Northeastern IPM Center – IPM Partnership Grants – 2010 – Proposal
Project Description

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Project Title: A Market-Based Approach to Increasing IPM Adoption in Potatoes
Project Type: IPM Partnerships, IPM Issues

(Follow the RFA instructions for your project type. Use single-spaced, 12-point font, with 1-inch margins, and two returns (one blank line) between paragraphs.

Project Summary (Approximately 250 words long):

The potato industry in the US and Canada has a long history of promoting the latest Integrated Pest Management (IPM) innovations and best practices. In 1997 the National Potato Council (NPC) initiated a industry-wide survey to measure adoption of IPM practices that reduce the risks to the environment of pesticide use while maintaining or increasing overall productivity. In 2008, the National Potato Council committed to updating its initial survey as part of its member strategy for the US EPA Pesticide Environmental Steward Program. Over the last eight months, a broad collaboration of producers, processors and buyers including NPC, Canadian Horticultural Council, McDonalds, Simplot, McCain, Lamb Weston and individual potato growers have been working to develop a survey tool that can be used by the majority of growers to evaluate the use and adoption over time of IPM and other best management practices. Here we are requesting funding to operationalize the survey and reporting components so that participating potato growers will be able to complete the survey online, and the potato industry will be able to generate IPM adoption statistics by state, region, intended market and overall, including contributing to the national effort to measure and evaluate IPM impacts. The industry has committed significant cash and in-kind resources (Approximately $37,500 by Jan 13, 2010) to develop the survey and will continue to do so as it tests the survey over the next three months, and then conducts outreach to ensure participation once the on-line survey is operational. During the first year of operation it is expected that a minimum of 350,000 acres (of 1,000,000 USA acres) will be reported on the site.

Background and Justification:

1. Problem or challenge:
    a. High acreage of potato production to supply corporate food companies, expected moderate, but currently unknown, level of IPM use among these growers.
    b. Challenge to help potato growers identify ways they can improve their IPM use while protecting their operation's economic vitality.
    a. Opportunity for large-scale IPM adoption among this group of potato growers through use of proposed online survey.
2. Grower/stakeholder needs:
    b. Collaboration with McDonalds, McCain Foods, National Potato Council, others to identify grower and stakeholder needs:

c. Increased agricultural sustainability, specifically increased adoption of IPM, to meet demand of marketplace (2007 Vege Priority #3)
d. Technical support and resources to adopt sustainable agricultural practices.
e. Marketplace incentives for IPM adoption to protect economic vitality of industry (2007 Vege Priority #4).

3. Potential to impact large number/percentage of potato acres nationally:
   f. Acreage of potato fields nationwide, amount of potatoes supplied to companies like McCain Foods, McDonalds.
   g. Pest pressures on potatoes (considering regional variances), conventional pesticide use on potato fields.
   h. Example of grower/supplier participation in Sysco Sustainable Ag/IPM Initiative, reduction of pesticide use.
4. Marketplace impact:
   i. Buyers and shareholders increasingly asking for products and services that consider and reduce environmental impacts.
   j. Creates inter-potato industry incentive to increase IPM use. Proposed project creates online program that allows :
      i. Suppliers to identify which growers use highest levels of IPM and use that information to select which grower to purchase product from.
      ii. Growers to measure how their IPM use compares to other growers, creates a competitive environment fostering continual improvement.
5. Potential to contribute to national IPM impact measures:
   k. Project to have a national scope, including potato production regions in northeastern U.S.
   l. Proposed online survey has capacity to:
      i. Measure what level of IPM potato growers currently use (baseline data),
      ii. Provide resources for making IPM improvements,
      iii. Compare IPM use changes per grower, among industry and over time.

Objectives and Anticipated Impacts:

1. Finalize a comprehensive survey instrument which catalogs user's IPM practices.
   a. *Anticipated impact*:
      i. Collate information on the growers' current use of IPM to use as baseline data. As the user returns to update their IPM use list, the survey will track IPM use improvements and comparisons over time.
   b. The IPM survey currently includes the following grower practices:
      i. Management and worker protection,
      ii. Soil-borne pests and disease management,
      iii. Seed selection,
      iv. Planting techniques,

v. Crop protection,
vi. Nutrient management,
vii. Water management,
viii. Harvest and storage practices,
ix. Soil and water conservation.

