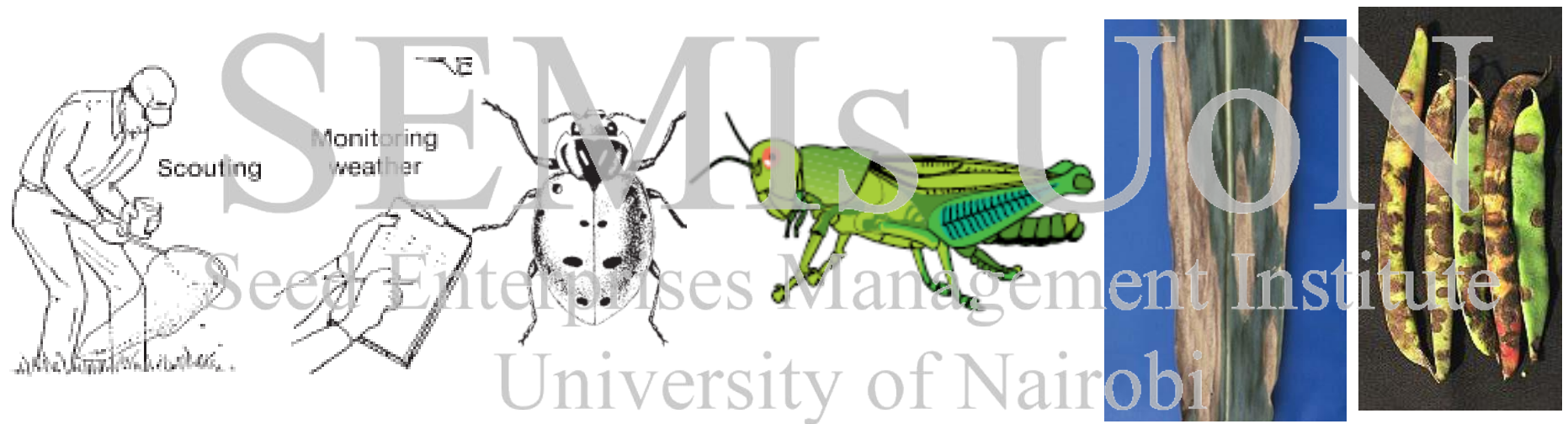


SEED ENTERPRISE MANAGEMENT INSTITUTE (SEMIs)

Seed Production Field Diagnostics Short Course

16th – 22nd November 2014

Criteria for Selecting Appropriate Pest Management Options



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INTEGRATED PEST MANAGEMENT

Integrated - broad interdisciplinary approach based on scientific principles of crop protection that combines a variety of management strategies and tactics to reduce pest populations

Pests include insects, mites, nematodes, weeds, bacteria, fungi, viruses, vertebrates

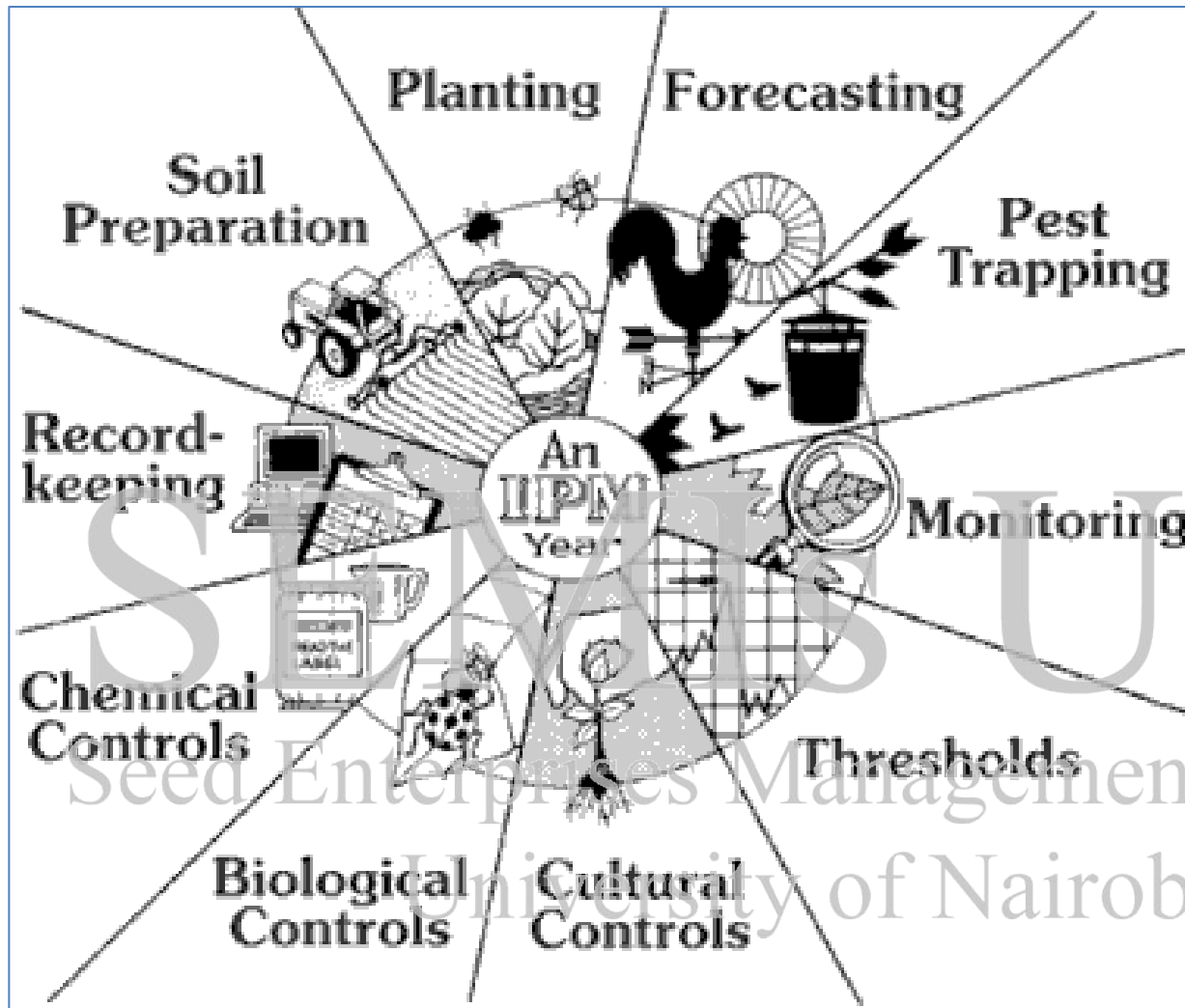
Management - a process by which information is collected and used to make good management decisions to reduce pest populations in a planned, coordinated way.

