Fact Sheet – Multipurpose Vegetables

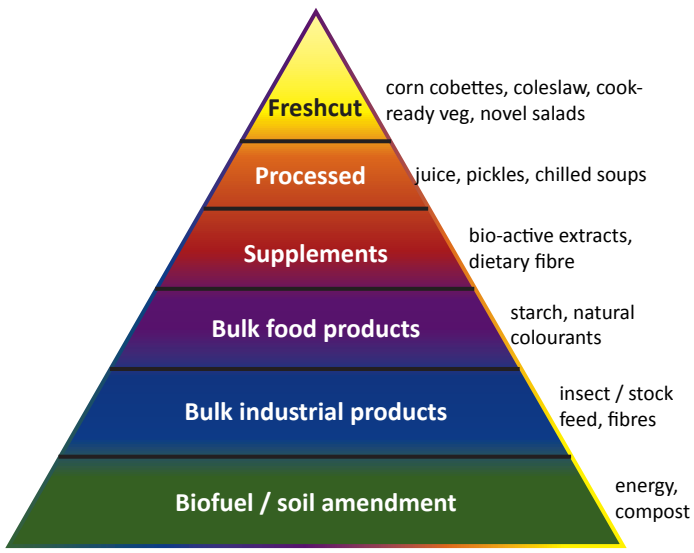
Products with a "Plan B"

In general, the vegetables with the least waste are those for which there are multiple different uses, and where these different uses have been anticipated and planned for.

Lettuce provides an example where careful crop scheduling, predicting market demand, and vertical integration with freshcut product manufacturing have reduced wastage to as little as 5% for some grower / processors.

Achieving such low levels of waste assumes a positive growing environment, high level of understanding of both the crop and its markets, and a range of strategies to deal with different outcomes; not just a Plan B, but a Plan C and even Plan D!

It can be useful to think of the different uses of waste on a hierarchy; most valuable at the top and least at the base. Products that can be used at all levels of the pyramid may be considered truly multipurpose.



Case study – Black carrots

At an estimated 93 kt annually, more carrots are wasted than any of the other vegetables studied. However, carrots have qualities that make them ideally suited to other uses.

A recent HAL project defined the production methods necessary for growing black carrots. These varieties are rich in anthocyanins, a potent antioxidant associated with a wide range of benefits for human health. Black carrots could be used to produce a range of different products while also adding significant extra value.

Processing – Black carrot juice

Black carrot juice is a product with great market potential. The juice can be extracted, concentrated and sold in bulk domestically or to export markets in the same way as standard varieties. However, there is good evidence for additional nutritional benefits for juice produced from black carrots due to potential anticarcinogenic effects.

Supplements – Dietary fibre

Soluble dietary fibre containing anthocyanins could be derived from black carrots, in addition to a significant content of insoluble fibre. These products could prove valuable additions to many manufactured products. As fibre could be extracted using the pomace left over fruit juice production, this would provide an additional use for the same crop.

Bulk food products – Anthocyanins

There is wide interest in incorporating natural anthocyanins in a range of different food and drink products. However, there are a number of issues with these pigments. One is that their colour changes according to pH. Another is that high concentrations of other phenolics can cause hazing and precipitation when added to fruit juices.

Anthocyanins from black carrots are more stable over a wider pH range than anthocyanins from other sources. They can provide an excellent bright strawberry red shade at acidic pH values, making them an ideal choice for colouring fruit juices, soft drinks, conserves, jellies and confectionery as well as low pH foods such as yoghurt and dairy products. They also contain only low levels of the phenolics that can cause issues with juice clarity and, as a natural colourant, do not to be declared with an E-number on the food label.

Bulk industrial products – Animal / insect feed

Any remaining carrots could also be used in animal feeds, particularly those developed for the high-value companion animal market. The addition of colour as well as fibre, starch and natural sugars would make them an ideal high quality ingredient in feed pellets.

