

## CUSTOMIZING MANAGEMENT STRATEGIES FOR NEW POTATO VARIETIES

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Potatoes are a genetically complex crop as evidenced by the fact that they come in many sizes, shapes and colors. This complexity also causes potato varieties to be individualistic in their management requirements, each one requiring a different set of conditions in order to perform at it's best. This is partially illustrated in Table 1. Determination of the best management practices for any new variety is difficult and time consuming. The intent of the following presentation is to provide an outline of a scheme that may be used by those growing new varieties to develop their own management systems when little or no information is available.

### Developing Management Strategies for New Varieties:

When faced with the task of growing a new variety, a grower can do one of two things; either use management practices developed for old varieties and hope they are suitable, or based on the best information available, try to predict what may be the best practices for the new variety. Any effort to customize management for a new variety will likely result in a better crop. However, without a systematic plan, attempts to tailor a management package for any variety can be confusing and frustrating. One scheme for developing such a package is presented here. There are four basic steps involved in this method, 1) determine the suitability of the variety, 2) collect information on the unique characteristics of the variety, 3) use the information to customize a management strategy, and 4) annually evaluate and revise the strategy.

#### 1. Determination of Suitability:

Management can improve the quality of any crop, but it cannot overcome genetic inferiority or force a variety to conform to quality specifications it was not designed to meet. Consequently, the first step is to determine if a variety can do what is needed. Four questions must be answered affirmatively before any variety is grown on a large scale. 1) Is the variety adapted to local growing conditions? 2) Does the variety have the required quality attributes for the intended use? 3) Is there an easily accessible market for the variety? 4) Does the management requirements of the variety allow it to easily fit into the existing operation.

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A negative answer to any of these four questions should eliminate a variety from consideration or at least indicate caution is warranted. If uncertainty exists about answers to any of the questions, then only small amounts of the variety should be grown until definitive answers can be found.

Table 1. Comparison of general management recommendations for Russet Burbank, Shepody, Russet Norkotah and Frontier Russet.

Variety	Plant Spacing	Nitrogen Fertility	Irrigation	Herbicide Response	Disease Management	Storage Conditions	Other
Russet Burbank	Wide	High N user	High amount throughout season	Resistant to most herbicides	Avoid: Verticillium Control: Early blight Fusarium	Temp 47°F sprout inhibition after 3 months	Avoid conditions of stress
Shepody	Close	Low N user	Moderate amounts throughout season	Highly sensitive to metribuzin	Avoid: Scab Control: Early Blight Fusarium	Not recommended for storage due to high sugar content	Harvest when solids reach highest point
Russet Norkotah	Close	Moderate N user	Low amounts with late season reduction	Resistant to most herbicides	Avoid: Verticillium Control: Early blight	Not recommended for storage due to quality problems	Prevent oversize tubers
Frontier Russet	Medium	Moderate N user	Moderate amounts with late season reduction	Sensitive to post-emergent Prowl	Control: Early blight in foliage and tubers	Temp 47°F Sprout inhibition after 3 months	Use wider seed spacing if intended for processing

## 2. Collection of Information:

If any research reports have been written concerning the management of a variety, this is the first information that should be acquired. The second type of information needed is a list of the unique characteristics that will influence the management of a variety. Sources of this type of information include the breeder, extension personnel, other growers, and potential buyers. The information collected should contain, as a minimum, the following:

1. Length of dormancy
2. Number and distribution of eyes
3. Average tuber set and tuber size
4. Relative vine size
5. Maturity class
6. Herbicide response
7. Disease resistance and susceptibility
8. Bruise susceptibility
9. Potential quality problems
10. Yield potential

### 3. Customizing a Management Strategy:

The object of any management strategy should be two-fold, 1) optimize yield and quality, and 2) minimize potential weaknesses. The actual process of building the strategy is to compare the information gathered about a new variety with what is known about a familiar variety, then adjust existing practices accordingly. It works well to use a concept of "more or less". Based on the information available, decide whether a new variety needs more, less or similar amounts of the management input in question in comparison to a familiar variety.

The actual process of customizing a management strategy is as follows:

First, list chronologically the management practices that can be altered. The list should, at the least, include the following.