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Pest Management Tactics

- i. Biological - Parasites, predators, entomopathogens, antagonists
- ii. Chemical - Pesticides, pheromones, baits, attractants
- iii. Cultural - Rotation, planting date, site selection, fertility, pH, plant populations, sanitation
- iv. Host Resistance - Resistant Varieties, Transgenic Crops
- v. Mechanical - Cultivation, Tillage, Rotary Hoe, Fly Swatter, Traps, Screen, Fence
- vi. Physical - Rain, Freezing, Solar Radiation

Components of IPM programme



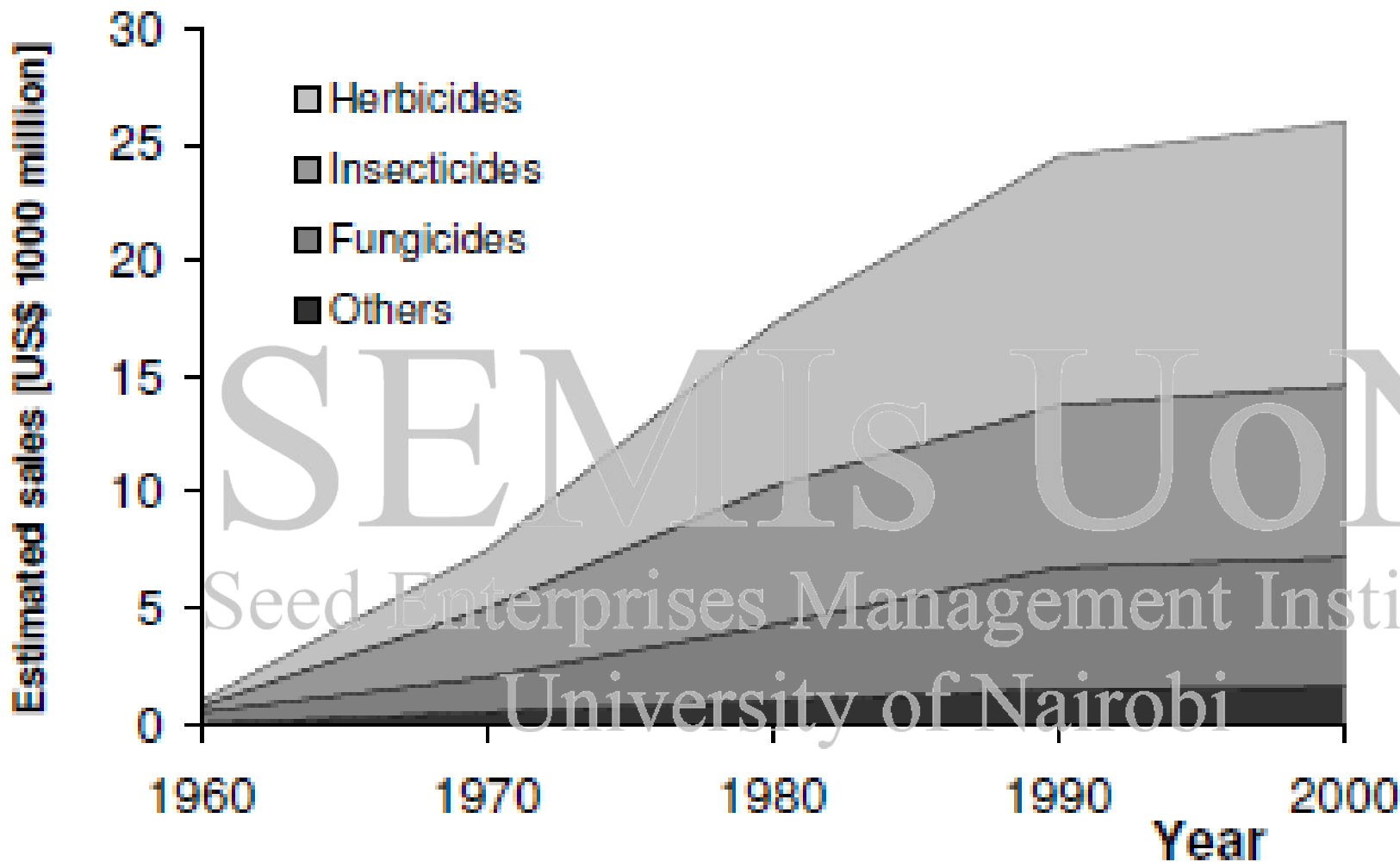
Definitions of IPM

1. "Selection, integration, and implementation of pest control based on predicted economic, ecological, and sociological consequences".
2. "A comprehensive approach to pest control that uses combined means to reduce the status of pests to tolerable levels while maintaining a quality environment".
3. "The optimization of pest control in an economically and ecologically sound manner, accomplished by the coordinated use of multiple tactics to assure stable crop production and to maintain pest damage below the economic injury level while minimizing risks to man and the environment".
4. "A sustainable approach to manage pests by combining biological, cultural, physical and chemical tools in a way that minimizes economic, health and environmental risks". (National Coalition on IPM)

