Understanding ridging to improve potato production

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Introduction

The most important aspect in any crop production is the soil planted in. The soil is where all production takes place and it is a dynamic resource that supports life. Soil provides several essential services:

- Soil supports plant growth.
- Soil regulates the distribution of water.
- Soil stores and manages nutrients.
- Soil acts as filter to protect resources.
- Soil supports structure.

This article gives guidance to assist the farmer to understand and adapt ridge structure to achieve optimal potato quality and yield.

Ridging of potatoes

The optimal soil water content should be around 50-60% of field water capacity when working soils to form a decent seed bed and ridge.

Figure 1 shows the basic single ridge shape but this
will differ with different environmental conditions and the variety planted. The formation of the ridge will also depend on the conditions the crop is planted in. There is no single solution.

**Aspects to remember with ridging**

- **Row spacing (RS)** depends on equipment settings with mechanization, especially the wheelbase of the tractors which are used in production. The yield of the tubers and its quality depend on the volume-ratio of the ridges as a result of RS (Table 1).
- **Wider RS** provide more soil to perform a good ridging operation than a narrow RS. As the RS decrease ridging operations must be deeper to provide adequate soil to achieve the same ridge height and cross-sectional area as with wider RS.
- **The extent of the ridge surface, the ridge cross-sectional area and soil temperature where the seed potato is planted with RS at 66, 75 and 90 cm play an important role regarding yield and quality of tubers produced.** Table 1 gives the ratio between surface area and cross-sectional area. As this ratio increase the quality and marketable yield of the potatoes also increases.
- **Soil temperature at the seed** influence the quality of the tubers. There is a significant difference in soil temperature between different row spacings. These differences are the highest during hot, summer days and can differ with up to 1.7°C between row spacings of 66 and 90 cm. In the morning, the smallest ridges (66 cm) cool down very fast, but during the day they warm up faster as well. Larger ridges (90 cm) warm up very slow during the day and cool down easily at night.
- **At 100% soil cover** the marketable yield of the 90 cm RS is higher than at the 75 cm RS. The yield of green tubers is lower at the 90 cm RS than at the 75 cm RS, due to a larger cross-sectional area of the ridge. Thus, the soil covering of tubers in the ridge was better.
- **Hollow heart and internal brown spot disorders affecting tubers depend more on the susceptibility of a particular cultivar, the population/stem density and the weather conditions during growing period than the RS used.** The susceptibility to hollow heart disorder with susceptible cultivars can

Table 1. Potato ridge dimensions and ratios.

<table>
<thead>
<tr>
<th>Row spacing (RS)</th>
<th>Height of ridge</th>
<th>Surface area</th>
<th>Cross-sectional area</th>
<th>Ridge ratio</th>
<th>Top</th>
<th>Side</th>
<th>Surface area</th>
<th>Cross-sectional area</th>
<th>Ridge ratio</th>
<th>Top</th>
<th>Side</th>
<th>Surface area</th>
<th>Cross-sectional area</th>
<th>Ridge ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Single Hill</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Sharp</td>
<td>66</td>
<td>35</td>
<td>96</td>
<td>1</td>
<td>12.0</td>
<td>20</td>
<td>23</td>
<td>104</td>
<td>1505</td>
<td>14.5</td>
<td>86</td>
<td>23</td>
<td>170</td>
<td>3815</td>
</tr>
<tr>
<td>Flat</td>
<td>75</td>
<td>35</td>
<td>103</td>
<td>1</td>
<td>12.8</td>
<td>23</td>
<td>26</td>
<td>110</td>
<td>1715</td>
<td>15.6</td>
<td>98</td>
<td>26</td>
<td>185</td>
<td>4340</td>
</tr>
<tr>
<td>Flat</td>
<td>90</td>
<td>35</td>
<td>114</td>
<td>2</td>
<td>13.8</td>
<td>27</td>
<td>32</td>
<td>121</td>
<td>2048</td>
<td>16.9</td>
<td>117</td>
<td>32</td>
<td>211</td>
<td>5198</td>
</tr>
</tbody>
</table>

**Figure 1. The basic structure of a potato ridge after planting and ridging.**

**Figure 2. Ridge structure for single and double ridges.**
be more prominent in years with a higher yield an/or lower planting populations.

- Inter-row subsoiling in the growing season can significantly increase the marketable potato tuber yield with up to 9.0 t/ha and reduce the occurrence of malformed potatoes. Three factors may modify the effects of subsoiling: Soil water status in the growing season, precipitation immediately before and after the subsoiling operation, and crop growth stage at the time of sub-soiling.