1. Seed management
2. Fertilizer management
3. Irrigation management
4. Weed control
5. Disease control
6. Vine kill and harvest
7. Storage management

Second, analyze each component of the above practices one at a time, determine the variety characteristics that may be influenced by the practice in question, then determine logical changes in the farm operation that will optimize conditions for the variety. For example:

Seed management is influenced by:

1. Number and distribution of eyes  
Few eyes or poor eye distribution will require the purchase of small seed and possibly the cutting of larger seed pieces.
2. Tuber set and size  
Large set and small tubers will indicate the need for a wide seed drop spacing while a small set and/or large tubers a narrow spacing.
3. Disease responses  
A tendency for seed piece decay will preempt precutting, and encourage the use of seed treatments, with the particular susceptibility dictating the treatment used.  
Susceptibility to Rhizoctonia will indicate a need to avoid planting in cold soils.

Fertilizer management is influenced by:

1. Tuber set and size  
Manipulate tuber set with nitrogen levels; large, early applications will encourage a larger tuber set.

2. Vine size  
Larger vines usually indicate the need for more nitrogen.
3. Maturity class  
Earlier maturity dictates lower levels and earlier applications of all nutrients. Late varieties often benefit from split applications of nitrogen. For very late varieties it is often necessary to allow a nitrogen deficiency to occur late in the season in order to speed the onset of maturity.
4. Quality problems  
Low specific gravity can be partially alleviated by making sure that high levels of phosphorus are available. Quality problems associated with immaturity can be influenced by the timing and quantity of nitrogen applications. Stress induced defects can often be minimized by avoiding erratic nutrient availability.

Irrigation management is influenced by:

1. Vine size  
Large vines result in greater water consumption both daily and annually.
2. Maturity class  
Late season water management is dictated by maturity. It is common to overwater early varieties and cause late-season stress in late varieties.
3. Stress response  
Varieties susceptible to stress induced defects must be managed more carefully and may require maintenance of a slight excess of water during much of the growing season.

Weed control practices are influenced by:

1. Herbicide response  
Susceptibility to customary herbicides will require the use of other registered compounds.
2. Vine size  
Small vines will dictate the need for a more comprehensive and careful weed control program. An adjustment in row spacing may be required to increase competition.
3. Maturity class  
Early vine death may create a need for a late season weed control program. Early varieties will also require better control of opportunistic weeds such as nightshade.

Disease control is influenced by:

1. Disease response  
Susceptibility to each individual disease must be addressed individually and the appropriate control measures devised. Many disease problems can be minimized by using certified seed.
2. Bruise response  
Bruising and skinning during handling operations can create entry routes for disease organisms. A tendency for bruising must be countered by practices that minimize bruising.

Vine kill and harvest management are influenced by:

1. Maturity

Most late maturing varieties will require vine killing at the end of each season. A longer maturing period, between kill and harvest, must be allowed for plants with green, vigorous vines than for those that are already partially senesced.

2. Disease response

Varieties prone to storage diseases will need to be completely mature at harvest. Any practice that may injure the skin of the tuber, and allow disease entry, must be avoided.

3. Bruise response

Varieties susceptible to bruising require special handling during the harvesting operation. Harvesting when the soil is too dry, too wet, or too cold must be avoided. Blackspot bruise tends to worsen as the tubers mature and can be minimized by killing when the vines are still green and then harvesting as soon as the skin is set.

Storage management is influenced by:

1. Length of dormancy

Prohibition of sprouting during storage can be regulated by a combination of cool temperatures and sprout inhibitors. Short dormancy will dictate that special attention be given to sprout prevention. A combination of short dormancy and a requirement for warm storage conditions may indicate a need for multiple applications of chemical sprout inhibitors.

2. Disease response

Susceptibility to any storage disease will require the formulation of a preventative treatment using a combination of storage conditions and chemical treatment.

3. Potential quality problems

The management of temperature, humidity, pile depth, length of storage period and other storage conditions will be dictated by the variety's tendency for any storage induced quality problem.

This is not intended to provide a complete list of the management practices that can be adjusted to benefit a new variety. However, it should be sufficient to demonstrate the principles that can be used by a grower to develop a management strategy when inadequate management information is available from other sources.

4. Evaluation and Revision of the Management Strategy:

At the end of each growing season it should be possible to identify weaknesses in the overall management program for any new variety. The last step in developing a management strategy is to include a system for continually evaluating and revising the existing practices. This can be accomplished in three steps 1) keep good records during the production year, 2) identify weaknesses in the existing strategy, and 3) revise the strategy for the following year.

Growing new potato varieties can be interesting and profitable, but it can also bring additional uncertainty to an already unpredictable enterprise. Careful attention to the management requirements of individual varieties can remove some of the uncertainty and assist in the consistent production of a quality product.