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Application of hazard and critical control point analysis (HACCP) in organic farming

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Abstract

The primary purpose of this discussion paper on the integration of food safety management systems based on the Hazard and Critical Control Point Analysis (HACCP) with organic certification was to inform those within and outside the organic industry of recent developments in this area. It is also intended to highlight the need for the organic industry to address food safety management as part of the organic certification process. During the past two years, legislation and international demand in the marketplace for food safety management (complete with verification of the use of these systems) has led to a situation where it has become more a matter of 'how' than 'if'.

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Introduction

While the origins of and motivations for the development of the organic industry worldwide are diverse, the industry has generally been supported by consumers who are concerned about avoiding the risks inherent in conventional means of food production (Morgan & Murdoch 2000). In order to protect consumers from fraudulent claims of organic practices being used during production, the labeling food as organic has become increasingly prevalent. In addition the audit and certification by a third party to

verify organic status of the product has become necessary. This certification is done in the context of a set of standards. During the past two decades, organic certification programs in India, and elsewhere, have proliferated in number as has the complexity of the standards applied. The organic philosophy contains a number of integrated ideological positions having to do with morality, environmental concern, health, and ecological feedback, which affect management decisions and economic analysis on the part of the grower (Parr et al. 1983).



Traditionally, the concerns of the organic movement centered on the risks to humans and soil from pesticides, insecticides and other chemical contamination of food within a diversity of individual farmer philosophies and practices (McCann et al. 1997; Kaltoft 1999). Many of the consumers of organic products do so out of their personal conviction that organic food is safer than food produced in conventional agriculture as well as more nutritious, yet there is little evidence that organic food is safer than conventional food over all possible categories of risk. This discussion paper examines current trends toward the use of food safety audit and management systems to ensure consumer protection from harm in the foodstuffs they consume. It considers the potential for organic certification to be combined with food safety management systems, with a particular focus on Hazard and Critical Control Point (HACCP) standards for food production. Food safety management is a key area that is rapidly changing as legislation and the food safety systems involved are in a state of flux, refinement and resistance. In addition, the burdens that are placed on businesses from these, and other new requirements for record keeping.

Food safety certification systems developed in India through state government departments have the potential to create such a situation. This would be accomplished through the perceived ability on the part of the government agencies to simply subsume organic standards into the food safety standards or other certification systems in the interest of one farm/one inspection quality system to reduce costs to producers. In

addition, the proliferation of certification systems which label or brand products on a variety of different criteria is another concern for the organic industry. Quality assurance auditors have programs that integrate a variety of standards or codes to achieve a single quality management system that are developed to adapt to industry needs for specific cropping systems. There are also threats to organic agriculture as ‘sustainable agriculture’ from the proposed use of food safety and quality control systems to be used in conjunction with other environmental standards and then certified and labeled as ‘sustainable’ (AFFA 2001). The Bureau of Rural Sciences business plan for 1999-2000 includes the development of certification and auditing of sustainable agriculture and such labeling could confuse consumers of organic products. Indeed, Tovey (1997) argues that as the commodity chains for food become more globalize and the grower more distant from the consumer, *‘connections between what farmers do and what [people] end up eating become harder and harder for consumers to make.’* The organic industry is split between globalize production similar in its distribution and marketing to conventional agriculture and a continuation of the tradition of smaller growers who sell to local markets. Establishing a chain of custody has become essential for the former distribution system and less critical for the latter (Buck et al. 1997). The organic industry must prepare for these changes through strategic planning now, rather than later. The mandate for this discussion paper proceeded on the organic advisory committee’s assumption that due to the avoidance of many food safety risks

through the use of organic methods, food safety certification should probably be subsumed into organic certification rather than the other way around. Increasingly, other sectors of Indian and overseas agriculture are adopting food quality assurance systems, either voluntarily or through newly introduced food safety standards and proposed legislation. There is potential for the organic industry to attract increased numbers of growers through the market opportunities offered by organic practices in avoiding certain types of food hazards. For example, mad cow disease, hormone residues, agricultural chemical residues and the safety hazards of genetically modified organisms are not seen to be a risk in organic products. This may open up lucrative markets for Indian producers through the mechanism of organic certification. The new food safety legislation requirements that pressure growers into quality assurance systems and audit may also make the lower organic certification and audit costs more attractive. However, it is necessary to establish that organic practices and certification can meet the requirements of the new legislation in order to justify such assumptions. As these systems evolve, it is obvious that food safety will simply be a part of commercial agriculture of any type, organic or otherwise.

Food safety and risks to consumers

The primary risks from food at present derive from changes in farming and processing practices that are both corporate and consumer driven (Cerexhe & Ashton 2000). While some reactions against unsafe food benefit organic and alternative agriculture (such as reaction against pesticide

contamination, hormone use in meat production, and the use of genetically modified organisms), some newer risks (outbreaks of more harmful bacteria and viruses) may well pose a threat to the organic industry. Concern about food safety has escalated as new food borne illnesses appear. A threat to the organic industry arises through a potential for attention to the real risks caused by assuming that organic foods are inherently safer than conventionally produced foods. While the organic industry does indeed avoid some of the risks associated with the use of agricultural and veterinary chemicals or genetically modified organisms, it does not avoid all food risks. If organic producers are not attentive to basic rules of hygiene or have a source of water that is contaminated, then food risks may be passed on to the consumer. Another example would be the use of fish fertilizer as a foliar spray. Fish fertilizer was implicated in a serious case of bacterial contamination in conventional fresh orange juice. The organic industry could be crippled by a scandalous recall of organic products if an allowed substance was found to be a health risk. Court awards of damages in food poisoning cases against the negligent parties can be quite high. Four million dollars was awarded for salmonella contamination of peanut butter at Kingaroy Local council was sued successfully for the hepatitis outbreak from oysters in NSW and the judge suggested that oysters carry food warning labels. The organic industry is not immune from damage claims for foreign objects, contamination due to poor hygiene or other risks not planned for and avoided. One of the difficulties in ensuring that risk is minimised is the difficulty

in ensuring that all risks have been anticipated. Shrader-Frechette (1991, p. 102) pointed out that *'the basic problems of risk assessment stem from the uncertainty of the scientific knowledge of the health hazards addressed.'* Not only is there great uncertainty with regard to the degree of potential hazard, but the ability of scientists to discover smaller and smaller amounts of contaminants is also increasing. The discovery of minute amounts of contaminants has the potential to raise unnecessary alarms. Shrader-Frechette (1991) concluded that bridging the gap between uncertain science and cost-effective and rational management decisions to avoid food safety risks is difficult, at best. In order to make cost-effective and rational management decisions to guard against food safety risks, it has been proposed that quality assurance and food safety hazard analysis should be incorporated into the day to day management of farms and food businesses. Some of the organic certifiers are actively doing so at the present time. This discussion paper explores the issues of the use of hazard analysis and food safety quality systems in the organic industry to address the issue of food safety under proposed changes to the National Food Standards Code.