2. Convert the survey to function online.
    a. *Anticipated impacts:*
        i. Increase number of participants. Attracts a large number of growers nationwide that may input their pest management practices from their home or office and receive immediate comparison results.
        ii. Increase supplier reporting of sustainable practices. Allows suppliers access information on and cite their growers' increased IPM use, which they can use to meet public's demand for more sustainably-produced food.
            1. Companies such as McDonalds and McCain Foods may see an increase in product sales due to this improvement in sustainability.
        iii. Encourages science-based pest management practices by providing regionally specific, peer-reviewed resources to growers to improve their IPM use. This will result in:
            1. Grower cost-savings related to pesticide applications due to prevention and number of required treatments,
            2. Environmental and human health benefits associated with reduced number of pesticide applications and use of less-toxic pesticides,
            3. Increased implementation of IPM by increasing grower awareness of specific IPM practices listed in the survey and in provided resources.
3. Conduct outreach to potato growers, processers and buyers to increase awareness of the program, its benefits and its long-term goals.
    a. *Anticipated impacts:*
        i. Increase the quantity and quality of IPM adoption by increasing awareness of the program among a broad group of potato growers.
        ii. Anticipated number of growers to conduct outreach to: 1,500
        iii. Anticipated traffic volume to website based on this outreach: Growers as above; level of public viewing TBD.
4. Secure the participation of at least 33% of target growers within the first six months after the survey is placed on-line, including those supplying McDonald's and McCain Foods and members of the National Potato Council.
    a. *Anticipated impacts:*
        i. Increase the quantity and quality of IPM adoption by ensuring 33%, or 700 growers, of these growers document their IPM use and receive the

resources and technical assistance necessary to implement IPM improvements.

ii. Anticipated number of growers to use the program in the first year: 700
iii. Anticipated number of acres affected in the first year: 350,000
iv. Anticipated number of growers to use the program in the second year: 1000
v. Anticipated number of acres affected in the second year: 500,000

5. Develop survey components to ensure its crop adaptability.
    a. *Anticipated impacts:*
        i. Increase the quantity and quality IPM adoption by expanding the survey's user group to include growers of additional crops.
        ii. Anticipated number of crops the survey will be available for: 4 (soybean, cotton, corn, wheat)

Approach and Procedures:

Approaches to completing Objective 1: Finalize a comprehensive survey instrument which catalogs user's IPM practices.

1. Use IPM Elements and Guidelines for potatoes to verify the need for each component listed in Objective 1.b and identify any additional key components.
2. Circulate survey for review and enhancement among representatives from National Potato Council, McDonald's, McCain Foods and other core potato processors.
3. Collate and apply review responses to survey draft(s) and finalized survey.

Approaches to completing Objective 2: Convert the survey to function online.

1. Employ technical expertise within [company] to convert the survey to an online, user-friendly and financially sustainable program. Program functions must include:
    a. Growers are able to check boxes in survey corresponding to their IPM use,
    b. Boxes correspond to "basic", "steward", "expert", "master" IPM use levels,
    c. Results are available immediately online while user is in program,
    d. Grower scores are displayed against total potato and market segment groups (seed, fresh, processor, chip, dehydrated, other),
    e. Survey results are converted to subsequent years and grower only updates,
    f. Processor may download grower detail specific to processor,
    g. Processor may download summary specific to processor.
    h. Site has public access pages to view overall industry IPM adoption rates.
2. Compile IPM resources for users which correspond to the IPM practices listed in Objective 1.b. Resources must be university-based or peer-reviewed, and consider regional variances in pest pressures and other environmental factors (e.g., soil type, rainfall patterns, etc.). Resources can include:

   a. IPM Elements and Guidelines – University of California's State IPM Program, Ohio State Extension, Cornell University's State IPM Program, University of Massachusetts Extension, Rutgers Cooperative Extension.
   b. University and Extension publications on potato Best Management Practices (BMPs),
3. Identify at least twenty growers and two suppliers to test pilot version of program. Use these results to improve functionality and address other potential glitches in program. Make the improved version available online.

