



Potato Growing:

A best practice guide for improving soil health,
and water quantity and quality

Produced by the Water Sensitive Farming
Initiative, in partnership with Branston Ltd.

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1. Overview and summary

Produced by Norfolk Rivers Trust as part of their Water Sensitive Farming Initiative¹ - which seeks to improve the quality and resilience of the water environment - this guide provides advice and guidance on soil and water management for potato growers.

Growing potatoes can be associated with various risks including the occurrence of diffuse pollution and the degradation of soil. When faced with an ever-changing climate, preparing and following best practice can effectively mitigate against these issues to ensure future sustainability of this crop.

Best Practice Summary



Pre-Growing

- ✓ Assess the site's topography, condition and soil health
- ✓ Identify mitigation and adaptation opportunities for improvement, and act on these
- ✓ Select most appropriate crop variety for current conditions
- ✓ Prepare soil using minimal disturbance
- ✓ Leave in cover crops for as long as possible, and form planting beds just before seeding
- ✓ Choose a suitable irrigation system, and get to know the water requirement of chosen crop variety



During Growing

- ✓ Ensure quick crop establishment
- ✓ Implement correct buffer and headland management for maximum water absorption
- ✓ Apply inputs in correct doses, and during appropriate conditions
- ✓ Check weather regularly and only irrigate when needed – frequently monitor equipment for leaks and mistimings
- ✓ Break up tramlines and wheelings with a ridging device



Harvest Post Harvest

- ✓ Wait for correct weather conditions
- ✓ Minimise trafficking, and prevent all driving on margins and buffers
- ✓ Cultivate immediately after harvest
- ✓ Identify any compacted areas or field issues for prompt mitigation
- ✓ Check and clean out silt traps
- ✓ Create a green cover
- ✓ Conduct an honest review of the season



Figure 1. Conducting a VESS assessment



Figure 2. SciMap can be used as a guide to identify where diffuse pollution is most likely to originate from

2. Pre-growing and planting

2.1 Assess and check the field as far in advance as feasible

- **Assess field topography** - gradient of slope and length of slope. A long and gentle uninterrupted slope can cause more run-off and erosion than a short, steep slope.
- **Check for compaction** - locate pans and compacted areas by digging. Use a spade to dig several pits across the field, as pans can be easily missed without proper location.
- **Assess soil texture, porosity and bulk density** – assessment can be undertaken using the quick and simple Visual Evaluation of Soil Structure (VESS) scoring system². Sands, silts and those with low soil organic matter are particularly vulnerable to run-off.

Following the assessment, ask yourself: 'Is this still an appropriate and safe crop for this site?' Remove a field from the potato rotation if there have been previous run-off or erosion events, unless suitable mitigations have been used to significantly reduce the risk of recurrence.

1 Available at: <https://norfolkriverstrust.org/our-work/water-sensitive-farming/>

2 Available at: https://www.sruc.ac.uk/info/120625/visual_evaluation_of_soil_structure



Figure 3. Silt trap at bottom of long slope to protect the receptor river alongside



Figure 4. Wide planted headland mix at the Elveden Estate

2.2 Identify opportunities and act

2.2.1 Mitigation and adaptation

- Plant across a slope - where a field contains multiple-facing slopes, identify the point at highest risk from run-off where soil and water might leave the field, and cultivate across this slope.
- Break up long slopes and large fields by planting a hedge or creating a 2-4m wide 'beetle bank' or buffer strip across the slope to slow the flow.
- Where a field adjoins a receptor (ditch, road or watercourse), leave very wide headlands (at least 10-20m wide depending on slope) that can be planted with headland mixes or roughly cultivated to capture run-off.
- Sow a cover crop or two-year clover ley to build soil organic matter, release nutrients and improve soil structure.
- Prevent all driving on margins and buffers and implement a controlled traffic farming plan.
- Create bunds and silt traps in combination with buffer strips to reduce soil and water leaving the field.
- Always use low tyre pressures and adjust after travelling on roads to decrease the pressure on soils.
- Block gateways where water may leave the field, and relocate these to lower risk locations such as at high points. Where a gateway cannot be moved, raise the gateway entrances leading up to the road with a wide hardcore base to reduce the chance of soil and water reaching the road.
- If on rented land, discuss stewardship options with the landowner to take high risk or awkward to manage areas out of production, as well as to increase environmental features.



Figure 5. Tree and hedge planting with corner bund



Figure 6. The Baselier planter and hook tine combination



Figure 7(a). Cover crops

2.2.2 Management

Variety selection

- Be as flexible as possible with your crop variety choice. Select a variety that is best suited to field conditions taking account of length of the growing season and risk of late harvest. View the AHBD potato variety database³ for help.
- Plant maincrop and later-harvested varieties on land with low risk of run-off. If higher risk land has to be used for potatoes, then plant varieties that can be harvested early, such as salad varieties, to ensure plenty of time for good post-harvest land management (see post-harvest section). This may allow time to establish an autumn crop or cover crop after harvest.

