

HACCP/RMP ADOPTION IN THE NEW ZEALAND MEAT INDUSTRY

Kay Cao

Dept. of Economics, Waikato Management School, New Zealand

Email: kaycao@waikato.ac.nz

and

Frank Scrimgeour

Dept. of Economics, Waikato Management School, New Zealand

Email: scrim@waikato.ac.nz

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Abstract

In New Zealand, the Animal Products Act 1999 requires that all animal product primary processing businesses must have a risk management programme (RMP) based on the principles of Hazards Analysis and Critical Control Point (HACCP). However, due to market access requirements, many primary food exporters have voluntarily adopted HACCP systems for food safety management since the 1990s. This paper studies the process of HACCP/RMP adoption and the transition from voluntary HACCP to mandatory RMP in the New Zealand Meat industry. The main issues explored are plants' motivations, implementation problems, costs and benefits associated with the implementation of HACCP/RMP. The paper concludes with implications for policy design and further research.

Key words: *HACCP/RMP implementation, HACCP/RMP benefits and costs, New Zealand Meat Industry*

1. Background

The New Zealand Food Safety Authority (NZFSA) was established from 1 July 2002 to administer food safety legislation covering food for sale on the domestic market and exported food. This is a merger of the responsibilities for food safety previously held by the Ministry of Health (MoH) and the Ministry of Agriculture and Forestry (MAF). Prior to the establishment of the NZFSA, the Animal Products Act 1999 was implemented which eventually replaced the Meat Act 1981. Significant drivers for this reform were growing consumer concerns about food safety and changes in food safety legislations in overseas markets. These are reflected clearly in the stated aims of the reform: (1) to manage associated risks; and (2) to facilitate overseas market access (NZFSA, 2002).

The Animal Products Act 1999 requires that all animal product primary processing businesses must have a risk management programme (RMP) based on the principles of Hazards Analysis and Critical Control Point (HACCP). This is phased in four stages from July 2003 till July 2006. Most licensed red meat processors, export seafood processors and packing houses are required to have a RMP by the end of the first period (July 2003).

Due to market access requirements, many primary food exporters have voluntarily adopted HACCP systems for food safety management since the 1990s. The Animal Products Act recognises these systems by allowing a roll-over for existing MAF approved HACCP. Moreover, a streamlined approach to RMP adoption developed in September 2002 also facilitates the move-over from HACCP to RMP. Nevertheless, the mandate of RMP does add in some costs to the industries in terms of both time and money.

This paper aims to study the process of HACCP/RMP adoption in the New Zealand Meat industry. We chose Meat industry as it is one of first industries which have to comply with the 2003 deadline. Also, being an export-oriented industry, the Meat industry provides a typical case of the transition from voluntary HACCP to mandatory RMP. The main issues addressed in this study include plants' motivations, implementation problems, costs and benefits associated with the implementation of HACCP/RMP. Moreover, differences in the implementation experience for different plant sizes are analysed.

2. Literature Review

Since the emergence of HACCP as a food safety management system and especially after the mandate of HACCP implementation in some significant markets such as the USA, there have been studies considering the implementation process and the impacts, as well as costs and benefits of this implementation on food businesses. Significant studies using survey as an approach to analyse the process of HACCP implementation such as those of Martin and Anderson (2000), Colatore and Caswell (2000), Mortlock et al (2000), Buchweitz and Salay (2000), Nganje and Mozzocco (2000), Siebert et al (2000), and Henson et al (2000) have revealed the international experiences regarding the adoption of HACCP. Our study employed a similar approach to the above-mentioned studies, in which a survey is conducted to gather

information regarding firms' experiences with the process of HACCP implementation. The unique feature in the case of New Zealand food firms (especially New Zealand meat companies) is that they have both experiences with the voluntary adoption of HACCP and mandatory adoption of RMP. Therefore, in designing this study it is important to consider the complexity of the adoption process. Moreover, recent study on the impacts of HACCP such as that of Cao et al (2004) has helped to shape the framework of this study.

3. Survey design

The survey questionnaire consists of 5 sections¹. Section 1 asks about the process of RMP implementation such as the amount of time spent on plan design and implementation, how the RMP was developed, and time since a completed RMP has been in place. Section 2 asks about the process of HACCP implementation. Section 3 considers motivations in adopting HACCP/RMP, difficulties faced, and expected benefits of having HACCP/RMP. Section 4 considers the costs associated with implementing and operating HACCP/RMP. Section 5 gathers other plant characteristics such as activities, age, products, size (in terms of number of employees), volume of production, export markets and the adoption of other quality/safety management systems than HACCP/RMP.

