

Using Quality Compost in potato production to increase yields



Plot to demonstrate the effect of quality green compost on potato yields at the 'Potatoes in Practice' event, 7th August 2008, Gourdie Farm, Invergowrie, Dundee

Potatoes were grown using six combinations of quality compost (made from garden waste such as grass cuttings, prunings and leaves) and fertiliser in Eastern Scotland. Compared to the unamended plots, yields increased in those plots where compost and fertiliser, and compost alone, was used.

Advantages of using quality compost in potato production

Demonstration plot

Background

Quality green composts add valuable organic matter to agricultural soils and also provide a slow release of nutrients such as nitrogen, phosphate and potassium, together with a wide range of micronutrients.

Compost additions also improve soil structure. As a result water infiltration into the soil is increased, as is soil water holding capacity. Workability is also improved and applied fertiliser usage optimised.

Previous field trials with potatoes suggested that when quality green compost was added to the soils tuber yields were increased. To demonstrate the potential advantages of using quality green composts in potato cultivation to the potato industry a plot was established at the 'Potatoes in Practice 2008' event.

Potatoes in Practice, organised by SCRI, is the largest annual potato knowledge transfer event in the UK. The 2008 event attracted more than 700 visitors, including farmers, retailers, agronomists and advisors from the UK and Europe, and from Australia, China, Egypt, Israel and Japan.

Trial Design and Location

The demonstration plot was located in a field at Gourdie Farm, Invergowrie, Dundee. The soil was Balrownie association, a sandy loam derived from a brown forest soil. This has a Land Capacity classification of 2, which is a highly productive soil, capable of growing a wide range of crops. This field had previously cropped winter wheat. Soil analyses showed residual values of 30 Kg N; 44 kg P, as P₂O₅; and 141 kg K, as K₂O.

Duplicate rows were amended with a range of inputs: no addition; compost at 35 tonnes per hectare equivalent; compost at 100 tonnes per hectare equivalent; fertiliser alone; compost at 35

tonnes per hectare together with fertiliser and compost at 100 tonnes per hectare with fertiliser.

Fertiliser was added at the normal commercial rate, of 147 kg of N; 147 kg P, as P_2O_5 ; and 293 kg K, as K_2O , per hectare. All rows were planted with the potato variety Vales Sovereign, provided by Greenvale-AP Ltd., on 13 May 2008 and harvested on 31st October 2008. The plot was not irrigated, but was routinely sprayed with both fungicides and aphicides, following normal horticultural practice.

Compost

The quality compost used was produced to the BSI PAS 100 specification by Scottish Water and screened to a particle size of 20mm. Dry matter content was 56%, of which 1.47% was nitrogen, 0.24 % phosphorous and 0.78 % potassium, and a pH of 7.6.

Results

All amendments increased yields (Figure 1) compared to the rows that were not amended. The highest yield was produced in the rows amended with 100 tonnes of compost only.

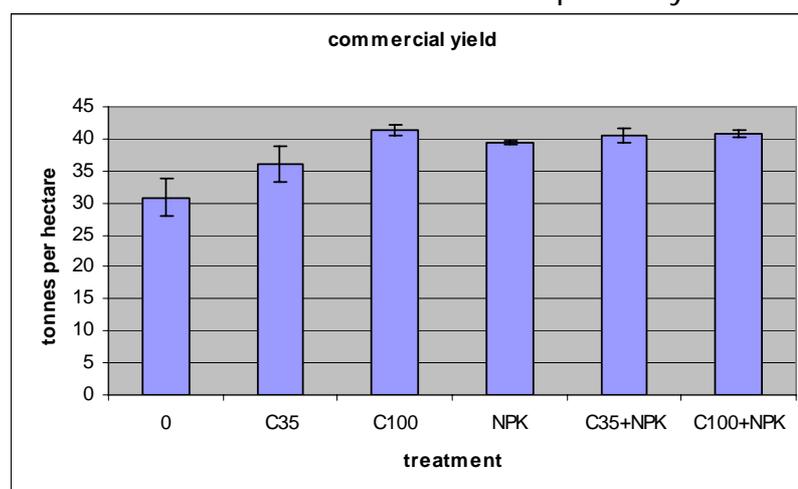


Figure 1: The yield of commercial size potatoes, Vales Sovereign, in the amended plots.

