Sack Potatoes: What went wrong?

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By Philemon Buruzi

When the sack potato technology was introduced, almost every farmer was excited about it. Barely a year on a good number of the same farmers do not want to hear anything about this wonderful way of growing potatoes. This technology is said to be capable of giving a farmer an excess of 15kg of potatoes from one bag, but that is yet to materialise locally. To add salt to injury, Zimbabwe recently woke up to a story in one of the daily papers that the local market was rejecting potatoes grown in sacks. The buyers are said to have cited numerous keeping and cooking quality concerns. This undoubtedly dealt a blow to those who had managed to at harvest something using this technology. I have met several furious farmers who believe that all the yield expectations they were told were fallacies and only directed at duping them of their cash. Well, I will not comment on that but a quick research that I conducted showed me that this technology been successfully used in Israel and USA for years now with very encouraging results. So, where did we go wrong?. Can things be done differently to achieve better results?. The discussion below takes you through some of the key factors to consider in pursuit of excellence as far as sack potato production is concerned.

Season of Establishment

This is one of the important factors that could have to an extent contributed to the failures of most first time potato growers. Farmers should be aware that potato plants are photoperiod sensitive, meaning to say that the average daylight length has an impact on the performance of the crop. Potatoes tend to thrive well when exposed to shorter days accompanied by cooler temperatures. These conditions promote vigorous tuber initiation, whilst the reverse is true for longer daylight periods under higher temperatures which are known to delay tuber initiation. This has an effect of failing the critical timing that should so exist between tuber initiation and peak foliar growth and photosynthetic activity. Once tuber initiation has started, more assimilates are partitioned to the reproductive parts and less to the leaves. Hence when tuber initiation is delayed the redirection of assimilates to the tubers will come late and the leaves will age and go into senescence before fully developing the tubers. This undoubtedly results in too few ill-developed tubers.

Water Management

Constant water supply is critical throughout all the growth phases of the crop. There is however some critical stages which should not suffer from any form of water shortages. This is particularly so during tuber initiation and tuber enlargement. In order for the crop to yield as expected the farmer should ensure that moisture levels do not drop below 65% of field capacity. Water stress in young plants will lead to premature tuber initiation. This leads to yield losses due to the fact that the tubers commence development when the canopy has not developed enough to support the tuber bulking process as expected. This scenario results in a case of a huge number of small tubers despite the level of fertiliser application. Conversely, if moisture levels are sustained at levels above field capacity, yield is negatively affected due to leaching effect as well as oxygen denial of the roots. Not

only is the yield affected, the same goes for the cooking quality of the resultant vegetable. So, irrigation of the potato crop should be matched with the respective water-holding capacity of the soils so as to maintain the moisture at field capacity.

Soil type and characteristics

Potatoes are known to do well in widely varied soil types, being tolerant to high pH variations and this has seen them being grown almost in any part of this country. Despite the aforementioned, potatoes ideally require deep, well drained and disgregable soils to do very well. If one intends to use soils high in organic matter such as peat or muck, then the key issue to watch is how to make the soil drain adequately because potatoes will not do well in waterlogged soils. Similarly if one is using excessively draining soils such as sandy soils with limited clay composition and or little organic matter, the farmers should be prepared to raise their bar in terms of fertiliser applications as well as irrigation in order to avoid moisture stress and nutrient deficiencies. In addition to that farmers should be aware of the fact that when establishing potatoes from sprouted tubers, they should be wary of the soil temperatures at the time of establishment in order to give them a good start. Ensure that the soil temperature ranges between 7^0C-21^0C and that the soil is not excessively wet.