Approaches to Objective 3: Conduct outreach to potato growers, suppliers and buyers to increase awareness of the program, its benefits and its long-term goals.

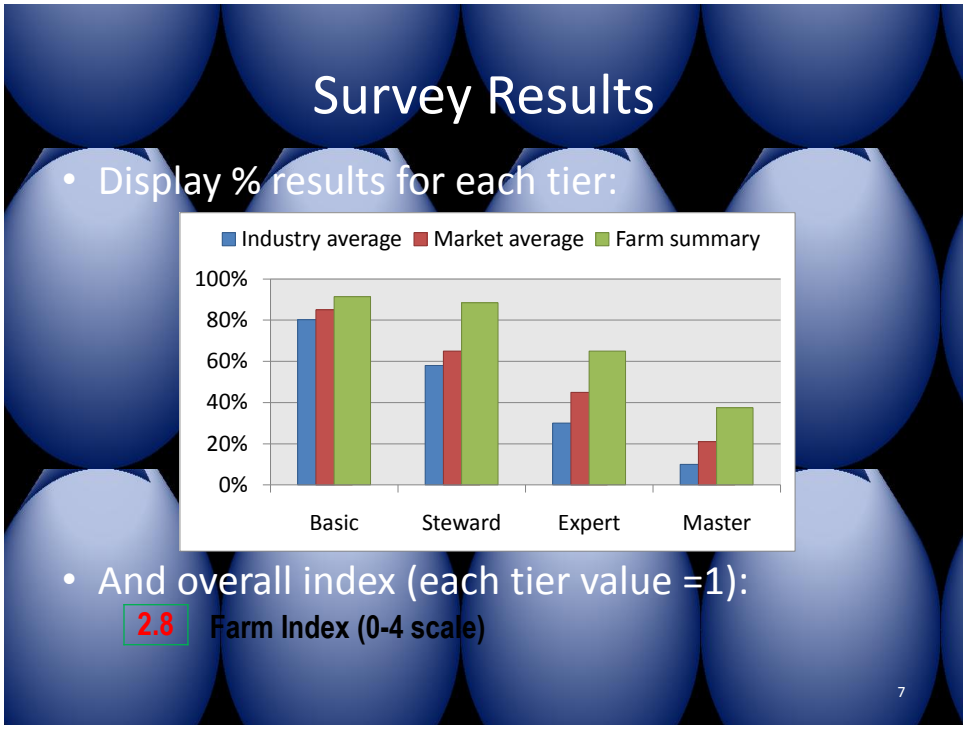
1. Identify grower associations, unions and groups to target for outreach. This includes growers supplying McDonald's, McCain Foods, the National Potato Council and other potato processors.
2. Build contact database of:
   a. Growers identified within these grower groups,
   b. Key representatives from supplier companies,
   c. Key representatives from buyer companies, including food distribution companies.
3. Launch email and/or post-mail outreach campaign to contacts in database to increase use of survey. Outreach materials will include:
   a. Background information and justification,
   b. Significance of survey program and long-term importance (economic, social and environmental),
   c. Link to online program,
   d. Link to resources.
4. Conduct secondary and tertiary outreach efforts to contacts in database which did not respond to initial outreach effort.

