

PEST MANAGEMENT (Acre)

Definition:

Managing the control of agricultural pest infestations (including weeds, diseases, insects, and other animal pests)

Purpose:

To control agricultural pests for optimum crop yields while minimizing the adverse impacts of the applied pesticides on the natural resource base.

Conditions where Practice Applies:

Where agricultural pesticides are applied to improve or protect crop and/or forage production.

Planning Considerations

Consider four general areas when planning resource management systems that incorporate pest management. These are:

- 1) Condition of the Natural Resources Present
- 2) Planned Pest Control Methods
- 3) Economic Considerations
- 4) Pertinent Regulations

I. CONSIDER THE CONDITION OF THE NATURAL RESOURCES PRESENT

A. Consider the conservation treatment unit (CTU) within the hydrologic unit. Consider the CTU's receiving water bodies within the hydrologic unit and the water quality of each water body. Consider pesticide transport pathways to surface and groundwater bodies, wells, and other significant hydrogeologic features within the hydrologic unit. Remember to consider that pesticides be transported by surface runoff in solution and also attached to sediment particles.

B. Consider irrigation and rainfall inputs and the potential movement of pesticides in anticipated runoff and leaching may occur.

C. Consider the surface loss and leaching potential of the CTU soils. The field's soils have a direct effect on the potential for surface or leaching losses.

D. Consider any natural resources (endangered species, wildlife habitat, etc) within the hydrologic unit and review the potential effect planned pest control measures will have on these resources.

II. PLANNED PEST CONTROL METHODS

A. Consider the target pest(s) for control. The producer should contact the appropriate Cooperative Extension Service (CES) county office listed on Table 1 for publications and technical assistance to identify target pest (s) and periods when pests are most vulnerable to control.

B. Pest control treatments should consider all available methods. Consider all biological, cultural, mechanical, and chemical pest control methods suitable for use. Refer to Table 2 for examples of pest control methods.

- 1) Consider the use of crop rotations, resistant varieties, and other measures as part of an integrated pest management system (IPM) to help reduce the need for pesticide use. This is especially important for CTUs that have been identified as contributing to sensitive surface or subsurface waters. Be sure to consider effects of planned pesticides on all crops in the planned crop rotation.

- 2) Emphasize cultural practices to minimize the need for use of pesticides. These include:
 - a) use of Irrigation Water Management,
 - b) regular field scouting for pests,
 - c) timely tillage for weed control,
 - d) crop rotation to disrupt pest life cycles and infestations,
 - e) use of specialized green manure crops which reduce specific pests (ie. 'Tropic Sun' sunn hemp to reduce root-knot nematodes),
 - f) use of barrier or predator-host plantings adjacent to crop,
 - g) regular rotation of pesticides and tillage where feasible to reduce the risk of pest tolerance or resistance.

- 3) Biological control agents are useful in reducing pest populations are available. They should be integrated with other pest control reduce pest populations. Contact the local Hawaii Department of (DOA) office for information on possible control agents available (a for DOA county office contact information).

- 4) Plan erosion control practices which minimize the soil loss, runoff, or leaching problem as it applies for each CTU. A list of practices which affect the transport of pesticides on sediment and reduce leaching losses to groundwater are listed in Table 3.

- 5) Consider effects of pest control measures on on-target organisms, both on future crops in a planned rotation. Pesticide use should not adversely impact threatened and endangered species of plants on site or off site (like in receiving water bodies). The effects of pesticide residues should also be considered when planning pesticide use and

planning

what crops are to be used in rotation.

- 6) The producer should be informed of the importance of calibrating

application

equipment to insure proper application rates of recommended pesticides.

C. Consider the target pest control pesticides for the proposed crop. These can found in the Hawaii Pesticide Information Retrieval System's (HPIRS) software ("Easy Access to Pesticide Registrations") or from recommendations given to the producer by CES. If the producer needs information on appropriate pesticides, rates, formulations, application methods, or usage, refer the producer to the appropriate CES county office listed on Table 1, Hawaii Department of Agriculture, Pest Control Branch county office listed on Table 1a, or information listed on the pesticide label.

