Integrated Fruit Production Guidelines for Apple Orchards in Canada

includes

The Canadian Apple Growers National IFP Self-Assessment Evaluation

Canadian Horticultural Council
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Canadian Horticultural Council

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Introduction

Integrated Fruit Production (IFP) is a systems approach, which promotes sustainable agriculture practices to produce optimal yields of high-quality fruit. IFP seeks to balance farm inputs with outputs, maintain environmental integrity and biodiversity in the rural landscape, and encompasses the entire farm as a unit for economically viable crop production.

Important principles of IFP are:

- IFP emphasizes the *minimal use of pesticides* through adoption of integrated pest management and other best management practices.
- The transition to IFP is a process. For apple growers the transition normally requires several progressive steps influenced by economics and increasing knowledge and comfort in using IFP practices.
- IFP requires *an interdisciplinary effort* to be successful. Partnerships and cooperation between growers, packers, retailers, extensionists, researchers, policy makers and consumers is crucial to IFP’s success.
- IFP provides the grower with the *ability to measure progress* in adopting integrated pest management, best management practices and contentious land stewardship on the farm.
- IFP promotes *economic, environmental and societal sustainability* at all levels of the food production chain.
- IFP is an *on-going, dynamic production system*. Fresh challenges will require new and innovative solutions, thereby further improving the sustainability of the program.
1. **Enhance economic viability of the apple industry by:**
   - Producing high-quality fruit in an economically and environmentally sound manner
   - Meeting international standards for fruit quality, environmental standards and food safety guidelines
   - Providing an alternative marketing tool for Canadian apples
   - Enhancing consumer confidence in food quality, food safety and environmental responsibility
   - Minimizing business risks and responding pro-actively to environmental and food safety issues

2. **Minimize negative impacts on environment and wildlife by:**
   - Reducing reliance on and use of pesticides and fertilizers
   - Protecting soil and water resources, air quality, and natural biodiversity

3. **Enhancing awareness, acceptance and adoption of sustainable apple production practices by:**
   - Providing Canadian apple growers with opportunity and incentive for education and learning in sustainable production practices and ethic
   - Supporting apple producers in taking a leadership role in the community by providing a safe workplace and ethical treatment of farm workers, proactively addressing issues arising at the rural-urban interface and recognition of farmers as stewards of the land

4. **Providing a framework and minimum standard for the development of provincial or other independent IFP protocols/standards for eco-marketing purposes or for individual growers or packers to evaluate their progress along the "IFP continuum."**

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**Purpose of the IFP Guidelines**

The following IFP Guidelines have been developed in general accordance with two internationally recognized standards – the International Organization for Biological Control (IOBC-WPRS)'s Guidelines for Integrated Production of Pome Fruits in Europe (1994, revised 2002) and the Euro Retailer Producer Working Group’s EUREPGAP Protocol for Fresh Fruit and Vegetables (2001).

*These IFP Guidelines are meant to be a guide and framework for sustainable apple production in Canada. They define a minimum standard and are intended to provide the framework for all provincial, regional and independent IFP standards and protocols. They also provide a means for Canadian apple growers to measure and improve their adoption and use of IFP practices on an ongoing basis.*
A. Orchard Planning/Pre-plant Preparation

Principle:
The long-term success and productivity of a new apple planting is very dependent on pre-plant site preparation. A "tired" soil, which has been in production for many years must be allowed to "rest" and additions of organic matter and required nutrients made before replanting. Proper site preparation may take several years but pays for itself in healthier trees and higher levels of quality fruit production in subsequent years.

Practices:

• When selecting a planting site first conduct a Environmental Risk Assessment (impact on water table, wetlands, adjacent properties, etc.) and develop a management plan

• Prior to planting research economics and market needs. If starting a PYO or farm market carefully consider location, client base and competition

• Considerations and improvements prior to planting should include site topography, soil characteristics, drainage, and grassed buffers for water bodies

• When possible avoid marginal soils (highly poor or thin soil structure, erodible land, frost pockets, poorly drained soils), and sensitive wildlife habitat

• Soil fumigation should only be used if nematode testing indicates necessary action or if re-plant disease/disorder is a concern. If an option, use alternatives such as plant nematode suppressant cover crops or fallow the land to reduce nematode populations

• In replant sites attempt to rotate out of apple orchard for at least one growing season. Plant plow-down green manure crops and add composted manure to build up organic matter and beneficial soil micro-organisms

• Use of GPS mapping is encouraged to better prepare and meet nutrient needs over the entire planned orchard

• Use cultural practices (i.e. fallowing, repeated plowing) and burn-off herbicides (such as glyphosate) to prepare a weed-free planting site

• Sod mixes must be selected for site suitability, compaction, shade and drought tolerance, and diversity. Consider establishing sod prior to planting, and then use burn-off herbicide to designate rows for planting

• Avoid legumes (e.g. clover) in sod mixes since they are alternate hosts to some pests (e.g. tarnished plant bug) and release nitrogen at
times of the year that may not be beneficial to apple trees
• A recommended orchard renovation rate is 4% per year
• When planning the planting consider sprayer limitations/requirements
• Match cultivars, rootstocks and tree densities based on soil, climate, and market needs
• Planting material should be sound and virus-free certified
• Plant new blocks with cross-pollination in mind. Alternate rows of pollen compatible varieties and use flowering crab apples for optimal pollination
• Tree support and irrigation should be installed at time of planting

B. Soil Management

**Principle:**
A healthy and productive soil is an essential component of integrated fruit production. A healthy, well-nurtured soil is one that has good depth, tilth and water holding capacity, high levels of organic matter, withstands compaction, has a balanced pH and nutrient content, has good aggregate stability and cation exchange capacity, supports healthy soil life, is resilient to degradation and erosion, is well-drained and is free of chemical residues. Healthy soils help reduce surface run-off; filter groundwater; bind and breakdown surplus pesticides; support a diverse array of beneficial soil microbes, insects, and earthworms; absorb, release and transform many different chemical compounds; make nutrients and water available to plant roots, store carbon (reducing greenhouse gas emission).

**Practices:**
• Maintain optimal pH of 6.2 to 7.0 and apply recommended amendments if soil is too acid or too alkaline
• Avoid driving heavy equipment over saturated soils to reduce compaction
• Strive for soil organic content of 2% or higher. Recycle and add disease-free organic material (e.g. prunings, mulched leaves, grass clippings) to the orchard
• Maintain records of soil tests, fertilizers, amendments and organic matter applied on the farm for a period of at least 5 years
C. Orchard Floor Management

**Principle:**
Well-managed orchard sods reduce erosion and leaching, improve soil structure, reduce nutrient loss, regulate soil pH, reduce the need for herbicides, discourage rodent pests, provide traction, maintain plant species diversity, and provide visual appeal for pick-your-own operations.

Management of the orchard floor "in-the-row" combines use of non-residual herbicides, cultural weed management and mulches to minimize weed competition with tree roots. Mulches aid in: reducing weed competition, enhancing moisture retention, adding organic matter, stimulating soil microbial life and earthworm activity, and providing protection from sudden extreme soil temperature changes.

**Practices:**
- Alleyways should be grassed to avoid soil erosion and ruts, and allow access for machinery during wet conditions
- Avoid excessive use of nitrogen and other fertilizers so as to prevent overly vigorous sod growth
- Mow sod to maintain a height of 10 to 15 cm (4 to 6 inches) to reduce competition and prevent provision of suitable small rodent habitat
- Fertilize sod lightly in the Fall, if required, to maintain healthy ground cover
- Use minimum width feasible for an "herbicide strip"
- Apply herbicides sparingly and minimize the use of residual herbicides
- Use of postemergence herbicides, such as glyphosate, will allow regrowth of weeds in late summer, resulting in uptake of any excessive nitrogen from the soil
- Experiment with various mulches, taking into consideration economics and benefits. Avoid mulches that are attractive to voles and mice
- Consider use of mechanical weed control techniques (e.g. flamers, hand-cultivation)
**D. Nutrition Management**

**Principle:**
A balanced fertilizer program is crucial in providing apple trees with the ability to optimize vegetative growth, and maximize quality fruit growth and development. The aim of a good nutrition program is to supply needed nutrients at times of the year when they are needed – based on the tree’s procession of activity (e.g. active root growth, shoot growth, and fruit growth and development). A strong, healthy tree, supplied with a balanced nutritional program, is best able to withstand climactic extremes and pest pressures.