The questionnaire was tested through visiting to 2 plant sites and meeting with industry representatives. The complete questionnaire were sent in July 2003 to all members of the New Zealand Meat industry (excluding those visited for pre-test), i.e. 88 plants as listed in New Zealand Contacts in Agriculture 2002. Follow-up mails were sent to non-respondents in October 2003. Total usable responses is 42, this represents a valid response rate of 48%.

4. Descriptive statistics

Among respondents, 61% are large plants which employ more than 100 fulltime equivalent employees (FTEs). Twelve percent (12%) of respondents are small plants (employing less than 20 FTEs) and 27% are medium².

About 47% of respondents are young plants which have been operating for less than 20 years. Of these young plants, more than 60% are small and medium plants (SMEs). About a quarter of all respondents have been operating for more or less a hundred years, most of them are large plants. Figure 1 shows the distribution of plant age.

Sixty six percent (66%) of respondents are doing both slaughtering and processing. Among these, 76% are large, 24% are medium, none are small plants. See Figure 2 for more details about plant activities.

¹ A copy of the questionnaire is available from the authors on request

² Classified according to Statistics New Zealand's standards

Twenty four percent (24%) of respondents handle just one animal type; 29% handle 3 animal types; and about 33% handle more than 4 animal types. Overall, the average number of products for SMEs is 2.6 and for large plants is 3 (summarised in Table 1).

Figure 1. Plant Age

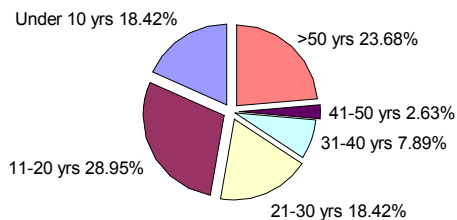


Figure 2. Plant Activities

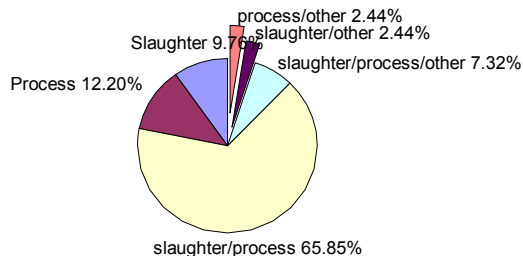
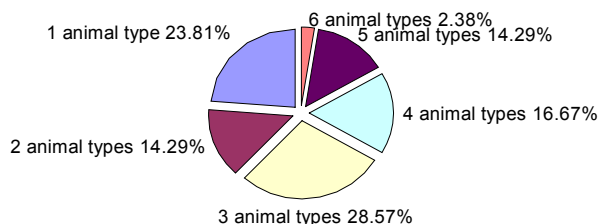


Figure 3. Plant products



Eighty six percent (86%) of respondents export their products. Most of them are large and medium plants. Small plants in general only serve the local market.

All plants have at least some forms of quality management systems (QMS). The most common form is a combination of Sanitary Standard Operating Procedures (SSOPs), Good Manufacturing Practice (GMP), and Industry Codes of Practice (ICP) (29%). Overall, about 14% have more than 5 QMSs, 76% have SSOPs and GMP in their QMSs; and about 26% have all ISO9000, SSOPs, GMP, and ICP.

In general, SMEs are younger plants, have less complicated production process (i.e less activities and number of products), less QMSs and smaller size of export markets. These features will certainly have effects on the process of HACCP/RMP implementation and the associated costs and benefits. Therefore, in the following sections, we focus on plant size while analysing the implementation process of HACCP/RMP.

5. HACCP/RMP implementation

As noted earlier, HACCP has been voluntarily adopted by many members of the Meat Industry since the 1990s. In 1999, after the legislation change from the Meat Act 1981 to the Animal Products Act 1999, the New Zealand Food Safety Authority (NZFSA)

started to mandate the implementation of Risk Management Program (RMP) which basically developed from HACCP principles. The current situation reflects the transition period from voluntary HACCP to mandatory RMP. As a result, some plants have both HACCP and RMP, some either have HACCP or RMP, and some have none of these programs.

