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ACA Crop Rotation Best Practices

May 2019

References

NOP Preamble

Applicability of Crop Rotation Requirement to all Operations

One State program commented that the crop rotation practice standard in the proposed rule was unreasonable for producers who operated in regions where limited rainfall and irrigation resources or unique soil conditions made cover cropping impractical. This commenter stated that certain dryland cropping systems, such as aloe vera production, function as "semi-perennial" systems that do not include rotations, yet fulfill the objectives of the crop rotation practice standard. A certifying agent expressed a similar concern by suggesting that the crop rotation practice standard be changed by adding "may include, but is not limited to" prior to the list of allowed management practices. This commenter felt that the "may include" clause afforded individual growers greater discretion by acknowledging that not every allowed management practice would be applicable to all operations.

We have retained the language from the proposed rule because it already provides the flexibility to develop site-specific crop rotation practices requested by these commenters. The regulation as originally written includes the "but not limited to" clause that allows producers to include alternative management practices in their organic system plan. Additionally, the regulation states that the producer must implement a crop rotation that provides the required functions "that are applicable to the operation." This further establishes that the crop rotation component of an organic system plan must be considered within the context of site-specific environmental conditions including climate, hydrology, soil conditions, and the crops being produced. The final rule requires implementation of a crop rotation, but the producer and certifying agent will determine the specific crops and the frequency and sequencing of their use in that rotation. Crop rotations must fulfill the requirements of this practice standard--to maintain or improve soil organic matter content, provide for pest management, manage deficient or excess plant nutrients, and control erosion--and are not obligated to use any specific management practice. We structured this and other practice standards, as well as the requirements of the organic system plan, to enable producers and certifying agents to develop organic system plans adapted to natural variation in environmental conditions and production systems.

§205.2 Definitions

Crop rotation. The practice of alternating the annual crops grown on a specific field in a planned pattern or sequence in successive crop years so that crops of the same species or family are not grown repeatedly without interruption on the same field. Perennial cropping systems employ means such as alley cropping, intercropping, and hedgerows to introduce biological diversity in lieu of crop rotation.

§205.200 General.

The producer or handler of a production or handling operation intending to sell, label, or represent agricultural products as “100 percent organic,” “organic,” or “made with organic (specified ingredients or food group(s))” must comply with the applicable provisions of this subpart. Production practices implemented in accordance with this subpart must maintain or improve the natural resources of the operation, including soil and water quality.

§205.205 Crop rotation practice standard.

The producer must implement a crop rotation including but not limited to sod, cover crops, green manure crops, and catch crops that provide the following functions that are applicable to the operation:

- (a) Maintain or improve soil organic matter content;
- (b) Provide for pest management in annual and perennial crops;
- (c) Manage deficient or excess plant nutrients; and
- (d) Provide erosion control.

§205.203 Soil fertility and crop nutrient management practice standard.

(b) The producer must manage crop nutrients and soil fertility through rotations, cover crops, and the application of plant and animal materials.

§205.206 Crop pest, weed, and disease management practice standard.

(a) The producer must use management practices to prevent crop pests, weeds, and diseases including but not limited to:

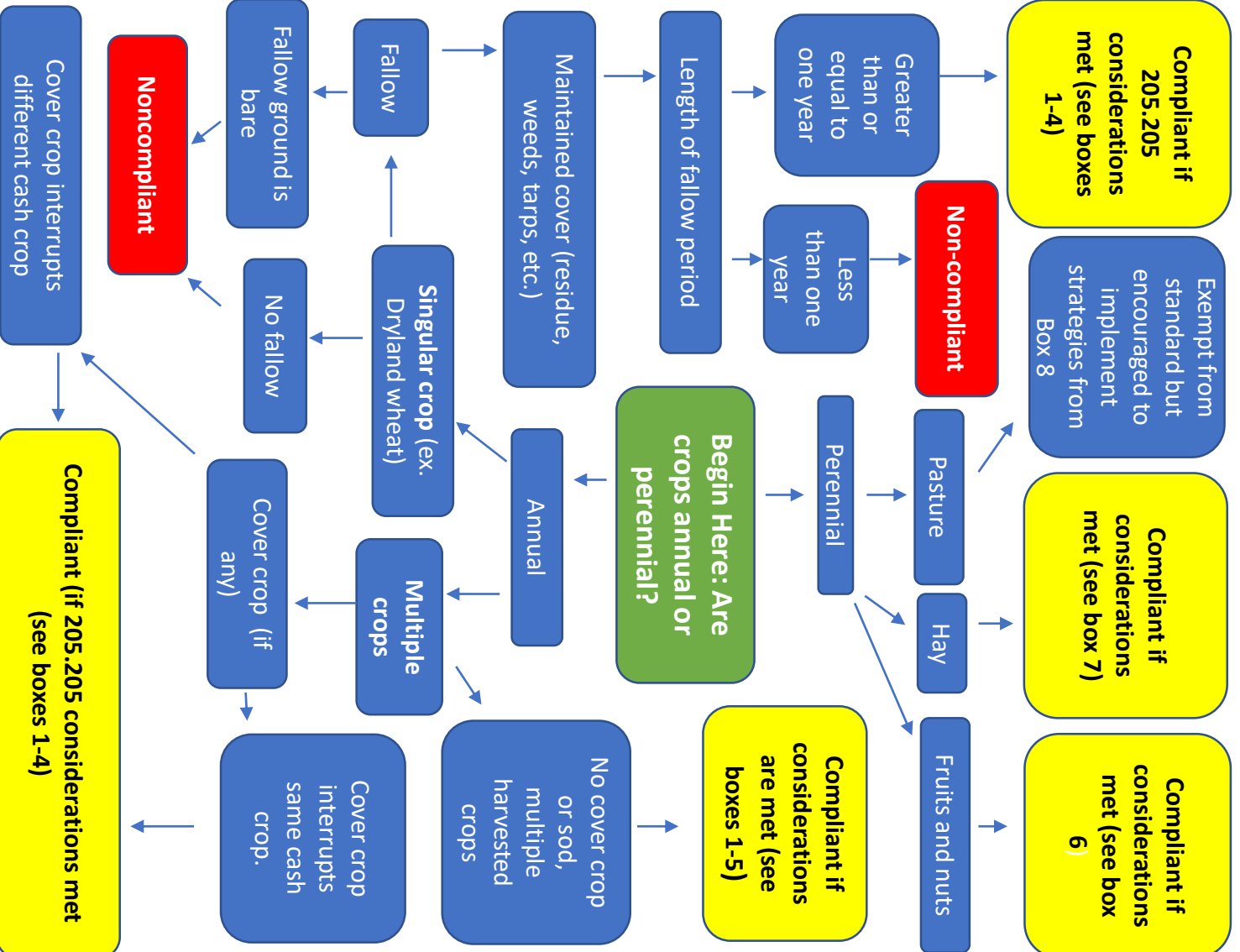
- (1) Crop rotation and soil and crop nutrient management practices, as provided for in §§205.203 and 205.205;

Framework to evaluate crop rotation

When assessing a crop rotation plan for compliance with the Crop Rotation Standard, §205.205, certifiers should examine all aspects of organic management reported in the OSP and by the inspector, including but not limited to fertility and pest control inputs, cover cropping, slope of the land, soil conservation practices, and diversity of crops within the rotation. In addition, field activity, input application, and monitoring records help document whether the rotation provides for pest management, maintains soil fertility, manages deficient and excess nutrients, and prevents erosion as required under the standard. When assessing if the crop rotation standard is being met on a farm, use the following decision tree, detailed discussion, and Q&A.

All rotations must comply with the sections of the regulations cited above including 205.205. The numbered boxes and additional considerations below reflect a higher level of scrutiny for some crop rotations.

Cover Crop Decision Tree



1. Maintain and improve soil organic matter content: Soil organic matter must be maintained or improved. Producers should demonstrate this through: field activity records and input logs, quantifying soil organic matter or a nutrient management plan. (See page 4 for details.)

2. Provide Pest Management: The rotation must provide for pest management. Can be demonstrated through: field activity records, pattern of control without inputs, a documented threshold, variety selection, control of weeds with methods other than cultivation. (See page 4 for details.)