**Practices:**

- A balanced nutrition program should be maintained, based on soil and leaf analysis. Timely corrections of nutrient deficiencies and excesses should be addressed as soon as possible
- Sample soil nutrient levels, pH and organic matter content at least every 3 to 4 years
- Conduct leaf analysis on individual orchard blocks at least every 2 years where feasible
- Avoid over-fertilization with nitrogen (leaching and ground water contamination potential) and phosphorous (contamination of water bodies)
- Follow provincial guidelines on application of recommended rates of nutrient fertilizers applied per hectare
- Experiment with the use of organic fertilizers (e.g. vegetative matter, grass mulch, etc.)
- Use of new technologies (e.g. GPS mapping) for each farm is encouraged to gain a better understanding of variable nutrient needs over the whole orchard
- Development of Nutrient Management Plans for the farm are encouraged (Note: NMPs may be mandatory in some provinces)
- Keep written records of all soil and foliar fertilizer applications, including rates, application techniques, and dates applied, and maintain for a period of at least 5 years

*A balanced nutrition program maintains healthy trees and a crop of high-quality fruit

photo: CHC*
E. Irrigation

**Principle:**
Water is an essential element for fruit trees, as it is for all living organisms. Apple trees require water for vegetative growth (roots, wood, leaves), flower formation and for fruit production. Environmental conditions – precipitation, soil properties, drainage, ground cover, weed competition – all affect water utilization by apple trees in an orchard. It is important to supply required water to the tree when there is a natural shortage, but to do so with minimal impact on aquatic ecosystems and hydrology.

**Practices:**
- To avoid tree stress, ensure adequate soil moisture and water needs are met at all times
- Based on an initial soil profile analysis, use weather networks, the internet, and irrometers to determine soil moisture requirements and irrigation scheduling
- Irrigation systems should be properly designed and sized for the operation
- Use most efficient water delivery system with least waste (e.g. trickle irrigation versus over-head)
- Manage irrigation systems to minimize risk of diseases like apple scab or fire blight
- Irrigation systems that are used to supply nutrients to trees (fertigation) should be fitted with an anti-backflow device to prevent contamination of water source
- Consult and comply with federal, provincial and municipal legislation regarding taking water from natural water sources and constructing water-holding structures (e.g. farm ponds)
F. Tree Training and Pruning

**Principle:**
The objective of tree training is to provide optimal interception and distribution of incident light for use in photosynthesis, fruit bud formation and attaining high fruit quality. Training, in non-bearing trees to form structure, and during production years to maximize light interception will optimize fruit quality on a consistent basis.

Pruning is an important tool in maintaining tree shape and structure, maximizing light interception, provides increased air flow for faster drying (thereby reducing disease establishment) and for increased spray penetration.

**Practices:**

- Prune dormant trees when required to maintain manageable, well-shaped trees, which allow optimum sunlight interception and spray penetration.
- Use strategic limb removal, and limb-spreaders, string and weights to achieve optimal/desired branch angles on young trees.
- Prevent excessive growth of established trees by using appropriate cultural techniques (balanced nutrition program, summer pruning, scoring, root pruning).
- Support trees on dwarfing rootstocks using individual posts or wire-and-post structures.
- On dwarfing trees maintain relatively weak lateral growth and remove any large limbs that are competing with the leader. It is recommended that any limb larger than 50% of the trunk diameter be removed.
Principle:
From an economic standpoint, the ultimate goal for any apple producer is to produce high-yielding trees with high-quality fruit. Obtaining the best possible quality fruit requires a harmonized approach to fruit production that takes into account many factors, some of them already described in previous sections. Attention to pollination requirements, fruit thinning of heavily cropped trees, nutrition, and pest management all play a factor in producing a premium quality crop.

Practices:
• Use recommended number of honeybee hives per hectare to ensure adequate pollination
• Chemically thin fruit to strive for optimum number of fruit and desired fruit size
• Use carbaryl as a chemical thinner sparingly and only on cultivars that do not respond well to hormone-type thinners. Use labelled rates and attempt to not use more than once per season on any given block or cultivar
• Apply hand thinning to cultivars where economically justified
• Maintain records of chemical fruit thinning treatments for a period of at least 5 years

Principle:
Integrated pest management is a systems approach to managing insect and mite pests, disease organisms and weeds in agricultural production. To succeed it must be both environmentally sustainable and economically viable. IPM is based on the philosophy of maintaining pest populations below economic thresholds by understanding their biology, regular and frequent monitoring, conservation of beneficial insects and mites, the use of sound cultural management practises, and the use of narrow-spectrum benign pesticides as a last resort only. The adoption and implementation of IPM practices on the farm is understood to be dynamic as new pests arise, pesticide resistance occurs, new knowledge is uncovered and new technologies are developed. Adoption and use of IPM practices should be an on-going process in orchards, as should a grower’s learning curve and knowledge of IPM in the context of more sustainable agriculture.
Practices:

- All apple orchards must be monitored on a frequent and regular basis for the presence and abundance of pests/diseases or their damage in order to determine the need for, timing and type of management action.
- Monitoring can be performed by either the grower, if familiar with monitoring techniques, by a pest management consultant or scout, or by a trained packinghouse field personnel.
- Use monitoring methods, development models and established economic thresholds prescribed for specific pests in your apple-growing region. Appropriate disease forecasting equipment and models (e.g. leaf wetness sensors for apple scab, Marybylt® for fire blight) should be used to determine the need for and timing of fungicide/bactericide sprays.
- Monitoring of beneficial insect and mite species is strongly recommended.
- Pesticides should be used only as a last resort, and selective, least toxic materials should be applied whenever possible.
- Encourage and conserve a diversity of beneficial insects and mites in the orchard by using pesticides that are least toxic to beneficials, apply border or spot sprays when feasible, and maintain nectar and pollen food sources for adult beneficial insects in and around the orchard.
- To manage/prevent pesticide resistance alternate chemical families where possible, ensure thorough coverage, apply pesticides only as and when needed. Do not exceed label rates and use no more than maximum number of applications listed on the label.
- Conduct pre-harvest fruit assessments to determine presence of problem pests.
- Maintain all pest monitoring sheets, weather and spray records, and decision-making rationales for a period of at least 5 years.
I. Vertebrate Pest Management

Principle:
A number of bird and mammal species can cause economic injury to orchards, either by gnawing or stripping bark off of tree trunks, eating young terminals and limbs, scraping antlers on branches or feeding directly on developing fruit. The aim of a vertebrate pest management program is to prevent economic losses to the crop and/or trees in an environmentally sound and humane manner.

Practices:
- To minimize build-up of rodent populations, keep floor vegetation less than 15 cm high during the growing season and less than 10 cm in the fall, clear vegetation and mulch from around trees bases in the fall, install raptor perches in and around orchards, and install mouse guards as needed
- Minimize use of rodenticides. If a rodenticide is necessary, use enclosed bait stations to prevent access by non-target animals. Anti-coagulant type rodenticides should be used in bait stations. Avoiding practice of broadcasting grain-baited pellets is strongly recommended
- Use exclusion technology (e.g. deer fencing) and/or repellents for managing other vertebrate pests where feasible
- Any physical removal (shooting, trapping, poisoning) of vertebrate pests (e.g. deer, groundhogs, gophers) should be done humanely and based on provincial and municipal regulations

The meadow vole, a pest in Eastern Canada orchards, is capable of significant damage to apples trees by “girdling” or removing the bark near the base of the tree

photo: OMNR

J. Pesticides: Use, Storage and Application

Principle:
Pesticides, because they pose potential health risks to humans and the environment, must be stored, mixed and applied with care. A primary aim of IFP is to reduce pesticide use and to use least toxic or non-chemical alternatives whenever possible. Pesticides can become ineffective due to development of resistance in pests; can adversely effect beneficial insect and mite populations, non-target wildlife and biodiversity; can leach and contaminate ground and surface water; can bio-magnify in the food chain; can pose risks to farm workers; and are often expensive to use. Adoption of IPM practices (see Integrated Pest Management section) are important in reducing pesticide use. Pesticide reduction benefits humans, wildlife diversity and the environment.
Practices:

- Pesticides must be used in accordance to label instructions and only pesticides registered under the Pest Control Products Act (PCPA) can be used
- Pesticides prohibited for use in provincial/regional IFP/IPM programs cannot be used at any time
- Pesticides used should be least toxic/disruptive products whenever possible. Toxicity to natural enemies should always be considered
- Accurate, complete and up-to-date spray records must be kept (see Section on Record Keeping/Farm Inspection/Certification)
- Proper personal protection equipment (PPE) must be worn by all persons handling and applying pesticides
- Always read the label before spraying any pesticide. Obey stated pre-harvest intervals and re-entry times
- Use sprayers appropriate in size to the planting
- Sprayer output should be matched to tree height and spacing. Use tree row volumes (TRV) to determine spray volume requirements
- Minimize pesticide drift and phytotoxic effects by avoiding spraying under windy conditions, hot temperatures and other weather extremes

K. Harvesting, Handling and Fruit Quality

Principle:

Often poor harvesting and handling of fruit can nullify the grower’s success in growing an excellent crop of high-quality apples. Close attention to fruit harvest and handling procedures can make a significant difference to a grower’s return. The process of apple harvesting and handling should be efficient while maintaining optimum fruit quality and minimizing negative impacts on the environment.