Legislating to control risk

Early in the twentieth century concerns about food safety and regulation of foodstuffs centered more on the adulteration of foods (Senauer et al. 1991). The earliest food legislation attempted to regulate a long list of concerns (Harrigan & Park 1991):

- Compositional or microbiological standards or specification for the foods themselves.

- Hygienic precautions to be taken during preparation, storage and/or distribution.
- Processing procedures or processing parameters such as the heat treatment to be applied during thermal processing.
- The training or qualifications required of food handlers, food manufacturers and the like.
- The design, construction, and licensing of food premises.
- The training and qualifications of enforcement officers, food analysts, etc.
- Procedures for inspection, seizure and recall of food, closure of premises, prosecutions,

Quality assurance and HACCP management systems

a) Quality assurance systems

Quality in any given product or system needs to be defined because quality, as a concept, has no absolute characteristics (Harrigan & Park 1991). Quality in food products can be concerned with uniformity of appearance, size and/or colour, cooking qualities, keeping qualities or assurance that it is safe to eat. Quality assurance systems are also intended to protect the consumer from food safety hazards such as food borne diseases or drug and chemical residues (Hubbert et al. 1996). Bolton (1997) points out that the aim of total quality management is to *'make everyone accountable for their own performance and to get them committed to attaining quality in a highly motivated fashion.'* Quality tools include computerized process and record keeping, statistical sampling, cause and effect analysis, and benchmarking where performance is measured against other firms in the industry. Gould and

Gould (1993) suggested that failures in food quality systems came from the following faults:

- Poor supervision
- Lack of instructions
- Varying quality of incoming materials
- Machines out of control
- Uncomfortable working conditions
- Lack of statistical information or performance data
- Poor design of processes.

Gould and Gould define quality assurance as being '*the control, evaluation and audit of a food...system.*' It is customer focused; that is, it is intended to meet the customers' needs. Food quality assurance systems, such as HACCP, are intended to meet the customer's perceived need for food free of substantial risks. In addition to food safety concerns, consumers also want their food to have (Spanier et al. 1993):

- Visual appeal
- High levels of desirable flavours
- Freedom from off-flavours
- Desirable nutritional profiles
- Stability on storage and convenience in preparation
- Freedom from biotoxins.

Achieving these characteristics may require a science-based control system and so food quality and food safety management systems may be very tightly linked.

HACCP programs

One key food quality assurance approach is HACCP, otherwise known as the Hazard Analysis and Critical Control Points approach. It is not a new system. What is new is its incorporation into food safety legislation as a mandated food quality system. HACCP

was developed in order to produce safe food for astronauts as part of the space program and was first published and documented in the United States in 1971 (Ourfood, 2001). The originator, Howard Bauman, developed and used HACCP in the Pillsbury Company starting in 1959 and shared his system with NASA. In the 1970s, Bauman developed training systems for the FDA (Food and Drug Administration United States). In 1985, the National Academy of Science recommended use of the HACCP system and it was recognized by FAO/WHO (Bauman 1995). By 1993, the European Union was including HACCP in food regulations and in 1998 the German hygiene rule demanded the specific use of HACCP food safety systems. HACCP is recognised by *Codex Alimentarius* and is based on scientific validation of its central principles (Guelph Food Technology Centre 2001). By science based, it is meant that scientific measurement is used to ensure that food is safe. It also means that scientific methods, such as the estimation of maximum allowable exposure levels to pesticides or the development of the irradiation of food, are key elements of HACCP systems. Risk analysis and monitoring are also essential to HACCP (Institute of Medicine, National Research Council 1998). HACCP is based on seven basic principles (QAS 2001): Conducting a hazard analysis

- Identifying the critical control points for each step
- Establishing critical limits
- Establishing monitoring requirements
- Taking corrective action
- Keeping records

- Verifying that the HACCP system is working correctly.

HACCP systems typically use teams of individuals and are suited for large food processing companies, as that is where they were initially developed. Mortimore and Wallace (1994) suggest that HACCP implementation projects must be integrated with health safety training and procedures, food handler basic hygiene training, laboratory accreditation projects, construction of food safe facilities, good manufacturing practices improvement programs and recall and incident management systems. Clearly, these would not apply to all businesses in the organic industry, but they would apply to some of them. Loken (1995) suggests a variety of individuals should be trained in HACCP including industry professional, educators and trainers and those working in the regulatory agencies. HACCP systems can be viewed as a management and training tool that can be expanded to address (Sumner 1995):

- Hazards to consumer health (product safety)
- Hazards to consumer satisfaction (product quality)
- Hazards of energy loss
- Hazards of material loss
- Hazard of time loss
- Regulatory hazards
- Hazards to worker's health, including explosion or fire hazards
- Hazards of environmental pollution.

Two types of experts are commonly required to implement the HACCP principles, an expert in HACCP as a system and an expert in hazard analysis. The HACCP expert

understands the principles of HACCP, can serve as a facilitator during the development of a HACCP plan and can manage, review or verify a HACCP plan. The expert in hazard analysis has more specialized skills. This expert needs to either be an expert in the hazards of concern (such as a chemist, toxicologist or microbiologist) or have the knowledge to assign levels of severity and risk and recommend controls. The experts also determine criteria and procedures for monitoring and verification, recommend the disposition of product when criteria are not met, recommend research related to a HACCP plan and predict the success of a HACCP plan (Tompkin 1992). Hazards are defined as a 'biological, chemical or physical property which may cause a food to be unsafe for human consumption' (Mortimore & Wallace 1994). Sumner (1995) goes so far as to suggest that HACCP can be used to bring together senior and line managers in a vision of workplace democracy that unifies and promotes teamwork. Once hazards are identified, then control points need to be established to ensure that the outcome is always safe food. Most investigations into major food poisoning incidents, such as the Garabaldi Company in South India a few years ago, reveal that control of hazards is not part of the management system (ANZFA 1999). Critical control points are defined by public health officials as (Sumner 1995):

A location, practice, procedure or process at which control can be exercised over one or more factors which, if controlled, could minimize or prevent a hazard. Sumner further suggested that a wider definition of critical control point (CCP) could be used: A

point in the operation which, if not controlled, will lead to problems with the product's public health/shelf life status or its utility.