3. Manage deficient/excess plant nutrients: The rotation must manage deficient or excessive plant nutrients. Producers should demonstrate this through: alternating crops based on nutrient demands, soil or tissue tests, nutrient budget, monitoring phosphorus, consultations with experts or resources. (See page 5 for details.)

4. Provide erosion control: The rotation must provide erosion control. Producers should demonstrate this through: field activity records, monitoring records, established practices (windbreaks, terraces, etc.), deep rooted crops, consultation with experts. (See page 5 for details.)

5. Multiple crops or sod, no cover crop: To ensure compliance, producers should demonstrate: Their rotation includes a sufficient amount of diversity (plant species, planting dates) and length (time between plantings of crops in same family) to meet the requirements of 205.205. (See pages 5-6 for details.)

6. Fruit and nuts: Producers must introduce biological diversity. To ensure compliance, producers should demonstrate this with: alley cropping, intercropping, hedgerows, field borders, windbreaks or other features; field records to demonstrate a crop rotation between plantings of short-term perennials. (See page 6 for details.)

7. Hay: Producers must introduce biological diversity and manage nutrients. To ensure compliance, producers should demonstrate this with: hedgerows, field borders, windbreaks, wild areas or other features; field records to demonstrate management of nutrients. (See page 6 for details.)

8. Pasture: Producers can introduce biological diversity and manage nutrients. They can demonstrate this with: hedgerows, field borders, windbreaks, wild areas or other features; field records to demonstrate management of nutrients. (See pages 6-7 for details.)

Detailed discussion from corresponding boxes in decision tree

(1) Does the rotation maintain or improve soil organic matter content?

Soils rich in organic matter (OM) produce healthier plants and root systems. Organic matter content will vary depending on the type of soil. Sandy soils have lower OM while loam and clay soils have higher OM. Maintaining or improving OM requires the incorporation of organic materials, such as manure, cover crops, and plant-residues, as well as establishing permanent or semi-permanent sods. Applying mineral inputs, such as lime, will also maintain or improve OM by balancing soil pH. Organic matter can be lost through excessive tillage and erosion. Soil testing can be used to monitor OM over the long-term. Soil testing should be performed at the same time each year and by the same lab to ensure consistency. Baseline testing is imperative for comparing changes in soil nutrients and OM levels. Soil tests must include OM levels and should be re-taken every three years. Due to a variety of factors, OM levels may vary over the short-term, but consistent soil tests over time will help producers assess long-term trends in OM.

The crop rotation must maintain or improve soil organic matter. To ensure compliance, producers should demonstrate this with:

- Field activity records that demonstrate minimal tillage or other soil disturbance
- Input application records that demonstrate the application of manure, compost, and lime or other mineral inputs
- A crop rotation that includes a variety of root structures
- Consistent soil tests to quantify soil organic matter and nutrient levels
- Control of weeds by methods other than cultivation, such as mowing, burning, and grazing

(2) Does the rotation provide for pest (and weed) management in annual and perennial crops?

Crop rotation plays an important role in breaking pest, weed, and disease cycles. For example, the European corn borer can be controlled by rotating corn out of production for several years. Similarly, a diverse crop rotation can suppress weeds and reduce overall weed pressure. For example, weeds adapted to corn and soybeans, like giant ragweed, foxtails, or pigweed, can be controlled by perennial forages such as alfalfa hay. Perennial weeds, such as thistles, can be cultivated by adding a row crop into the rotation. Producers should keep in mind that it takes time to create a balanced and effective crop rotation, and that each year will present different challenges.

The crop rotation must provide for pest (insect, weed, disease) management in annual and perennial crops. To ensure compliance, producers should demonstrate this with:

- Field activity records that reflect minimal tillage and that weeds are controlled with methods other than cultivation (i.e. mowing, burning, grazing)
- Field activity records that reflect consistent or increased harvest levels
- Historical records that reflect a pattern of controlling pests without inputs (extensive use of pest control inputs may reflect an ineffective crop rotation)
- Documentation that pest damage or outbreak thresholds are met prior to using pest control inputs (i.e.: Ag Extension notice or trap counts indicate a pest outbreak)
- A diverse selection of crops that effectively address weed, insect, and disease pest management
- If the fields are fallow with only volunteer cover (i.e. producer is not grower a cover crop), monitoring of pest and weed pressure to avoid future problems.