Practices:

- Prior to harvest ensure orchard floor is in good condition – eliminate ruts, groundhog/gopher holes, branches and other obstacles, and grade and smooth driveways in the orchard
- Train all pickers in correct ways of picking fruit, placing in bins and using harvest tools (baskets, ladders, etc.)
• Provide clean toilet and washing facilities to workers and train in basic hygiene. Have legislated/approved First Aid kit available in the field
• Clean bins of all organic debris prior to harvest
• Harvest fruit at correct maturity based on starch iodine testing, Brix, firmness, and other maturity indicators
• If frost occurs during harvest do not touch or move fruit until thawing is complete to prevent bruising
• Transport containers of picked fruit to storage in timely manner
• Maintain accurate harvest records for cultivar, farm block, and date of harvest for a period of at least 5 years
• Efficient use of post-harvest treatments to protect against storage disorders and breakdown on fruit destined for CA storage

L. Machinery and Equipment

Principle:
Choice of machinery that best fits orchard operations and the efficient maintenance and use of farm machinery can save growers thousands of dollars over the lifespan of the machinery. Environmental benefits can include less pesticide, less spray drift, less fuel and oil usage and less soil compaction.

Practices:
• Tractor size should be matched to orchard design and implements
• Tractors and other farm machinery should be maintained and operated based on manufacturers specifications
• Where orchard row width permits, it is suggested that tractors are fitted with cabs during pesticide applications
• All employees should be trained in the safe use of farm machinery
M. The Farmstead

**Principle:**

Apple growers and their families live on the farm and can be exposed to various health hazards around the farmstead. Various farm activities can also impact the environment (e.g. contamination of drinking water in water wells, poorly insulated barn structures can waste electricity, and old septic systems can contaminate streams and rivers). Managing the farmstead to provide a safe and comfortable environment to your family, your employees and yourself is always a priority.

**Practices:**

- Every farm should have a farmstead map indicating location of wells, septic systems, farm buildings, pesticide storages and fuel storage areas
- Wells should be well maintained to prevent surface water contamination
- Water wells which supply water for human consumption should be tested at least twice a year for bacteria and once every 3 years for pesticide and nitrate contamination
- Abandoned wells should be filled and plugged according to provincial regulations
- Storage of pesticides, fertilizers and petroleum products must follow provincial regulations/guidelines
- Use energy efficient lighting in barns and storages to save on electricity
- Landscape the farmstead to protect from prevailing winds and to control snow drifting; plant trees to provide summer shade and winter sun to housing units

N. On-Farm Food Safety

**Principle:**

Production of safe, wholesome fruit requires a non-contaminated environment. Apple growers can reduce the risk of contamination of fruit by using sound production methods and considering the following:

- Fertilizers can potentially contaminate tree fruit, either by microorganisms in manure or foreign toxic matter, such as mercury, arsenic, and lead in chemical fertilizers
Organic-based mulching material (e.g. straw, corn cobs, wood chips) can be extremely valuable to conserve water, inhibit weed growth, provide organic matter to the soil, and stimulate healthy soil life activity. But they can also represent a risk of chemical and microbial contamination.

All animals, including insects, birds, and other wildlife are potential sources of contamination to produce because they harbour or vector a variety of pathogens. Feeding by animals on fruit can also result in secondary contamination by pathogenic microorganisms. A sound integrated pest management (IPM) program in the orchard helps minimize these risks.

Contamination of fruit can also occur during harvest operations and transportation to packing house facilities. Sanitation and use of clean harvesting and transportation equipment can greatly reduce risks of microbial contamination of fruit.

**Remember, food safety begins at the farm!**

**Practices:**

1. **Production Site**
   - If the land is being used for the first time to plant a crop, ensure that the land is compatible for this purpose (i.e. not a land fill site or toxic waste site)
   - If the land was used for livestock production in the previous year ensure that any manure is incorporated into the soil prior to planting trees
   - Ensure that adjacent farm operations (e.g. chicken operation, hog farm) and non-farm uses (e.g. dump site, industrial refinery) do not have potential of contaminating your crop
   - Do not allow livestock to browse or forage in the orchard

2. **Use of Chemical and Organic Fertilizers**
   - Do not use road salt (sodium chloride) as a foliar calcium spray as it is not for agricultural use and may contain foreign matter
   - If using livestock manure ensure it is thoroughly composted or well-aged (at least one year) and do not mound around trunks. Spread thinly and if feasible, incorporate into the soil as soon as possible after application
Solid and liquid manure should only be used on orchards no closer than 4 months prior to harvest. In all cases, to ensure active microbial digestion, the soil must be sufficiently warm and moist.

Avoid application of sewage sludge or pulp factory waste.

Maintain records of sources of all fertilizers, type e.g. ammonium nitrate, composted chicken manure), rate applied per unit area, application date and orchard block(s) applied on. All farm records should be maintained for a period of 5 years.

3. Use of Mulching Materials

Ensure organic-based mulching material is not contaminated with chemical residues (agricultural and/or industrial) and/or pathogens if it is likely to come in contact with the crop.

Avoid using any livestock waste, composted or not, as mulch underneath trees.

Store mulching material in designated areas, separate from where produce, agricultural chemicals, cleaning agents, manure and packing materials are stored.

4. Water Sources and Uses in Field Production

Maintain wells in good working order and ensure wells and pumps are sealed to prevent surface runoff contamination and other microbial or chemical contaminants from leaching into the well.

When possible, install drip irrigation rather than overhead sprinklers to reduce the risk of contamination to fruit.

Prevent livestock and limit wild animal access to open water sources used for irrigation or filling of sprayers.

Water supply tanks and/or systems should be properly maintained and cleaned/sanitized at the beginning of the harvest season to prevent microbial contamination of water.

If purchasing and using tertiary water (i.e. town water) conduct regular testing (once every 6 months during the growing season) for pathogenic organisms such as E. coli bacteria.
5. *Fruit Harvesting and Handling Procedures*

- Harvesting containers should be inspected prior to usage to ensure their cleanliness and proper condition.
- All reusable harvesting containers should be properly cleaned, rinsed and sanitized, when appropriate, so as to remove any soil, plant or animal debris before they are reused.
- Harvesting containers should only be used for carrying harvested produce (i.e.: not to be used to carry agricultural chemicals, lubricants, oil, cleaning chemicals, plant debris, lunch bags, tools, etc).
- Harvest fruit at the correct maturity so as to minimize bruising, cuts, etc. that allow entry of bacteria and fungi.
- Produce should be loaded in such a fashion so as to prevent physical damage (e.g.: properly braced) and to allow proper air circulation.
- Products should be transported out of the field as soon as possible.
- Fruit should be transported to storage facility as quickly as possible to minimize microbial growth.
- Excess soil, dirt and mud should be removed from pallets returning from fields. This cleaning procedure should be done in the fields or in a designed and separate area so as to prevent contamination of growing and harvested produce.

6. *Transportation Equipment*

- Before loading transportation equipment inspect for odors or foreign material such as dirt, glass, oil, chemicals and plant or animal debris; insects or other pests or evidence of their presence; and wall, floor or ceiling defects (e.g.: wood, metal or plastic fragment that could penetrate and remain lodged in produce) that could contaminate the product. If evidence of the above clean prior to use.
- A fully completed bill of lading should be used as a transportation record.
**Principle:**
Farm labour is generally the single highest cost to an apple farm in Canada. The aim of any good farm manager is to ensure his/her workers are well trained in all aspects of their job, including safety. Common sense worker safety precautions and good living conditions (if workers are housed on the farm) are critical in maintaining a healthy and enthusiastic workforce.

**Practices:**
- Training must be provided to workers handling and applying pesticides and those operating heavy machinery
- Applicators must be equipped with suitable, approved protective clothing in accordance with pesticide label instructions
- Health and safety risks and accident/emergency procedures must be posted in an accessible area (e.g. outside pesticide storage, mixing area)
- When mixing pesticides correct handling and filling procedures, as stated on the label, should be followed
- Provide clean toilet and washing facilities to workers and train in basic hygiene. Have approved First Aid kit available in the work area
- All employment conditions must comply with federal and provincial regulations with regard to wages, workers age, working hours, living quarters on the farm and all other legal and health requirements

**Principle:**
Waste products, odours and noises are part of any farm operation. All waste products should be reused, recycled or disposed of properly. It is in the best interest of the farm owner to avoid conflicts with rural neighbours regarding noises and odour – a little common sense and cooperation can go a long way.