With this wider definition that includes utility, CCPs can also be used for quality control as well as the regulation of food safety hazards in the management system. Sumner acknowledges that there are some food processing hazards for which there are no cost-effective controls. For example, the inclusion of small stones in dry beans or sultanas is an intractable problem as even hand picking can miss some of these and would make the product prohibitively expensive. One motive for extending food safety systems to the point of origin (primary production) is to attempt to institute control points at source that might possibly correct the problem. For example, freshly harvested grapes could be floated in water and thus eliminate stones. Auditors of HACCP systems are generally looking for evidence that there is provision for the control of nonconforming product and provisions for corrective and preventative actions (NSW Meat Authority 1997).

The various HACCP programs rely on the use of charts, flow diagrams and/or manuals to document the management system and its controls. Almost any book or pamphlet on HACCP contains the same basic material: sample flow diagrams, audit checklists and the use of standard symbols so the management system is portrayed in a visual manner to those using it. The visual nature of the flow diagrams is also used to enhance decision making by having the critical control points portrayed as decision nodes, often as a yes/no with an if/then directive to management. Work

instructions are prepared for these situations which include the preventative or corrective actions to be taken to avoid the presence of food hazards (Standing Committee on Agriculture and Resource Management 1997). Some HACCP manuals rely on linear charts rather than flow diagrams (Mortimore & Wallace 1994). Internationally recognized symbols used in HACCP are circles in boxes for steps or actions contained in the process, arrows used for the transfer of goods and triangles to represent storage (NSW Meat Authority 1997). HACCP has serious limitations, which have been acknowledged. These are generally regarded to be comprised of the concerns that (Institute of Medicine, National Research Council 1998):

- Ensuring that food is entirely safe may not be cost-effective.
- HACCP systems reduce risk but rarely eliminate it.
- • There is a general lack of state and federal coordination in nations that endorse the use of HACCP.
- • There is generally a lack of unified mission amongst the various agencies involved in food safety.
- There is often an inadequate emphasis on surveillance to ensure the system is sound.
- Resources for surveillance and research are inadequate.

Without ensuring that sufficient measures are taken and examined, a HACCP based food safety system can provide false security against food safety risks. A drawback of all of these HACCP based systems is their suitability for larger businesses and the high compliance costs expected for smaller businesses to implement the same type of

system. HACCP India was formed to take advantage of the recent requirements in Victoria for all larger food businesses to put food safety plans that are HACCP based into place (HACCP India 2001). Food Safety Victoria (1999) drafted model food safety programs for businesses having food service processes which suggest accessing raw materials from approved suppliers. Victoria extended the deadline for filing food safety plans for smaller businesses that do not serve food to 'at risk' populations, such as the elderly and children (Food Safety Victoria 2001).

Independent audit and HACCP

As with certification to organic standards, businesses wishing to certify to HACCP follow a similar process of application, formulation of a plan and audit to verify the system once it is in place. The business' documents are used to check the systems in place and to identify any non conforming aspects of the business operations. The initial audit allows the business to be placed on a public register and follow-up surveillance audits are conducted six monthly. Auditing HACCP based quality assurance systems can involve two types of audits: technical or systems (Khandke 2000). Setting up a thorough and competent audit involves 7 elements, according to Khandke (2000):

1. **Scope-** defines the type and limits of the audit.
2. **Standards-** define the depth of the audit.
3. **Preparation-** allows the auditor to develop an understanding of the product, process and standards.

4. **Format-** determines the method for the audit, e.g. using checklists or questionnaires.
5. **Assessment and scoring-** describes the methods by which the audit will be evaluated.
6. **Follow-up-** checks progress against an agreed action plan resulting from an audit
7. **Frequency-** defines how often the audits will take place.

Food safety management and primary production

One of the primary purposes of this discussion paper was to investigate the use of food safety systems in primary production. It should be obvious that the current thrust of legislation in India and the drafting of new food standards do not as yet dictate the use of food safety systems for primary production in most cases. However it is clear from the examination of a number of internet sites and other published information about HACCP and food safety, that many growers will be induced to adopt food safety programs in response to market demand. That is, many supermarket chains or wholesalers want a food safety system in place. This is largely in the form of demand from supermarket buyers for quality assurance programs that can accommodate food safety for due diligence purposes (Agriculture Western India 2001). Businesses using any of these HACCP based food quality systems are entitled to display a logo after verification by audit. Primary production is divided into low and high-risk businesses, much as other food businesses. The production of meat and livestock is considered high risk and is highly regulated. HACCP systems are required (Pearson &

Dutson 1995; NSW Meat Authority 1997). The production of herbs and spices is also coming under scrutiny as microbial and fungal contamination as well as mycotoxins are identified (Farkas 2000; Michels 2000). Even fruits and vegetables are viewed with some suspicion. The demand for HACCP food safety systems to be developed for fruit and vegetable production (which should be low risk) is based on the work of microbiologists who established a number of potential hazards. These hazards derive from the growing environment and/or human handling. Potential sources for contaminants are (Anon. 2001):

- Irrigation water
- Faecal contamination
- Pesticide residue
- Breakdown of tissue from poor packaging or handling
- Human handling.

This same source suggested that the National Advisory Committee for Microbiological Criteria (USDA/FDA) found risks from *cyclospora*, *cryptosporidium*, *e coli* 0157:H7 and possible enteric viruses. Pickers could transmit Hepatitis A, if infected. Queensland DPI suggests that fruit and vegetable growers are likely to need HACCP plans in order to satisfy customers and to guard against food poisoning outbreaks similar to those occurring overseas (Bagshaw & Ledger 2000). Some American farms are choosing to adopt HACCP under a USDA Agriculture Quality through Verification Program (Chestnut Hill Farms 2001) and advertise this accreditation on their website to promote their products. In India, food safety programs have been included in the 1999-

2000 Horticulture Research and Development Corporation business plan because the HRDC believes that the industry '*must demonstrate safety and environmental care to maintain and gain lucrative export markets, especially with major overseas supermarket chains*' (HRDC 1999). What was been endorsed for development is Approved Supplier plans and the use of SQF 2000. The HRDC strategic plan also emphasizes that consumers are becoming more health conscious and environmentally aware and that the horticulture industry

Integrating organic standards and food safety

In this section, the complementarity between organic standards and food safety is explored. The organic industry is already closely integrated with international standards through four key mechanisms (NASAA 2000):

1. Organic standards are provided for in the *Codex Alimentarius*.
1. Organic standards are provided for in the *Basic Standards for Organic Agriculture and Food Processing* published by the International Federation of Organic Agricultural Movements
2. India has an export control order (No 6, 1997) pertaining to Organic Produce Certification.
3. Organic standards are provided for through a National Standards Committee.