D. Consider the potential for pesticide losses using the Soil-Pesticide Interaction Screening Procedures ratings, contained in the Field Office Water Quality Binder or the NPURG software.

E. Pesticide applications should be consistent with label guidelines, state and local restrictions, and applied with consideration of method, time, form, and placement.

- 1) The producer should plan the method of pesticide application considering the potential for loss.
 - a) Ground or aerial spraying, wicking, or broadcasting can affect the degree of drift and volatilization considerably.
 - b) Calibrate broadcast applications using metering devices when using mechanical spreaders or visually when broadcasting by hand. Avoid skips or excessive overlaps in application when broadcasting pesticides.

- c) Banding, incorporating or injecting pesticides may improve their effectiveness while reducing potential surface and leaching losses.
 - d) If using pesticides in conjunction with fertilizers, check for material compatibility. Incompatibility can result in the loss of effectiveness of the pesticide, the fertilizer, or of both.
- 2) The time at which the producer should apply a pesticide depends on the pest life cycle, climate, soil, pesticides, and crop. Avoid applying pesticides during or prior to periods of high rainfall or when soils are saturated. The amount of rainfall between the time of application and the time of utilization by the plant will influence the efficiency of the application.
 - 3) Pesticide formulation may effect potential losses. If any producer plans to use nitrogen-pesticide combinations containing N03-nitrogen, inform them that use of this combination could increase both leaching and surface loss potentials.
 - 4) Placement of pesticides affects its efficiency and potential loss. Incorporation of pesticides or any placement below the soil surface reduces exposure to runoff process and enhances soil adsorption. Foliar applied pesticides may also reduce potential losses.

F. Advise producers to keep records of:

- 1) pesticides used (use EPA registration number)
- 2) amounts applied
- 3) time applied
- 4) method of application
- 5) significant rainfall events
- 6) yield.

Records help determine what practices are profitable for the farm and help to evaluate the responses to pesticide applications over a period of years.

III. EVALUATE THE ECONOMIC CONSIDERATIONS OF THE GROWER AND IDENTIFY THE BENEFITS OF WISE SELECTION AND USE PEST CONTROL METHODS.

A. Crop quality and yield are two of the major reasons for controlling the target pests. Yield, aesthetic quality (color, firmness), shelf life, size, shape, symmetry, taste, injury, harvest timing, and dirt and spray residues are all important considerations in planning pest control methods and should reflect producers values. These goals need to be realistic and attainable. Refer producer to Cooperative Extension Service publications for more information on reasonable yields and crop quality.

B. The producer should balance the relative cost of the different pest control methods, in terms of time, labor, dollars and environmental effects, against increases in crop quality and yield when setting production goals. Unrealistic or abnormally high crop quality and yield goals will encourage a pest control program that is more intensive and expensive than is necessary. The producer should understand that sometimes the increase in crop quality or yield caused the application of that last unit of pesticide is not worth the cost of applying that pesticide.

C. Producer limitations should be incorporated into their pest management program. Consider availability of sophisticated equipment, availability of labor, and time requirements when discussing alternatives. Help the producer understand

that calibrating application equipment is essential in insuring the proper application of pesticides as part of their pest management program.

IV. ALL PESTICIDE USE WILL BE CONSISTENT WITH STATE AND LOCAL REGULATIONS.

A. Pesticides (4-66-2) are regulated by the State Department of Agriculture. Consult the Hawaii Pesticide Law, Chapter 149A H.R.S., for guidelines on the use of such pesticides.

B. Point discharges to surface waters (11-54-09) are regulated under the State Department of Health's National Pollutant Discharge Elimination System (NPDES) program. The State's Water Quality Standards, Administrative Rules, Title 11, Chapter 54, should be reviewed if point discharges of pesticide contaminated waters are expected may occur.

