

4Rs Case Study # 3 – Basic Practice

Production: The grower focuses production on carrots and onions, supported by the extensive use of cover crops. The grower pursues aggressive yield goals.

Challenges: Fields are situated near waterways, leading to continuous concerns about nutrient loss to the environment. Both water and wind contribute to erosion. The grower is evaluating two types of buffers, a silt sock and a permanent grassed buffer strip, as potential solutions to mitigate water erosion. Economic goals remain a priority, with an emphasis on achieving maximum fertilizer efficiency. However, certain fields show suboptimal responses to fertilizer applications.

Soil: The entire farm consists of muck soil, though some fields include areas with both coarse and fine textures. Soil samples are taken post-harvest using a grid pattern.

Infrastructure: All fields are tile-drained, complemented by additional ditches to manage runoff water. The drainage system includes three controlled outlets and six water floats to direct water into nearby waterways. In some areas, the tiles flow freely. A series of gates in the tile system allows for water table control throughout the growing season, accommodating field elevation changes. Field tiles are spaced 30 feet apart, buried at least 4 feet deep, and laid within the clay layer. Irrigation is available for all fields.

Production System: All crops are grown from seed. In previous years, a field section has been retired for a year and planted with tall grasses, followed by oilseed radish or mustard over winter. This practice helps manage nematodes and soil acidity issues. Another field retirement is planned in 2026.

Carrot seedbed preparation involves one pass with a disc followed by a cultivator-roller pass. A seeder is used to shape the hills, on which an outside row of barley, three rows of carrots, and another outside row of barley is planted. Deep ridges between rows facilitate drainage. Post-harvest, carrot tops are cut and incorporated into the soil which requires up to five field passes. In the process the field is re-leveled for the next onion crop. Due to the challenges of working with muck soil, this post-harvest operation is often delayed until the soil becomes crusty from frost.

For onions, the post-harvest field conditions determine whether a chisel plow is used after an initial disc pass. The seedbed is cultivated and rolled in a single pass before seeding with a roller-equipped seeder to firm the bed. Onion tops are worked into the soil post-harvest with two passes, followed by planting a cover crop.

Weed and Pest Management: Herbicides are applied post-harvest if necessary and again in spring as a pre-emergence treatment. Two additional herbicide applications during summer effectively manage weed pressure. Pest monitoring services from the Muck Crop Research Station guide appropriate interventions for insect and disease challenges.

4R Practices

Right Source

Enhanced efficiency fertilizers are used to lower application rates. Mycorrhizae are applied to onion seeds, and a Bacillus-based product is used on carrot seeds to boost soil microbial activity.

Right Rate

Fertilizer application rates align with crop removal rates, determined during planning meetings with the CCA. Tissue samples are taken twice during the growing season to adjust mid-season fertilization based on test results.

Right Time

Fertilizers are applied in spring by an ag retailer. Side dressed fertilizer is applied in June for onions and July for carrots by the grower.

Right Place

Both fertilizer applications are surface applied. The first application is immediately incorporated. A broadcast spinner spreader is used, and weather forecasts are considered to optimize application timing. Irrigation is employed when needed to transport nutrients into the root zone. A broadcast fertilizer application is considered a basic practice but is used to achieve timely seeding operations and reduce cost.

Regenerative Practices

- Uses coated seeds with biological agents.
- Uses cover crops after onion harvest.
- Uses barley as a nurse crop to prevent early season wind erosion.
- Implements field retirement.
- Applies wind erosion BMPs.

Conclusion

The grower utilizes a basic data management system, which is sufficient for current needs but limits analytical potential for planning purposes. Fertilizer use decisions are at a basic

level with manual record-keeping supporting food safety reporting. The use of several mitigating actions improves fertilizer use efficiency and minimizes the impact of broadcasting fertilizers.

Gaps and Opportunities

- The manual data management system restricts analysis capabilities; transitioning to a more integrated system offers future opportunities.
- Creating written goals would enable measurement of achievements over time.
- Real-time access to nutrient management records via a web portal could improve decision-making.
- Trialling buffer types and placement results over the next few years will help the grower develop a comprehensive buffer implementation plan to enhance environmental protection.

4R Rating

An overall basic rating is achieved based on the information provided.