Over the past decade these mechanisms have meant organic standards worldwide are increasingly the same. This works to facilitate trade in organic products. The organic industry has also received recognition in India as providing for sustainable agriculture, but is

facing increasing competition from other certification schemes (for example, the present strategic thrust of Agriculture, Forestry & Fisheries, India). The organic industry is also recognized as exemplary in its provision of third party audit and verification of adherence to the organic standards as set by the various certification bodies. The initial push for quality management and HACCP in the organic industry came from export customers and international standards. The recent legislative changes, as outlined in Section 2, mean that HACCP may well become the basis of any farm quality management system and is already mandated for all food processors and food businesses. In the first part of Section 5, the food safety issues that organic standards are already able to address are spelled out. The second part considers the differences between HACCP plans and organic certification. In the third part, an attempt to demonstrate the potential offered by HACCP plans to cover the organic standards is demonstrated through the use of standard HACCP flow diagrams.

Organic standards

In order to determine what aspects of food safety are already covered by the organic standards it is necessary to differentiate between those hazards that are entirely avoided by organic practices and those which are not. Those hazards that are acknowledged as generally being avoided by organic practices include:

- Most concerns about veterinary chemicals
- Most concerns about pesticide residues
- Genetically modified organisms.

What are not covered are those food safety issues relating to hygiene and water contaminants. There is also no inherent

protection in the organic standards from viruses and microbial infections. What is present in the standards of BFA and NASAA is a requirement to assess risk to the organic integrity of products using HACCP plans. Therefore, organic certification though each of these two certifiers is focused on the identification of risk and institution of suitable control and prevention measures. It would seem reasonable, therefore, to assume that the more conventional concerns of food safety could be incorporated into the standards with little extra burden to the grower in terms of increased record keeping.

In addition, it must be kept in mind that any organic producer of meat or poultry products is required by legislation to have a HACCP plan in place that is audited by an accredited certifier. It would be possible, through the development of more comprehensive training programs to train organic inspectors to audit HACCP and other quality assurance systems. Certainly, the Biological Farmers of India have elected to include an element of HACCP training into their inspector training program in recent years.

Key terms associated with HACCP and interpreted in the context of organic certification are identified below.

1. **Acceptable level** means the presence of a hazard that does not pose the likelihood of causing an unacceptable health risk; most organic methods would allow for hazards to be classed in this manner due to the generally safe ingredients.
2. **Buffer zones** are required for certified properties where external hazards are considered to be substantial. Buffer zones

already apply to protect organic producers from contamination from non-organic practices of their neighbors and therefore this type of process implies that more thought will go toward identifying all hazards. The size of the buffer zone will vary on a case by case basis, but will likely be no less than 5 meters and usually no greater than 300 meters.

3. **Control point** means any point in a specific food system at which loss of control does not lead to an unacceptable health risk. That is, these are areas in the process that do not need to be singled out for special attention.

4. **Critical control point**, a point at which loss of control may result in an unacceptable health risk. These CCPs are at the heart of the HACCP process and are those areas that

receive greater management attention to avoid problems.

5. **Critical limit** means the maximum or minimum value to which a physical, biological, or chemical parameter must be controlled at a critical control point to minimize the risk that the identified food safety hazard may occur. These are considered to be limits that can be measured scientifically. For example it might be the minimum temperature for cooling vegetables to avoid bacteria or fungal growth.

6. **Deviation** means failure to meet a required critical limit for a critical control point. Deviations are to be avoided.

7. **HACCP plan** means a written document that delineates the formal procedures for following the HACCP principles as developed by the organic certifier.

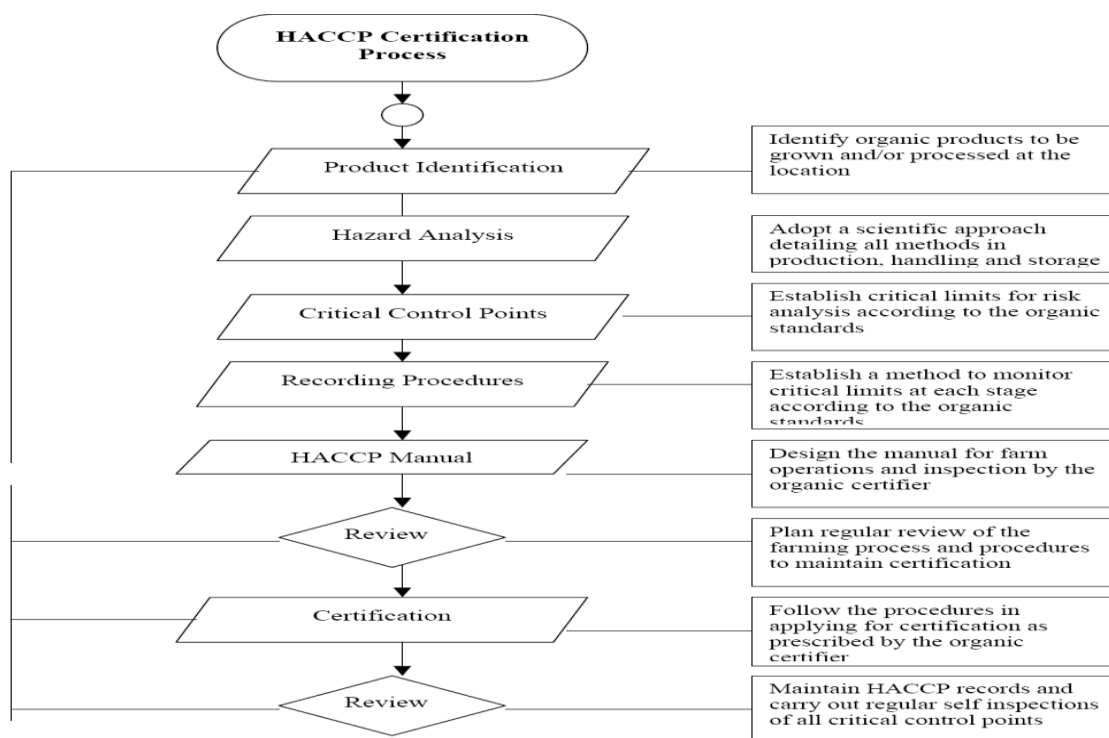


Fig. 1 HACCP certification process

8. **Hazard** means a biological, chemical, or physical property that may cause unacceptable risks to the certified operation and may include neighboring conventional fields, carelessness, previous land use, imported inputs, or packaging. For example, the plastic stickers placed on fruit are a food hazard, if ingested.