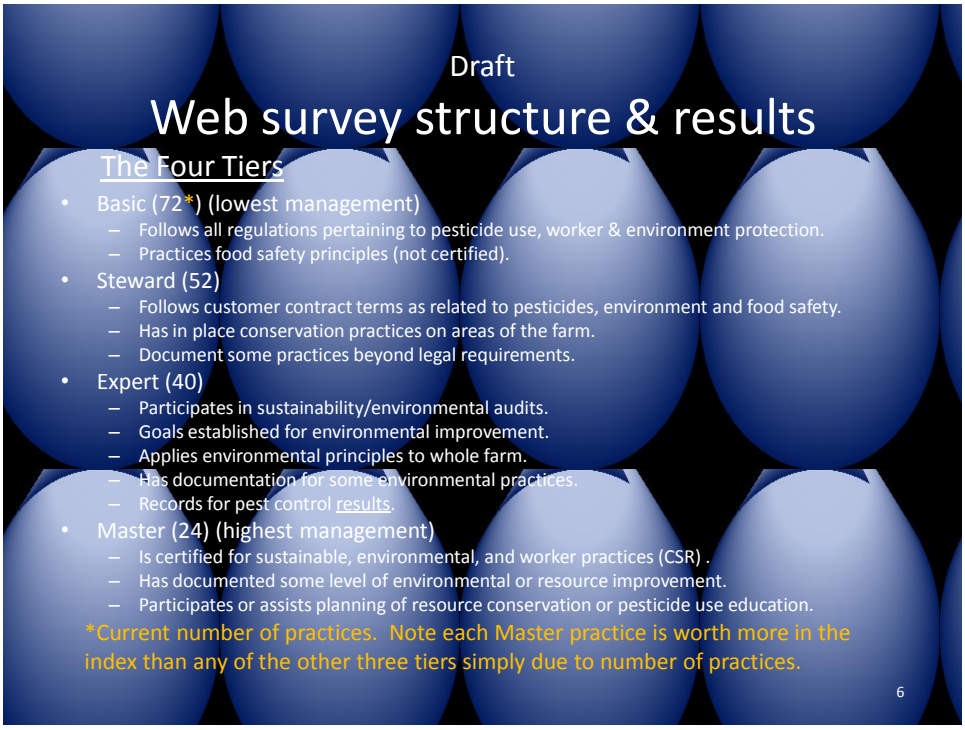
Approaches to Objective 4: Secure the participation of at least 33% of target growers within the first six months after the survey is placed on-line, including those supplying McDonald's and McCain Foods and members of the National Potato Council.

1. The three major frozen potato processors represent 37% of the potato acres in the USA. All have agreed that this survey will be mandatory for their suppliers (farmers) of raw potato. Additional acres for fresh, chip and seed farmers will achieved through voluntary participation according to the marketing ability of the NPC and associated state organizations.

Approaches to Objective 5: Develop survey components to ensure its crop adaptability.

1. Identify IPM practices which overlap between crops.
2. Identify IPM practices which require specification per crop.
3. Consult IPM Elements and Guidelines, university crop specialists, crop BMPs to create IPM practice lists for selected crops.
4. Review and finalize the selected crop surveys.
5. Develop workplan to convert survey to online program.
6. Example site results below:





Project Timeline (Duration: One year)

First quarter:

-Verify need for each IPM practice listed in Objective 1.b; add additional practices if necessary.

-Circulate survey among stakeholders, collate and incorporate draft suggestions.

-Finalize survey.

-Hire website designer/programmer to convert survey to an online program.

Second quarter:

-Develop pilot version of program.

-Test pilot program among group of ten volunteer growers and two suppliers.

-Collate pilot testing results and improvement suggestions.

-Release improved version of survey for online use.

-Conduct primary outreach effort to contact database.

Third quarter:

-Track website monthly traffic volume: number of visitors, number of pages viewed, number of unique user sessions, change in volume during growing season, average viewing time.

-Conduct secondary outreach effort to non-responsive contacts in database.

-Improve functionality as needed.

-Identify survey components requiring modification to adapt tool for other crops.

Fourth quarter:

-Conduct tertiary outreach effort to non-responsive contacts in database.

-Consult IPM Elements and Guidelines, university crop specialists, etc. to develop survey components for crop adaptability.
-Develop workplan for converting additional crop surveys to function online.
-Evaluate number of growers that have input their IPM use information, accessed resources and returned to the website.
-Evaluate number of suppliers that have used program to access their growers' IPM use.

The project will continue to operate as a collaboration for the next quarter, then the main aspects of site development and ongoing operation will fall to the NPC, MPB and the subcontracted services. The major potato processors will continue to support the site development and use by their suppliers (potato farmers).