(3) Does the rotation manage deficient or excess plant nutrients?

Crop yields can reflect overall soil fertility and help determine whether deficient or excess nutrients are being managed through the producer's crop rotation. When the crop rotation is in question, soil tests can help the producer monitor changes in fertility and nutrients and evaluate the connection between her crop rotation plan and soil fertility. Depending on the situation, soil tests are recommended every three years and should be performed by the same lab to ensure consistency. Forage testing can also be used to measure soil fertility.

The crop rotation must manage deficient or excess plant nutrients. To ensure compliance, producers should demonstrate this with:

- Long-term crop rotation records that demonstrate crops (cash and cover) are alternated based on nutrient demands
- Soil or tissue tests that show a balanced nutrient management budget
- Monitoring of phosphorus when manure or compost are used
- Monitoring of fruits, flowers and leaves to ensure excessive nutrients are not present
- Consultation with professionals, such as agronomists, or other resources to ensure rotation is effectively managing nutrients

(4) Does the rotation provide erosion control?

Soil erosion is caused primarily by wind and water. To address erosion, it is ideal to have crops or cover crops growing on the land at all times. Consecutive years of row crops can lead to soil erosion, especially on steeper slopes and when the crops are low biomass, such as soybeans. Therefore, a rotation that may be acceptable for flat land may not be acceptable on steeper slopes. Crops planted on steeper slopes should be planted on the contour with alternating strips of hay or grain crops. Leaving residue in the field and forgoing fall tillage can also help prevent soil erosion. Waterways must be maintained.

The crop rotation must provide erosion control. To ensure compliance, producers should demonstrate this with:

- Field activity records that demonstrate the producer is minimizing the time when ground is bare or uncovered ("cover" can include crops, cover crops, field residue, mulching, tarps); consider taking pictures of the covered field to show inspectors.
- Field activity records that demonstrate reduced cultivation and ground disturbance
- Monitoring records that address crop germination and yields
- Use of terracing, contouring, leaving headlands uncultivated, or other erosion control strategies
- The inclusion of a variety of root structures in the rotation (tap, fibrous, sod, etc.)
- The presence of wind breaks to control wind erosion
- Consultation with NRCS, Conservation District, or crop advisor to address erosion risk and develop control strategies.

(5) Multiple crops grown without cover crops or sod

205.205 lists "sod, cover crops, green manure crops, and catch crops" as options for producers to include in their crop rotation. While sod, cover crops, green manure crops, and catch crops are not required, their absence should prompt a closer examination of the crop rotation. For many producers, such as vegetable and grain farmers, sod is not a viable option. However, other cover crops can provide enough "sod effect" to meet the regulation. For example, vegetable producers often have shorter rotations that don't include sod, but instead include a variety of cover crops and/or under-seeding. The

rotation should be evaluated in its entirety. A longer rotation with a diversity of species and planting dates, even if it does not include sod, cover crops, green manure, and catch crops, may effectively manage soil fertility, control pests, and prevent erosion as required by the crop rotation standard.

Producers should demonstrate compliance with:

- A rotation that includes sufficient length, species diversity, and planting dates to meet the requirements of 205.205 and is also consistent with points 1-4 above.

(6) Fruit and nuts

While producers of fruits and nuts are not required to employ the same rotation as annual growers, they must take steps to introduce biological diversity into their orchards and vineyards.

Fruit and nut producers must introduce biological diversity. To ensure compliance, producers should demonstrate this with:

- The cultivation of cover crops or other plants between or within rows (alley cropping, intercropping)
- The planting and maintenance of hedgerows, field borders, windbreaks or other features to introduce additional species (required if grower is only managing weeds or natural cover within the production area)
- For short term perennials (i.e. three years or less), field records should demonstrate a crop rotation between plantings

(7) Hay

While perennial hay fields are not required to employ the same rotation as annual growers, producers must take steps to introduce biological diversity and manage nutrients.