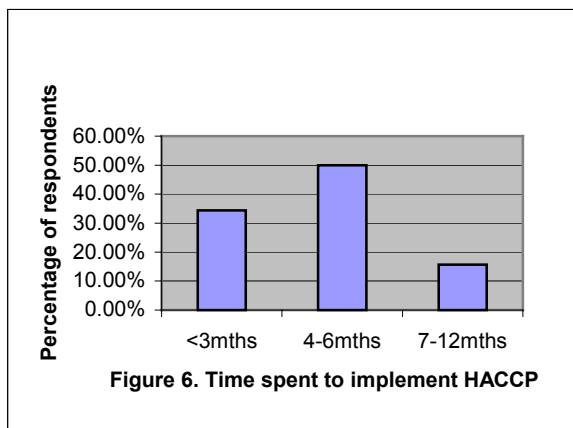
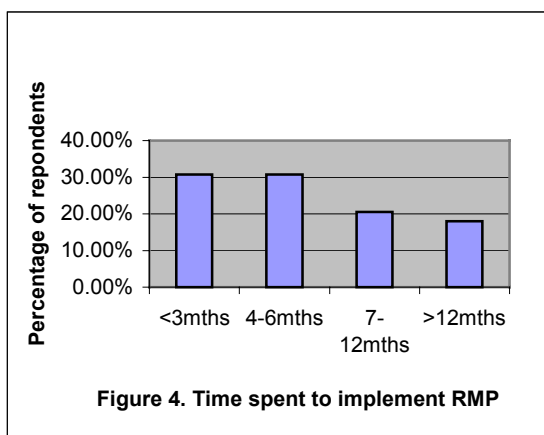
As at September 2003, 90% of respondents have HACCP system in place. Most of plants that do not have HACCP are small and medium plants serving the local markets. Most HACCP plans were developed by plants' employees (87%), just 13% were developed by joint coordination with external consultants. Small and medium plants (SMEs) lagged behind in adopting HACCP, just 81% SMEs have HACCP while the rate of large plants is 96%.

Eighty three percent (83%) of respondents have a registered RMP in place. Again, small and medium plants are far behind in implementing RMP, just 62.5% of SMEs have completed RMP, while the rate of large plant adoption is still very high – 96%.

Seventy nine percent (79%) of respondents have both HACCP and RMP while 5% have no HACCP and are developing RMP. Seventeen percent (17%) have either HACCP or RMP.

Figures 4-7 illustrate the amount of time plants spent on designing and implementing HACCP and RMP, and also the period that those systems have been in place. Average time spent on developing HACCP is 5 months; for RMP, it is 8.5 months. In general, SMEs spent less time on developing HACCP/RMP than large plants, perhaps because of their less complicated production process. However, SMEs are slower than large plants in adopting HACCP/RMP (e.g. time RMP in place is 6.8 months vs. 8 months for large plants; and 4.3 years vs. 5.3 years with HACCP). This reflects that SMEs have less incentive to adopt HACCP/RMP.

Summaries of plants' descriptive statistics and HACCP/RMP implementation process are presented in Table 1.



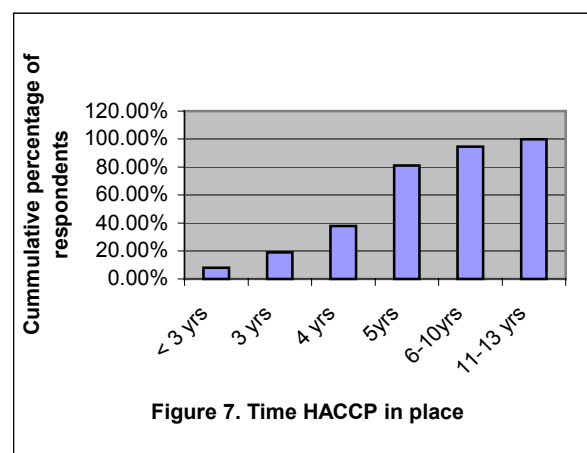
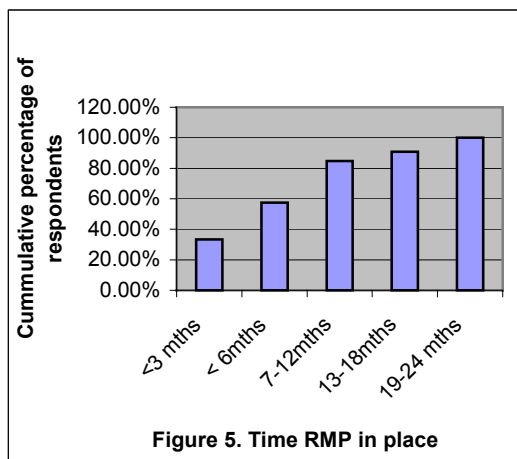