Seedbed preparation and planting

- Soil preparation for the potato crop should be undertaken with minimum soil disturbance. Reduce ploughing and if possible, use a one pass cultivation system.
- De-stone the bed to as shallow a depth as viable.
- Leave cover crops to grow for as long as possible, and cultivate as close to planting as feasible to ensure that the soil surface is protected.
- Planting bed formation should occur as close to seeding as possible.

³ Available at: <http://varieties.ahdb.org.uk/>

⁴ Available at: <http://www.d-risk.eu/index.php?params=webtool>

⁵ Available at: https://potatoes.ahdb.org.uk/sites/default/files/publication_upload/Irrigation%20for%20potatoes_0.pdf

- Any cover is better than none! Where beds have been formed but planting has to wait, drill a quick growing cover crop to hold newly formed seed beds in place, to provide cover for bare ground, and to maintain soil structure e.g. mustard or rye. Destroy immediately prior to crop establishment.



Figure 7(b). Cover crops (phacelia)

Irrigation

- Choose appropriate irrigation equipment for the situation and set-up - drip irrigation is most effective at preventing run-off. This method also reduces humidity in the canopy. Use the D-Risk web planning tool⁴ created by Cranfield University to help manage your irrigation, abstraction and drought risks.
- Know the water holding capacity of the soil and understand the water requirement of the chosen crop variety. If a slope is more than 3 degrees, reduce the irrigation rate; a commonly used maximum infiltration rate on steeper slopes is 10mm per hour.⁵

3. During growing season

3.1 Management

- Ensure good and quick crop establishment to provide rapid vegetation cover.
- Manage buffers to provide a wide, rough and absorbent strip. If a permanent buffer is not in place, plant a cover crop headland in May or June. Prevent driving on this at any time!
- Apply all inputs in adequate doses and at times of appropriate soil and weather conditions (e.g. based on soil analysis, crop requirement and current RB209⁶ recommendations). This will avoid extra costs and prevent run-off and leaching.
- Only irrigate when needed; use soil probes to assess soil moisture level in field, and match water application to the potato crop's requirements.
- If infiltration has reached a maximum and run-off is occurring, delay or reduce the application rate. Using smaller nozzles can be effective at increasing water uptake by the crop.
- Regularly check the weather forecast before irrigating, and turn on irrigation before the temperature falls below freezing point.
- Check and monitor irrigation equipment regularly; fix leaks and mis-timings.
- Find out more with ADAS's Irrigation Best Practice Guide.⁷



Figure 8. AHDB's RB209 Nutrient Management Guide

3.2 Mitigation and adaptation

- Use a ridging device in wheelings and tramlines to break up and divert run-off flow back into the potato beds after rainfall and irrigation. Results show that this can reduce water loss by more than 90%.⁸
- Tramline and wheeling disruption machinery⁹ are available to trial for free through the Water Sensitive Farming Initiative including the 'Wonder Wheel' by Bye Engineering and the 'Wheel Track Roller' by Creyke.
- Potato field trials,¹⁰ conducted at the Elveden Estate, found that these treatments were significantly effective¹¹ at reducing run-off volume, sediment concentration, total soil loss and total oxides of nitrogen concentration in run-off.
- Consider using an inter-row hoe for weed control - this can reduce pesticide use, break up capping of soil, and promote nitrogen mineralisation for crop use.



Figure 9. Run-off down wheelings



Figure 10. Wheeltrack Roller (left) and Wonder Wheel (right)



4. Harvest and post-harvest

4.1 Management

- Plan for harvest during correct weather conditions.
- Ensure that field access points are not located at the bottom of fields when harvesting. If this is the only option, make sure cross drains or bunds are used to prevent water and soil from leaving the field.
- Where possible, reduce tractor and trailer trafficking when harvesting and prevent all driving on margins and buffers.
- Cultivate straight after harvest to leave a rough, absorbent surface that will reduce the risk of erosion.
- Where compaction is suspected, dig soil pits to identify exact location and depth of any compaction and field issues to ensure correct mitigation.
- Check and clean out silt traps if being used.
- Create a green cover where good establishment can be achieved.



Figure 12. Examining soil compaction

4.2 Mitigation and adaptation

- Conduct an honest review of the season to improve next year's results.

Find out more by visiting the Norfolk Rivers Trust's website.¹²



Figure 11. Cross drains in track to divert flow



6 Available at: <https://ahdb.org.uk/Search?q=rb209>

7 Available at: <http://79.170.40.182/iukdirectory.com/iuk/pdfs/water%20management%20for%20potatoes.pdf>

8 Available at: <https://www.fwi.co.uk/arable/potatoes/video-cultivating-potato-tramlines-cuts-water-soil-losses>

9 Available at: <https://norfolkriverstrust.org/wp-content/uploads/2019/10/Pinpoint-Tramlines.pdf>

10 Available at: <https://ahdb.org.uk/farm-excellence/elveden>

11 Available at: <https://projectblue.blob.core.windows.net/media/Default/Programmes/Farm%20Excellence/Potatoes/Elveden/SPot%20East%20results%20day%2011012018%20FINAL.pdf> Page 63-88

12 Available at: <https://norfolkriverstrust.org/our-work/water-sensitive-farming/>



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