Problems with pesticides

- *Economic and energy costs
- *Resistance to pesticides
- *Disruption of natural control
- *Target pest resurgence
- *Induced secondary pest outbreaks
- *Human health hazards - acute and chronic effects - user and consumer risks
- *Environmental pollution and effects on wildlife
- *Effects on pollinators

Trends in pesticide use



Goals of IPM

1. Increase Farm Profitability (increase net profit)
2. Improve Environmental Quality
3. Improve Public Image of Agriculture



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Increase Farm Profitability (increase net profit)

- *Prevent or avoid crop and pest problems before economic losses occur.
- *Eliminate crop input expenses by avoiding unnecessary management actions.
- *Improve the efficiency of management actions by adopting better application practices.

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Improve Environmental Quality

*Judicious use of pesticides and fertilizers based on identified needs.

*Use selective chemicals or application methods where possible to reduce risk to non-target organisms.



Improve Public Image of Agriculture

*Far-reaching “side benefits” of reducing further regulatory and societal restrictions on the use of pesticides.

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Underlying Principles of IPM

1. **The management unit is the agroecosystem** - basis of the systems or holistic approach to IPM
2. **Any pest exists at some tolerable level** – this notion forms the basis of the economic injury level concept.
3. **Natural control factors regulate pest populations and are maximized** in IPM as the primary means of management; if this strategy fail to maintain pests below economic levels, then pesticides in combination with other tactics are used as a last resort.
4. **Less than 100% control is desirable to leave a permanent pest residue** for natural enemies and as a refuge for susceptible pests to reduce the chances of resistance development.

Steps in the Implementation of IPM

1. Correct pest Identification
2. Understanding of pest and crop dynamics
3. Planning Preventive Strategies
4. Monitoring
5. Decision making
6. Selection of Optimal Pest Control Tactics
7. Implementation
8. Evaluation