Table 1. Summaries of plants' statistics and HACCP/RMP implementation process (Mean score)

Statistics	Large plants	SMEs	Total
Plant age	51.26 years	23.19 years	40.50 years
Activities (both Slaughtering&Processing)	91.67%	43.75%	65.85%
Average no. of products	3.00	2.68	2.90
Average no. of QMSs	3.64	2.75	3.29
Exporting plants	100%	71%	86%
Plants having RMP	96%	62.5%	83%
Plants having HACCP	96%	81.25%	90%
Plants developing RMP	4%	37.5%	17%
Plants having no HACCP	4%	18.75%	10%
Time spent developing RMP	9.12 mths	7.77 mths	8.59 mths
Time since RMP in place	8.07 mths	6.87 mths	7.8 mths
Time spent developing HACCP	6.05 mths	4.36 mths	5.15 mths
Time since HACCP in place	5.39 years	4.3 years	5.05 years
Hired consultants to design HACCP	8%	23%	13%
Hired consultants to design RMP	12.5%	35.71%	20%

5. Motivations

We presented respondents with a list of motivations in adopting HACCP/RMP which have been suggested from the existing international literature (e.g. Henson et al, 2000; Cao et al, 2004). Respondents were asked to rank the importance of each motivation

on a 7-point scale. Alternatively, respondents can give a zero rank if they do not think the suggested item is a motivation. Mean score and percentage of rank zero for each motivation are reported in Table 2. In general, the three highest ranked motivations are: (1) to meet legal requirement; (2) to access new overseas markets; and (3) to meet the needs of major customers. According to Cao et al (2004), motivations can be categorised into external and internal factors. External factors are those requirements from customers or regulations or recommendations from industry associations. Internal factors are the motivations to improve product quality and safety, to reduce wastage, or to improve the control of the production process. Survey results show that respondents in general ranked external motivations higher than internal ones. The motivations ranked zero by the most respondents are reducing product wastage and improving efficiency/profitability.

The analysis of motivations of different plant size reveals that in general SMEs are not much different from large plants. The three highest ranked motivations remain the same, just the orders are different. For example, ‘access new overseas markets’ was ranked higher by SMEs than by large plants (6.08 vs. 5.38). This could be due to the fact that large plants already have accesses to overseas market while many SMEs are attempting to do so. More results for SMEs and large plants are reported in Tables 6-7 (See Appendix).

Table 2. Plants’ motivations in adopting HACCP/RMP

Motivation	Mean score	% rank 0
Meet legal requirements	6.70	0.00
Access new overseas markets	5.68	15.00
Meet the needs of major customers	5.67	2.50
Recommended by MAF/Industry Association	4.85	15.00
Improve product quality	4.57	12.50
Generally regarded as Board or CEO country wide policy	4.57	25.00
Attract new customers for products	4.52	17.50
Generally regarded as good practice	4.46	12.50
Improve control of production process	4.25	10.00
Needed for plant to be third party accredited	4.25	20.00
Improve efficiency/profitability of plants	4.13	42.50
Reduce need for quality audits by customers	4.12	37.50
Reduce customer complaints	3.64	30.00
Reduce product wastage	3.59	45.00

6. Costs

The pre-test survey suggested that plants often do not have a detailed record for costs associated with the implementation of HACCP/RMP. In fact, survey results showed

that 93% of respondents do not keep a separate record for implementation costs. Therefore, to have a feel about HACCP/RMP costs, we asked respondents to rank a list of costs according to their importance in the total implementation cost. For example, respondents were asked to give rank 1 for the largest cost, rank 2 for the second largest and further. They were also asked to rank zero for the cost items that have not been incurred. Mean score for each cost item and the percentage of ranking one and zero are reported in Table 3.