**Practices:**
- Use safe and legally accepted methods for disposal of excess post-harvest treatment solution (used for dipping fruit prior to placing in storage)
- Obsolete and deregistered pesticides should be disposed of at provincially regulated depots
• Farm wastes (such as packaging, preservatives, worn-out machinery, and construction material) should be reused, recycled or composted (if biodegradable)

• Organic crop debris (e.g. prunings, grass clippings, waste fruit) should be recycled on the farm

• A Waste Management Plan for the farm should be developed

• Ensure farm practices have minimal impact on neighbours (re. noise and odour). Obey all municipal noise and odour control by-laws

• Maintain good relationships with non-farm neighbours and local media

**Q. Environmental Stewardship**

**Principle:**
Every farmer, as a steward of the land, has the responsibility of conserving and improving soil resources, protecting the quality and supply of water resources, using hazardous materials wisely and safely, providing habitat for animals and plants, and respecting the diversity of nature.

**Practices:**

• Having an Environmental Farm Plan for your farm is strongly encouraged (if available in your province)

• Irrigation ponds, streams, wetlands, and other watercourses and shorelines should have grassed buffer zones

• Drains should be maintained with little or no erosion evident and have buffer strips for stabilization

• Spraying out ditch banks, woodlot edges, etc. along orchard perimeters must be avoided

• Avoid over-application of nitrogen (to prevent ground water leaching) and phosphates (to prevent de-oxygenation and algal growth in farm ponds and streams)

• Maintain floodplain areas with natural vegetation cover

• Marginal lands should be retired and converted to wildlife habitat. Plant vegetation for wildlife, provide feeding and nesting structures for birds

• Do not disturb nesting birds, fox dens and other non-nuisance wildlife, and preserve natural wildlife corridors (fencerows, hedgerows, grassed strips) and natural wetlands on the farm property

• Practice sustainable forest management on existing woodlots
Principle:
Keeping accurate records of farm activities can be extremely beneficial to the grower. They provide an historical record of farm activities, and allow faster and more informed responses to potential problems. Farm records are also useful in planning nutrition, IPM and irrigation scheduling programs, for insurance purposes and for legal situations.

Practices:
- Growers must keep updated and accurate records of sprayer maintenance and calibration, spray records, pest monitoring sheets, fertilizer and chemical thinner applications
- An orchard map and history (date of planting, distances, densities, #’s of trees, etc.) for each block should be maintained and each block should be individually identified for record-keeping purposes
- Pesticide application records should include: pesticide used, amount used per ha., date of application, target pest(s), reason for application, and any other data required by the certification body
- Growers are recommended to conduct their own annual audit using these National IFP Guidelines for Apple

Principle:
Learning and applying new knowledge is a life-long process. Growers using IFP practices need to be fully trained in its philosophy, goals and practical use. Continued learning can occur by attending workshops, conferences, field days and demonstrations, reading technical and trade publications, setting up demonstration blocks, participating in grower discussion groups, and by taking formal college or university courses.

Practices:
- Grower should be a member of a recognized grower organization
- Grower should understand and use an IPM manual(s) and IFP protocols/standards developed for their province
- Growers should attend workshops, courses, conferences, fruit schools, field days and fieldtrips on a regular basis (a minimum of 3 per year is recommended
• Growers are encouraged to initiate or participate in on-farm demonstration trials

• Groups of local growers are encouraged to form "Apple Study Groups" to discuss and update each other on production practices, marketing and events on a regular basis. Growers should encourage farm visits from study groups and tours to view both improvements and mistakes they have made

Principle:
IFP guidelines and protocols allow growers to measure their progress on the IFP Continuum (see Appendix I) and provide eligibility for a certification and labelling program. If certification of a product or an eco-label is to be used an independent inspection and certification program must be implemented in order to guarantee program credibility.

Practices:
• A grower or organization wanting to participate in an IFP program and use marketing channels requiring IFP certification must sign with appropriate provincial/regional organization

• Whole farms should participate in an IFP program

• Growers must be willing to allow inspection of farmstead, orchards, machinery, pesticide and fuel storages and have available all up-to-date, written records (i.e. leaf and soil analysis, sprayer servicing, monitoring sheets, spray records, etc.) at all times
Selected Resources Used to Develop the National IFP Guidelines for Apples:

*Guidelines for Integrated Production of Pome Fruits in Europe*

*EUREPAP Protocol for Fresh Fruit and Vegetables.*

*Nova Scotia Dept. of Agriculture and Fisheries Resource Stewardship Division website* www.gov.ns.ca/nsaf/rs/rsmenu.htm

*Guide de Gestion Intégrée des Ennemis du Pommier*

*Integrated Pest Management for Ontario Apple Orchards, Publication 310*

*Working Document: Integrated Pest Management Protocols for Ontario Apple Production*

*Ontario’s Environmental Farm Plan*
Ontario Soil and Crop Improvement Association, 2000

*Best Management Practices guides for Ontario*
(including Nutrient Management; Nutrient Management Planning; Pesticide Storage, Handling and Application; Integrated Pest Management; Irrigation Management; Water Management; Horticultural Crops, and Fish and Wildlife Habitat Management)

*Tree Fruit Production Guide*

*Steps to Success in Replanting*

*Management Guide for Low-Input Sustainable Apple Production*
USDA Northeast LISA Apple Production Project, 1990.
Appendix I: The IFP/IPM Continuum

The following outlines the stages an apple grower can progress through as he/she follows the IFP/IPM continuum.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Program</th>
<th>Decision Making Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>Calendar Spraying <em>(static phase)</em></td>
<td>• Routine pesticide applications</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Intelligent Pesticide Management <em>(transition phase)</em></td>
<td>• Application of pesticides based on advisory services, crop monitors and/or consultants&lt;br&gt;• Some selective use and timing of pesticides and rudimentary attempts at pesticide resistance management</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Integrated Pest Management <em>(dynamic phase)</em></td>
<td>• Use of crop monitoring, decision support systems and economic thresholds to time selective pesticides&lt;br&gt;• Use of cultural, biological and sanitary strategies to manage pests&lt;br&gt;• Emphasis on resistance management strategies and selective pesticide use and pesticide alternatives to reduce impacts on beneficials and non-targets, and protect groundwater, soil and air quality&lt;br&gt;• Whole farm approach&lt;br&gt;• Good level of grower training and use of IPM manual and other learning tools</td>
</tr>
<tr>
<td>Stage 4</td>
<td>Integrated Fruit Production <em>(dynamic phase)</em></td>
<td>• Integration of cultural, biological, and chemical strategies to manage pest complexes based on ecological principles&lt;br&gt;• Emphasis on good soil management, balanced nutrition programs, environmental farm stewardship, safe working conditions, consumer awareness, and sound promotion and marketing&lt;br&gt;• Whole farm/farmcommunity approach&lt;br&gt;• High level of on-going grower learning and training</td>
</tr>
</tbody>
</table>
**Acaricide**
A chemical used to control mites; also called miticide.

**Active ingredient**
That portion of a pesticide formulation that is toxic to pests.

**Application Rate**
The amount of a pesticide product or active ingredient applied to control a pest. It is usually expressed as amount per area (e.g., 30ml per 10m²), per length of crop row (e.g., 40 g per 10m length of row) or as a dilution (e.g., mix 50ml in 4L of water and spray to thoroughly wet foliage).

**Bacteria**
One-celled micro organisms, some of which cause disease in plants, insects or other animals. They can only be seen with a microscope.

**Biofix**
A biological fix point used to synchronize a degree-day model with insect development, such as the first capture of moths in a pheromone trap.

**Biological Control**
The use of beneficial species, such as predatory and parasitic insects, birds, nematodes, or disease organisms to suppress populations of pests.

**Broadcast Application**
An even application of a pesticide over an entire area, as opposed to treating part of the area or only individual plants in the area.

**Broad-spectrum pesticide**
A pesticide that will kill, or affect, a wide range of organisms in addition to the target pests. The opposite of a selective pesticide.

**Chemical hazards**
Chemicals (e.g. agricultural chemicals, cleaning agents, heavy metals, etc.) that have the potential to cause an adverse health effect.

**Clean water**
Water that does not contain pathogenic organisms at levels that compromise food safety.

**Compatibility**
Materials in a spray or dust mixture are compatible if one does not reduce the effectiveness of the other and if crop injury does not result from use of the combination.

**Composted Manure**
A solid, mature product resulting from composting, which is a managed process of bio-oxidation of a solid.