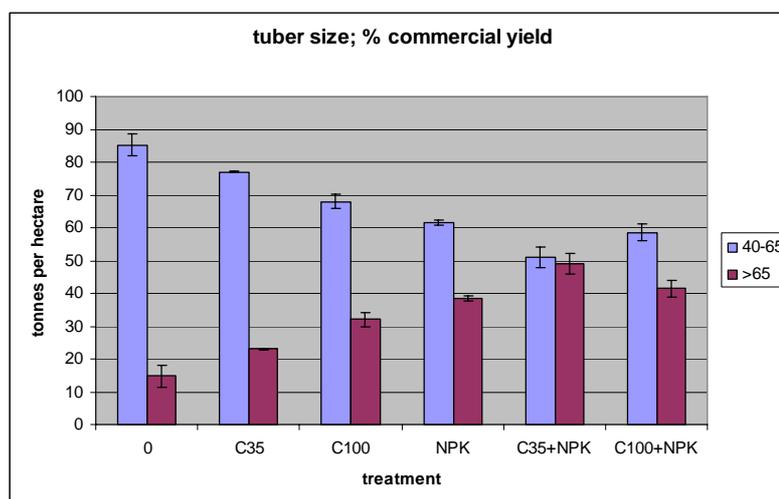


Figure 2:- Tuber size distribution, with the different amendments.

The greatest proportion of 40 – 65 mm tubers were produced in the unamended plots (Figure 2), although yields were also the lowest (Figure 1). The addition of compost appeared to increase the proportion of 'bakers', in the more than 65 mm range.

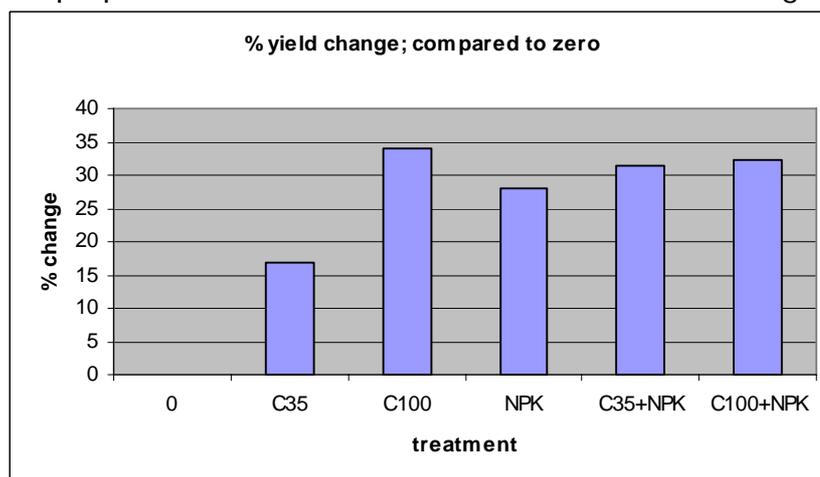


Figure 3: Changes in yield with the various amendments.

Amending the soil with 100 tonnes of compost per hectare equivalent alone gave the greatest percentage increase in yield of all the treatments. All inputs increased yields compared to the unamended treatment. And the addition of compost to the

standard fertiliser treatment, at either rate, increased potato yield compared to the fertiliser alone treatment (Figure 4).

