable brush or trees. Do not use when brushy growth can be controlled by normal farm mowing.

28 Control Burn - Use this to control small hardwoods (10 feet tall or less) and reduce litter/fuel buildup.

Lime and Fertilizer

29 Apply Limestone - This practice is recommended on permanent pasture perennials, and row crop land where the pH is below 5.8. The pH of the soil is given in a soil-judging contest.

30 Apply Nitrogen - Use this practice on newly planted pasture grasses or perennials to stimulate growth, on established pasture sod that has few or no legumes present, and on nonleguminous row crops (corn, cotton, grain sorghum, etc.). This encourages early and continuous growth throughout the growing season.

31 Apply Phosphate- Use this practice on pastures, perennials, and row crops where soil test indicates the phosphorus level is medium or less. The soil test level is given in a soil-judging contest.

32 Apply Potash - This practice should be used on pastures, perennials, and row crops where soil test indicates the potash level is medium or less. The soil test level is given in a soil-judging contest.