**Composting**
A managed process is which organic materials are digested aerobically or anaerobically by microbial action.
**Confidence Interval (CI)**
In statistics, the estimated mean, plus or minus a range within which one is confident that the true mean occurs. For instance, for a 95% confidence interval of 2.0 plus or minus 0.4, the estimate of the mean is 2, and if you were to repeat the experiment 100 times, in 95 of those experiments the estimated mean would fall between 1.6 and 2.4.

**Contact pesticide**
A compound that causes the death of an organism when it comes in contact with it; the pesticide does not need to be eaten or inhaled by the organism to be effective.

**Contaminant**
Any biological or chemical agent, foreign matter, or other substances not intentionally added to food, which may compromise food safety or suitability.

**Corrective action**
Any action taken to bring the process into control and manage any affected product when critical limits or other criteria are not met. The action is to be prompt and appropriate to the seriousness of the deficiency.

**Cross-contamination**
The introduction or occurrence of a contaminant from an outside source into the food or food environment.

**Ecosystem**
A system made up of a community of animals, plants and bacteria, and its interrelated physical and chemical environment.

**Facility**
Buildings and/or physical structures used for or in conjunction with harvesting, washing, sorting, storage, packaging, labelling, holding or transport of fresh produce.

**Farm**
Any premises or establishment in which fruit is grown and harvested, and the surroundings under the control of the same management.

**Food-contact surfaces**
Those surfaces that contact fresh produce and those surfaces from which drainage onto the produce or onto surfaces that contact the produce may occur during the normal course of operations. “Food-contact surfaces” includes equipment, such as containers and conveyor belts that contact fresh produce, used in harvesting, post-harvesting, and packing operations. It does not include tractors, forklifts, hand-trucks, pallets, etc. that are used for handling or storing large quantities of contained or packed fresh produce and that do not come into actual contact with the food.
**Food hygiene**
All conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain; farmer’s trees or vines to consumer’s home.

**Food safety**
Assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use.

**Formulation**
A mixture of active ingredient(s) with carriers, spreaders or other materials to improve the storage, mixing and/or application properties of a product.

**Fumigation**
The use of chemicals in gaseous form to destroy pests or disease organisms.

**Fungi**
A group of often microscopic organisms lacking chlorophyll (green colouring); they grow from microscopic spores. Many fungi cause plant diseases, such as rots, rusts, mildews, and blights; some species of fungi attack wood or cause decay in buildings and others cause diseases in insects. (Singular: fungus)

**Fungicide**
A pesticide used to control fungi that cause plant diseases.

**GAP**
Good Agricultural Practice, referring to practices used in the growing, harvesting, sorting, packing and storage operations to reduce chemical, biological and/or physical contamination.

**Hazard**
A biological, chemical or physical agent in or on food with the potential to cause an adverse health effect.

**Herbicide**
A pesticide used to kill plants and control vegetation.

**Hygiene**
A system or practice for promoting and maintaining good health, personal cleanliness and personal habits such as proper washing of hands.

**Insecticide**
A pesticide used to kill or repel insects.

**Insects**
An enormous group of organisms with hard exterior skeletons; the adults have a body divided into three segments (head, thorax and abdomen), with 3 pairs of legs and 1-2 pairs of wings (if present) attached to the thorax.
Glossary continued

**Key pest**
Pest around which management programs are built. Examples are codling moth, oriental fruit moth and cherry fruit fly.

**Lot**
Apples produced or packed during period of time identified by a specific code.

**Manure**
Organic agricultural waste consisting of excrement of livestock, solid or slurry animal manure, organic materials added for the absorption and collection of such waste, and mushroom media.

**Microbial insecticide**
A biological pesticide that contains microorganisms, such as bacteria, viruses, or fungi, that attack insects.

**Mites**
Minute animals having eight legs in the adult stage. There are harmful and beneficial species, closely related to spiders.

**Miticide**
A pesticide used to kill or repel mites.

**Monitoring**
A planned sequence of observations or measurements to assess whether a critical control point (or other activity) is under control.

**Nematicide**
A pesticide used to control nematodes.

**Nematodes**
A group of elongated, cylindrical worms, also called threadworms or eelworms. Some species attack roots or leaves of plants, others are parasites on animals or insects.

**Parasite**
An organism that lives on or in one of another species, from which it derives sustenance or protection. It usually does not benefit the host, and often does it harm. It may complete its life cycle without killing the host.

**Parasitoid**
An insect parasite, such as various wasp larvae that feed on immature stage of host.

**Pathogen**
A microorganism capable of causing disease or injury to humans.

**Pest**
Any animal such as birds, rodents, insects, and weeds, which can affect tree health, reduce yields, or carry pathogens that can contaminate food.

**Pest Control Products Act**
Federal Act administered by Agriculture Canada. The Act provides
that, in order to be registered for sale in Canada, a pesticide must be accompanied with evidence of effectiveness for the purposes claimed, and it must be accurately labelled as to directions for use. Registration is authorized by the Plant Products Division of Agriculture Canada.

**Pesticide**
A chemical or chemical formulation used to control or destroy weeds, insects, mites, nematodes, rodents, fungi and other types of organisms injurious to plants or animals, including man.

**Pesticide residue**
A deposit that remains in, or on, a product following application of a pesticide.

**Phenology**
The relationship between the climate and biological events, such as flowering or leafing out in plants.

**Phenology model**
A model based on accumulated heat units used to predict significant events in the life cycle of a plant or insect (e.g. full bloom, egg hatch).

**Pheromone**
A chemical compound given off by an insect to communicate with other insects of the same species.

**Phytotoxic**
Damaging or injurious to plants, often by destroying the protective surface on plant leaves.

**Potable Water**
Water safe for drinking, free of pathogens.

**Quantitative Measurement**
Provides measurable information in terms of numbers, proportions or other quantities.

**Random Sampling**
Collecting samples based on chance, rather than on making conscious choices for each sample, ensuring that the samples collected are likely to show an accurate estimate of the situation.

**Residual Pesticides**
Products that continue to have killing or repellent effect for a period of time (e.g. weeks or months) after application.

**Residue tolerance**
The maximum amount of pesticidal residue that may lawfully be present in, or on, a food product offered for sale. It is expressed in parts per million (ppm).

**Risk**
An estimate of the likelihood of occurrence of a hazard.
Glossary continued

**Sanitation**
The use of sanitary practices and sanitizers to remove unhealthy elements (microbes) and carriers of certain elements (soil) from produce.

**Secondary pest**
A pest which feeds on vegetative tissue (e.g. leaves) and is therefore less important than a key or primary pest. Examples are aphids, mites and leafhoppers.

**Selection**
A process by which certain organisms or characters are favoured or perpetuated in preference to others.

**Selective pesticide**
A material that destroys or repels a limited group of organisms; e.g., a selective insecticide may kill sucking insects (e.g. aphids, leafhoppers) but not harm beneficial insects.

**Semiochemicals**
“Message chemicals” that are used by insects as signals; some are produced by plants and attract or repel insects (e.g. kairomones), others are produced by insects to communicate alarm or attract mates (e.g. pheromones).

**Species**
The basic unit of classification of living organisms. A class of similar insects that generally interbreed only among themselves; a subdivision of a genus.

**Spot Treatment**
An application of a pesticide to localized or restricted areas (e.g., a certain cultivar or block in the orchard) as opposed to a broadcast treatment that involves a uniform application over an entire orchard.

**Spray**
A pesticidal formulation dissolved or suspended in liquid (usually water or oil), so that it can be applied in fine droplets.

**Toxic**
Able to poison a living organism; poisonous.

**Toxicity**
The degree to which a substance is poisonous or injurious to a plant or animal. Toxicity is one consideration in assessing the hazard in handling a particular pesticide.

**Water Supply**
Includes municipal water, community well, private well, irrigation well, watercourse, cistern, reservoir, river, pond and lakes.
The National Integrated Fruit Production (IFP) Guidelines, developed for the Canadian apple industry by the Canadian Horticultural Council (CHC), have several objectives:

1. Maintaining economic viability and global competitiveness of our apple industry by:
   - Producing optimum yields of high-quality fruit economically
   - Meeting international standards for sustainable food production protocols
   - Providing an alternative marketing tool for Canadian apples
   - Maintaining consumer confidence in food quality, food safety and environmental responsibility

2. Minimizing negative impacts on our environment and wildlife by
   - Reducing the use of agrochemicals and other chemical inputs
   - Protecting soil and water resources, air quality, and natural habitat
   - Raising awareness and appreciation for sustainable farming practices

3. Ensuring responsible attitude towards farm worker health and safety, rural neighbours and society at large by:
   - Supplying on-farm workers with safe work conditions and adequate training
   - Maintaining good relationships with non-farm neighbours and the press
   - Providing the public with an educated view of sustainable agriculture

4. Providing a framework and minimum standard for the development of provincial or other independent IFP protocols/standards for eco-marketing purposes or for individual growers or packers to evaluate their progress along the "IFP continuum."