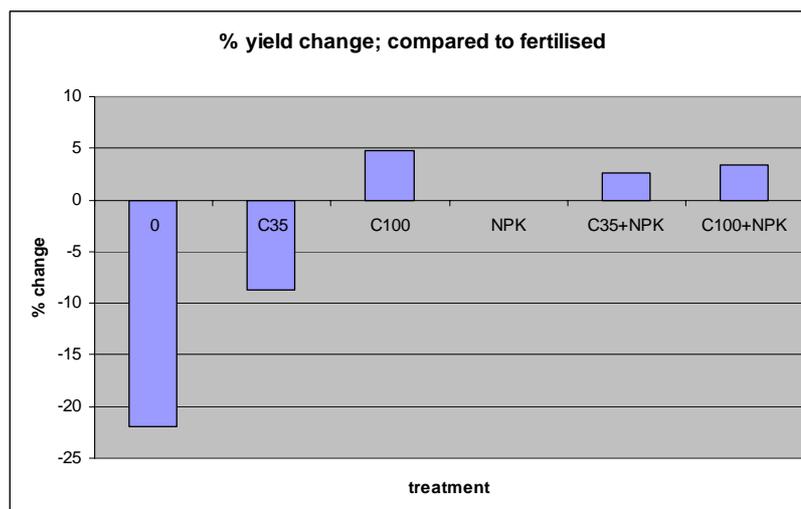


Figure 4: Differences in yields compared to the standard fertilization.

Discussion

All the inputs, whatever the combination, increased potato yields compared to the unamended plots. However, such increases were not simply a response to increased nutrient availability or supply. For example, when two of the amendments were used jointly, e.g. 100 tonnes of compost per hectare together with fertiliser, the increase in yield was not a compound of the two individually but was, in fact, reduced. However, using compost alone at that rate resulted in the greatest yield. Conversely, combining compost at the 35 tonne rate with fertilisation significantly increased the yield compared to either individually. Such variations in response illustrate the complexity of interaction involved in crop production, and the requirement for extensive trialling.

Commercial implications

Amendment	None	C35	C100	NPK	C35+NPK	C100+NPK
Crop value*£	3082	3605	4133	3946	4050	4079
Increase cf zero	0	523	1051	864	968	998
Input costs	0	275	600	292	567	892
Added value	0	248	451	572	401	106

Table 1: Relationships between cost of inputs and increased value of the potato crop (* crop valued at £100 per tonne).

At the greatest, these inputs represent less than 20% of the wholesale values of the crop, and the lowest is around 5%. The use of all of these inputs is economically effective whatever the type or cost.

Although the actual input costs for the 35 tonnes of compost per hectare and the fertiliser alone treatments are similar, the lower yield in the compost treatment gives a lower net return per hectare. Increasing the inputs (and costs) increased crop quantity but did not result in a net economic return. In this comparison the conventional fertiliser practice gave the best added value return.

Conclusion

These trials show that using compost alone in potato production can significantly increase yields. A combination of compost and fertiliser, at the standard rate, further increases yields slightly. Based on current fertiliser prices, compost and potatoes, the use of fertiliser alone is the most effective economically. However, if fertiliser prices continue to rise this could easily change, as some of the differences are relatively small.

Also, the longer term benefit of future cropping in the compost amended soils needs to be considered. It is probable that only about 10% of the nitrogen in the compost become available in any cropping season. Most of the potassium will be made available

in years 1 to 3, and about 15% of the phosphorous will become available each year, dependent on soil type and crop. So future crops on the fields in which the potatoes were first grown should also benefit and show increased yields. The economic benefits of this also need to be factored in.

Only a limited combination of compost amounts, both with and without a standard fertiliser application, were used in this demonstration trial. Other combinations, particularly with reductions in the amounts of fertiliser used, could provide better economic advantage.

Recommendations for using compost on potato crops

Key facts about using compost

- Compost contains slow-release nitrogen, phosphate, potassium and sulphur, plus smaller but useful amounts of other minerals, all of which help to improve the availability of nutrients for potato growth.
- Soil rich in compost absorbs and retains water better, meaning it needs less irrigation, so reducing production costs for the same potato yield.
- Compost adds organic matter, giving soil a more workable structure which leads to improved root growth and better plant establishment. It also means that less fuel will be used during the many mechanical inputs required in potato production.

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