Postharvest Handling Systems Assessment for Vegetables in China and Australia

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Abstract

The needs of industry are increasingly being targeted when planning research programs. This is frequently done informally by individual researchers or research groups, but often lacks a comprehensive study of the systems and people in the system. This may result in misdirected, inappropriate, or inadequate research programs that do not meet the needs of the industry groups concerned.

A component of the ACIAR project PHT/1994/016 "Shelf-life extension of leafy vegetables" was the assessment of postharvest handling systems for a range of vegetables in China and Australia.

The assessment methodology selected was an adaptation of 'A commodity systems assessment methodology for program and project identification' developed by J. La Gra of the University of Idaho, USA. We used the methodology in a series of case studies reflecting the main postharvest handling systems. Crops assessed were Chinese cabbage, oriental bunching onion, pak choi (in China), and broccoli (in China and Australia). We assessed:

- fresh and stored, and domestic and export, Chinese cabbage;
- stored oriental bunching onion;
- fresh pak choi; and
- fresh domestic and exported broccoli.

We also included in the assessment peri-urban production and product transported long distances to market.

This paper discusses the methodology used and its advantages and limitations.

THERE is increasing focus on targeting the needs of industry when planning research and development (R&D) programs. This is usually done informally by individual researchers or research groups, but often lacks a comprehensive study of the systems and people in the system. This may result in R&D programs that do not meet the needs of the industry groups.

A component of ACIAR project PHT/1994/016, 'Shelf-life extension of leafy vegetables', was the assessment of postharvest handling systems for a range of vegetables in China and Australia.

A rigorous assessment of postharvest handling systems provides several benefits to R&D planning:

- it increases the likelihood that R&D outcomes will focus on industry needs;
- it improves adoption of research outcomes because they are more likely to be affordable, practical, and appropriate;

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- it aids understanding of the impact of a technology or practice on the whole handling system. Conversely, it identifies where changes will need to be made in the whole system to accommodate a new practice or technology; and
- it identifies industry trends, allowing R&D focus to change accordingly.

The Methodology

The methodology selected was an adaptation of a more comprehensive systems assessment described by La Gra (1990). The method entailed the following steps:

- *Select case studies*

  Case studies representing the main handling systems were identified using a range of criteria. Criteria will differ for each project.
- *Map process flows and document in a process flow chart*

  Process flow charts were developed for each system, highlighting every step of the handling and marketing system. The scope of the study was from harvest to retail sale.
- *Describe and document each process in the handling system*

  This was done concurrently with the above step. Qualitative and quantitative information was collected by observation, questioning, and measurement, and documented in summary table form.
- *Measure losses where they have been identified as significant*

  Where subjective assessment indicated reasonable losses, then actual losses were measured. Losses can vary widely from consignment to consignment depending on weather, season, handling variables, and the people involved. Most of the losses measured were for normal handling conditions.
- *Identify key problems/issues in the handling systems*

  Based on data, major loss points and causes of losses were identified.
- *Identify potential solutions, or further R&D required*

  After analysing the data collected, the project team identified some potential solutions and future areas of R&D in the handling systems. These included training and extension needs where applicable.

The assessment approach used observation, interviewing, measurement, and qualitative judgment to gather and assess information. Postharvest technology R&D personnel conducted the assessments.

Case Studies

Case studies were selected to represent a range of vegetable postharvest handling systems in China. Studies were conducted in northern China (around Beijing) and central-eastern China (around Zhejiang Province). These are two of the major vegetable production regions in China. Case study selections in these regions were based on crops and season, whether the crop was to be stored or fresh marketed, whether it was for the domestic or the export market, and the distance to market. In addition, one case study was conducted in Queensland, Australia as a model assessment. Table 1 summarises the case studies conducted in this project.

A questionnaire was developed to ensure completeness of information and consistency between case studies. Information generated from these case studies was summarised into tables based on process flow diagrams for ease of analysis. The format of these tables is shown in an appendix to this paper.

Table 1. Postharvest handling assessment case studies.

Crop	Region (season/marketing profile)	Distance to market
Chinese cabbage	Beijing (autumn fresh domestic/export)	180 km
	Beijing (winter stored)	Peri-urban
	Hangzhou (summer/winter fresh)	Peri-urban to 800 km
	Hangzhou (winter stored)	1600 km (Shandong province to Hangzhou)
Broccoli	Beijing (summer fresh domestic/export)	180 km
	Queensland, Australia (winter fresh)	100 km
Oriental bunching onion	Beijing (autumn harvest stored over winter)	80 km
Pak choi	Hangzhou (summer/winter fresh)	Peri-urban to 25 km

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Benefits of the Methodology

This methodology was developed to identify, in particular, the technical dimension of vegetable postharvest handling systems, the product losses within the systems, and the causes of losses. From this information, potential improvements and areas of research were identified. Staff from three research organisations conducted the assessments in China and Australia.