Additionally, the National IFP Guidelines can be a valuable tool for you, the apple producer, by allowing you to evaluate and self-assess your own farm and your farm management practices. The following Self-Assessment Evaluation will allow you to measure your level of adoption of the National IFP Guidelines and indicate where improvements are possible.
Familiarize yourself with the National Integrated Fruit Production Guidelines. Following harvest read through the questions in this document and answer either "Yes" or "No" with a for each question. If you answer "No" to a question also check off a reason in the "Barriers to Putting Practice into Action" column. Descriptions of what each number associated with a Barrier to Action means are given below.

This evaluation should take you no more than 45 minutes to an hour to complete and will provide you with valuable information on how you can continue to make your orchard operation more sustainable, especially when completed and measured against previous assessments on an annual basis.

1. The expertise or information was not available to allow me to implement this practice.
   *Example: No information found in literature or on the internet on using organic mulches*

2. The materials or services were not available for me to implement this practice.
   *Example: No commercial source for purchasing predatory mites was found.*

3. The cost of implementing this practice is too high.
   *Example: Financial resources unavailable to purchase a smaller tractor for new experimental high density planting.*

4. This practice is just not practical or realistic on my farm.
   *Example: Limited land base does not allow for maintaining any in a natural state.*

5. Although I don't consider this practice an immediate priority I intend to implement within the next few years.
   *Example: Building a new pesticide storage with separate areas for storing different types of pesticides.*

   *Example: Mating disruption technology not yet registered*
The point scoring system is meant for individual growers to be able to establish a baseline for their orchard management program, and to provide a continuum upon which growers can strive to annually improve their sustainable IFP practices as part of their total orchard operation. By assessing their IFP program on an annual basis new benchmarks can be realized every year and continual improvements strived for.

Points range from 1 to 3 per activity. The number of points awarded to each activity is based on a combination of economic, good management and environmental factors (e.g. most points for actions that benefit the environment and safe production practices, while maintaining economic viability). "B" denotes bonus points for optional practices that can help (1) protect the environment by reducing fertilizer and/or pesticide use, protecting natural resources (soil, water, air, wildlife) or (2) improve management practices and decisions (e.g. developing nutrient and waste management plans).
### A. Orchard planning/ pre-plant preparation

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Points</th>
<th>Yes</th>
<th>No</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Was an environmental risk assessment conducted on the new site and a management plan developed based on this assessment?</td>
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<tr>
<td>2. Were improvements made (re. tile drainage, weed management and soil nutrition) prior to planting?</td>
<td>2</td>
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<tr>
<td>3. If soil fumigation was used, was it justified by previous history of replant problems or by a nematode test?</td>
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<td>4. Were nematode suppressant cover crops planted as an alternative to fumigation?</td>
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<td>5. Were soil tests and/or GPS mapping used to determine nutrient needs prior to planting?</td>
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<tr>
<td>6. Were residual herbicides avoided in favour of burn-off herbicides to prepare a weed-free site?</td>
<td>2</td>
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<tr>
<td>7. Was the sod mix for the orchard selected based on site conditions and needs?</td>
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<tr>
<td>8. Was a legume-free sod mix used for the new planting?</td>
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<tr>
<td>9. Were cultivars, rootstocks and tree densities selected based on soil, climate and market needs?</td>
<td>3</td>
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<td>10. Were flowering crabs and/or pollen-compatible cultivars inter-planted to enhance pollination?</td>
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<tr>
<td>11. Were irrigation and tree support systems installed at time of planting?</td>
<td>2</td>
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</table>
### B. Soil Management

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Points</th>
<th>Yes ✓</th>
<th>No ✓</th>
<th>1</th>
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<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Was pH of orchard soil maintained between of 6.2 to 7.0 pH??</td>
<td>2</td>
<td></td>
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<tr>
<td>2. Was a organic matter content of the soil kept at 2% or higher?</td>
<td>2</td>
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<td>3. Were organic amendments (mulches, grass clippings, etc.) applied to the orchard floor?</td>
<td>2</td>
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</tbody>
</table>

### C. Orchard Floor Management

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Points</th>
<th>Yes ✓</th>
<th>No ✓</th>
<th>1</th>
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<th>5</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Are alleyways sodded to prevent erosion?</td>
<td>2</td>
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<td>2. Was excessive nitrogen application to the sod avoided?</td>
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<td>3. Is postemergent residual herbicide use avoided?</td>
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<td>4. Were mechanical weed control techniques being used?</td>
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</table>
### D. Orchard Floor Management

<table>
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<tr>
<th>Management Practice</th>
<th>Points</th>
<th>Yes ✓</th>
<th>No ✓</th>
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</thead>
<tbody>
<tr>
<td>1. Is soil analysis conducted on a regular basis (every 3 to 4 years)?</td>
<td>2</td>
<td></td>
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<tr>
<td>2. Is leaf analysis conducted on a regular basis (every 1 to 2 years)?</td>
<td>2</td>
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<tr>
<td>3. Were corrections to nutrient deficiencies made based on leaf and soil analysis and on provincial recommendations?</td>
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<td>4. Was overfertilization with nitrogen avoided at all times?</td>
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<tr>
<td>5. Were organic fertilizers used?</td>
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<tr>
<td>6. Were new technologies (e.g. GPS mapping) used to gain a better understanding of nutrient needs throughout the orchard?</td>
<td>B1</td>
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<tr>
<td>7. Have Nutrient Management Plans been developed for the farm?</td>
<td>B1</td>
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</table>

### E. Irrigation

<table>
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<tr>
<th>Management Practice</th>
<th>Points</th>
<th>Yes ✓</th>
<th>No ✓</th>
<th>1</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Is an irrigation system being used in the orchard?</td>
<td>1</td>
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<tr>
<td>2. Was the system designed and sized to match the water requirements of your operation?</td>
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<tr>
<td>3. Was irrigation scheduling based on use of moisture monitoring devices or weather forecasting?</td>
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<tr>
<td>4. If using fertigation, were anti-backflow devices utilized to prevent source water contamination?</td>
<td>2</td>
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<tr>
<td>5. Was operation in compliance with all federal, provincial and/or municipal water taking regulations?</td>
<td>1</td>
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</table>
### F. Tree training and pruning

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Points</th>
<th>Yes ✓</th>
<th>No ✓</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Were trees (winter) pruned regularly to optimize sunlight distribution and interception?</td>
<td>2</td>
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<tr>
<td>2. Was summer pruning practiced on blocks where required?</td>
<td>2</td>
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<tr>
<td>3. Were limb-spreaders, string or weights used to achieve optimal limb angles to encourage fruiting wood production?</td>
<td>1</td>
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<tr>
<td>4. Is a support system in place for plantings of trees on size-controlled rootstock?</td>
<td>2</td>
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<tr>
<td>5. Were strong limbs that compete with the leader removed and weaker laterals maintained (especially on size-controlled trees)?</td>
<td>1</td>
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</table>

### G. Quality Fruit Production

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Points</th>
<th>Yes ✓</th>
<th>No ✓</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Were numbers and placement of strong honeybee hives during bloom optimized for tree density?</td>
<td>2</td>
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<tr>
<td>2. Were chemical thinners applied to prevent biennial bearing and improve fruit quality?</td>
<td>1</td>
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<tr>
<td>3. Was carbaryl use, as a thinner, restricted to cultivars that do not respond to hormone-type thinners?</td>
<td>1</td>
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<tr>
<td>4. Was hand thinning practiced?</td>
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</table>
**H. Integrated Pest Management**

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Points</th>
<th>Yes ✓</th>
<th>No ✓</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Was your orchard monitored for pests on a regular and frequent basis (i.e. once weekly) during the growing season?</td>
<td>3</td>
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<tr>
<td>2. Was a IPM practitioner (e.g. fieldman or consultant) or IPM scout used to monitor your orchard?</td>
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<tr>
<td>3. Were disease forecasting/prediction models used to time fungicide applications?</td>
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<tr>
<td>4. Was information collected from pest monitoring used to help make pest management decisions?</td>
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<tr>
<td>5. Were established thresholds utilized to make pest management decisions?</td>
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<tr>
<td>6. Were beneficial insects and mites monitored and is information collected used to help make pest management decisions?</td>
<td>B2</td>
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<tr>
<td>7. Were pesticides used only as a last resort (i.e. economic threshold reached and other options are unlikely to provide satisfactory control)?</td>
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<tr>
<td>8. Were reduced risk, most IPM-compatible pesticides used whenever possible?</td>
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<tr>
<td>9. Was rotation of pesticide families used where possible to reduce risk of resistance development?</td>
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<tr>
<td>10. Where possible, were border sprays used to manage key pests (e.g. plum curculio, codling moth, apple maggot)?</td>
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<tr>
<td>11. Were pre-harvest fruit damage assessments conducted?</td>
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</table>
# I. Vertebrate Pest Management