Fertiliser Application

It is an open secret that the development of a healthy plant is hinged on its access to adequate nutrients from the soil. In a cases where productivity is expected external application of fertilisers to boost the soil levels is common practice. The major nutrients that need to be available at optimal levels are nitrogen, phosphorus and potassium. Generally nutrient deficiencies result in limited canopy growth and shorten canopy duration which results in reduced carbohydrate production and consequently reduced tuber growth rates. On the other hand if nitrogen is excessive it encourages excessive foliar growth and the nutrient and substrate partitioning between roots and leaves is disoriented. This results in vigorous leaf development at the expense of tuber development, yield and may results in some physiological disorders such as hollow heart disorder and associated poor cooking qualities as pointed out by the Zimbabwean markets recently. Phosphorus is essential in stimulating early root development and its importance in a root crop like this can never be overemphasised. Phosphate deficiency often causes poor yield of which the tubers are have compromised keeping and cooking qualities. Potassium is the other most important nutrient to that needs not be deficient at all costs given that it is functional in the deposition of starch. As such deficiency of potash will hamper tuber bulking and growth. On the contrary, excess potassium in the soil causes imbalances in other nutrients notably calcium and magnesium. This is undesirable because calcium and magnesium deficiency is detrimental to tuber quality. Given all this, it is important to optimise the availability of all these essential nutrients.

Seed Physiological Age

The physiological age or generation of the seed that one uses to establish their potato crop remains important whether the farmer uses seeds, seedlings or tubers. Aged seed tends to produce potato plants with numerous stems that sprout and develop rapidly and die early. High stem numbers usually result in a high number of tubers per plant, which reduces average tuber size by reducing the amount of carbohydrate available to each tuber during bulking. Early death also shortens bulking time and limits overall productivity. By comparison, plants from physiologically young potato seed

begin to bulk later than those from aged seed, which may shorten the linear tuber growth phase in areas with a short growing season.

Key Observations

Having looked at the key success factors in potato production one could still be wondering where most of our farmers got it wrong, well let me point out a few pitfalls that I have observed in my numerous farm visits.

Sack potato farming has been attempted in all parts of the country, that is from natural region I to V. One can imagine the variations in soil types and climatic conditions that the crop has been grown under yet all looked forward to similar yields. When I looked at some of the production manuals that farmers were given I discovered that they had but just one standard measure for fertiliser. This measure was used by all the farmers across Zimbabwe regardless of the glaring differences in the soil structure, type and fertility levels. Let us look at one of the instructions extracted from one production manual given to one farmer after training, "***use a shovel to make a hole of about 10cm deep at the centre of the sack, apply compound s in the hole using a 30gram cup".*** This means that 30grams was to be used by a farmer in Mazowe under the nutrient rich red clays and the same cup was supposed to be sufficient for the farmer plying his trade under the sandy soils in Chiwundura. This has resulted in deficiencies or excessive fertiliser applications to the detriment of the entire crop and the farmer's pocket. One can easily see that most of the quality concerns raised by the market as alluded earlier in the discussion emanate from improper application of fertilisers.

The other observation that I made was that most of our farmers who made a go at sack potato did not take into cognisance the planting dates that are recommended by agronomists for both the summer and winter potato crops. If you look at the times when they expected to enter the market and calculate backwards, it is evident that some of the potatoes were sown at the wrong time and the photoperiod effect caught up with them.

Most farmers used good quality seeds such that there was no problem emanating from using poor quality seeds. However water management was an issue especially with first time farmers and I have observed that some of the cases that recorded very poor yields had had problems in watering to field capacity. Now as seen above if it so happens at critical stages in the plant growth cycle yield losses incurred from there are massive.

The major reason why most of the results from sack potato have been so disappointing is that sack potato plant is grown in a limited environment such that any slight imperfection in this microenvironment derails production in a big way. For instance when sown in the ground, excessive nitrogen can be diluted by leaching thus moderating the negative effects but that is not the case with the sack culture. Hence the future of this technology lies in our ability as farmers to take cognisance of the key success factors, acting in precision and paying attention to details as expounded by qualified agronomists. Lets seek adequate knowhow first before we invest our energy, time and money.

For all questions and comments: email philemonburuzi@gmail.com. Responses will be provided within the shortest possible time.