

Enhancing Phytonutrients to Change the Game: Vitalvegetables[®]

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INTRODUCTION

The food industry is grappling with the impact of globalisation of world markets and the competition which comes from that. The industry is facing a revolution not dissimilar to the industrial revolution experienced by our predecessors over a century ago. The evolution of technologies like biotechnology, real time non-destructive sensing, data processing and communication technology, and the speed of communication have accelerated the pace of change.

The productivity growth in agriculture and horticulture in recent years is due to the ability to converge these technologies into systems that deliver productivity gains for these industries like no other sector of the economy.

Forty years ago the catch cry in agriculture was get big or get out. This is now an outdated paradigm. The new paradigm is to innovate and create points of difference to distinguish your product from the pack. With globalisation it has now become competition for market share, reflected by competition between supply chains which can take business into new, unexplored markets through strategic collaboration and partnerships. The question becomes what does each organisation bring to the partnership to create competitive advantage in the supply chain to offer the consumer value which no one else can?

The reality is that the agriculture and horticulture industries are facing a major restructure with the imperative to find new, more efficient and innovative ways of bringing products to market that are different and satisfy ever changing consumer preferences. It requires an innovative, integrated, complex system response through the complete value and supply chain.

In the 1990s Victoria had a dynamic broccoli export industry to Asia, along with a range of other vegetables. By the mid-1990s it was feeling the pressure from low cost vegetables coming out of China. Austrade market research found the industry would not be able to compete on price alone, even though the products were of better quality. Product innovation and differentiation was needed to create points of difference, as the platform of a new competitive advantage paradigm.

VITALVEGETABLES[®] PURPOSE

Vitalvegetables was a program to develop knowledge and integrated management systems for enhancing the phytonutrient content of vegetables to make a naturally good product even better, while being good to eat and retaining freshness. At the outset, this was to be done as naturally as possible, so genetically modified organisms were ruled out due to consumer resistance.

Vitalvegetables aimed at understanding the influence of genetic, management, and environmental factors on vegetable composition specifically antioxidants which have evidence of their benefits in disease prevention and wellbeing. This was the impetus for Vitalvegetables, a joint venture between researchers in Australia and New Zealand along with two leading international vegetable breeders, the Australia and New Zealand (NZ) industries, with funding from Horticulture Australia Limited, Department of Primary Industries Victoria, and Plant and Food Research NZ.

The purpose was to build a new competitiveness platform for the vegetable industries by creating a new category of nutritionally enhanced, higher value vegetables. The intent was to deliver benefits to consumers and participants in the production and marketing chain.

This approach brought together research and development capability with strategic commercial partners including international vegetable breeders and vegetable production

and marketing companies, aimed to create a sophisticated and innovative research, development, production, commercialisation and marketing platform (CIE, 2008). The result was a strategic yet fragile, tri-party joint venture with a competitive advantage.

Modelling by the Centre for International Economics (CIE, 2008) highlighted the significant growth potential for the horticultural industries through increasing market demand for products by development of: novel products, improved quality, and consistency, improved commercialisation platforms and synergies via collaboration. Chasing productivity improvements alone is a challenge as improvements tend to plateau, however improvements in product demand tend to be open-ended. The modelling suggested that big payoffs come in order of declining returns from, the commercial/marketing platform, novel products, consumer satisfaction and productivity.

The main indicative capability contributions are from, breeding and genetic, taste and perception science, cool chain and quality management, farming and systems productivity (CIE per com).

ENHANCING FOOD COMPOSITION

There are two fundamental ways to enhance or alter the composition and nutritional content of plant or animal based food.

Fortification

Is the process of putting ingredients in or extracting ingredients in a factory, much as we see with high calcium, low fat milk for example and processed foods.

Biofortification

Is the process of manipulating the composition or nutritional content of food during the production process on the farm. This works by optimising the genetic attributes for the desired composition ingredients and understanding how management and environment factors interact to alter food composition. Biofortification is an entirely natural process and has the additional benefits that ingredients which are enhanced by this approach are more bio-available. That is availability to consumers is high because they are in a form found in natural food, and they are more bio-effective than the ingredients in fortified product as a rule. The output of the biofortification approach is “smart foods”.