Hay producers must introduce biological diversity and manage plant nutrients. To ensure compliance, producers should demonstrate this with:

- The planting and maintenance of hedgerows, field borders, windbreaks or other features to introduce additional species
- Conserving wildlife habitat, such as riparian zones, wetlands, scrublands, and forested areas
- Implementing strategies to protect wildlife, such as delaying harvest to provide nesting habitat for birds
- Field activity records that demonstrate strategies to manage nutrients, such rotating legumes, grazing, and applying compost or manure.

(8) Pasture

Pastures are exempt from the crop rotation standard. However, as a best practice, producers should be encouraged to introduce biological diversity and manage nutrients.

Producers managing pastures should be encouraged to introduce biological diversity and manage plant nutrients. Producers could demonstrate this with:

- The planting and maintenance of hedgerows, field borders, windbreaks or other features to introduce additional species
- Conserving wildlife habitat, such as riparian zones, wetlands, scrublands, and forested areas
- Implementing strategies to protect wildlife, such as delaying harvest to provide nesting habitat for birds

- Field activity records that demonstrate strategies to manage nutrients, such as rotating legumes, grazing, and applying compost or manure.

Question and Answers

What length of the crop rotation should be requested from the producer?

To fully evaluate a crop rotation plan, the OSP should describe the producer's long-term plan. For example, the OSP may only list corn-soybeans-wheat as her crop rotation, but may plan to sow alfalfa after that to manage erosion, improve organic matter, and address weeds and other pest issues. Therefore, it is important to request the "full picture" in the OSP. Consider six years a minimum.

How does deviation from the planned rotation impact compliance?

Producers may deviate from the planned rotation for a variety of reasons, including weather, the availability of planting stock and labor, changes in market demand, pest pressures, and soil fertility concerns. For this reason, certifiers should recognize that rotations must be flexible. Consider asking producers to anticipate possible changes and describe potential alternatives in their OSP. Require producers to notify you of changes in their rotation, at least during their annual review. Certifiers should review changes to ensure the rotation remains in compliance.

How does a crop failure impact compliance?

Cash crops and cover crops occasionally fail due to weather or other extenuating circumstances. ACAs should allow for temporary deviations in a crop rotation for these reasons, provided they are not a pattern. If crop or cover crop failure is a continuing problem, the producer should work to improve their crop rotation and communicate these changes to her ACA.

Is fallow consistent with an organic crop rotation?

Fallow periods include time when cropland is not planted with cover or cash crops. While fallow periods may be used in certain cropping systems and geographic regions to manage moisture, pests, and nutrients, they can also be a cause for concern depending on the timing and purpose. A season-long fallow period, as is common with some dryland wheat systems, may be compliant when it includes maintained cover. Inspectors should focus on the amount of cover in the fallow period. A single crop, such as wheat, rotated with only a bare ground fallow period (less than season long) would not be a compliant due to the potential for erosion and the depletion of soil organic matter nutrients. As an alternative to fallowing, encourage producers to experiment with additional cash crops, lengthen or diversify their rotation to include cover crops, consider interseeding or seek assistance from professionals or other resources to improve their rotation. USDA NRCS has resources on in-field assessments including residue cover. Short term fallow periods for field preparation, and that raise no issues of concern, should be considered compliant.

Are climate and environmental factors a consideration for assessing a crop rotation?

Yes. The NOP Preamble states "the crop rotation component of an organic system plan must be considered within the context of site-specific environmental conditions including climate, hydrology, soil conditions, and the crops being produced. The final rule requires implementation of a crop rotation, but the producer and certifying agent will determine the specific crops and the frequency and sequencing of their use in that rotation." Some regions are limited in crops and practices (ex: arid, dryland production areas). Other regions have many more options due to more favorable climate. In areas with a more

favorable climate, certifiers should increase scrutiny of rotations that are limited in their diversity (ex: only a single cash crop and single cover crop).

What is the crop rotation requirement for container systems?

Certifiers may vary in their approval of container systems. To comply with the crop rotation standard these systems could employ means such as rotating containers between crops to prevent buildup of pathogens, alley cropping, intercropping, and hedgerows to introduce biological diversity in lieu of crop rotation. In lieu of crop rotation and cover cropping, producers could implement soil regeneration and recycling practices to demonstrate that the required functions/goals of crop rotation have been achieved through these alternate practices, as applicable to the operation. Specifically, by maintaining or improving organic matter content, providing for pest management in crops, managing deficient or excess plant nutrients, and by providing erosion control.