C. The use of wastewater effluent for irrigation (11-62-25) and wastewater sludge for agricultural purposes (11-62-07) is regulated by the State Department of Health. Requirements for wastewater systems are found in the State's rules on Wastewater Systems, Administrative Rules, Title 11, Chapter 62.

D. Wellhead protection is regulated by the State Department of Health's Wellhead protection Protection Program. The program guidelines are currently being developed by the Department of Health's Environmental Planning Office.

E. The counties manage growth within their areas of jurisdiction through general plans, development plans, and zoning ordinances. See individual County Water Use and Development Plans for County-specific regulations.

SPECIFICATIONS

I. GENERAL

A. Assess the potential for pesticide loss by the CTU and the sensitivity of the CTU's receiving waters using the pest management informational worksheet located in Appendix A. Retain original and provide producer with copies of CTU potential leaching loss and groundwater sensitivity and surface loss and water sensitivity information sheets.

B. The importance and sensitivity of an aquifer will increase to concern of pesticide use in its recharge areas. Identify the CTU groundwater development stage, utility, and vulnerability from the DOH's AQUIFER IDENTIFICATION AND CLASSIFICATION documents, if available. Identify any documented pesticide impairments from DOH's HAWAII GROUNDWATER QUALITY PROTECTION STRATEGY and other available documents

C. Areas that contribute runoff to sensitive surface waters will increase the concern for pesticide use. Identify the DOH Use Category for surface water bodies within the CTU's hydrologic unit, if any have been designated as water quality limited segments, and any known water quality impairments. This information is available from the DOH's Hawaii Administrative Rules (Chapter 11-54), Water Quality Maps, and HAWAII'S ASSESSMENT OF NONPOINT SOURCE POLLUTION WATER QUALITY PROBLEMS.

D. Identify surface runoff pathways for pesticide travel to any receiving surface water body. Determine the runoff travel distance from the CTU to receiving waters in order to assess the potential pesticide movement time frame. The faster a pesticide can reach a receiving surface water body, the less chance for it to breakdown or become immobilized.

E. Develop a water budget, using the procedure contained in the Field Office Water Quality Binder, to provide information about when anticipated runoff and leaching may occur.

- 1) Any month identified by the water budget to have an average monthly runoff or leaching total that exceeds 10% of the annual total will be considered to have a "high" probability for pesticide loss.
- 2) Any month identified by the water budget to have an average monthly runoff or leaching total that is less than 5% of the annual total will be considered to have a "low" probability for pesticide loss.
- 3) Where irrigation is a major contributor to leaching losses, plan the use of Irrigation Water Management (practice code 449) to tailor irrigation applications to crop needs and soil characteristics. Pesticide applications and irrigation water applications should be planned to reduce the pesticide movement with through leaching.
- 4) In all cases, application of pesticides shall not be scheduled just prior to predicted rainfalls to prevent loss of applied pesticides and ineffective control of target pests.

F. Identify the surface loss and leaching potential of the CTU soils.

- 1) Identify the predominant soils, by field, contained in the CTU using the State Soil Surveys and any supplemental mapping. (A predominant soil covers over 25 percent of a field.) Verify the presence of these soils by field inspection. Determine if supplemental soil investigations are necessary.
- 2) From Soil-Pesticide Interaction Rating database or the NPURG software, identify the Surface Loss Potential and the Soil Leaching Potential of the major soils.

G. Document any other known natural resource concerns (endangered species, wildlife habitat, etc) within the hydrologic unit and consider these resources when planning pesticide use.

H. Integrated pest management (IPM) principles should be encouraged in all instances. The use of IPM systems that utilize the most appropriate means of pest control including cultural, mechanical, biological, and chemical methods should be used as part of pest management recommendations whenever practical. Refer producer to appropriate CES county office listed on Table 1 for more information on IPM.

- 1) Identify target pest(s). Identify selected biological, cultural, mechanical, and chemical control methods.
- 2) Encourage field scouting of pests to determine when the treatment may be needed.