9. **Monitoring** means a planned sequence of observations or measurements of critical limits designed to produce an accurate record and intended to ensure that the critical limit maintains product safety. Continuous monitoring means an uninterrupted record of data.

10. **Preventive measure** means an action to exclude, destroy, eliminate, or reduce a hazard and prevent recontamination through effective means.

11. **Risk** means an estimate of the likely occurrence of a hazard.

12. **Sensitive ingredient** means any ingredient historically associated with a known microbiological hazard that causes or contributes to production of a potentially hazardous food as defined in the Standards.

13. **The plan** should identify significant hazards or risks associated with maintaining certification, outline procedures for reducing or eliminating such risks, and describe the method of monitoring these procedures to ensure ongoing compliance to the Standards.

14. **Verification** means methods, procedures, and tests used to determine if the HACCP system in use is in compliance with the HACCP plan.

Farm Management

The previous part discussed a general flow diagram which explored the ‘bigger

picture’ of the HACCP plan in the organic context and outlined definitions for key terms used in HACCP food safety management. In this section, the details for the six stages of the HACCP management system are discussed and illustrated through the use of further flow diagrams. One of the most critical aspects of the development of the HACCP plan for the farm is to recognize what types of problems could arise from the use of organic practices. Some areas for concern include poor hygiene leading to contaminated produce, risks from the inappropriate use of restricted botanical insecticides, inadequate volume of sanitizing agents and other risk factors. High risk foods have been identified and should be targeted as a priority.

Stage 1: Product Identification

The first step in the development of a HACCP plan for a food operation is the identification of the products to be grown, packed and/or processed at the farm or organic facility. This is to ensure that labeling meets defined standards and is recognized by the regulating community, the customer and any third parties in the food supply chain. In the first major step, the farm management team audits the farm and catalogues the organic products that are currently growing.

Management also considers what crops might be grown organically during the future in order to outline possible crop rotations and how the planting or grazing areas will be prepared for the crops. The next step includes the consideration of the propagation methods and here consideration must be given to the difficulties of obtaining seeds free of chemicals as a risk to the organic business.

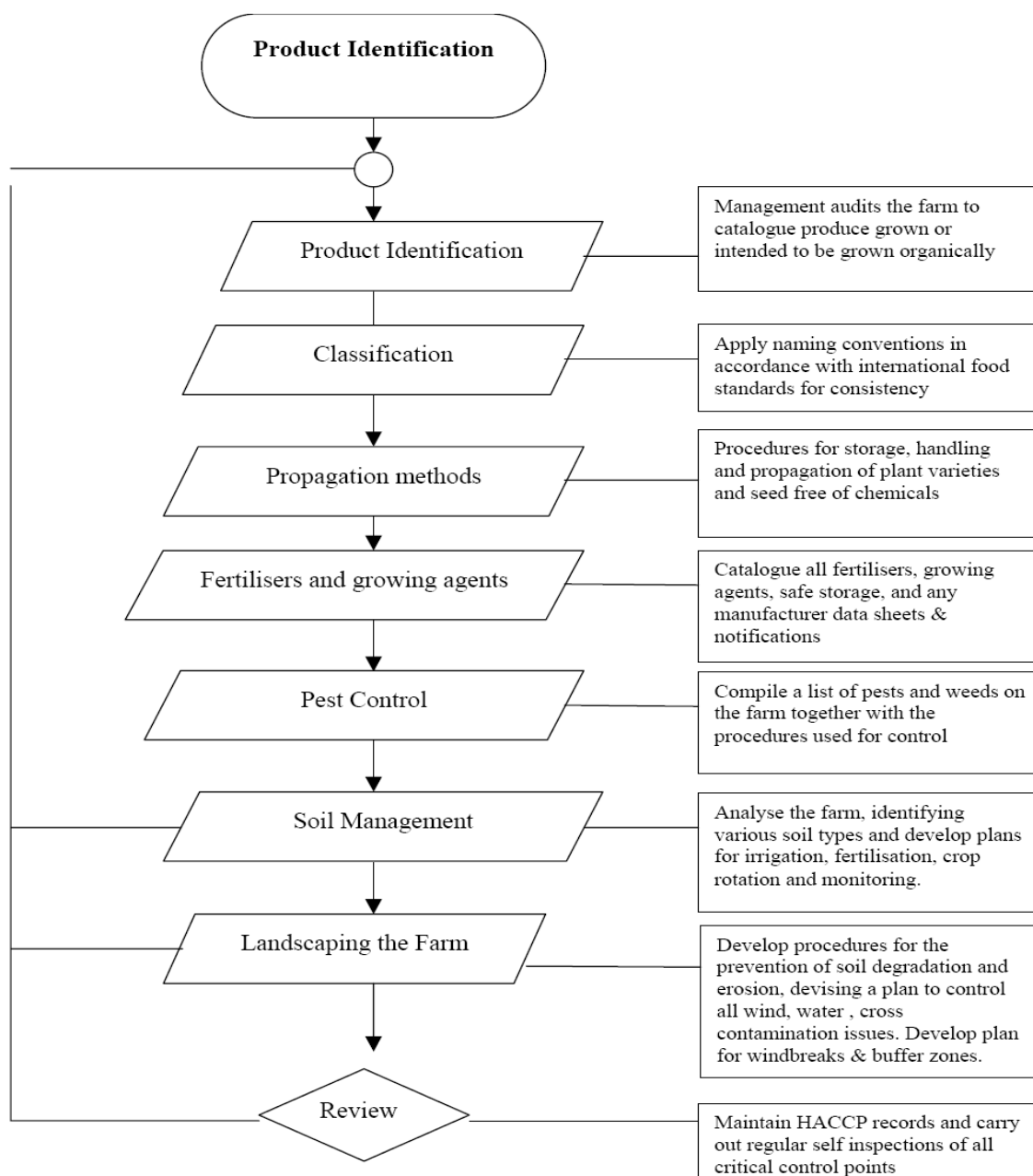


Fig. 2 Product identification using HACCP

If the operation has mixed activities that are organic and non-organic, then provision must be made to have separate storage areas that are verifiable. Organic farmers need to keep accurate records of all fertilizers and growing agents in order to demonstrate that

only approved substances have been used. Detailed records of the fertilizers and the application rates and times as well as copies of any manufacturer's data sheets and labels will help to establish a paper trail that the organic inspector can quickly audit.