The ranking of costs indicates that: (1) for implementation, design and development costs seem to be the largest proportion; and (2) for operating costs, verification seems to be the largest proportion. Ranking of implementation costs seems to agree with the international experience (see for example the study of Henson et al (2000) about HACCP adoption in the UK dairy industry), which found design and development costs have the biggest weight especially in terms of staff time in documenting systems. However, while the international experience seems to point to record keeping as a highest proportion of operating costs, it was not indicated as such in this survey. The lack of recorded data in terms of costs associated makes it impossible to analyse the differences.

Both SMEs and large plants did not experience large costs spent on staff training or new investment due to HACCP/RMP implementation. In fact, 63% of respondents indicated that they have not experienced new investment in equipments or new building. Verification costs ranked the first in operating costs as many respondents have highlighted the fact that the verifying process is time consuming. The ranking orders are quite similar for SMEs and large plants. Nevertheless, SMEs did experienced the burden of record-keeping tasks (ranked second in operating costs). More results for SMEs and large plants are presented in Tables 8-9 (See Appendix).

The analysis of costs associated with HACCP/RMP has to be taken with cautions. Firstly, respondents did experience costs associated with HACCP for quite a long time (average 4-5 years). However, as most of them do not have a separate record for HACCP costs, recalling the amount spent maybe a difficult task. Secondly, RMP is a new requirement with average time life of 7 months (Table 1). Therefore, viewing its costs is not easy either, especially with operating costs. A longitudinal approach to conducting survey maybe able to shed further lights on costs incurred with the condition that plants have a record for RMP costs.

Table 3. HACCP/RMP costs

Implementation costs	Mean Rank	% rank 1	% rank 0
Design and development costs	1.60	57.14	0.00
Evaluation/Register costs	1.79	42.86	2.86
Training costs	2.50	20.00	14.29
Equipment purchases, new building	2.92	2.86	62.86

Operating costs	Mean Rank	% rank 1	% rank 0
Verification	1.32	68.57	2.86
Sampling/Testing	2.07	31.43	14.29
Record-keeping	2.39	17.14	11.43
Recurred training costs	3.07	17.14	22.86

7. Benefits

Respondents were presented with a list of benefits which have been suggested by existing literature (Henson et al, 2000; Nganje and Mazzocco, 2000; and Cao et al, 2004). They were then asked to rank each benefit on a 7-point scale according to its importance relative to the overall benefit of HACCP/RMP. They were also asked to give a rank zero for the items that they did not observe as benefits. Mean score and percentage rank zero for each suggested benefit are reported in Table 4.

In general, ‘to increase the ability to access new overseas market’ was ranked the highest (5.9 out of 7). SMEs even view this benefit more important than large plants (6.18 vs. 5.68, Table 10 Appendix). This shows that for SMEs adopting quality/safety management systems like HACCP/RMP is a very important means to gain access to overseas markets. ‘To reduce product microbial counts’ is also highly ranked (overallly 5.5 out of 7). This shows HACCP/RMP is perceived to increase the safety of products which was observed by both SMEs and large plants. ‘To increase product prices’ was ranked the lowest, however ‘to increase sales’ was highly ranked. This once again shows the importance of gaining markets access as a result of HACCP/RMP implementation.

Although all benefits were ranked high (lowest score is 4.1), many benefits were ranked zero by a large proportion of respondents. This is particularly true for potential internal benefits such as ‘reduced production costs’ (52% rank zero), ‘increasing efficiency in the use of inputs’ (47%), and ‘reduced product rework’ (40%). These results imply that while some plants enjoyed the benefits of HACCP/RMP as a business management tool (beside safety/quality assurance), others had none of these benefits. This can be explained partly by the ways in which businesses implement and operate HACCP/RMP. It is argued that if HACCP/RMP being properly implemented and operated they can improve the overall management system (Njanje and Mazzocco, 2000). Some of the important factors in developing an effective HACCP/RMP program are: (1) management and employment training and education; (2) operator control; (3) team work; (4) effective communication between management and workers; and (5) constancy of purpose by management (op cit).