I. Mechanical and biological controls should be considered, whenever appropriate, to control pests. Consider use of hand weeding for small, isolated areas or on larger areas where labor costs are not prohibitive. Use spot spraying rather than full-coverage spraying as an alternative.

J. All biological control agents will be used according to recommendations available

from the Hawaii Department of Agriculture.

II. PESTICIDES APPLICATION SHALL BE CONSISTENT WITH CURRENTLY APPROVED FEDERAL AND STATE LABEL PROVISIONS.

A. Identify the pesticides planned for use as controls of the target pest(s) using the HPIRS software "Easy Access to Pesticide Registrations" or recommendations obtained from the producer. If the producer needs information on appropriate pesticides, rates, formulations, application methods, or usage, refer the producer to the appropriate CES county office listed on Table 1, Department of Agriculture, Pest Control Branch county office listed on Table Ia, or to the information listed on the pesticide label.

B. From the Soil-Pesticide Interaction database or NPURG software, identify the surface loss and leaching loss potential for all recommended pesticides.

- 1) Potential 3: This pesticide applied on this soil has very low probability of being lost to surface runoff or leaching. This pesticide could be used according to label with little hazard to the respective water resources.
- 2) Potential 2: This pesticide applied on this soil has the possibility of being lost to surface runoff or leaching. However, the possibility of loss is not as great as Potential 1. Potential 2 guidelines differ from potential 1 in:
 - a) the pesticide surface loss potential may be reduced one rank, i.e., large to medium, if foliar applied, incorporated, or banded under the surface
 - b) the pesticide leaching potential could be reduced one rank if foliar applied
 - c) the use of this pesticide on this soil could be considered similar to potential 3 if the rainfall probability is low.
- 3) Potential 1: This pesticide applied on this soil has a high probability of being lost to surface runoff or leaching. The producer should be advised to seek an alternative pesticide, apply recommended treatments to reduce the pesticide's potential loss, or control the target pest(s).
- 4) Soil-Pesticide combinations with a POTENTIAL LOSS RATING of "1" or "2" should be planned for use with recommended treatments to reduce potential runoff and/or leaching losses are applied.

C. Using both the CTU soils and the pesticide loss ratings, determine the POTENTIAL PESTICIDE LOSS RATING from the leaching matrix (Table 4) and the surface loss matrix (Table 5) or the NPURG software.

D. Soil-Pesticide combinations with a POTENTIAL LOSS RATING of "3" has a low potential of being lost to surface runoff or leaching. This combination could be used according to label with little hazard to the respective water resources. Soil-Pesticide combinations with a POTENTIAL LOSS RATING of "1" or "2" represent an increased potential of being lost to surface runoff or leaching. These combinations should be planned for use with recommended treatments to reduce potential runoff and/or leaching losses.

1. Potential Loss Rating "2" soil-pesticide combinations should be planned for use under the following conditions:

a) For Soil Surface Loss

Recommendations call for pesticide to be foliar applied, incorporated or banded.

OR

the

2) Pesticide application is scheduled prior to a month identified by the water budget to have a low probability for rainfall.

b) For Leaching Loss

OR

1) If recommendations call for pesticide to be foliar applied.

OR

2) Pesticide application is scheduled prior to a month identified by the water budget as having a low probability for rainfall.

3) Erosion and sediment control practices that do not increase the infiltration of surface water are used. (Table

2. Potential Loss Rating "1" soil-pesticide combinations should be planned for use with the following treatment measures:

a) For Soil Surface Loss

OR

1) Fields scheduled for pesticide application have erosion and sediment control Systems installed to reduce field sediment production to "T"1 or below;

AND

2) have installed sediment retention basins or filtering measures, according to SCS standards and specifications, to reduce sediment leaving the site.

3) Pesticide application is scheduled prior to a month identified by the water budget as having a low probability for rainfall.

For Leaching Loss

AND

1) If recommendations call for pesticide to be foliar applied;

AND

2) Pesticide application is scheduled prior to a month identified by the water budget as having a low probability for rainfall

AND

3) with the careful and complete application of Irrigation Water Management Standards with no overhead, flood, or furrow irrigation.