Is crop rotation required in a high tunnel/hoop house?

Yes, the crop rotation standard is applicable when a producer is growing in a high tunnel or hoop house. These structures are used to extend the growing season and have the potential to provide an extended period of time to grow cover crops in addition to cash crops. Producers could consider growing a cover crop at the beginning, middle or end of the extended growing season.

Can producers add soil in lieu of a crop rotation?

Some producers have inquired about adding soil to areas of crop production as a practice to meet the crop rotation standard. For example, a producer growing only tomatoes in a high tunnel would add soil from another part of the farm to the high tunnel production area. This practice would raise several issues of concern and is unlikely to be compliant. First, would the producer be able to remove soil in a way that would “maintain or improve the natural resources of the operation, including soil” (205.200)? How would this practice contribute to the interruption of growing the same species in successive years (205.2)? This practice would also need to comply with the crop rotation standard by maintaining or improving soil organic matter, managing pests, managing nutrients, and providing erosion control.

How can ACAs encourage producers to do more?

The producer’s attitude plays an important role in the development of a successful crop rotation, as organic certification is based on continued improvement rather than instant compliance. A positive attitude toward crop rotation is evident by producers’ willingness to test different strategies and communicate with their ACA regarding their plan. Other producers will be more reluctant to spend the time and resources on crop rotation. In this case, it may be helpful to suggest the producer experiment on a smaller scale, such as planting cover crops in just one field and assessing the outcome. It may also be helpful to direct the producer to technical and financial resources, some of which are provided below. If the producer remains unresponsive to encouragement, and the rotation is not compliant, certifiers should move to appropriate enforcement actions.

Technical and Financial Resources

- [USDA Natural Resources Conservation Service \(NRCS\)](#)
- [National Association of Conservation Districts](#)
- [Sustainable Agriculture Research & Education \(SARE\)](#)
- [ATTRA Sustainable Agriculture/National Center for Appropriate Technology](#)
- [Organic Farming Research Foundation](#)
- [USDA National Organic Program](#)

Sample rotations

	Examples of Compliant Rotations	Examples of Noncompliant Rotations	Examples where further information/scrutiny is needed
Vegetables	<p>Sweet peas in spring, followed by fallow (weeds) from July to mid-September then a fall cover crop. Same rotation in year 2. Then sweet corn grown in year 3.</p> <p>Nutrients are managed, no problems with soil erosion are observed, and there are no problems noted with weeds or pest.</p> <p>Certifier action: Approve rotation for short-term, with continued monitoring.</p>	<p>Sweet peas in spring, followed by fallow (weeds) from July to mid-September. No cover crop planted. Same rotation in year 2. Then sweet corn grown in year 3.</p> <p><i>More than one of the following are true:</i></p> <p>Weeds or pests are not controlled (demonstrated by reliance on National List inputs or by field observations). Soil organic matter has decreased over time. Yields or other observations indicate low fertility. Visible erosion is identified in the field.</p> <p>Certifier Action: Issue Notice of Noncompliance based on 205.205 since crop rotation does not maintain or improve soil organic matter content, provide for pest management, manage deficient or excess nutrients, and/or provide erosion control. Follow-up on corrective action</p>	<p>Sweet peas in spring, followed by fallow (weeds) from July to mid-September then a fall cover crop. Same rotation in year 2. Then sweet corn grown in year 3. Cover crops are used inconsistently and/or fail to meaningfully establish on a consistent basis.</p> <p><i>Any of the following are true:</i></p> <p>Weeds or pests are not controlled (demonstrated by reliance on National List inputs or by field observations). Soil organic matter has decreased over time. Yields or other observations indicate low fertility. Visible erosion is identified in the field.</p> <p>Possible Certifier Actions:</p> <ol style="list-style-type: none"> 1) Notify operator of requirements of 205.205. 2) Request operator to provide evidence that requirements of 205.205 are met. 3) Consider unannounced inspection