Table 4. HACCP/RMP benefits

Benefit	Mean score	% rank 0
Increased ability to access new overseas markets	5.90	22.50
Reduced product microbial counts	5.50	45.00
Increased ability to attract new customers	5.35	22.50
Increased ability to retain existing customers	5.21	15.00
Increase sales	4.95	47.50
Reduced production costs	4.95	52.50
Increased control over operating process	4.89	32.50
Increased product shelf life	4.86	47.50
Reduced product rework	4.58	40.00
Increased efficiency in the use of inputs	4.55	50.00
Increased product prices	4.10	47.50

8. Implementation Problems

The analysis of problems associated with HACCP/RMP implementation was conducted in a similar way as with motivations and benefits analysis. Results are reported in Table 5. Overall, the highest ranked problem is recouping costs of implementing HACCP/RMP (mean score of 5.09 out of 7). This indicates that businesses are most concerned about the costs associated with the implementation. Other high ranked problems are the lack of flexibility in introducing new products. Indeed, some respondents highlighted the problems that processes cannot be changed until a RMP amendment is approved. Costs in terms of time spent are also a concern.

SMEs in general are more concerned about the costs of HACCP/RMP than large plants (mean score 5.43 vs. 4.8). They are also concerned about their size of business, especially in terms of resources (staff, time, budget) available for the implementation tasks. ‘Lack of expertise in HACCP/RMP implementation ‘ is reported by both SMEs and large plants. This suggests that NZFSA may need to provide further assistance to plants in the implementation process. Both SMEs and large plants have not experienced much change in their production processes or the number of their products due to the implementation. More results for SMEs and large plants are presented in Tables 12-13 Appendix.

Table 5. Implementation Problems

Problem	Mean score	% rank 0
Recouping costs of implementing HACCP/RMP	5.09	12.50
Reduced flexibility to introduce new products	4.54	12.50
Reduced staff time available for other tasks	4.50	15.00
Reduced flexibility of production process	4.24	15.00
Lack of expertise in HACCP/RMP implementation	3.60	37.50
Need to retrain supervisory/managerial staff	3.42	5.00
Need to retrain production staff	3.42	10.00
Attitude/motivation of supervisory/managerial staff	3.42	17.50
Attitude/motivation of production staff	3.21	15.00
Reduced flexibility of production staff	3.00	25.00
Need to modify production process	2.36	30.00
Have to cut down number of products	2.26	52.50
We are too small for HACCP/RMP	2.25	70.00

9. Concluding remarks

Using information gathered through a survey of the members of the New Zealand Meat Industry, this study has explored the experiences of businesses with the implementation process of HACCP/RMP. Impacts of the implementation on businesses, especially benefits and costs, have been assessed qualitatively. The followings are the significant points conveyed by the study:

(1) *The implementation process*: Ninety percent (90%) of respondents had HACCP in place for an average time of 5 years before the mandate of RMP. Most of the adoptions were voluntary through customer requirements or market access requirements. This leads to questions about the purposes of mandatory RMP as it is not clear whether it adds benefits that are yet already achieved via HACCP. Many respondents have voiced their opinion that RMP is in fact a waste of time and money. On the other hand, judging the costs and benefits of RMP is not easy as it is newly implemented. Nevertheless, NZFSA should consider this fact and have an effective communication strategy to businesses.

Small and medium plants on average took less time to develop HACCP/RMP than large plants, perhaps due to their less complicated production processes. However, they lagged behind both in the adoption of HACCP and RMP. This reflects their lack of incentives as well as their difficulties in terms of resources available for the implementation tasks.

(2) *Plants' motivations*: External factors such as meeting legal requirements, customer requirements, and gaining market access are ranked higher than internal factors such as increasing production efficiency or control of production process. This

implies respondents in general have known of HACCP/RMP as a marketing advantage but not as a business management tool.

(3) *Costs*: The fact that most plants did not keep a separate record for costs associated with HACCP/RMP implementation has limited further analysis on the impacts of these programs (for example, impacts on production cost, profit, and production efficiency). Among cost items, HACCP/RMP plan design, evaluation, and verification costs were believed to be high proportions of total costs. Plants observed less spend in record-keeping and equipment purchases.

(4) *Benefits*: Gaining market access was highly ranked among other benefits. Also, the benefit of reduction in product microbial count was frequently cited. This shows HACCP/RMP was perceived to deliver the two main objectives of the legislation, i.e to manage risks and to facilitate market access. Another interesting feature is that while many plants reported the benefits of HACCP/RMP as a management tool (increasing efficiency and control of production process), many others have seen none of these. This points to the importance of factors that lead to an effective implementation of HACCP/RMP such as staff training and education, team work, and communication between management staff and workers.