Criteria for Selecting Appropriate Pest Management Options

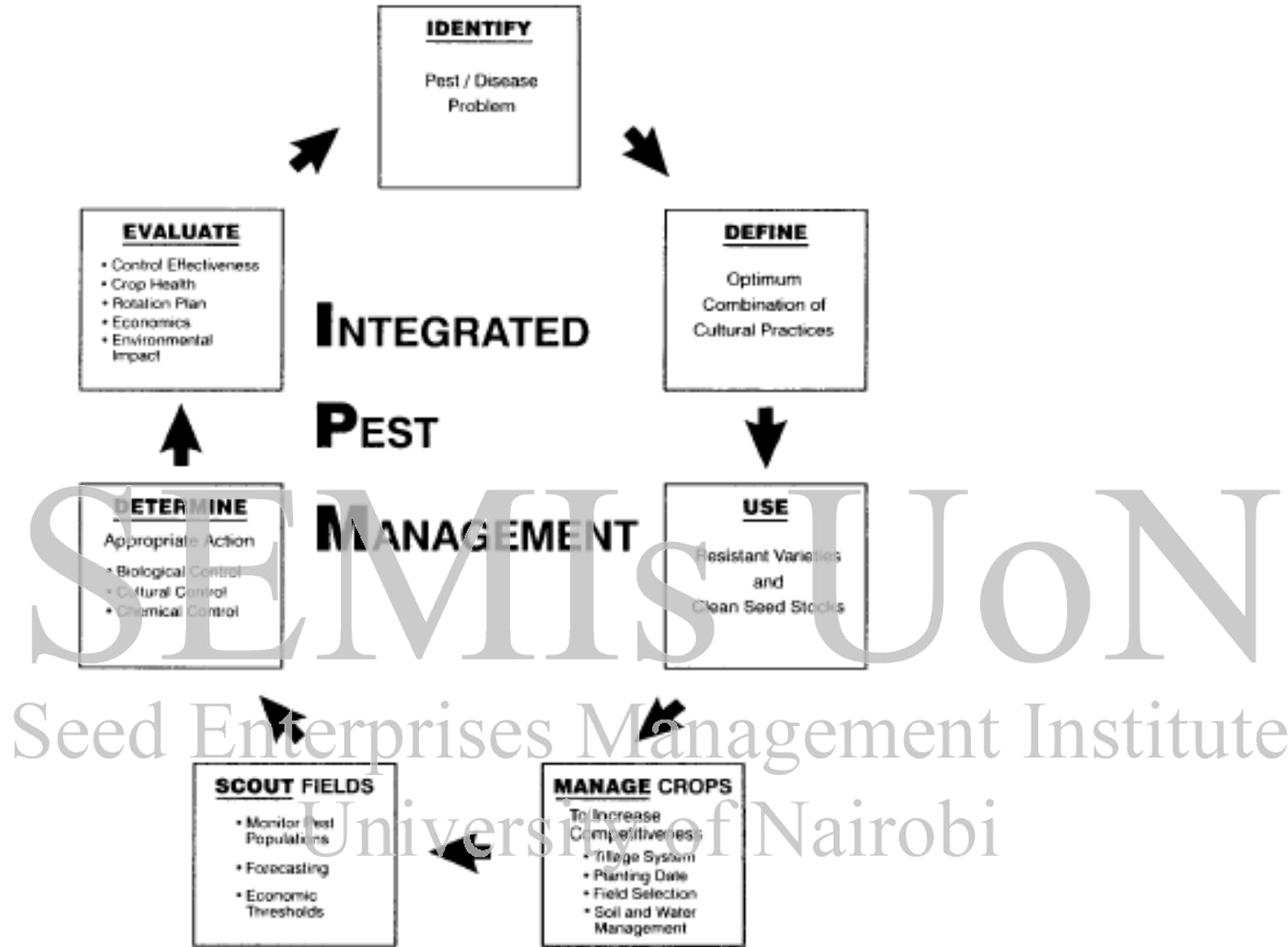
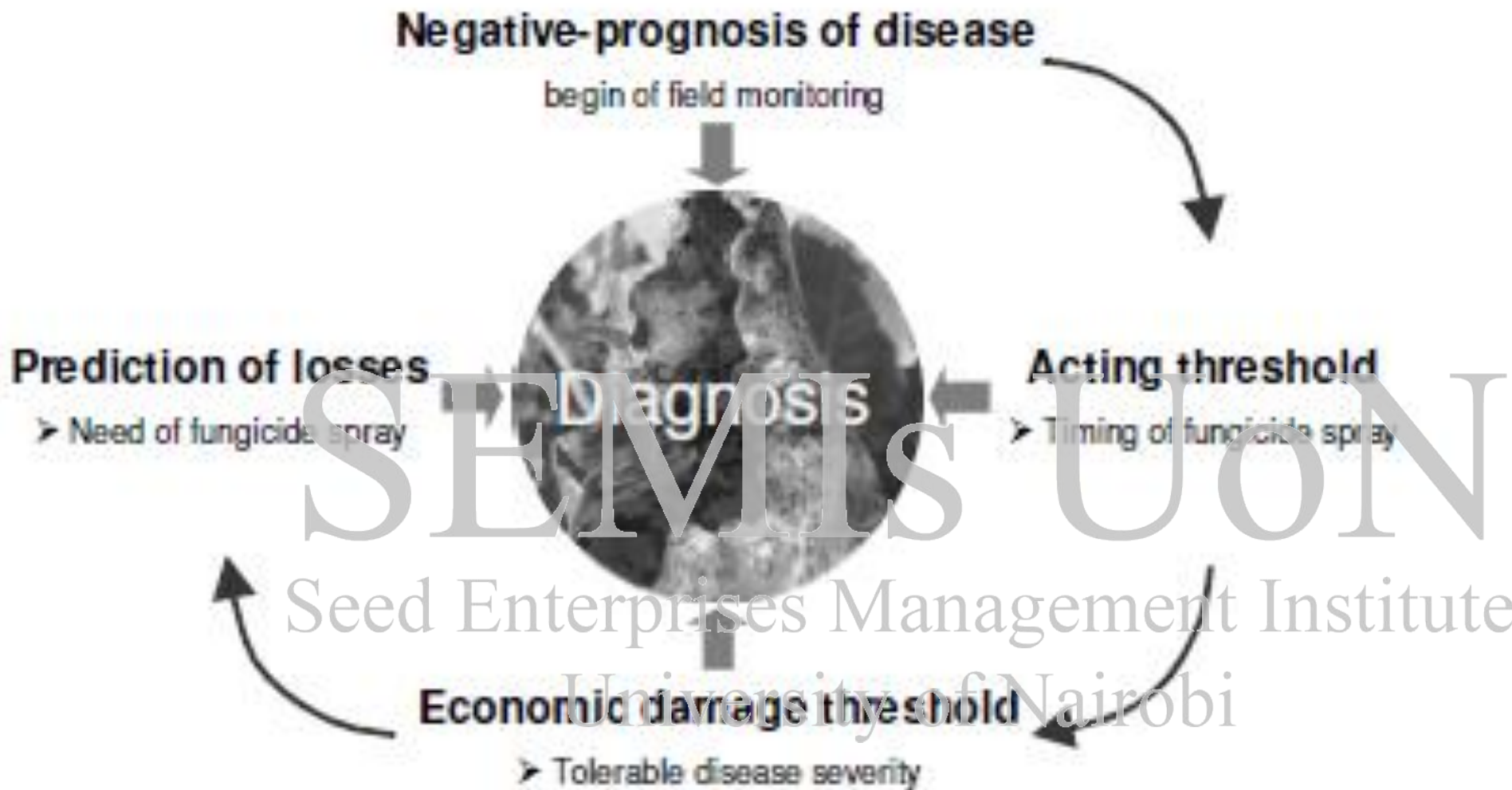


Figure 1. Integrated Pest Management systems incorporate a number of tools to effectively manage weeds, insects, and diseases.

Criteria for Selecting Appropriate Pest Management Options



Correct pest Identification

Type of pests and stages are causing the damage. This is foundation of all decision making



Understanding of pest and crop dynamics

- *When does the pest inflict feeding injury?
- *How much injury is tolerable?
- *What are the expected losses of the pest if controls are not used?
- *What is the most vulnerable stage for management?



Planning Preventive Strategies

Careful examination of field history and all aspects of crop production system:

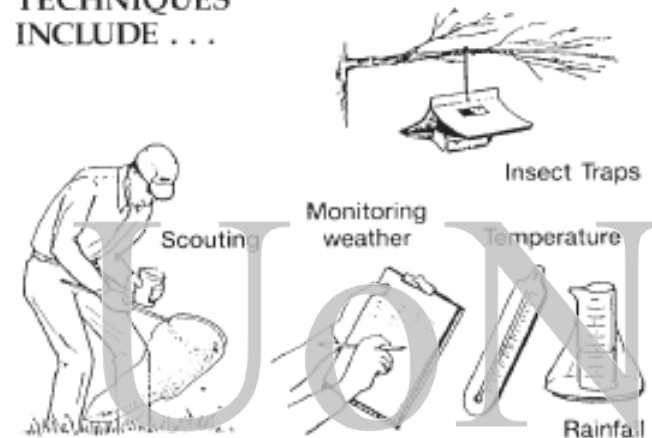
- * Manipulation of cropping practice to reduce pest attack - time of planting, crop rotation, or tillage
- * Are the chances of economic pest losses great enough to justify a preventive pesticide strategy?
- * What are the benefits and risks of soil insecticides?
- * What are the existing natural control agents that can be augmented or conserved?

