

# **Horticulture Innovation Australia**

## **Final Report**

### **Global scan for vegetable innovation - Fresh and Minimally Processed**

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## 7. DISCUSSION

The following section of the report, sections 7.1-7.10, discusses the 10 innovations as shortlisted by HIA and AUSVEG. Each innovation is described in detail and is followed by a summary identification of the key benefits the innovation is likely to provide Australian growers and an evaluation of the innovation for its suitability towards various fresh and minimally processed vegetables.

### 7.1 MICRO-PERFORATIONS

#### 7.1.1 INTRODUCTION

Post-harvest packaging is a vital component in production processes, which is key to protecting the integrity of vegetables for consumption around the world. Micro-perforation technology is adaptable to most commodities and can significantly extend the shelf life of fresh and minimally processed vegetables while reducing wastage incurred both along the supply chain and also while being displayed on retail shelves.

**Table 1 Innovation Summary- Micro-perforated packaging**

<b>Type of Innovation</b>	Packaging
<b>Region of innovation origin/usage</b>	Western Europe (UK)
<b>Status of Innovation</b>	Commercially available
<b>Ease of implementation*</b>	High
<b>Estimated cost of implementation*</b>	Low
<b>Potential value from implementation*</b>	High

*\*Note that the above metrics were subjectively rated by Euromonitor International*

#### 7.1.2 DESCRIPTION

##### **Enhanced modified atmosphere packaging (MAP) solution**

Micro-perforations refer to small holes, averaging 5µm-300µm in pore diameter, installed into polymeric films, used in the packaging of fresh and minimally processed vegetables. The technology is categorised under the MAP umbrella of solutions, which aims to enhance and extend the quality and shelf life of fresh produce beyond the primary means of external temperature monitoring and relative humidity control. Micro-perforations or micro-pores can be installed on polymeric films through two main procedures: mechanical puncturing and laser perforation. The former involves the use of a fabricated drum which punctures holes into the polymeric surface as it is being rewound and converted, while the latter uses laser beams to create well-defined holes in the film's surface.

##### **Integrated sensing meets packaging**

The benefits of micro-perforation technology are best manifested through online laser technology, compatible with existing fill/ seal systems. Online laser technology systems are typically accompanied by intelligent sensors which determine product respiration rates to optimise perforation diameters and density and still account for the permeability of polymeric film in use.

### 7.1.3 CURRENT USE AND DEVELOPMENTS

#### **A new and commercially available technology**

Micro-perforation technology, both pre-perforated films and micro-perforation systems (mechanical pin, laser-guided) are commercially available today and used in parts of the United Kingdom and Western Europe. Leading UK retailer Marks & Spencer adopted micro-perforation technology for soft fruits in 2014.

### 7.1.4 KEY BENEFITS

#### **Longer shelf life and extended freshness**

Micro-perforations are more effective than macro holes in moderating internal atmospheric conditions such as increased gas permeability and plant respiration while simultaneously slowing down internal atmospheric moisture loss, a common cause of product spoilage. This packaging solution is especially suitable for fresh vegetable produce with high oxygen transmission rates (OTRs). Micro-perforation technology is widely accepted to aid respiration under imperfect storage, transport and retail conditions.

#### **Cost savings for growers and packaging processors**

Online laser micro-perforation technology allows growers and processors to react effectively to ever-changing and growing demands for attractive and sophisticated packaging while minimising the inventory of film stock and retaining optimal internal atmospheric conditions for fresh and minimally processed vegetables. Although pre-perforated films do not require additional capital investment, the benefits of increased flexibility of perforation and atmospheric settings are expected to offset initial outlay and switching costs. Users can enjoy economies of scale with the purchase of cheaper, non-perforated films which can be easily customised according to clients' varied needs, whether bulk packaging for transportation or the preparation of other flexible retail formats.

#### **Decreased supply chain costs**

Increased product life span due to micro-perforations in film packaging benefits retailers by reducing buffer stock and in-store wastage. Growers and distributors benefit from having greater options in choosing the transportation mode of fresh produce. Growers and distributors alike can elect to transport more products by land and sea rather than by air, bringing down transportation costs in the process. Furthermore, the use of land and sea transportation reduces cold-chain breakage, which occurs more frequently during air freight.

#### **Reach new markets and enhance Australia's reputation**

Locally cultivated produce from Australia can now be transported further from its source through micro-perforation packaging solutions. Extended product shelf life and freshness reinforce Australia's association with quality produce, especially in Asian markets, most of which have a positive view of Australian-grown produce.