(5) *Implementation problems*: Respondents were highly concerned about the costs of the implementation, especially with small and medium plants. Costs in terms of reducing staff time available for other tasks and reducing the flexibility of the production process are also a concern. Respondents also indicated the lack of expertise in HACCP/RMP implementation, which suggests that NZFSA may need to provide further assistance to plants.

As our study was conducted when RMP had not long been implemented (average 7.8 months, Table 1), a longitudinal approach to conducting survey maybe able to shed further light on the benefits and costs of the implementation. It will also be better if plants record their HACCP/RMP costs. Our suggestions for policy design are that (1) NZFSA should have a better communication strategy to businesses, especially about the benefits of RMP in terms of the uniformity of food safety management practises of NZ food businesses and the generic marketing advantage of the New Zealand brand; and (2) There should be further assistance to businesses, particularly SMEs. Also, education maybe needed in terms of the management practices to deliver an effective implementation of RMP.

References

- Buchweitz and Salay (2000). *Analysis of implementation and costs of HACCP system in foodservice industry in the county of Campinas, Brazil*. In L. J. Unnevehr (Ed.), *The economics of HACCP: costs and benefits* (pp.335-346). St. Paul, Minnesota, USA: Eagan Press.
- Cao, K., Maurer, O., Scrimgeour, F., and Dake, C. (2004). *The economics of HACCP: a literature review*. Forthcoming in *Australian Agribusiness Perspectives*.
- Colatore, C. and Caswell J. A. (2000). *The cost of HACCP implementation in the seafood industry: a case study of breaded fish*. In L. J. Unnevehr (Ed.), *The economics of HACCP: costs and benefits* (pp.45-68). St. Paul, Minnesota, USA: Eagan Press.
- Henson, S., Holt, G., and Northen, J. (2000). *Costs and benefits of implementing HACCP in the UK dairy processing sector*. In L. J. Unnevehr (Ed.), *The economics of HACCP: costs and benefits* (pp.336-347). St. Paul, Minnesota, USA: Eagan Press.
- Mortlock, Peters, and Griffith (2000). *Applying HACCP to small retailers and caterers: a cost benefit approach*. In L. J. Unnevehr (Ed.), *The economics of HACCP: costs and benefits* (pp.301-314). St. Paul, Minnesota, USA: Eagan Press.
- Martin, S. and Anderson D. (2000). *HACCP adoption in the US food industry*. In L. J. Unnevehr (Ed.), *The economics of HACCP: costs and benefits* (pp.15-28). St. Paul, Minnesota, USA: Eagan Press.
- Nganje and Mazzocco (2000). *Economic Efficiency Analysis of HACCP in the US red meat industry*. In L. J. Unnevehr (Ed.), *The economics of HACCP: costs and benefits* (pp.241-266). St. Paul, Minnesota, USA: Eagan Press.
- NZFSA (2004). Web site <http://www.nzfsa.govt.nz>
- Sielbert, Nayga Jr., and Hooker, N. (2000). *Dimensions of food safety risk mitigation strategies adopted by meat processors: the case of HACCP. Paper presented at the World Food and Agribusiness Forum, IAMA, Chicago.*

Appendix (Size analysis)

1. Motivations

Table 6. SMEs' motivations

Motivation	Mean score	% rank 0
Meet legal requirements	6.60	0.00
Access new overseas markets	6.08	20.00
Meet the needs of major customers	5.27	0.00
Recommended by MAF/Industry Association	5.00	6.67
Improve product quality	4.69	13.33
Attract new customers for products	4.50	6.67
Generally regarded as Board or CEO country wide policy	4.50	33.33
Generally regarded as good practice	4.43	6.67
Improve control of production process	4.31	13.33
Improve efficiency/profitability of plants	4.00	46.67
Reduce need for quality audits by customers	4.00	33.33
Needed for plant to be third party accredited	3.73	26.67
Reduce product wastage	3.25	46.67
Reduce customer complaints	3.20	33.33