Evaluation Plans:
We will track and report:

1. Website monthly traffic volume including number of visitors, number of pages viewed, number of unique user sessions, change in volume during growing season, average viewing time;
2. Number of website's registered users, their affiliations, their acreage and their frequency of survey updates;
3. Number of resources accessed;
4. Change in IPM adoption over time, by single index or by percentage in each of four tiers.

Cooperation, Institutional Units and Key Personnel Involved:

1. Roles and responsibilities of lead institution/stakeholder group:
    a. All current stakeholders will participate through completion of the web site.
2. Key personnel within each institution/stakeholder group.
    a. Don Flannery, MPB, funding for site programming
    b. John Keeling, NPC, hosting of web site.
    c. IPM Institute, processors, growers – continued review of survey and beta version of web site.

Basic	Steward	Expert	Master	Integrated Pest Management / Integrated Crop Management Practice
				Management & worker protection
☐				Pesticide applicator has taken a pesticide safety course and if required has achieved applicator certification. Applicator participates in continuing education through refresher courses and updates to new regulations.
	☐			The Farm Manager has taken a pesticide safety course and stays current with pesticide regulations.
			☐	The farm is used as an educational site for pesticide applicator training.
		☐		The farm manager or other farm personnel participate in demonstrations for pesticide applicator training.
☐				The farm is compliant with ALL Worker Protection Standards.
☐				Personal protective equipment is in good repair and used by workers.
☐				Pesticides are stored in adequate facilities to maintain product integrity and prevent site contamination.
☐				Obsolete pesticides are disposed of properly according to ALL regulations and guidelines.
☐				Land, crop fields, and stored crops are managed to minimize food safety risks.
	☐			The farm has annual food safety certification for growing/handling/storing/shipping of specific field(s) of one food crop.
		☐		The farm has whole-farm annual food safety certification for growing/handling/storing/shipping specific food crop(s).
			☐	The farm has whole-farm annual food safety certification for all food crop(s).
				Soil-borne pests and diseases
☐				The farm manager or crop advisor can identify the major soil-borne pests and diseases for the region.
	☐			The farm manager or crop advisor understands the life cycle of major soil-borne pests and diseases for the region.
☐				Chemical treatment of soil is done according to label precautions and based on historical pest and disease problems.
	☐			Chemical treatment is based on pest/disease monitoring.
	☐			Pest populations are monitored when bringning new land/grassy edge in cultivation
	☐			Biological control of soil-borne pests and diseases have been tested on the farm.
		☐		Biological control of soil-borne pests and diseases are practiced on more than 25% of the suitable crop acres.
			☐	Biological control of soil-borne pests and diseases are practiced on more than 50% of the suitable crop acres.
☐				All pesticide application records are maintained according to local Government requirements.
☐				Weather at the time of all chemical and fertilizer applications are maintained according to local Government requirements.
				Seed
☐				Only certified seed is used (crop)
		☐		Farm is a participating site for testing of new varieties.
☐			☐	Farm manager participates on industry committees responsible for introduction of new varieties or is an early adopter of new varieties.
				Seed cutting equipment is sanitized between seed lots.
	☐			Seed is inspected or sampled for disease such as late blight prior to delivery.