Pest control is another critical area in organic production to demonstrate that the organic standards have been met. A HACCP plan provides for the recording of the pests and weeds found on the farm, which can be used as evidence to substantiate the necessity to use restricted substances and to demonstrate that the farm has a pest control management plan based on scientific data.

Another aspect of sound organic management is detailed maps and soil management plans; these are provided for in

the product identification stage of standard HACCP plans.

Stage 2: Hazard Analysis

The risks and hazards associated with the production of organic produce will vary from farm to farm, as well as the different varieties of produce. The flowchart will need to be modified in accordance with this specification. A hazard plan identifies the potential hazards and risks during the production stages and suggests what actions are required to remove them.

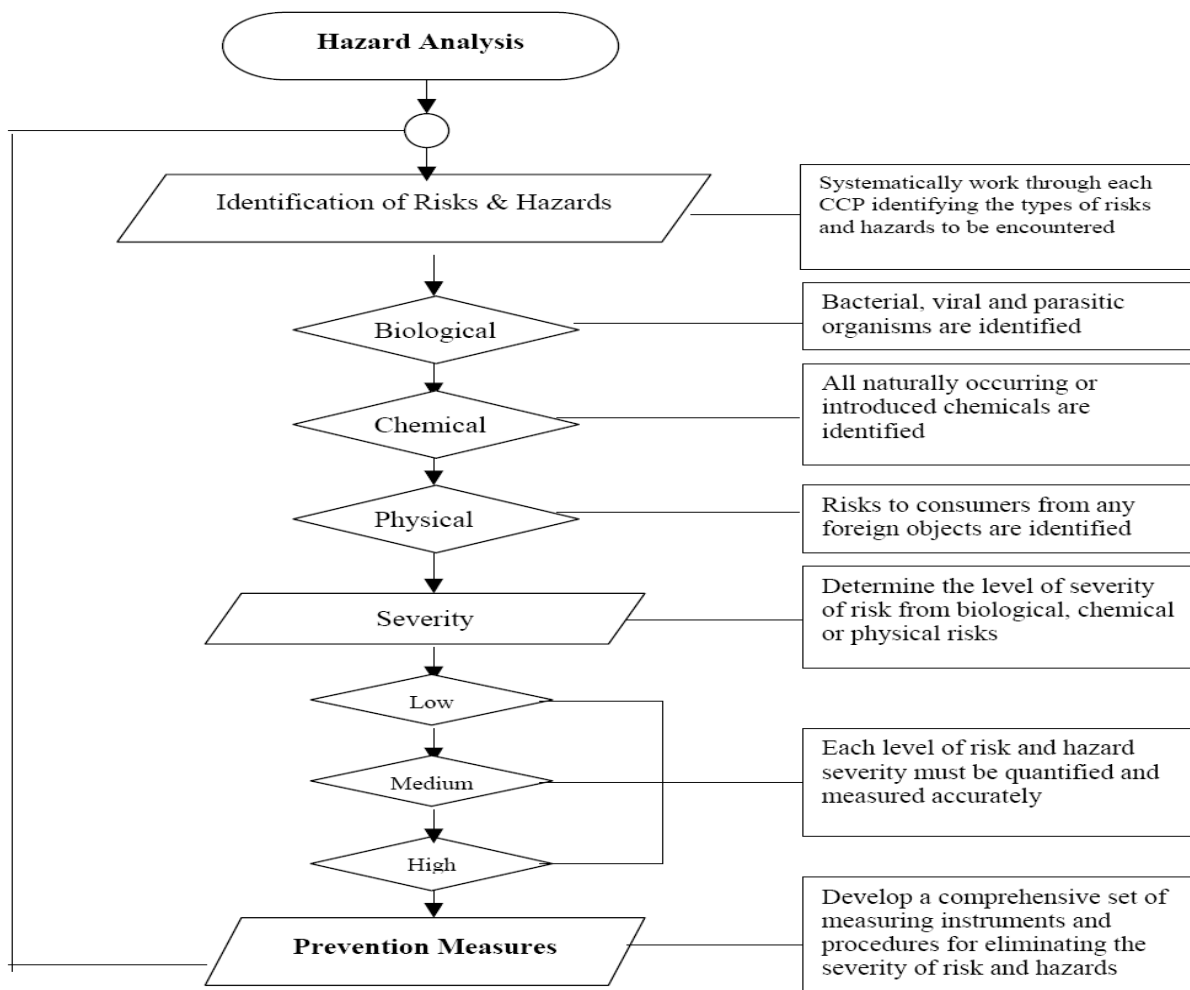


Fig. 3 Hazard analysis in a flow diagram

Stage 3: Critical Control Points

Defining the Critical Control Points (CCP) defines the step-by-step procedure to prevent, eliminate, or reduce risks and hazards

to an acceptable level and is used through the daily processes and procedures as well as for inspection.