Table 7. Large plants' motivations

Motivation	Mean score	% rank 0
Meet legal requirements	6.75	0.00
Meet the needs of major customers	5.87	4.17
Access new overseas markets	5.38	12.50
Recommended by MAF/Industry Association	4.75	16.67
Generally regarded as Board or CEO country wide policy	4.47	20.83
Needed for plant to be third party accredited	4.40	16.67
Attract new customers for products	4.39	25.00
Improve product quality	4.38	12.50
Generally regarded as good practice	4.35	16.67
Reduce need for quality audits by customers	4.20	37.50
Improve control of production process	4.09	8.33
Improve efficiency/profitability of plants	4.00	41.67
Reduce customer complaints	3.71	29.17
Reduce product wastage	3.54	45.83

2. Costs

Table 8. SMEs' costs

Implementation costs	Mean Rank	% rank 1	% rank 0
Design and development costs	1.40	60.00	0.00
Evaluation/Register costs	1.64	40.00	6.67
Training costs	2.23	13.33	13.33
Equipment purchases, new building	2.43	6.67	53.33

Operating costs	Mean Rank	% rank 1	% rank 0
Verification	1.21	60.00	6.67
Sampling/Testing	2.31	13.33	13.33
Record-keeping	1.83	26.67	20.00
Recurred training costs	2.64	20.00	26.67

Table 9. Large plants' costs

Implementation costs	Mean Rank	% rank 1	% rank 0
Design and development costs	1.46	45.83	0.00
Evaluation/Register costs	1.58	37.50	0.00
Training costs	2.19	20.83	12.50
Equipment purchases, new building	2.10	0.00	58.33

Operating costs	Mean Rank	% rank 1	% rank 0
Verification	1.17	62.50	0.00
Sampling/Testing	1.52	37.50	12.50
Record-keeping	2.26	8.33	4.17
Recurred training costs	2.70	12.50	16.67

3. Benefits

Table 10. SMEs' benefits

Benefit	Mean score	% rank 0
Increased ability to access new overseas markets	6.18	26.67
Increased ability to attract new customers	5.09	26.67
Increased ability to retain existing customers	5.08	20.00
Reduced product microbial counts	4.90	33.33
Increase sales	4.88	46.67
Reduced production costs	4.78	40.00
Increased control over operating process	4.33	20.00
Reduced product rework	4.22	40.00
Increased product shelf life	4.13	46.67
Increased efficiency in the use of inputs	3.78	40.00
Increased product prices	3.11	40.00

Table 11. Large plants' benefits

Benefit	Mean score	% rank 0
Reduced product microbial counts	5.91	54.17
Increased ability to access new overseas markets	5.68	20.83
Increased ability to attract new customers	5.42	20.83
Increased efficiency in the use of inputs	5.30	58.33
Reduced production costs	5.22	62.50
Increased control over operating process	5.21	41.67
Increased ability to retain existing customers	5.19	12.50
Increased product shelf life	5.17	50.00
Increase sales	5.08	50.00
Increased product prices	4.91	54.17
Reduced product rework	4.86	41.67

4. Problems

Table 12. SMEs' problems

Problem	Mean score	% rank 0
Recouping costs of implementing HACCP/RMP	5.43	6.67
Reduced staff time available for other tasks	4.73	26.67
Reduced flexibility to introduce new products	4.38	13.33
Reduced flexibility of production process	4.00	13.33
Need to retrain production staff	3.62	13.33
Lack of expertise in HACCP/RMP implementation	3.40	33.33
We are too small for HACCP/RMP	3.33	60.00
Attitude/motivation of production staff	3.17	20.00
Need to retrain supervisory/managerial staff	3.13	0.00
Reduced flexibility of production staff	3.00	33.33
Attitude/motivation of supervisory/managerial staff	2.92	20.00
Need to modify production process	2.36	26.67
Have to cut down number of products	2.25	46.67

Table 13. Large plants' problems

Problem	Mean score	% rank 0
Recouping costs of implementing HACCP/RMP	4.80	16.67
Reduced flexibility to introduce new products	4.64	8.33
Reduced flexibility of production process	4.38	12.50
Reduced staff time available for other tasks	4.27	8.33
Lack of expertise in HACCP/RMP implementation	3.64	41.67
Attitude/motivation of supervisory/managerial staff	3.55	16.67
Need to retrain supervisory/managerial staff	3.45	8.33
Need to retrain production staff	3.23	8.33
Attitude/motivation of production staff	3.14	12.50
Reduced flexibility of production staff	3.00	16.67
Have to cut down number of products	2.27	54.17
Need to modify production process	2.19	33.33
We are too small for HACCP/RMP	1.17	75.00