		<p>through ongoing process of inspection and review. Consider utilizing unannounced inspections and/or providing specific directions to inspector to verify activities related to crop rotation.</p>	<p>to view cover crop conditions. 4) Direct inspector to verify cover crop seed purchases, field activity logs, and other evidence of cover crop use. 5) Inquire regarding use of seed varieties or agronomic methods that will enable effective cover cropping. 6) Direct operator to publicly available and regionally appropriate resources related to effective cover cropping.</p>
<p>Corn and soybean</p>	<p>Year 1 corn, year 2 soybean, year 3 corn, years 4 - 6 hay. No problems noted with yield, pests, erosion, etc.</p> <p>Certifier Action: Approve rotation. Continue to monitor.</p>	<p>Year 1 corn, year 2 soybean, year 3 corn, year 4 soybean Year 5 corn, year 6 soybean. No attempt to cover crop.</p> <p><i>More than one of the following are true:</i></p> <p>Weeds or pests are not controlled (demonstrated by reliance on National List inputs or by field observations). Soil organic matter has decreased over time. Yields or other observations indicate low fertility. Visible erosion is identified in the field.</p> <p>Certifier Action: Issue Notice of Noncompliance based on 205.205 as described above.</p>	<p>Year 1 corn, year 2 soybean, year 3 corn, year 4 soybean Year 5 corn, year 6 soybean. Cover crops are used inconsistently and/or fail to meaningfully establish on a consistent basis.</p> <p><i>Any of the following are true:</i></p> <p>Weeds or pests are not controlled (demonstrated by reliance on National List inputs or by field observations). Soil organic matter has decreased over time. Yields or other observations indicate low fertility. Visible erosion is identified in the field.</p> <p>See possible certifier actions outlined above.</p>

<p>Perennial</p>	<p>Apple orchard where the producer grows flowering cover crops in the alley between trees and has planted hedgerows.</p> <p>Certifier Action: Approve rotation. Continue to monitor.</p>	<p>Apple orchard without any features to add biological diversity to the system. The Alleys are managed as bare ground.</p> <p>Certifier Action: Issue Notice of Noncompliance</p>	<p>Apple orchard where the only feature of biological diversity is mowed weeds between alleys.</p> <p>Possible Certifier Actions:</p> <ol style="list-style-type: none"> 1) Notify operator of crop rotation definition in 205.2. 2) Request operator to provide evidence that they are introducing biological diversity 3) Consider unannounced inspection to view cover crop conditions. 4) Direct operator to publicly available and regionally appropriate resources related to effective cover cropping
<p>Dryland</p>	<p>Alfalfa grown for 3 years, followed by a summer fallow, then winter wheat, a year of fallow with managed cover in then another year of winter wheat.</p> <p>Certifier Action: Approve rotation. Continue to monitor.</p>	<p>Winter wheat, short summer fallow followed by winter wheat (wheat crop grown each year).</p> <p><i>More than one of the following are true:</i></p> <p>Weeds or pests are not controlled (demonstrated by reliance on National List inputs or by field observations). Soil organic matter has decreased over time. Yields or other observations indicate low fertility. Visible erosion is identified in the field.</p> <p>Certifier Action: Issue</p>	<p>Winter wheat, followed by a year of fallow with managed cover.</p> <p><i>Any of the following are true:</i></p> <p>Weeds or pests are not controlled (demonstrated by reliance on National List inputs or by field observations). Soil organic matter has decreased over time. Yields or other observations indicate low fertility. Visible erosion is identified in the field.</p> <p>Possible Certifier Actions:</p> <ol style="list-style-type: none"> 1) Notify operator of

		Notice of Noncompliance based on 205.205 as described above.	requirements of 205.205. 2) Request operator to provide evidence that requirements of 205.205 are met. 3) Consider unannounced inspection to view cover crop conditions. 4) Direct operator to publicly available and regionally appropriate resources related to effective cover cropping.
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Conclusion: The ACA recommends all accredited certifiers adopt ACA Best Practices for the sake of consistent implementation of the USDA Organic Regulations. ACA Best Practices are reviewed periodically to ensure they are accurate and up to date. Concerns with this or any ACA Best Practice or guidance document should be submitted to the ACA Executive Director.