Monitoring

Periodic assessment of pests, natural control factors, crop characteristics, and environmental factors:

- Sampling
- Field scouting to make visual counts or assessment of damage
- Use of trapping devices (pheromone traps, light traps).

PEST MONITORING
TECHNIQUES
INCLUDE . . .



Decision making

Evaluation of the economic benefits and risks of pest management actions.

- Potential losses or benefits in absence or presence of control measures
- *Presence of natural control agents to reduce the pest population below economic levels
- *is the damage potential of the pest more costly than the cost of control?
- Determine the "economic threshold" or "action threshold" for specific crop growth stage or set of crop conditions.

Selection of Optimal Pest Control Tactics

Options for minimizing economic, health and environmental risks.

- Opportunities to integrate non-chemical tactics
- How the control option fit into the total management system
- How the management tactic control the pest
- Effects of control option on the user, society & environment
- Impact of selected strategy on other insect pest species & natural enemies
- Select best pesticide for the target pest considering optimal rate, legal status, safety requirements & use restrictions

Implementation

Timely deployment of the management options with precision and completeness.

- Maximum effectiveness of the management tactics
- Proper calibration and working condition of the pesticide application equipment
- Use of appropriate pesticide rate for the target pest
- Minimum disruption on natural enemies while still maintaining effective control.

Evaluation of the selected pest control options

- Was the choice of control action appropriate?
- Was the management action implemented on time and according to recommendations?
- What changes to the management tactics can be made to improve control if the same pest problem occurs in the future?
- What future changes in the production system can be made to achieve more permanent suppression of the pest problem?