	☐			Different lots of potato seed are kept segregated until planted.
	☐			Certified seed is used in rotation crops to minimize weed seed.
☐				If GM is used, identity preservation practices are followed to prevent mixing of non-GM seed and harvested crop
☐				GM farm trials are conducted following established government protocol and customers are informed.
		☐		GM research trials are conducted in cooperation with a recognized research coordinator following scientific principles.
☐				Equipment to haul seed and seed processing equipment are disinfected prior to handling seed.
☐				Seed processing equipment is disinfected between different seed lots.
☐				Seed handling and processing equipment is adjusted to optimize cut size.
☐				Seed waste is disposed in a manner to avoid being a source of disease inoculum and to prevent environmental contamination.
☐				Seed treatment products are used according to label directions.
☐				Potato seed is conditioned prior to handling to preserve seed integrity.
		☐		Seed treatment products are used according to a disease management plan to reduce pesticide use or known pest, or seed and/or soil disease problems.
	☐			Temporary seed storage conditions are documented.
		☐		Unusual seed conditions prior to planting are documented.
		☐		Seed handling and planting systems are assessed through post-emergence plant stand measurements.
			☐	Plant stand results, seed decay analysis and diagnosis of missing plants and diseased seed are documented.
			☐	Seed selection, handling and preparation techniques are used to eliminate the need for seed treatment pesticides.
				<u>Planting</u>
	☐			Field selection and rotation plans include geographic distribution to minimize crop damage risk due to weather, insects and disease.
☐				Planting equipment is serviced and adjusted prior to planting to optimize placement and rate of seed, fertilizer, and other chemicals.
☐				Planting equipment is washed and disinfected prior to planting.
	☐			Planting equipment is washed and disinfected between seed lots.
		☐		Seed placement and depth is assessed intermittently by uncovering a portion of the planted row.
			☐	Historical records are kept of seed placement accuracy.
☐				General cultural records of dates of planting, cultivation, and harvest are kept.
☐				Planting is done under good soil moisture conditions to avoid soil compaction that may result in restriction to root growth, excessive clods at harvest or conditions that favors disease development.
	☐			Planting equipment is adjusted, and care is taken, to plant seed in the center of each row.
		☐		Planting equipment is outfitted with GPS navigation to optimize field area and correct row spacing.
	☐			Planting depth is chosen and adjusted to account for soil conditions, regional disease problems, and specific variety needs.
				<u>Cultivating</u>
☐				Care is taken when forming the potato hill (row) to keep plant centered and and avoid root pruning.
☐				Cultivating is done under good soil moisture conditions to avoid soil compaction that may result in restriction to root growth, excessive clods at harvest or conditions that favors disease development.

	☐			Care is taken when forming the potato hill (row) to avoid throwing wet soil on foliage in fields with a history of white mold.
		☐		Self-centering equipment or GPS navigation is used when forming the potato hill (row) to keep plants centered.
	☐			Hill (row) shape and size is optimized for the region, soil type, and irrigation needs.
				<u>Crop protection</u>
☐				The farm manager or crop advisor can identify major weeds in the field.
	☐			The farm manager or crop advisor understands the life cycle of major weeds in the field.
	☐			The farm manager or crop advisor is aware of emerging weed problems in the region.
		☐		Historical records of problem weed areas on the farm are maintained.
☐				Herbicides are used according to label directions for rate, timing and soil type.
☐				Specific variety and herbicide combinations that result in crop phytotoxicity are not used.
		☐		Weeds that are difficult to control in the current crop are partially controlled in rotation crops.
☐				Mechanical equipment is cleaned when moved from fields with perennial weed problems.
☐				Preplanting herbicide use decisions are based on historical weed information.
	☐			Post-planting herbicide use decisions are based on weed seedling scouting and threshold levels.
	☐			Herbicides are selected to avoid injury to rotation crops.
		☐		Herbicides are selected according to reduced risk.
		☐		Herbicides are selected to reduce development of resistance.
		☐		Herbicides are reduced approximately 25% through use of banded/spot sprays, mechanical tillage, or other non-chemical methods.
			☐	Herbicides are reduced approximately 75% through use of banded/spot sprays, mechanical tillage, or other non-chemical methods.
	☐			Weed seed sources on field edges are controlled through mechanical methods.
☐				The farm manager or crop advisor can identify major insects for the region.
	☐			The farm manager or crop advisor understands the life cycle of major insects for the region.
	☐			The farm manager or crop advisor is aware of emerging insect problems in the region.
		☐		The farm manager can identify beneficial insects, such as natural predators of crop insect pests.
			☐	Beneficial insects are released on the farm.
☐				Insect pest scouting is performed in high risk areas, such as wind breaks or migration points.
	☐			Insect pest scouting is performed regularly in high risk areas, such as wind breaks or migration points.
		☐		Insect pest scouting is performed extensively in set patterns throughout fields.
	☐			Scouting, sampling or monitoring techniques are adjusted according to insect pest and/or crop stages.
	☐			Insect vectors (aphids) responsible for virus transmission are monitored until end of season.
		☐		Records are kept of insect pest populations as the result of scouting and control practices.
☐				Farm manager or crop advisor is aware of regional insect problems through newsletters, hotlines, or other means of public communication.
☐				Insecticides are used according to label directions.
	☐			Insecticide application timing is based on threshold levels, such as for CPB, aphids, leafhoppers, etc.
	☐			Insecticide application timing is based on pest growth models or predictive systems when appropriate.
	☐			Insecticides are selected according to reduced risk.
	☐			Insecticides are selected to reduce risk of injury to beneficial insects.
		☐		Insecticides are selected to reduce development of resistance.

