Institution:

Writtle College

Unit of Assessment:

UoA 6: Agriculture, Veterinary and Food Science

Title of case study:

Postharvest Loss Reduction of "*Pomme d'amour*" Cooking Tomatoes produced by Small Farmers in Mauritius

1. Summary of the impact (indicative maximum 100 words)

Writtle College's Postharvest Technology Unit and the Mauritian Agriculture Research and Extension Unit (AREU) studied the use of returnable plastic crates (RPC's) to reduce food losses for subsistence farmers in Mauritius. This study demonstrated that the RPC's reduced damage caused by pressure, abrasion and lower temperatures. This study had a positive impact, mainly economic, on the postharvest losses of the "*pomme d'amour"* cooking tomatoes in Mauritius due to rot, damage and dehydration. As a result these stakeholders have increased their income through having a more marketable-quality crop to sell.

2. Underpinning research (indicative maximum 500 words)

The introduction of RPC's within the EU into the supply chain was driven by the need to reduce packaging waste as opposed to reduction in food waste. However, the introduction of multi-vented plastic crates had the effect of changing the product temperature by greater airflow. Work on measuring the temperature changes due to the change of packing from cardboard cartons to RPC's started in 2000 and was reported in book chapters and conference papers (e.g. Bishop et al. 2002, Bishop et al 2007, Bishop & Hanney 2008).

Preliminary work with farmers in northern Mauritius occurred in 2003 and 2004. The first six months were spent visiting and talking to a farming community (around 35 farming families) by personal visits and AREU extension open days, where – traditionally – men undertake the tasks based in the fields, and women work inside sorting tomatoes 2-3 times weekly. The main issues encountered by the farmers in Mauritius were the loss of the produce because of poor handling due to the nature of the packaging used, poor temperature management and little air movement around the fruit during the ripening process. This was combined with the fact that any improvement that could be made to the post-harvest of the crop should pay for itself over a short period as the farmers had no financial liquidity.

The research consisted of temperature monitoring of the product itself with fly-lead single channel

temperature loggers rather than simply measuring the adjacent air temperature. This generated a much more accurate picture of the potential for disease and moisture loss. The research also involved close analysis under the microscope of the tomato surface so as to ascertain skin abrasion that would accelerate moisture loss. The combination of these standard postharvest technology techniques highlighted the problem areas and so meant that the trials could go forward with confidence. The results of the experimental research mentioned above were reported in Bishop *et al.* 2007; and in Bishop and Hanney, 2008.

Later, three experimental trials were undertaken in Mauritius during the harvest season by comparing existing methods with an improved system. These trials occurred in November 2003, March 2004 and September 2004. Research staff involved on the ground in Mauritius was Dr Chris Bishop, Reader in Postharvest Technology Writtle College and Mrs Indoomatee Ramma of AREU and extension colleagues, with support at Writtle College of Dr Alan Gash, Senior Lecturer in Agriculture (Dr Gash left the College in 2010) and the results were reported on Bishop and Ramma, 2012.

The work was carried out as part of the EU programme (Contract AREU/ EDF/01) Northern Plains Irrigation Project (NPIP) – Phase 2 Technical Assistance to Support Diversification 2003-2004 (Contract AREU/EDF/01).

3. References to the research (indicative maximum of six references)

1. Bishop, C.F.H., Wainwright, H. and Pailes, P. (2002) Cool-chain-an integrated temperature management system for Fresh produce. Chapter for book *Crop Management and Postharvest Handling of Horticultural Products* vol II ed Ramdane, Dris, pub Science Publishers, Enfield, NH

2. Bishop C F H , Hanney S J and Giles G (2007) Returnable plastic crates for flowers. Acta Hort 755:291-296 http://www.actahort.org/books/755/755_37.htm

3. Bishop C F H and Hanney S J (2008) Environmentally-compatible packaging of fresh agricultural and horticultural produce for book Environmentally-compatible food packaging Edited by E Chiellini, Woodhead Publishing

4. C.F.H.Bishop and I Ramma (2012) 'Postharvest Loss Reduction of "MST32/1" Cooking Tomatoes produced by Small Farmers in Mauritius'. *Acta Hort* 934 85-88 http://www.actahort.org/books/934/934_7.htm

4. Details of the impact (indicative maximum 750 words)

Following the results of the trials done in 2003-2004, several recommendations on postharvest practices were suggested. It was established that the use of RPCs to attain better temperature control, reduce damage and abrasion to the crop, thus reducing its susceptibility to contract diseases; will result in a reduction on losses on the postharvest of the tomato crop and an increase of the percentage on the top price of the crop. The results also showed a clear benefit on the investment of shallow, smooth sided, vented trays, compared with the traditional use of wooden boxes to store the fruit postharves. The cost of these trays will pay for itself in between one and two harvests.

These recommendations have resulted in the reduction of losses of the tomato "*Pomme d'amour*". As a consequence this has had an in important economic benefit to the community of subsistence-farmers of Mauritius. The cooking tomato "*Pomme d'Amour*" is considered the most important crop in the northern part of Mauritius and is an important part of the traditional diet. Almost all the crop is grown by small farmers as a substance for their family, but also an important proportion is sold to local markets. Therefore, the direct beneficiaries or stakeholders are the small subsistence farmers and their families of northern Mauritius who mainly grow the "*Pomme d'amour*" tomatoes on half a hectare or less.

After the implementation of the changes to the postharvest management of the tomato in 2005-2006, these stakeholders have greatly reduced their losses and have had a direct relationship on the increase of economic gain. This has become very apparent in the last few years; and by 2010, this reduction of loss has been very similar to what was originally trialled in 2003-2004. Around 20% of reduction in losses has been achieved and there has also been an increase to 60% from 25% on the eventual percentage of top price.

Nowadays subsistence farmers in Mauritius are experiencing the benefits in reduction of food loss which in turn has paid for the investment in RPC's in only one to two harvests. The increase of marketable tomatoes of around 2 kg per crate at a mean market price of £1.5-2.0/kg (in 2013 the mean weekly price varied from £0.7 to 2.7 /kg http://www.areu.mu/apmis/) compared with the price of the crates of £5.

The impact that this research has had to the postharvest of the crop have resulted in lower losses and so it has increased the value chain for the subsistence farmers. For example in a typical year, where two or three harvests can be achieved, if a farmer maintains the same area of tomato production of approximately 0.125 hectares, by using the RPCs there will be an increase in saleable fruit of around 800kg and an increase in income of around £1000.

5. Sources to corroborate the impact (indicative maximum of 10 references)

1. Assistant Director, Agricultural Research and Extension Unit, Food and Agricultural Research Council, Mauritius.

2. Principal Research Scientist, Agricultural Research and Extension Unit, Food and Agricultural Research Council, Mauritius.

3. Senior Lecturer in Food and Technology, Faculty of Agriculture, University of Mauritius, Mauritus.

4. Response to the Foresight report presented to the House of Commons by the Institution of Agricultural Engineers used the above case study as an example of appropriate technology to reduce post-harvest losses (p. 36)