4) only erosion and sediment control practices that do not increase the infiltration of surface water are used. (Table 3)

E. For fields that have multiple and different Potential Loss Ratings due to soil-pesticide combinations, plan for the worst case within that field.

F. Producers utilizing CTUs that contribute to the recharge of sensitive aquifers shall be informed about the aquifer sensitivity and recommendations will be made to reduce the potential for leaching of pesticides. Sensitive aquifers are those aquifers identified by the DOH's AQUIFER IDENTIFICATION AND CLASSIFICATION documents as having these characteristics:

- 1) used currently or will be potentially used, AND
- 2) are drinking water or ecologically important, AND

- 3) have a high vulnerability to contamination. OR
or where current pesticide-related impairments exist.

G. Producers utilizing CTUs that contribute to sensitive surface waters shall be informed about the sensitivity of these waters and recommendations will be made to reduce the potential for loss of pesticides in surface runoff. Sensitive surface waters are those waters identified as:

- 1) class 1, AA, and I surface waters or
- 2) waters where pesticide-related water impairments exist.

H. For CTUs contributing runoff to any surface water body, inform the producers of the runoff travel distance from the CTU to the receiving waters. Inform the producer that runoff travel distances of 300 feet or less to any receiving water body, channelized stream or drainage ditch indicates an increased potential for pesticide contamination of surface waters.

I. Where scheduled use of soil-pesticide combinations rated "1" fall during months with "high" leaching and/or runoff, inform the producer of the increased potential for leaching and/or runoff loss and recommend the application of treatments designated for high leaching and surface loss soil-pesticide combinations. Discuss the use of alternative pesticides OR the shifting of the crop cycle or application timetable to prevent the use of this soil-pesticide combination during this period.

Further information can be obtained from agencies and sources on monitoring, regulations, water quality problems and conditions, testing, soils and geology, climate and water budget, irrigation, pesticides (crop needs, pesticide characteristics, application information, yield data, safety, calibration, operation and maintenance, and disposal).

Cooperative Extension Service County Offices In Hawaii:			
County	Location	Address	Phone
Hawaii County Office	Hilo	875 Komohana St. Hilo, 96720	959-9155
Kamuela Office	Kamuela	State Office Bldg Kamuela 96743	885-7318
Kona Office	Kainaliu	P.O. Box 208 Kealahou 96750	322-2718
Maui-Molokai Office	Kahului	310 Kaahumanu Ave. Bldg. 214, Kahului, 96732	244-3242
Molokai Office	Kaunakakai	Hoolehua Recreational Center Kaunakakai, 96748	567-6698
Kauai County Office	Lihue	State Office Bldg. 3060 Eiwa St., Lihue 96766	245-4471
Oahu County Office	Wahiawa	910 California Ave. Wahiawa, 96789	622-4185
Kanehoe Office	Kaneohe	45-260 Waikalua Road Kaneohe 96744	247-0421
South Oahu Office	UH, Lower Campus	1420 Lower Campus Road Honolulu, 96822	956-7138

Table 1a. State Department of Agriculture. Pest Control Branch Offices			
Oahu Office	548-7121	Kauai Office	241-3413
Maui Office	871-5656	Molokai	567-6150
Hilo Office	933-4447	Kona Office	323-2608

Table 2. Examples of Pest Control Methods			
Weeds:			
Biological	cultural	mechanical	chemical
feeding insects	crop rotations	tillage	herbicides
pathogens	cover crops	cultivation	
allelopathy	crop residue	burning	
	narrow rows		
	crop variety		
Insects:			
Biological	cultural	mechanical	chemical
predators	crop rotations	tillage	insecticides
pheromone traps	trap crops	hand pick	
viruses	crop variety	vacuum cleaners	
bacteria	planting timing		
sterile male releases	harvest timing		
	burn residue		
Diseases:			
Biological	cultural	mechanical	chemical
competitive micro-organisms	crop rotations	tillage	fungicides
	trap crops		insecticides
	crop variety		
	planting timing		
	burn residue		
Birds and/or Rodents:			
Biological	cultural	mechanical	chemical
provide improved predator habitat	crop rotations	tillage	rodenticides
	trap crops	traps	avicides
		noise makers	