		☐		Insecticide use is reduced by approximately 25% through use of banded/spot sprays, biological sprays, or non-chemical methods.
			☐	Insecticide use is reduced by approximately 75% through use of banded/spot sprays, biological sprays, or non-chemical methods.
☐				The farm manager or crop advisor can identify major diseases for the region.
	☐			The farm manager or crop advisor understands the life cycle of major diseases for the region.
	☐			The farm manager or crop advisor is aware of emerging disease problems in the region.
☐				Disease scouting is performed in high risk areas, such as wind breaks or conducive microclimate.
	☐			Disease scouting is performed regularly in high risk areas, such as wind breaks or conducive microclimate.
		☐		Disease scouting is performed extensively in set patterns throughout fields.
☐				Fungicides are used according to label directions.
	☐			Fungicide application timing is based on weather and disease models.
☐				Farm manager or pesticide applicators is aware of regional disease problems through newsletters, hotlines, or other means of public communication.
☐				Cultural disease control practices are followed, such as spot vine destruction, control of alternate hosts (nightshade) and volunteer potatoes, elimination of cull piles, etc.
	☐			Fungicides are selected according to reduced risk.
		☐		Fungicides are selected to reduce risk of injury to beneficial insects.
		☐		Fungicides are selected to reduce development of resistance.
			☐	Overall crop health status is documented including success of pest and disease management program.
		☐		Remote sensing technology is used to monitor crop health status.
	☐			Fields are assessed for virus infection levels.
	☐			Seed fields are rogued for virus infected plants if appropriate.
			☐	Farm participates in regional insect and disease scouting programs or provides own scouting results for information sharing on blight "hot-lines" or newsletter alerts.
		☐		Insects and diseases are partially controlled through chemical treatment of alternate hosts or sites, including field edges.
			☐	Insects and diseases are partially controlled through cultural management of alternate hosts or sites, including field edges.
☐				Field sprayer is serviced and calibrated before start of growing season, when parts are replaced, or carrier rate is changed.
☐				Field sprayer calibration records are kept.
☐				Spill containment material, first aid kit, and clean water are readily available at mixing and application sites.
☐				Pesticide mixing is done away from sensitive areas and in a manner to prevent site contamination.
☐				Empty liquid pesticide containers are triple rinsed with rinse added to tank mixture.
☐				Empty containers are disposed in an approved manner.
	☐			Empty containers are recycled.
☐				Field sprayer is operated according to regional recommendations or regulations to minimize drift..
☐				Spray pressure, nozzle selection, and boom height are adjusted to minimize spray drift.
☐				Pesticide safety information forms (MSDS) are accessible to applicators and farm workers.
				Nutrient management