RELATIONSHIP BETWEEN PROFIT, QUALITY, AND COMPOSITION

Food Profitability (\$) = [Product volume sold × Price (\$)] – Costs (\$)

Food price is influenced by quality and value as perceived by consumer. Traditionally quality has been determined by visual and physical attributes: size, colour, shape, etc. However, as consumers become more sophisticated and discerning they are looking for more from food beyond satisfying their hunger. They are looking for, and demanding, other benefits and experiences which include; acceptable taste, interesting flavour and texture, enhanced nutritional, lifestyle, illness prevention, and health and wellbeing benefits. This brings into focus food composition related attributes; total fat, type of fatty acids (e.g., omega-3 or 6), types of oils plant or animal, carbohydrates, glycaemic index (GI), proteins, amino acids, fibre, minerals, antioxidants, vitamins, etc.

Incidentally, the post farm storage and processing performance of most agriculture products are influenced by the composition at the farm gate. Sheep fed pasture have higher levels of omega-3 and vitamin K than grain feed sheep. The meat from these sheep keeps better. The phytonutrients composition of plants is influenced by conditions during, and the speed of growth, and maturity at harvest.

Food quality is a function of the composition and the factors which influence it, which include the complex interaction between genetic, management, and environment factors. The interaction of these factors also influences yield. The relationship of these factors to profitability is the game.

There is broad recognition that food is a major factor in lifestyle related illness (e.g., diabetes, cardiovascular and heart disease, cancer, etc). Food composition can play a pivotal role in disease prevention along with a healthy active lifestyle. In particular phytonutrients in fruit and vegetables such as antioxidants have been found to play a major role in disease prevention and wellbeing.

DEVELOPMENT

The initial focus was on broccoli as a model crop due to its relationship with disease prevention. This research found that yield and antioxidant level can be inversely related, meaning that as yield increases the desired ingredients become less concentrated.

Vegetable post harvest storage and food preparation methods can have a significant influence on stability, and/or availability of some phytonutrients. For example, one of the main desirable ingredients of *Brassica oleracea* Italica Group (broccoli), glucosinolate, is lost by boiling at 100°C for 3 min or more, or inactivated by microwaving so, cooking below 100°C (e.g., steaming) for less than 3 min is advisable (Jones et al., 2006). On the other hand lycopene an ingredient of tomatoes associated with prevention of prostate cancer is made more available if prepared with olive oil. Plasma lycopene concentration in humans was 40 to 80% higher after ingestion of tomatoes cooked with olive oil, compared with fresh tomatoes (Fielding et al., 2005).

The first Vitalvegetables Booster™ broccoli was launched on the Australian market in August 2009. This launch attracted saturation media coverage across Australia and inquiries from overseas due to the novel nature of the product and program, in addition to being a basic ingredient in a healthy diet.

A number of valuable lessons were gained from this experience which included:

- Packaging must be strongly distinctive and enhance the shelf life of the product.
- Ongoing consumer communication is required in the market.
- Everyone must be committed to long term success; growers, packers, marketers, retailers.
- Distinctive convenient meal ready packaging solutions help satisfy consumer information needs, i.e., deliver x% of recommended daily intake of nutrients.

Market Driven

Before the research began there was need to establish was there a market for products of nutritionally enhanced vegetables.

This market research found across all consumer categories there is a high propensity to purchase “fresh and functional” fruit and vegetable products based on the proposition that sound science and R&D can suitably enhance levels of naturally occurring substances (Richards, 2004).

Propensity to purchase is driven by the following:

- High awareness that fruit and vegetables are essential for health with 89% of the population consuming 7-14 + meals per week containing fruit and vegetables.
- Currently, 30% of the population consume a particular fruit or vegetable for a specific health benefit.
- 61% of people buy functional food of some from.
- 63% of consumers indicated they would consume more fruit and vegetables if these had proven functional benefits.
- 20% of consumers claim they would definitely buy, and 43% said they would probably buy newly produced “functional” fruit and vegetables.
- 84% of consumers would rather consume functional food as fresh fruit and vegetables than in a processed form.