### 7.1.5 INNOVATION EVALUATION

#### **Highly compatible with various commodities**

Micro-perforation technology is suitable for most vegetable types and is best used for vegetables with high OTRs, such as leafy vegetables along the lines of spinach, chicory and salad leaves. Other suitable commodities include root vegetables such as parsnips, swede and potatoes, brassicas including broccoli and Brussels sprouts, tomatoes, eggplant, asparagus, radishes, mushrooms and leeks.

### **Ambient storage/ shelving conditions critical**

Temperature stability is widely acknowledged as the key prerequisite in the transportation of freshly harvested vegetable produce because vegetable respiration, degradation and susceptibility to microbial infection is dependent on its ambient temperature. Although micro-perforation technology cannot fully defend against extreme temperature fluctuations or replace cold chain logistics, it aids plant respiration more effectively than other packaging options currently available under imperfect storage/ transport conditions. Micro-perforation packaging provides an additional protective layer for fresh vegetable produce, which helps fully exploit and enhance the benefits of existing cold chain support systems.

### **Minimal pressure on profit margins in the long term**

Profit margins for growers are expected to remain stable in the long term even with a short-term cost outlay for the installation/ transition from existing MAP solutions to micro-perforated packaging. Cost savings from the purchase of cheaper, non-perforated polymeric films and increased flexibility to create new products based on client demands and overall economies of scale will drive down manufacturing costs, thus protecting profits in the future. The rate of produce wastage pre-sale will fall with the use of micro-perforation technology, maximising retail inventory for consumer purchases.

### **The growing modernisation of grocery retailing will boost need**

The steady shift of buying habits in Asia from traditional wet markets to organised, modern retailing is expected to lead to the extension and strengthening of temperature-sensitive supply chains. Previously, opportunities to export to developed markets across Asia-Pacific have been, in part, limited by the prevalence of traditional grocery retailing channels which often result in dismantled cold chains and eventual export wastage. The increased participation of distributor-retailer networks both locally and abroad will result in increased demand for packaging solutions such as micro-perforation technology to extend product shelf life and increase overall consumer demand for vegetables.

### **Sustained consumer preferences for fresh vegetables drive upstream adoption**

Although the majority of consumers, especially in Asian markets, still consider loosely sold vegetables to be fresher and of better quality than their packaged counterparts, more are gradually becoming aware of the benefits and superiority of the latter. Retailers who do not want to alienate customers can opt for produce which is bulk-packaged and transported in micro-perforated packaging, which allows for extended product shelf life during transport before being sold loose at stores, thus retaining maximum freshness as best as possible. As micro-perforation technology is best able to support consumer demands for fresh produce, increased upstream adoption by growers, distributors and retailers alike is expected to rise.

#### **7.1.6 INNOVATION COMPATIBILITY**

- ✓ Commodities: all commodities
- ✓ Target markets: all markets in Asia

**Summary 1 Innovation Compatibility- Micro-perforated packaging**

Extent of innovation compatibility with respect to...	Target markets		
	Australia	Asia (Developed)	Asia (Developing)
Range of commodities			
Cold chain/logistics			
Retailing landscape			

Legend:

High compatibility

Low compatibility

Not applicable

**Image 1 Micro-perforated packaging**Image Credits: A-Roo Company Llc (<http://www.a-roo.com/>)**7.1.7 NEXT STEPS**

The following table provides a non-exhaustive list of organisations that are aware of the innovation or have implemented the innovation. While in some instances, names of specific individuals cannot be listed due to confidentiality reasons, the organisation's email addresses or email addresses of media contacts (where available) have been provided as a first step to initiate communication for consultation purposes.

**Table 2 Sources- micro-perforated packaging**

Organisation	Description	Website	Contact
A-Roo Company Llc	Packaging company	<a href="http://www.a-roo.com">http://www.a-roo.com</a>	packaging@a-roo.com
Cooperative Group Ltd	Retailer	<a href="http://www.co-operativefood.co.uk/">http://www.co-operativefood.co.uk/</a>	craig.noonan@co-operative.coop
Marks & Spencer Plc	Retailer	<a href="http://www.marksandspencer.com">www.marksandspencer.com</a>	n/a
PerfoTec BV	Company providing laser technology for micro-perforation	<a href="http://perfotec.com/">http://perfotec.com/</a>	info@perfotec.com