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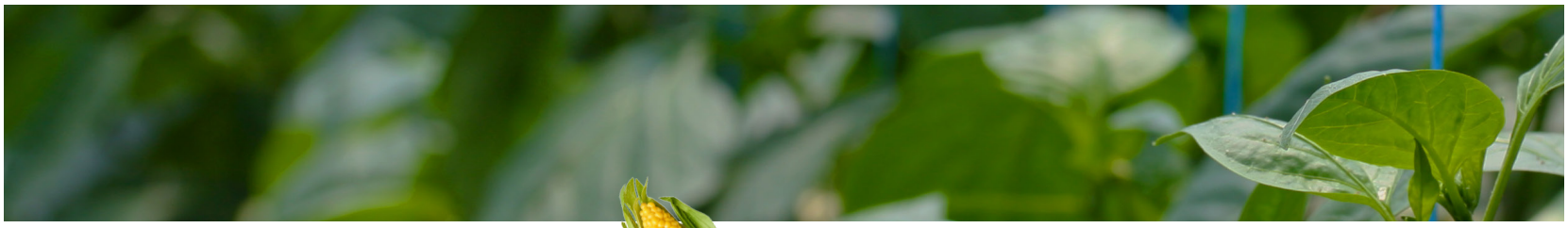
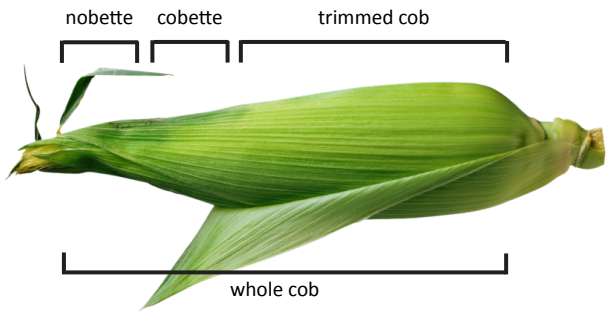


Case study – Sweetcorn

Sweet corn in some ways appears to be a relatively inefficient crop; only a small percentage of the total plant is actually edible. However, sweet corn has the advantage that it can be sold fresh or processed, and that fresh-market corn can be sold in a variety of different formats to maximize use of the crop.

Freshcut

Most corn is no longer sold whole in husk, but as trimmed partially dehusked prepacks. Some packers are able to also sell "microwave ready cobettes".



Processed

Despite the downturn in processing generally, more than a third of sweetcorn produced still goes to processing into either frozen whole cobs or kernels. Processing into cobs and kernels results in 32-45% and 50-55% waste respectively.

Supplements

Corn cores contain around 23% solid materials, most of which is composed of insoluble dietary fibre. This can be reasonably easily processed into a dietary supplement worth at least $1.85/kg. There is strong demand for natural sources of dietary fibre, with economic calculations suggesting that a new processing plant would break even within 4 years.

Bulk industrial products

Nobettes and corn cob trimmings are excellent animal feed, already saleable for around $8/t. Alternatively, all of the crop residues can be turned into silage for livestock. This is done by finely shredding the materials, ensuring there is 50-60% moisture content, inoculating with bacteria and storing under anaerobic conditions for about 2 weeks.

Corn cores can be turned into a highly microporous activated carbon by a process of pyrolysis (heating without oxygen). Activated carbons have a huge number of applications in water and air purification, metal extraction, decaffeination and medical uses.

Biofuel

Corn wastes are highly suitable for anaerobic digestion to produce biogas. As with silage, finely chopped materials are incubated under anaerobic conditions with specific bacteria, although in this case a higher moisture content is needed. Biogas can be used to replace LPG, generate electricity or provide heat directly. The process also produces liquid and solid digestate, used as high nitrogen soil amendments.

Case study – Capsicums

Capsicums are a major vegetable crop in Australia, grown both in the open and, increasingly, under protected cropping. About 46% of the fruit are suitable for 1st grade fresh market, 29% go for 2nd grade markets or processing and the remainder (~25%) are waste. Waste is estimated to cost industry nearly $14 million annually.

Freshcut

Capsicums can be sold sliced or diced in freshcut salads, stir-fry mixes or soup packs. They add colour and texture and have adequate shelf life relative to other ingredients. There may be scope to increase this usage.

Processed

Red and coloured capsicums are particularly suitable for pickling, semi-drying and preserving in oil. They can also be processed into pastes, sauces and other products for either home use or food service applications.

Supplements

Capsicums are rich in many different carotenoids, including lutein, zeaxanthin, β-carotene and capsanthin. The activity of these compounds can be retained during processing into powder. Capsicums could therefore be suitable for prodution of whole vegetable powders to add flavour and nutritional value to many different foods.

Bulk industrial products

The Spinning Cone Column is a relatively new piece of technology used to extract volatile flavour components from different raw materials. These concentrated extracts can be used to add natural flavour and aroma to soups, sauces, processed foods and many other uses. Capsicums are likely to be highly suitable for this process due to their strong flavour and high moisture content.

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