

Chapter 6. Developing a Crop Protection Strategy: Plant Protection

Introduction

Modern crop protection has shifted from a "kill-all" approach to a systems-based strategy prioritizing plant health. The goal is to manage the **agro-ecosystem** to favor the crop while ensuring economic and environmental sustainability.

6.1. General Objectives and Principles

6.1.1. Strategic Objectives

A valid strategy must balance four competing goals:



6.1.2. Fundamental Principles

- **The Agro-ecosystem:** Interventions are never isolated; they impact the entire web of crop-pest-beneficial interactions.
- **Economic Injury Level (EIL):** Treatment is only justified when the pest density causes financial damage greater than the cost of control.
- **Risk vs. Hazard:** Managing risk by reducing exposure (e.g., buffer zones) rather than just avoiding hazardous substances.

- **Resistance Management:** Rotating Modes of Action (MoA) to prevent pests from adapting to control measures.

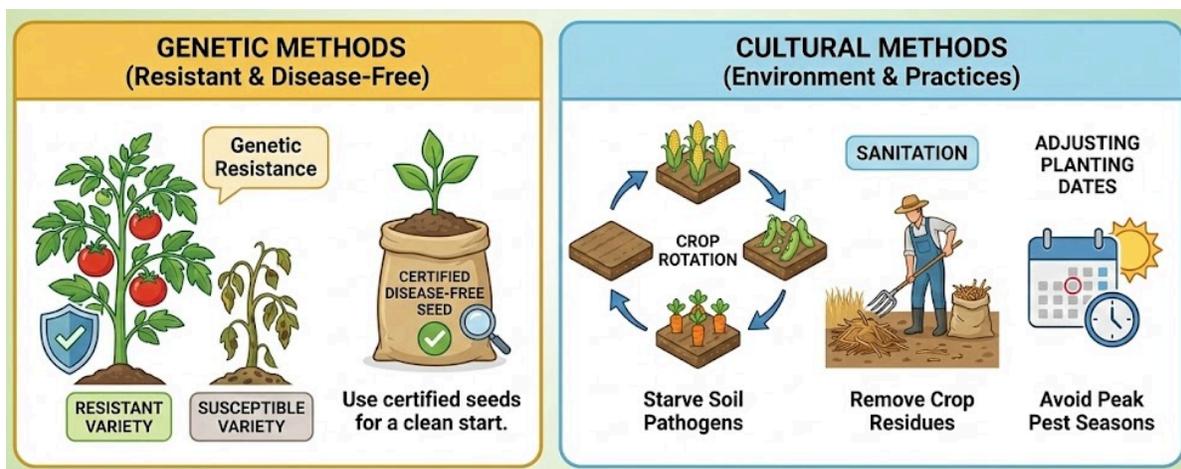
6.2. The Different Stages of Intervention

Interventions follow a temporal hierarchy: Prevention → Observation → Cure.

1. Prophylaxis (Prevention)

Measures taken *before* the pest establishes to reduce susceptibility.

- **Genetic:** Using resistant varieties or certified disease-free seed (the most effective tool).
- **Cultural:** Crop rotation to starve soil pathogens, sanitation (removing crop residues), and adjusting planting dates.



2. Monitoring (Observation)

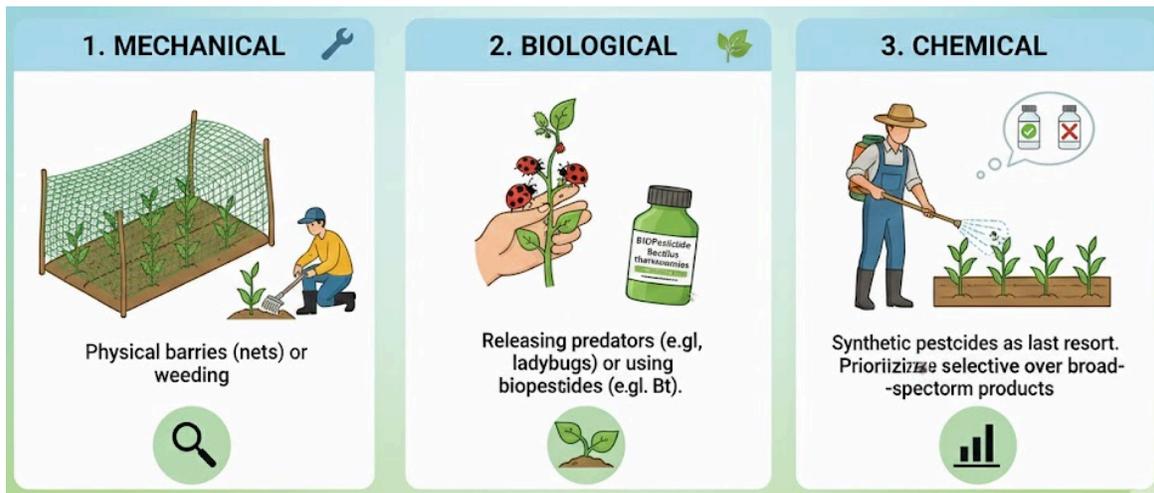
The bridge between prevention and cure that informs decision-making.

- **Scouting:** Systematic field sampling to estimate pest population density.
- **Forecasting:** Using weather models (e.g., for fungal spores) to predict outbreaks before they are visible.
- **Thresholds:** Identifying the "Action Threshold"—the point where intervention is necessary to prevent reaching the EIL.

3. Therapy (Curative)

Measures applied to suppress an outbreak *after* the threshold is breached.

- **Mechanical:** Physical barriers (nets) or weeding.
- **Biological:** Releasing predators (e.g., ladybugs) or using biopesticides (e.g., *Bacillus thuringiensis*).
- **Chemical:** Synthetic pesticides used as a last resort, prioritizing selective products over broad-spectrum ones.



6.3. Main Strategies

Strategies have evolved from "blind" application to knowledge-intensive management.

Strategy	Definition	Key Feature
Blind Control	Calendar-based spraying regardless of pest presence.	Obsolete, inefficient, high resistance risk.
Recommended Control	Based on regional warnings/advice.	Prevents "insurance spraying" but lacks precision.
Rational Control	Based on plot-specific monitoring and EIL.	Economic efficiency; uses chemicals responsibly.

IPM (Integrated)	Coordinated use of biological, cultural, and chemical tools.	Current Standard. Prioritizes non-chemical methods.
Agroecology	System redesign to maximize ecosystem services.	Focuses on autonomous control via biodiversity.

6.4. Crop Protection Strategies: Case Study

A strategy is a timeline of decisions. Below is a condensed model for **Processing Tomato**.

1. Pre-Plant (Prophylaxis):

- Select varieties resistant to Nematodes and Viruses (TYLCV).
- Rotate crops to break *Fusarium* cycles.

2. Vegetative Stage (Monitoring):

- Deploy yellow sticky traps to monitor Whitefly vectors.
- Release beneficial insects (*Encarsia*) if low-level presence is detected.

3. Reproductive Stage (Therapy):

- Use weather-based forecasting for Late Blight sprays (only spray if high humidity).
- Apply selective bio-insecticides (Bt) for fruit worms to save beneficials.

4. Harvest (Safety):

- Cease applications before the Pre-Harvest Interval (PHI) to ensure zero residues.