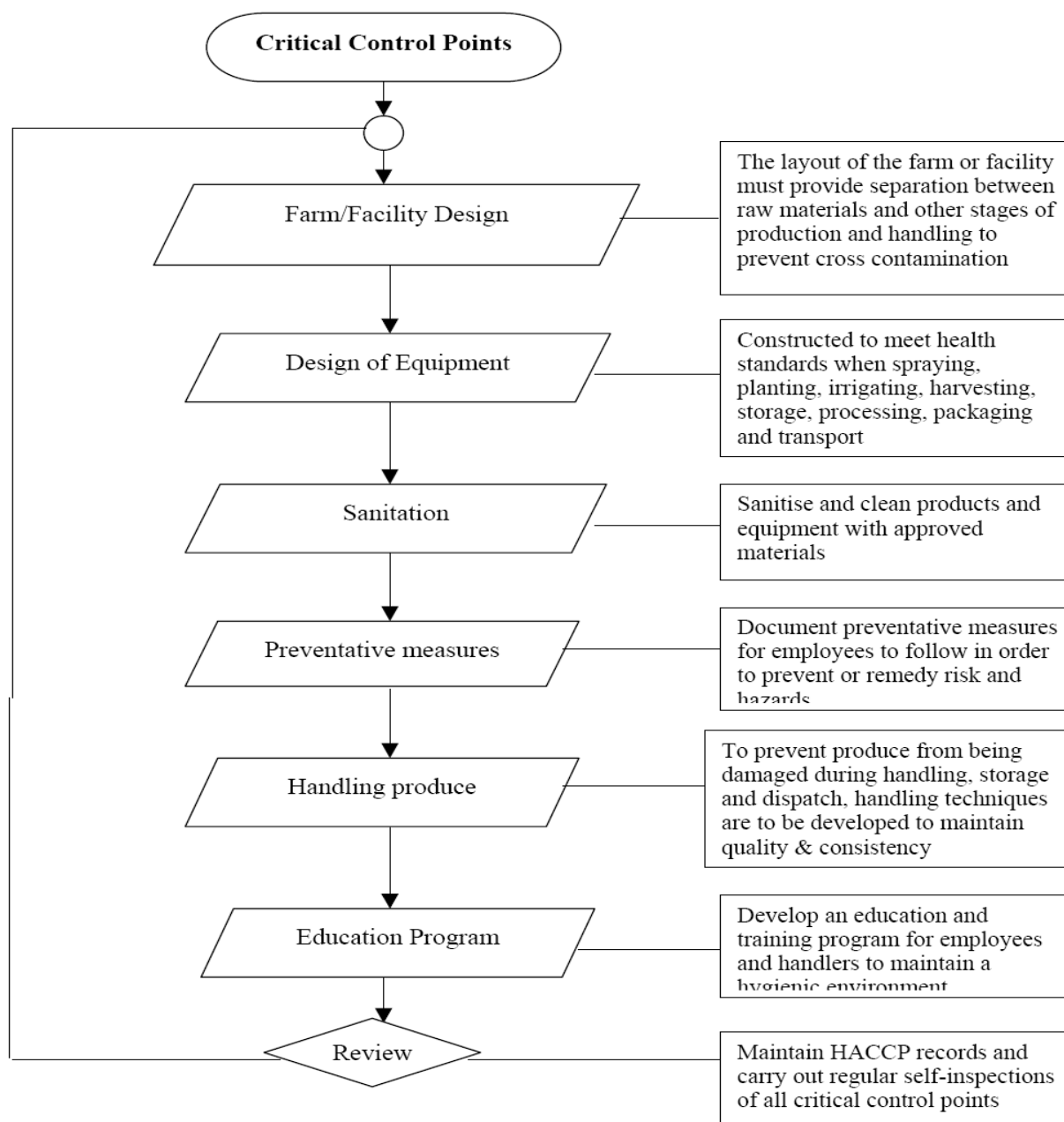


Fig. 4 Critical control points in a flow diagram

For each critical control point there is a set of procedures to address what preventative

steps are to be introduced and in the event of a defect, what steps will be taken to remedy the

situation. A key component of a CCP plan is in educating the employees and handlers as prevention is less costly than rectification. It is evident from the flowchart in Figure 4 that the farm/facility design is an important aspect of establishing the critical control points for each potential risk and hazard. All of the important records that are useful in the development of a

HACCP system are the same records that are necessary for the organic inspection.

Stage 4: Record Keeping

HACCP is reliant on sound and accurate record keeping and demonstrates the monitoring procedures and corrective actions are being followed.

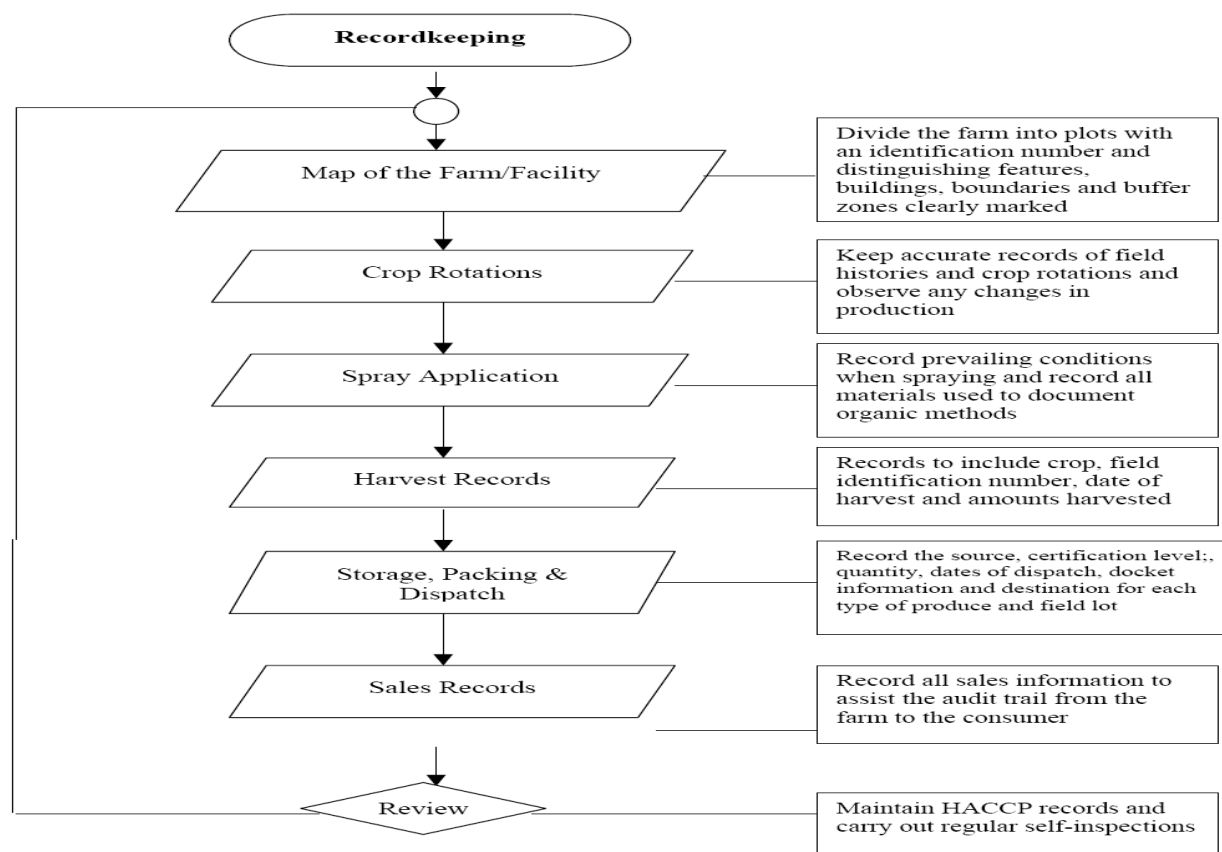


Fig. 5 Flow diagram for record keeping activities

An audit of the records should enable the tracing of produce from the customer back to the farm lot together with the processes used to grow, handle, package and transport the produce. It should be evident from an examination of Figure 5 (the Flow Diagram for Recordkeeping Activities) that crop rotations spray applications, harvest records and other required records are useful in

providing an audit trail. These records can also be used to identify the source of problems which might arise that need to be corrected. The storage, packing and dispatch records are now required in order to trace any problems to the particular batch of products. While growers may find keeping extensive records problematic at first, these sorts of documentation are now required for most

primary production and if pending legislation goes ahead, will be required for all primary producers. It should also be apparent that any producer that has a HACCP plan in place and who is in the process of reducing the use of chemicals could be seen as being in the very early stages of conversion. As well, the introduction of crop rotations and other