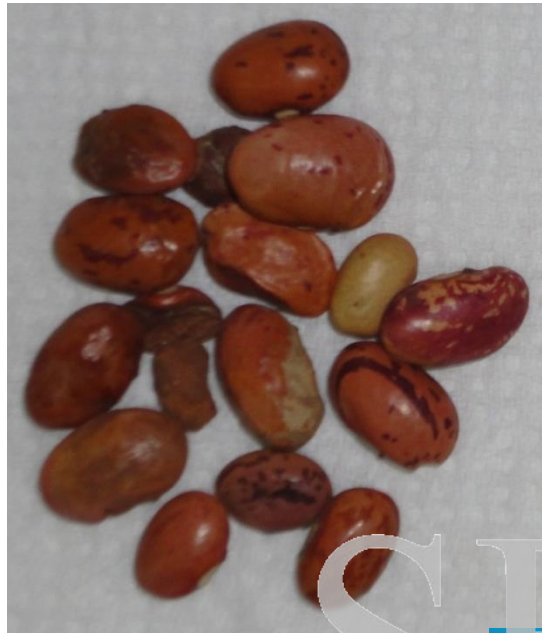
Start with clean seed

Seed health testing



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Effects of bad seed



Reduced seedling vigour



Seed discolouration,
Shrivelling, rotting &
reduced size



Reduced seedling vigour



Criteria for Selecting Appropriate Pest Management Options

Effects of bad seed

Infected seeds

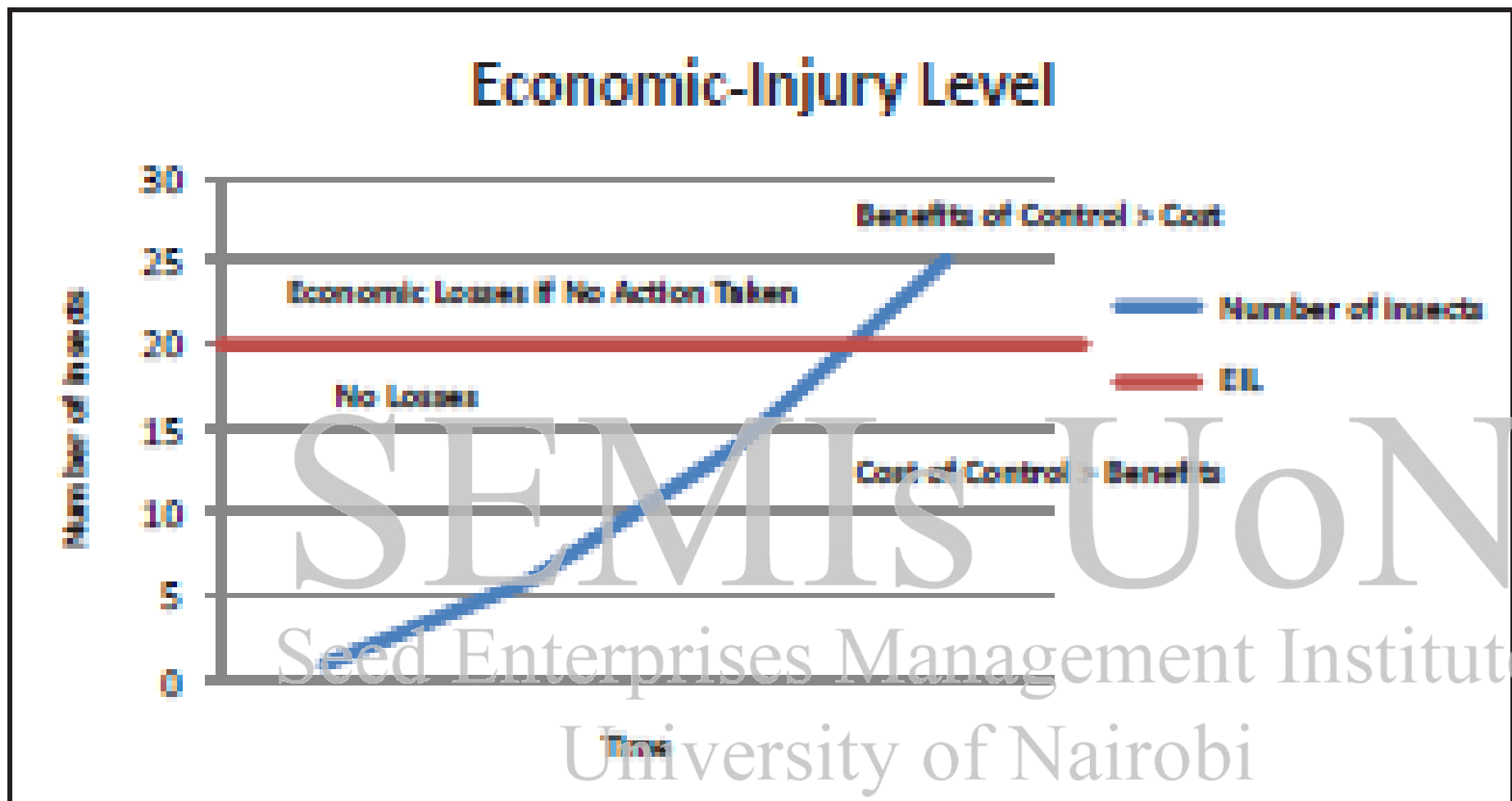


Use of the Economic Threshold in IPM

- Complete control of pests is neither necessary for maximum yields nor appropriate for IPM.
- Crops can tolerate a certain amount of pest damage without appreciable effects on vigor & yield.
- The tolerable damage or density are referred to economic injury levels" or "economic thresholds",.

Economic Injury Level (EIL)

- The lowest pest population level that will cause economic damage or the critical population density where the loss caused by the pest equals in monetary value to the cost of management.
- The economic injury level vary from area to area, crop variety to crop variety, and even between adjacent fields, depending on crop growth stage and specific agronomic practices.

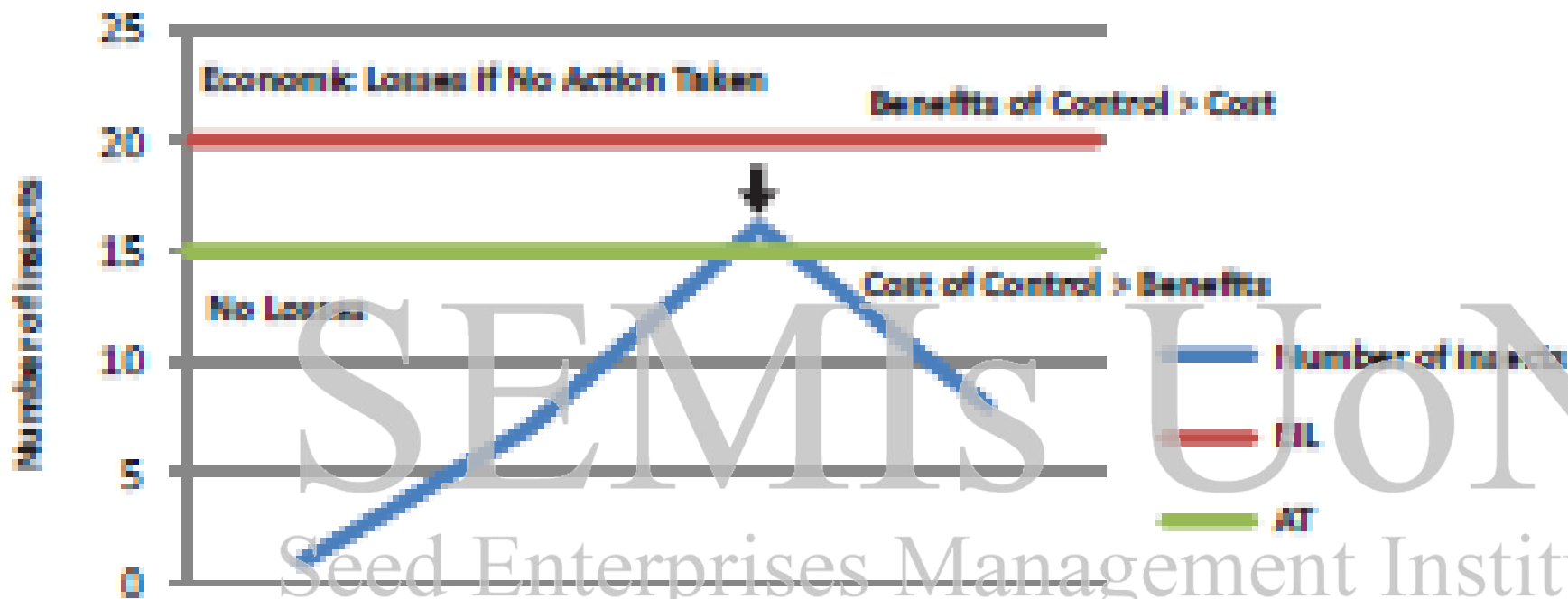


Economic Threshold or Action Threshold (AT)

- The point at which management actions should be taken to prevent an increasing pest population from exceeding the economic injury level.
- The ET always represents a pest density or level of pest damage lower than the EIL.