**Current practices in South Africa**

The shape of the ridge is used to achieve good yields and quality on the one hand but also meeting environmental conditions/challenges on the other hand. Potatoes are planted in all seasons and times in South Africa and with regard to the soil temperature, huge variations are found. Optimal sprout growth is at 15° and placement of the seed piece should be at this temperature to ensure good and fast emergence. This will influence timing of ridging practices with plant, pre-emergence or post-emergence. The general rule can be planting shallow in cold soils with ridging post emergence to planting and ridging in one operation in warm soils and climates. Variation between this will depend on the prevailing conditions and also production practices on the farm.

The following ridging practices are recommended:

**Ridging under wet growing conditions**

During wet conditions the top of the ridges should be small to allow run off of water. The ratio as described in Table 1 should be smaller for these conditions to allow faster drying of the ridge. This will allow run off and less water conserved in the ridge. Final placement of the seed piece should be in such a manner to ensure that the seed piece is above the through line between the two ridges. This is to ensure that the seed tuber placement and the area where tubers are being initiated do not lay in a drenched area for prolonged periods of time. These long wet conditions will ensure anaerobic conditions leading to the rotting of seed pieces.

**Ridging under dry growing conditions**

In dry climates it is important to conserve water and for this wider beds with flat tops is recommended. Wider rows with larger ratios (Table 1) improve water conservation in the ridge. Double rows is also more advantageous under these conditions. The ratio as described in Table 1 should be higher for these conditions. In very dry areas with irrigation the beds can be wide enough to accommodate a double row. By forming a small furrow/compaction layer (Figure 2 bottom) in the middle of the bed run off...
water will gather in this furrow improving the water content in the ridge profile and limiting water run off. Ridging of double rows can only done with planting.

**Ridging in areas with slopes and contours**  
Areas with slopes and contours are normally in areas with higher rainfall in South Africa. Contours are made to manage water and reduce erosion. These bends and width of the contours normally lead to difficult operations and under these conditions it is best to ridge with planting in a single operation. Ridging later will lead to plants not emerging from the centre of the ridge. The shaping of the landscape with contours leads to long areas with poor runoff. For these conditions it is recommended that the rows are broken at regular intervals to ensure the run off of the water is guided out between the rows and also the contour.

Often re-ridging on slopes is done to increase the depth of the furrow to ensure the seed piece and the initiated tubers are well above the trough between the ridges. The angle of the rows in relation to the slope is important. It should ensure run off but prevent erosion. In a dry year this practice will lead to run off of water with less water retained in the ridge.

**Depth of potato tuber initiation for different varieties**  
Potatoes vary in the depth of initiation with some cultivars initiating very shallow. This leads to quality problems like increased greening, tuber moth damage and damage by birds and other animals. A good rule of thumb is to ensure seed placement depth is between 20-25 cm from the top of the ridge. Planting at about 5-8 cm below natural soil surface leads to good seed placement after ridging. Always remember that if you are following a practice that does well under your conditions, stick with it.

**Conclusion**

Potato ridges form an integral part of your potato production on the farm and the equipment used. If you are happy with the way things are running then stick to the trial and tested methods on your farm. If not sure always try on a smaller scale like 0.5 ha for one to three seasons before changing systems and equipment. The main intent of irrigation/rain is to capture and retain as much of the applied water in the potato ridge but the ridge design should also allow the shedding of access water during heavy rain away from the ridge and into the furrow running out of the field without causing soil erosion. Ridges can be classed in three basic ridge variations: standard (sharp-topped) ridge, flat-topped ridge (width of ridge altered) and double-planted wide-bed.

There are so many variables coming into play that it is not always easy to follow the best practice for the area if the year is very dry or very wet. The general conditions in the growing season will determine the type of ridge used:
- Yield and quality of potatoes improve as the ridge ratio increase but common sense is crucial and seasonal conditions will determine the best practice to follow.
- Dry land prefer broad flat ridges to conserve water and maintain temperature at the seed placement and tuber initiation area.
- Alter the ridge by placing a furrow in the middle of the bed to limit run off of water and to improve conservation of water in the ridge.
- Wet conditions require sharper ridges to ensure run off of water.
- In hot conditions plant deeper and ridge to protect potato seed from high temperatures. Sprouting is optimal at 15°C
- In colder condition plant without ridging. Only ridge with emergence or after emergence.
- Always ensure seed placement is above the trough between the ridges to avoid rotting of seed and tubers.
- Contours and slopes pose challenges in wet years due to retention and run off of water. Contours are designed to limit runoff and to limit erosion and in its nature will cause problems in very wet years due to the accumulation of water on these big flat areas.