Stage 5: HACCP Manual

A HACCP manual is used as a verification procedure that the risk management plan is being implemented

mechanisms to improve soil management are another possible first step that is undertaken in following industry specific environmental codes of practice. The organic industry should view the wide training in and adoption of HACCP plans on farms in India as an opportunity for the organic industry to attract more producers into conversion programs.

according to the principles and guidelines set by the regulatory community.

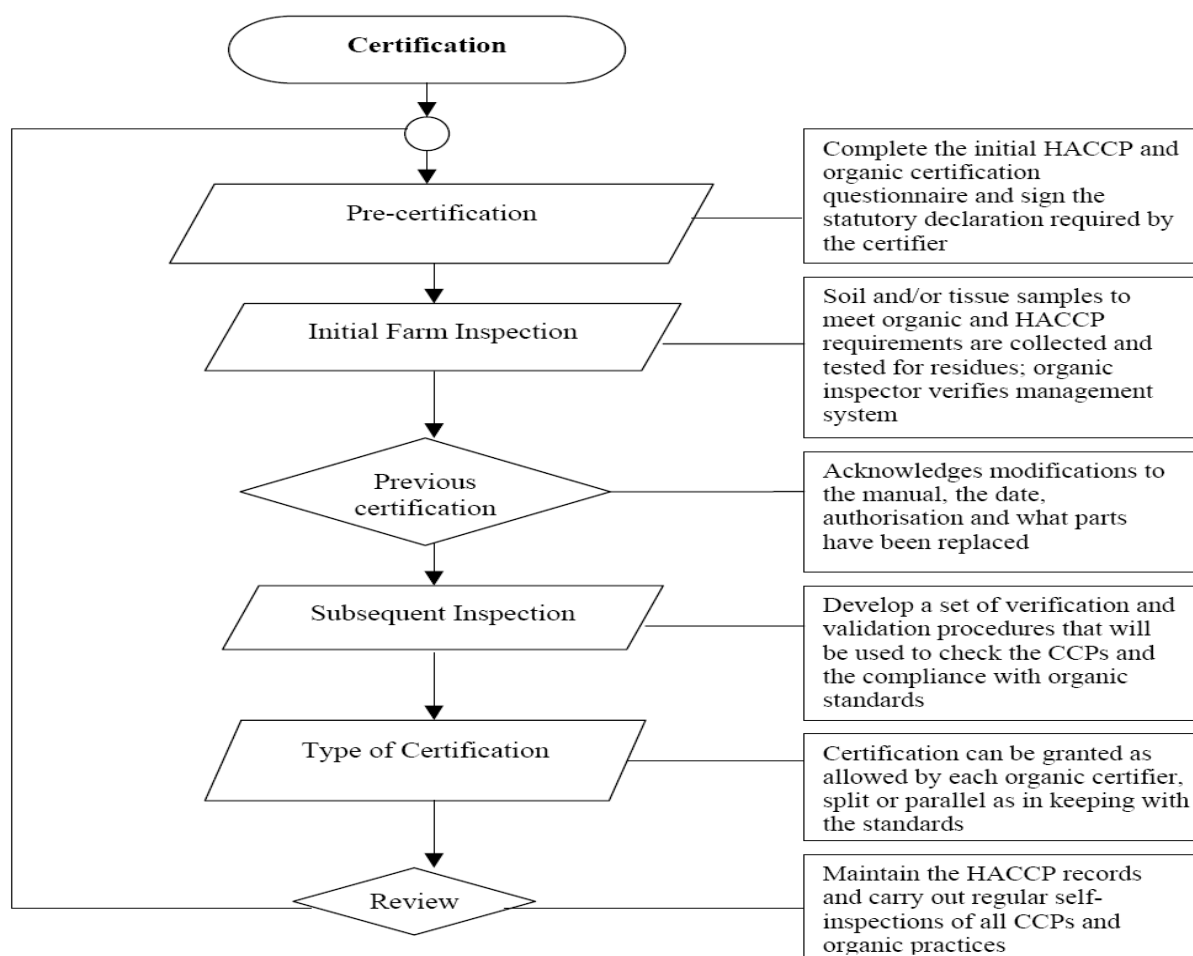


Fig. 6 Flow diagram for the certification process

There is no manual template as each farming operation is different and must be designed to suite each operation.

Stage 6: Certification

Certification will vary between applicants and the regulatory community,

however all operator must define their agricultural needs and follow the certification procedures while developing the HACCP Manual.

Conclusion

It should be evident that HACCP is based on flow diagrams and may well be a useful tool for producers and processors with minimal educational or record keeping skills. While the production of the diagrams can be complex, following the procedures is simplified by the setting out the steps to follow. Almost any type of process can be depicted in this way, hence its potential usefulness to certification bodies with complex organic standards to follow. The inspectors or auditors of the organic systems would certainly be assisted through the use of HACCP plans. The disadvantage of this system is the extensive requirements for documentation. However, it is patently obvious that commercial producers and processors will be required to keep extensive records in order to stay in business. There are useful software packages developed in Victoria that produce simplified HACCP plans along the lines of those depicted in this document. It is also obvious that the further development of organic standards needs to go further than merely accommodating HACCP planning as part of the process. HACCP is not applied to labeling as a logo or brand in the same manner that organic labels are applied. Yet there is an argument that it would be advantageous to have 'organic certified, quality assured' or some such wording as part of the organic labeling process. If this approach were taken, then organic certifiers could address this within their certification

process. The need to consider a 'higher level' HACCP program, such as SQF 2000 would depend on the market targeted and whether the organic grower was marketing domestically or exporting. Production standards, it would be advisable to work toward the integration of HACCP flow diagrams in publications that are intended to outline organic or conversion practices. This would most preferably be done in conjunction with HACCP programs that are already based within specific industries, such as meat and livestock or fruit and vegetable growing.

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