Table 3. Conservation Practices and Their Effects on Reducing the Loss of Pesticides			
1 - Medium to High Effectiveness			
2 - Low to Medium High Effectiveness			
3 - No Control to Low Effectiveness			
* - May Decrease or Increase Loading (depending on soil, crop, practice design, and management characteristics)			
Conservation Practices			
Receiving Waters	Surface		Subsurface
	In Solution	Adsorbed to Soil	
Management Practices:			
Irrigation System, Tailwater Recovery	1	1	*
Irrigation Water Management	1	1	2
Regulating Water in Drainage Systems	1	3	*
Soil Salinity Management	2	2	3

Structure for Water Control	3	1	3
Water Table Control	1	3	*
Pesticide Management **	1	1	1
Waste Management System	1	1	1
Runoff Management System	1	1	1
Vegetative Practices:			
Conservation Tillage	3	1	*
Contour Farming	2	1	*
Contour Stripcropping	2	1	3
Filter Strip	3	2	*
Field Border	3	2	3
Cover and Green Manure Crop	2	2	2
Conservation Cropping Sequence	2	1	2
Field Windbreaks	3	2	3
Pasture and Hayland Management	3	2	3
Field Stripcropping	2	2	3
Grasses and Legumes in Rotation	2	2	3
Structural Practices:			
Terrace	2	1	*
Water and Sediment Control Basin	3	1	*
Diversion	3	2	3
Grade Stabilization Structure	3	2	3
Grassed Waterway	3	2	3
Streambank and Shoreline Protection	3	1	3
Wetland Development or Restoration	2	1	*
** Includes all appropriate structural, vegetative, and management practices			

Table 4. POTENTIAL PESTICIDE LOSS RATING TO LEACHING				
Pesticide Leaching Potential				
Soil Leaching Potential	Large	Medium	Small	Total use
High	1	1	2	3
Intermediate	1	2	3	3
Nominal	2	3	3	3

Table 5- POTENTIAL PESTICIDE LOSS RATING TO SURFACE RUNOFF			
Pesticide Surface Loss Potential			
Soil Surface Loss Potential	Large	Medium	Small
High	1	1	2
Intermediate	1	2	3
Nominal	2	3	3

THE PURPOSE OF THE PEST MANAGEMENT STANDARD IS TO ASSIST THE AGRICULTURAL PRODUCER TO CONTROL AGRICULTURAL PESTS FOR OPTIMUM CROP YIELDS WHILE MINIMIZING

THE ADVERSE IMPACTS OF APPLIED PESTICIDES ON THE NATURAL RESOURCE BASE OF THE HYDROLOGIC UNIT.

THIS SPECIFICATION WORKSHEET IS INTENDED FOR USE BY SOIL CONSERVATION SERVICE PERSONNEL TO HELP THEM DETERMINE IF AN AGRICULTURAL OPERATION IS MANAGING THEIR PEST CONTROL METHODS ACCORDING TO SOIL CONSERVATION SERVICE SPECIFICATIONS.

THE STANDARD AND SPECIFICATION IS NOT INTENDED TO REGULATE THE USE OF PESTICIDES OR DETERMINE IF THE AGRICULTURAL PRODUCER IS IN COMPLIANCE WITH ANY COUNTY, STATE, OR FEDERAL ORDINANCE, STATUTE, REGULATION OR LAW.

EDITOR'S NOTE: THE WORK SHEETS ARE AVAILABLE IN THE USDA TECHNICAL GUIDE, APPENDIX A

Contact: Natural Resource Conservation Service, Maui Branch: 244-3100 Ext. 3