In summary the market research found that consumers wanted nutritionally enhanced (functional food), healthy vegetables but they needed to taste good and be fresh. They wanted to get their better nutrient package in a natural form not via a pill, and it should not taste like medicine.

Lifestyle consumers are willing to pay a price premium for health — but want “wellness” products which is a place where strong focus and strong brand identity pays off, this is the place for “Life Marketing” Source: Food & Health Marketing Handbook, Mellentin & Wenntron.

Vitalvegetables Booster™ broccoli was up to 200% higher in glucosinolate than standard broccoli and is also sweeter to taste which created huge interest. It’s was important not to get carried away at the product development stage with the potential of differentiating a product with a new ingredient level, because consumers do not buy products because of their ingredients. Consumers buy products for benefits relevant to them (Julian Mellentin per commun., 2009). Distinctive differentiating packaging serves many purposes by catching consumer’s eyes, communication of benefits, adds convenience and cares for the product.

RESEARCH AND DEVELOPMENT APPROACH

The program has been conducted by a strong team of researchers in Australia and New Zealand in collaboration with vegetable breeding companies and commercial partners in the markets in both countries.

Once target crops were agreed upon the germplasm pool was screened by the researcher to test the varieties for their agronomic performance and their composition level of target phytonutrients. The superior lines had further research carried out to understand how management and environment factors influence yield and composition, in addition to post harvest storage, handling conditions and how food preparation methods influenced the stability of key ingredients and their bioavailability.

This knowledge allowed suitable varieties to be identified and integrated production, storage, handling, preparation and testing protocols to be developed so that a consistent product was delivered to consumer every time. It is like running the Melbourne Cup but knowing who the winner was going to be every time, because the whole system from “seed to plate” could be managed. It is known how the crop/products would respond to different conditions.

The marketing/commercialisation of Vitalvegetables is supported by a suit of trademarks which have been registered across the category of products. This protects the systems intellectual property but also communicates to consumers the benefits based upon knowledge of the product ingredient composition.

The trademarks portfolio is as follows:

- Parent brand: Vitalvegetables®.
- Product category: Vitalsalad®, Vitalslaw® and Vitalmedley®. Depending on the product composition, it could be marketed as any of the following health benefit brands.
- Benefit brands: Vitalimmunity®, Vitalheart®, Vitalbones®, Vitalsight®.

GAME CHANGER

On reflection Vitalvegetables® was an innovative, ambitious joint venture aimed at being a game changer for the vegetable industry by taking vegetables from a commodity, caught in “the everyday lowest price” paradigm to a more highly differentiated, premier/higher value, convenient, ethical, health and wellbeing product.

Change creates uncertainty and challenges conventional thinking and paradigms, so we did come up against resistance and barriers to change as there is a threat to the status quo.

A paradigm which many have found difficult to come to terms with is that Vitalvegetables® as a premium, higher value, differentiated product, was always only ever going to appeal to a segment of the market that were seeking those attributes and were prepared to pay a premium.

It could not achieve mass appeal and across the board high volume sales at a premium price. Commodities need high volume as margins are low.

However by segmenting the market it provided the opportunity to grow total vegetable consumption by offering consumer greater choice and improve profitability for the

industry by changing the game from competing only on price in the everyday lower price commodity paradigm.

CONCLUSIONS

- The future fortune of food will be based upon sound knowledge of the composition/quality/value and interaction of factors which influence the composition and yield.
- Inappropriate food preparation techniques may be robbing us of many of the natural healthy ingredients in fresh food.
- Biofortification has a future in development of “smart foods”, increasing the efficiency of fresh food production and processing to support increasing market demand for more specialised foods.
- Biofortification shifts competition away from simply being a volume/yield productivity, cost cutting approach, to include value/quality (composition) in the competitiveness profitably equation.
- Multi party, joint ventures, collaborations and partnerships are the keystone of the new competition paradigm. Each partner needs to be able to answer the questions; what do I need to do, own or bring to this joint venture for it to be successful for all? They do not each need to own or have a finger in every pie. Collaborate to be competitive in the game as a joint venture.
- New paradigm joint ventures must be based upon a robust, win-win-win-win cultures where the risks and rewards are spread equitably and are aligned.

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