☐				Soil sampling frequency, sampling method and analysis is performed as per recognized regional needs, e.g., CCA, Extension recommendations, and used for fertility management of N-P-K and pH adjustments if necessary.
		☐		Soil sampling is done using precision/variable rate grid or zone sampling methodology to identify field variability and analysis used to adjust fertility management
☐				Fertilizer N-P-K is applied according to soil test, crop foliar test, nutrient budgets (accounting for credits from previous crop).
☐				Soil pH is tested and maintained within optimum range, e.g., lime is applied if indicated by soil test.
☐				Historical fertilizer records are maintained for at least three years.
	☐			Multiple nitrogen applications are done where appropriate, e.g., high-porosity soils with low water-holding capacity.
	☐			Phosphorus is placed in sidebands or the root zone (in furrow) where necessary to avoid off-site pollution.
	☐			Split potassium applications are done when recommended according to soil test.
		☐		Precision/variable-rate fertilization is practiced.
☐				Animal manure use on the whole farm is managed following a nutrient management plan, to include sample analysis, and according to contract requirements, USDA GAP and state regulations.
	☐			Soil amendments other than animal manure, e.g., green manures, non-animal composts, are applied at appropriate times and manner to prevent nutrient loss and contamination of ground and surface water.
		☐		Other crops are included in the rotation as partial alternative to synthetic fertilizer, e.g., nitrogen-fixing crops.
		☐		Advanced soil testing is done to monitor soil health (e.g., one or more of the following: potentially mineralizable nitrogen, soil biological activity/respiration, earthworm populations, etc.).
			☐	Improvement in soil health (organic matter content, soil biological activity, etc.) is documented.
				<u>Water management</u>
☐				pH is tested at least annually.
☐				Coliform is tested according to GAP regulations.
	☐			Comprehensive chemical analysis is completed annually including at least hardness, N-P-K, minerals.
				In-season crop nutrition sampling is performed, e.g., petiole or soil testing, where appropriate according to regional needs such as long seasons, sandy soil, and irrigation practice.
☐				Records are kept of the amount of water used for irrigation of each field.
☐				Water is obtained according to all applicable federal, state and local regulatory authorities.
	☐			Water is not taken from unsustainable sources.
			☐	Impact on water resource is documented, e.g., well depth, stream flow, oxygen content, temperature, biological activity.
☐				Pressurized irrigation system is used (reels, guns, wheel lines, solid set).
	☐			Pivot or linear move system is used.
		☐		Low impact sprinkler nozzles, e.g., low pressure, are used.
		☐		End guns do not spray beyond crop area.
			☐	Drip irrigation providing water to the plant root zone is used.
	☐			Irrigation system is serviced and calibrated annually, including nozzle checks.
	☐			Irrigation runoff controls are employed where necessary, such as reservoir tillage (dammer-diker), PAM.
☐				Irrigation is scheduled according to crop water use and soil-water-holding capacity.

☐

	☐			Irrigation is scheduled using an evapotranspiration model.
		☐		Irrigation is scheduled using a soil probe.
			☐	Quantitative monitoring of soil moisture reserves using infrared, Watermarks, satellite, nuetron probe, variable rate are used regularly.
				Post-Harvest
			☐	Experts are consulted to review cause of severe insect infestations or widespread disease infections and improve future practices.
☐				All culls and other crop waste are properly disposed, composted, or feed to livestock according to regional guidelines.
☐				Sprout inhibitor is applied in storage according to label directions by commercial certified applicator.
	☐			Sprout inhibitor rates and timings are selected to minimize potato residue levels.
			☐	CIPC and MH-30 alternatives with low residue levels are used on a portion of the stored crop.
				Soil & water conservation
☐				Soil type is identified and records are maintained for at least two years.
☐				Practice a minimum of two-year rotation in <120-day frost-free zone; three-year rotation in >120-day frost-free zone; one crop in the rotation must be soil conserving such as small grain, grass or forage.
	☐			On at least 50% of farm, practice a minimum of three-year rotation in <120-day frost-free zone; four-year rotation in >120-day frost-free zone. One rotation should be soil conserving, such as small grain, grass or forage.
			☐	On 75% of farm, practice a minimum of four-year rotation. Two crops should be soil conserving such as green
		☐		A winter cover crop is planted on at least 50% of potato acreage after potato harvest.
☐				Soil compaction is avoided or minimized by at least one of the following: flotation tires, tracks, avoiding traffic
	☐			Measurement have been taken to determine existence of compaction zone.
		☐		Existing compaction is reduced by deep ripping.
			☐	Existing compaction is reduced by cultural practices, e.g., deep rooted cover crops.
			☐	Advanced soil testing is done to monitor soil physical characteristics (e.g., one or more of the following: aggregate stability, surface hardness, structure, etc.).
		☐		The farm has implemented a written whole-farm soil and water conservation plan.
	☐			Spring or fall minimum tillage maintaining at least 30% residue is practiced on 50% or more of the tillable acres on the farm.
		☐		The farm has implemented a written sensitive wildlife habitat protection plan.