During the conduct of the assessments the following benefits became apparent.

- Technical experts can often identify issues and potential practical solutions that may not be recognised by those operating within the system. Outsiders to a handling system can bring a fresh perspective and wider knowledge of opportunities that, when tempered by input from the system participants, can provide very useful ways to improve a system, easily and at low cost.
- Researchers had the opportunity to observe and understand first-hand the whole handling system that their research programs aim to improve. Discussions with farmers, collectors, transporters, wholesalers, and retailers provide an understanding of the handling system from their perspective. Armed with this information, researchers are better equipped to undertake applied research and/or plan effective extension strategies.
- The scope of the assessments was from harvest to retail sale. This provided insights into all parts of the postharvest handling system, rather than focusing on one aspect or one client group within the system. As a result, the methodology enabled more understanding of the impact of a technical or process intervention on the whole system. This in turn highlighted where changes would be needed in the whole system to accommodate new technologies or processes, and who should be targeted in any training or extension programs.
- The methodology identified postharvest handling system linkages. These linkages between the players in the system may be financial or institutional. An understanding of the linkages helps to identify who wields influence in a handling system, and so who to target to bring about effective change.

Limitations of the Methodology

It is important to understand the limitations of any methodology or process so that measures can be taken to minimise the effects of the limitations, and/or results can be interpreted in context. Limitations of this methodology include the following.

- Some businesses may be unwilling to be studied. There may be various reasons for this. Whatever they are, they must be respected. Approaches to businesses or systems need to be done tactfully, assurances given of confidentiality, and all information collected so treated.
- Because this method relies on a limited series of case studies, there is the danger that they will not adequately represent the range of handling systems within an industry. They need to be selected carefully to ensure most industry circumstances are represented. The number of case studies selected will depend on how well the assessment project is resourced.
- Each case study observes and measures at a point in time. Handling practices and losses may vary from season to season, or even consignment to consignment, depending on weather and market conditions, or any number of other factors. Measures to minimise this problem include conducting case studies during different seasons, targeting those periods of perceived greatest risk (for example, warm, wet, summer conditions in China), and to question people in the handling system about issues, activities, and problems outside the time of the case study.
- Little involvement of industry 'players' in determining solutions to problems or determining research needs. In our project, the assessment team (consisting of researchers) conducted this activity. There are many benefits from involving industry in this process including:
  - more complete consideration of practical issues, both technical and non-technical;
  - clearer identification of barriers to adoption of solutions, and so improved strategies for overcoming these barriers; and
  - improved adoption of technologies or processes as a result of more 'ownership' by the industry because they have contributed to the final R&D plan. This is more likely to happen if influential industry groups or individuals are involved in the planning phase.
- Our assessments concentrated mainly on the technical aspects of the handling systems, with some unplanned minor assessment of economic, social, and infrastructure issues as participants raised them. La Gra (1990) included these factors in his methodology, but we could not because we had

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limited resources and staff. Factoring in this broader analysis with more resources and a more multidisciplinary team could improve the methodology.

Conclusions

The methodology has provided valuable information to the research organisations involved in the ACIAR project and given them a clearer vision for future R&D planning.

A critical step during development of R&D programs is to ensure technologies and processes suggested for improving the handling systems are practical and appropriate to the infrastructure and resources available to people and organisations within the handling system.

Postharvest handling system assessments need to be linked to robust extension and training programs to ensure improvements are widely adopted by the industry.

Reference

La Gra, J. 1990. A commodity systems assessment methodology for problem and project identification. Idaho, USA, University of Idaho, College of Agriculture, Postharvest Institute for Perishables.

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Appendix

Format of tables used to summarise information gathered during surveys

Table 1. Case study:_____ Region: _____

Steps	Action type	Temperature	Distance	Time taken	Observations

Table 2. Case study:_____ Region:_____

Steps	Impact of losses (H = High, M = Moderate, L = Low)		Comments
	Quantity	Quality	

Table 3. Case study:_____ Region:_____

Step (loss point)	Cause of losses	Suggested solution/further research/ comments

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