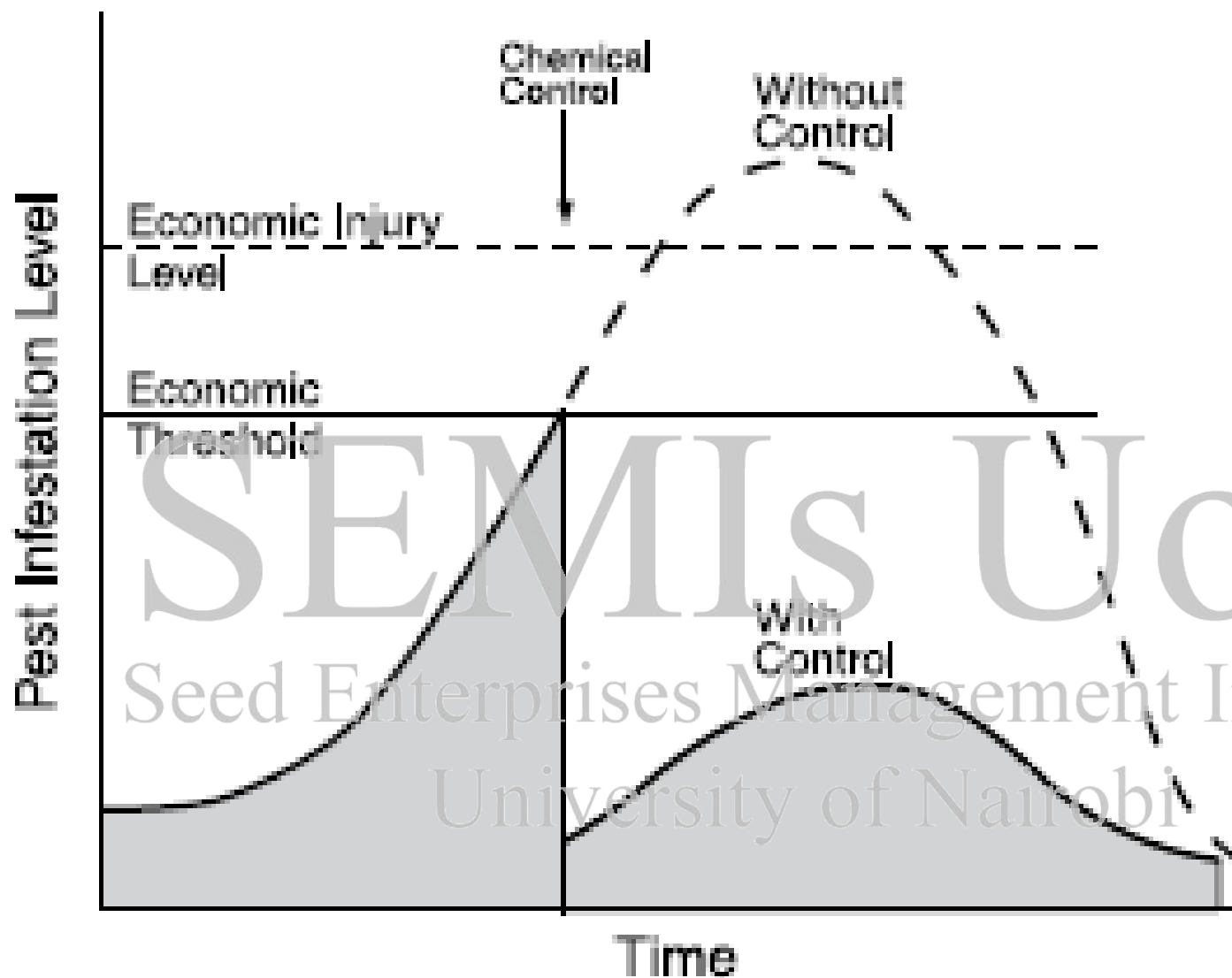
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Action Threshold



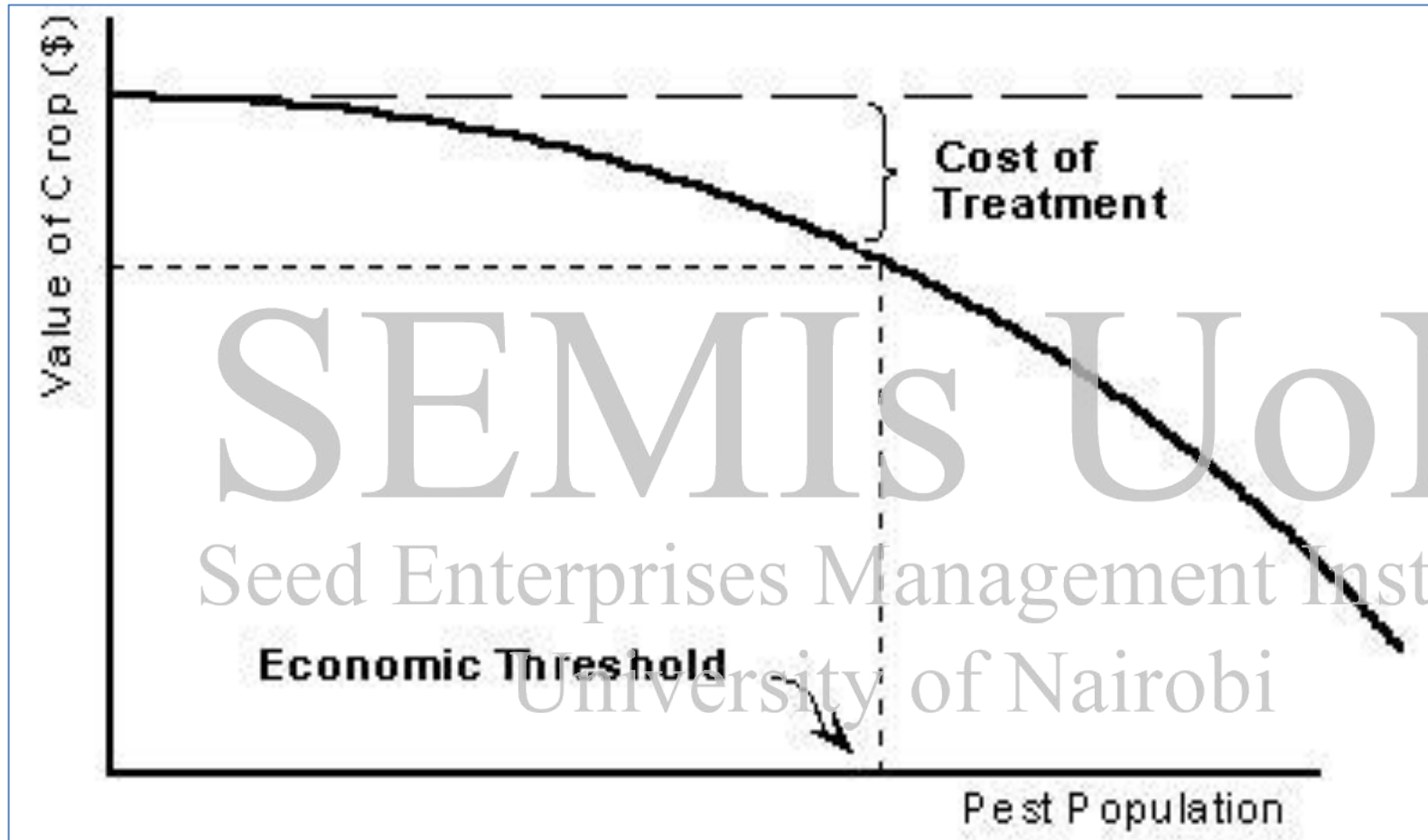
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Economic threshold and pest population models