<table>
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<tr>
<th>Management Practice</th>
<th>Points</th>
<th>Yes ✓</th>
<th>No ✓</th>
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</thead>
<tbody>
<tr>
<td>1. Was orchard floor vegetation cut to 10 cm during fall and winter to discourage voles and mice?</td>
<td>2</td>
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<tr>
<td>2. Was use of broadcasted, baited rodenticides avoided?</td>
<td>2</td>
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<tr>
<td>3. Were bait stations utilized to minimize non-target wildlife poisoning?</td>
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<tr>
<td>4. Were repellents and/or exclusion methods (i.e. fencing) used to discourage deer?</td>
<td>B2</td>
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<tr>
<td>5. Have raptor perches and nest boxes been installed around the orchard?</td>
<td>B1</td>
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<tr>
<td>6. Is removal of deer, gophers, groundhogs, etc. done humanely and according to provincial/ municipal by-laws?</td>
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</table>
J. Pesticide: Use, Storage and Application

<table>
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<tr>
<th>Management Practice</th>
<th>Points</th>
<th>Yes ✓</th>
<th>No ✓</th>
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<th>4</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Were all pesticides used in accordance with label instructions and only those registered under the PCP Act applied?</td>
<td>1</td>
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<tr>
<td>2. Did all persons handling and applying pesticides have required training and certification?</td>
<td>2</td>
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<tr>
<td>3. Does pesticide storage comply with all provincial regulations?</td>
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<tr>
<td>4. Are insecticides, fungicides and herbicides stored apart from each other?</td>
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<tr>
<td>5. Was proper personal protection equipment worn by spray applicator(s) at all times?</td>
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<tr>
<td>6. Were tree row volume (TRV) calculations used to match sprayer output to tree canopy volume?</td>
<td>3</td>
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<tr>
<td>7. Were pesticide applications avoided under adverse conditions (i.e. extreme heat and cold) to avoid plant phytotoxicity?</td>
<td>1</td>
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<tr>
<td>8. Was orchard spray drift minimized by avoiding spraying during windy conditions?</td>
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<td>9. Were sprayers calibrated at least once annually?</td>
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<td>10. Were nozzles cleaned &amp; replaced as needed?</td>
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### K. Harvesting, Handling and Fruit Quality

<table>
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<tr>
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<th>Points</th>
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<th>No ✓</th>
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</thead>
<tbody>
<tr>
<td>1. Were orchard floor and drive alleys prepared (ruts graded and obstacles removed) prior to harvest?</td>
<td>1</td>
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<tr>
<td>2. Were bins cleaned of any organic matter prior to harvest?</td>
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<tr>
<td>3. Were all pickers training in correct fruit picking and handling procedures?</td>
<td>2</td>
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<tr>
<td>4. Were fruit maturity indices (i.e. starch-iodine, Brix, firmness, etc.) utilized to accurately time harvest of fruit?</td>
<td>2</td>
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<tr>
<td>5. Was harvested fruit transported to storage in timely manner?</td>
<td>1</td>
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### L. Machinery and Equipment

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<th>Points</th>
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<th>No ✓</th>
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</thead>
<tbody>
<tr>
<td>1. Is tractor size matched to orchard design and implements?</td>
<td>3</td>
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<tr>
<td>2. Is all farm machinery maintained to manufacturers specifications and recommendations?</td>
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<tr>
<td>3. Is a cab installed on tractors used for pesticide applications?</td>
<td>2</td>
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</table>
### M. The Farmstead

<table>
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<tr>
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<th>Points</th>
<th>Yes ✓</th>
<th>No ✓</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Has a farmstead map been developed indicating locations of pesticide and fuel storages, wells, septic systems, farm buildings, etc.?</td>
<td>B2</td>
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<tr>
<td>2. Are water wells, used for supplying drinking water to the farmhouse, tested at least twice annually for bacteria and nitrates, and once every 3 years for pesticides?</td>
<td>3</td>
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<td>3. Are abandoned wells filled and plugged?</td>
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<tr>
<td>4. Do distances of storages and septic system from farm domicile and wells meet provincial regulations?</td>
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<tr>
<td>5. Are energy saving measures (i.e. fluorescent lighting in barn) being used?</td>
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### N. On-Farm Food Safety

#### a. Production Site

<table>
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<tr>
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<th>Points</th>
<th>Yes ✓</th>
<th>No ✓</th>
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</thead>
<tbody>
<tr>
<td>1. Were soil tests conducted for toxic residues prior to orchard planting?</td>
<td>B2</td>
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<tr>
<td>2. If the land was previously used for livestock production, was manure incorporated prior to planting?</td>
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<tr>
<td>3. Is livestock grazing in the orchard avoided?</td>
<td>1</td>
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<tr>
<td>4. Have you taken appropriate measures to prevent drifting and leaching of agricultural contaminants and/or manure storages from adjacent properties?</td>
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<tr>
<td>5. If there are industrial activities in your neighbourhood, have you evaluated contamination risks caused by air water and soil pollution?</td>
<td>1</td>
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</table>
### N. On-Farm Food Safety
#### b. Use of Chemicals and Organic Fertilizers

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Points</th>
<th>Yes ✓</th>
<th>No ✓</th>
<th>1</th>
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<th>4</th>
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</thead>
<tbody>
<tr>
<td>1. Did you avoid applying any non-agricultural products (e.g. road salt) to your trees?</td>
<td>1</td>
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<tr>
<td>2. If you store manure on the property, is it located at least 30 m away from the orchard, and not in the path of farm traffic?</td>
<td>B1</td>
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<tr>
<td>3. Is surface run-off from manure piles directed away from orchards?</td>
<td>B1</td>
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<tr>
<td>4. If you used livestock manure, was it thoroughly composted prior to application?</td>
<td>B2</td>
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<tr>
<td>5. Was application of sewage sludge and pulp waste avoided?</td>
<td>2</td>
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</tbody>
</table>

#### N. On-Farm Food Safety
#### c. Use of Mulching Materials

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Points</th>
<th>Yes ✓</th>
<th>No ✓</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. If using organic mulch, was care taken to procure uncontaminated materials?</td>
<td>B1</td>
<td></td>
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<td></td>
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<tr>
<td>2. Was the use of livestock waste as mulch avoided?</td>
<td>B1</td>
<td></td>
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<tr>
<td>3. Were mulching materials stored in designated areas?</td>
<td>B1</td>
<td></td>
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</tbody>
</table>
### N. On-Farm Food Safety

#### d. Water Sources and Uses in Field Production

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Points</th>
<th>Yes ✓</th>
<th>No ✓</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Are all wells and well covers inspected regularly and maintained in good working order? Are casings sealed against surface water contamination and wildlife access?</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2. Was drip/trickle irrigation used to reduce contamination risks?</td>
<td>1</td>
<td></td>
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<td></td>
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<tr>
<td>3. Were livestock prevented from having direct access to water sources?</td>
<td>B2</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>4. Were grassed buffers and runoff control structures implemented around surface water sources?</td>
<td>2</td>
<td></td>
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<tr>
<td>5. Is surface water run-off directed away from water supply?</td>
<td>2</td>
<td></td>
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<td></td>
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<tr>
<td>6. Although there are no standards in place, was irrigation water quality monitored, especially prior to harvest?</td>
<td>1</td>
<td></td>
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<tr>
<td>7. If using tertiary water sources (i.e. town water), was regular testing (every 6 months) for bacteria conducted?</td>
<td>1</td>
<td></td>
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</tbody>
</table>

### N. On-Farm Food Safety

#### e. Fruit Harvesting and Handling Procedures

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Points</th>
<th>Yes ✓</th>
<th>No ✓</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Was fruit harvested at the correct maturity to avoid bruising and cuts?</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Were pickers trained in proper harvest procedures (i.e. discarding damaged fruit)?</td>
<td>2</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>3. Was fruit loaded so as to prevent physical damage and to allow good air circulation?</td>
<td>1</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>4. Was fruit transported to storage facility as quickly as possible?</td>
<td>1</td>
<td></td>
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</table>
### N. On-Farm Food Safety