Criteria for Selecting Appropriate Pest Management Options

Economic threshold, value of crop and cost of treatment



General Equilibrium Position (GEP)

- The average population density of a pest over a long period of time, unaffected by interventions of pest management.
- This level fluctuates about a mean level as a result of biotic and abiotic regulating factors.

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Monitoring in IPM

Why monitor?

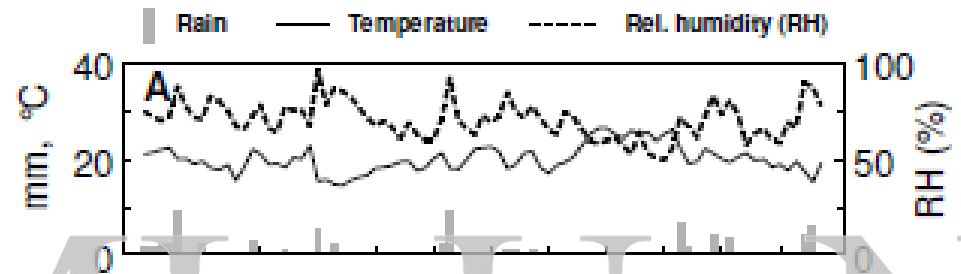
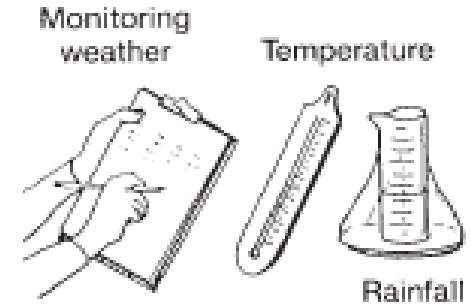
To determine accurate estimates of pest and natural enemy population densities and assess crop damage and its effects on yield for effective implementation of IPM

Field scouting is the primary means of obtaining information to make pest management decisions

Activities in field scouting

*Recording:

- i. Date & time of day
- ii. Weather conditions
- iii. Crop growth stage
- iv. Soil & crop conditions
- v. Scouting results using recording units for the particular pest(s)



Criteria for Selecting Appropriate Pest Management Options

- *Sampling the field using the method & pattern recommended for the particular pest(s)
- *Collecting samples of pests &/or their damage for identification
- *Making recommendation whether or not some type of control action is required for each pest
- *Reporting the scouting results

To conserve beneficial insects :

- preserve habitat and alternate food sources for beneficials
- learn to distinguish beneficial insects from pests
- minimize broad spectrum pesticide applications
- use selective pesticides that are less toxic to beneficials
- treat only those portions of the field where pests cause economic levels of damage.

These natural controls often work more slowly than pesticides, but they can be effective, environmentally friendly, and economically sustainable.

HOW TO CHOOSE FIELD SEED PRODUCTION

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CHOICE OF FIELD

Determine:

- i. Site Cropping History
- ii. Land Features
- iii. Check Soil Records or Perform Soil Assays

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Site Cropping History

- Identify previous crops that are known hosts to pests
- Past incidences of soil-borne pests/ diseases
- Types and levels of weeds
- Crops grown in neighbouring fields
- Previous use of herbicides that may have residual effects

Land Features

- Topography - Uneven fields may require extensive land leveling for proper drainage.
- Drainage- Check site for adequate irrigation and tail-water drainage.
- Water - Evaluate the quantity and quality of available irrigation water at the site

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Soil Quality

- Nutrient balance - Assay for phosphorous and potassium.
- pH. A pH of 6.2 to 7.5 is recommended. Lower pH does not support Rhizobium growth.
- Salinity - Electrical conductivity (EC_e) should be 2.0 mmhos/cm or less.
- Toxic elements - Check for excess of boron or sodium.
- Soil type – textures etc
- Soil depth - A site should provide adequate and unrestricted rooting depth.

THANK YOU FOR THE
AUDIENCE

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