#### f. Harvesting Containers

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Points</th>
<th>Yes ✓</th>
<th>No ✗</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Are all harvesting containers made of non-toxic, clean materials?</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Were harvesting containers inspected prior to harvest to ensure they were sound and clean?</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. After use, were all harvesting containers cleaned of any soil or plant debris?</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>4. Are harvesting containers restricted to their proper use, and not for transport of any other materials (e.g. chemicals, oil, tools, lunch containers, etc.)?</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
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</table>

#### g. Transportation Equipment

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Points</th>
<th>Yes ✓</th>
<th>No ✗</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Were pallets and bins inspected and cleaned of all debris prior to use?</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Was transportation equipment inspected for cleanliness prior to use?</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>3. Was a fully completed bill of lading recorded for each transported unit of fruit?</td>
<td>1</td>
<td></td>
<td></td>
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</tbody>
</table>
### O. Worker and Workplace Safety/Welfare

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Points</th>
<th>Yes ✓</th>
<th>No ✓</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Have workers been trained/certified in operating farm machinery and in pesticide handling and application?</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2. Have employees been provided with approved safety wear and equipment?</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>3. Are emergency and first aid procedures posted in accessible areas?</td>
<td>2</td>
<td></td>
<td></td>
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<tr>
<td>4. Is an approved First Aid kit available in work areas?</td>
<td>2</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>5. Are clean toilet and washing facilities available for orchard workers?</td>
<td>2</td>
<td></td>
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<tr>
<td>6. Do all employment conditions (i.e. pay rate, housing, work hours, etc.) comply with federal and provincial regulations?</td>
<td>1</td>
<td></td>
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</tbody>
</table>

### P. Waste Management/Odour and Noise Pollution Management

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Points</th>
<th>Yes ✓</th>
<th>No ✓</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Were any obsolete or old pesticides deposited at provincially-approved waste depot</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2. Was excess post-harvest treatment solution disposed of legally and safely?</td>
<td>1</td>
<td></td>
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<tr>
<td>3. Are all attempts made to re-cycle any organic waste (i.e. prunings, grass clippings)?</td>
<td>1</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>4. Has a Waste Management Plan been developed for the farm?</td>
<td>B2</td>
<td></td>
<td></td>
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<tr>
<td>5. Are all municipal by-laws on noise and odour obeyed?</td>
<td>1</td>
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<tr>
<td>6. Is an active and on-going effort made to maintain good non-farm neighbour and local media relations?</td>
<td>2</td>
<td></td>
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</table>
## Q. Environmental Stewardship

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Points</th>
<th>Yes ✓</th>
<th>No ✓</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Do you have an Environmental Farm Plan (if available in your province)?</td>
<td></td>
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<tr>
<td>2. Do all watercourses have grassed buffer strips?</td>
<td>2</td>
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<tr>
<td>3. Are drains stabilized and maintained to prevent erosion?</td>
<td>2</td>
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<td></td>
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<tr>
<td>4. Was spraying of non-crop vegetation avoided and was there sufficient separation distance to water bodies?</td>
<td>2</td>
<td></td>
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<tr>
<td>5. Are floodplain areas, hedgerows, and windbreaks maintained with natural vegetation?</td>
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<tr>
<td>6. Have marginal lands been retired for wildlife habitat?</td>
<td>B2</td>
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<tr>
<td>7. Is sustainable woodlot management being practiced on any wooded areas on the farm?</td>
<td>B1</td>
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</table>

## R. Record Keeping

<table>
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<tr>
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<th>Points</th>
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<th>No ✓</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Does your farm have a current (within last 5 years) business plan?</td>
<td>3</td>
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<tr>
<td>2. Are orchard maps indicating cultivars, row lengths and spacings available?</td>
<td>1</td>
<td></td>
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<tr>
<td>3. Were written records maintained for all fertilizers and organic amendments applied to the orchard?</td>
<td>2</td>
<td></td>
<td></td>
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<tr>
<td>4. Were written spray records and justifications for pesticide applications maintained?</td>
<td>3</td>
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<tr>
<td>5. Were records of all water testing maintained?</td>
<td>1</td>
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<tr>
<td>6. Were accurate harvest records maintained for all blocks and cultivars?</td>
<td>2</td>
<td></td>
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</table>
### S. Education and Training

<table>
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<tr>
<th>Management Practice</th>
<th>Points</th>
<th>Yes ✓</th>
<th>No ✓</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Barrier to putting action into practice ✓</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Are you a member of a recognized grower organization?</td>
<td>1</td>
<td></td>
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</tr>
<tr>
<td>2. Do you attend at least 3 IPM or pesticide safety workshops/schools/courses a year?</td>
<td>2 pt. for each; max. 6</td>
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<tr>
<td>3. Do you host at least one grower tour/workshop on your farm every three to four years?</td>
<td>B1</td>
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<tr>
<td>4. Do you conduct or participate in any on-farm demonstration trials?</td>
<td>1 pt. for each; max. 3</td>
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</tbody>
</table>

**Please indicate which IPM workshops/courses attended in current year:**

1. 
2. 
3. 
4. 
5. 

**Please describe your on-farm demonstration project(s):**

____________________________________________________________________
____________________________________________________________________

**Partners (if any):**

____________________________________________________________________

### T. IFP Certification and Marketing

<table>
<thead>
<tr>
<th>Management Practice</th>
<th>Points</th>
<th>Yes ✓</th>
<th>No ✓</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Barrier to putting action into practice ✓</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Do you participate in a provincial IFP program for the purposes of marketing and selling your fruit as &quot;IFP&quot; or &quot;ecologically&quot; certified?</td>
<td>B3</td>
<td></td>
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<tr>
<td>2. Did you have a third party inspect and certify your IFP program?</td>
<td>B2</td>
<td></td>
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</tbody>
</table>

**Please indicate which ecolabel/brand your apples are marketed under:**

____________________________________________________________________
### My IFP Self-Assessment Evaluation

(The following evaluation is for your own use, so that you can better assess your progress in implementing and using Integrated Fruit Production practices on your farm from year to year).

<table>
<thead>
<tr>
<th>Management Category</th>
<th>Total Points Available</th>
<th>Bonus Points Available</th>
<th>My Points</th>
<th>My Points Last Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Orchard Planning/Pre-plant Prep.</td>
<td>18</td>
<td>5</td>
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<tr>
<td><strong>SUB-TOTAL</strong></td>
<td><strong>18</strong></td>
<td><strong>5</strong></td>
<td></td>
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<tr>
<td>B. Soil Management</td>
<td>6</td>
<td>0</td>
<td></td>
<td></td>
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<tr>
<td>C. Orchard Floor Management</td>
<td>6</td>
<td>3</td>
<td></td>
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<tr>
<td>D. Nutrition Management</td>
<td>8</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E. Irrigation Practices</td>
<td>8</td>
<td>0</td>
<td></td>
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<tr>
<td>F. Tree Training and Pruning</td>
<td>8</td>
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<tr>
<td>G. Quality Fruit Production</td>
<td>6</td>
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<tr>
<td>H. Integrated Pest Management</td>
<td>20</td>
<td>2</td>
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<td>I. Vertebrate Pest Management</td>
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<tr>
<td>J. Pesticide Storage and Application</td>
<td>16</td>
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<tr>
<td>K. Harvesting, Handling &amp; Fruit Quality</td>
<td>7</td>
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<tr>
<td>L. Machinery and Equipment</td>
<td>6</td>
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<tr>
<td>M. The Farmstead</td>
<td>7</td>
<td>2</td>
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<tr>
<td>N. On-Farm Food Safety</td>
<td>28</td>
<td>11</td>
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<tr>
<td>O. Worker &amp; Workplace Safety/Welfare</td>
<td>11</td>
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<tr>
<td>P. Waste Mgmt/Odour &amp; Noise Pollution</td>
<td>6</td>
<td>2</td>
<td></td>
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</tr>
<tr>
<td>Q. Environmental Stewardship</td>
<td>8</td>
<td>6</td>
<td></td>
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</tr>
<tr>
<td>R. Record Keeping</td>
<td>12</td>
<td>0</td>
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</tr>
<tr>
<td>S. Education and Training</td>
<td>10</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T. IFP Certification and Marketing</td>
<td>0</td>
<td>5</td>
<td></td>
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</tr>
<tr>
<td><strong>SUB-TOTAL</strong></td>
<td><strong>182</strong></td>
<td><strong>37</strong></td>
<td></td>
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</tr>
<tr>
<td><strong>TOTAL POINTS (including A)</strong></td>
<td><strong>200</strong></td>
<td><strong>41</strong></td>
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</tr>
</tbody>
</table>

Areas where I want to improve my IFP practices next year:

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

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