AGROFORESTRY IN HAITI

VOLUME THREE: THE ENVIRONMENTAL ASSESSMENT

DESFIL
624 Ninth Street, NW
Sixth Floor
Washington, DC 20001

March 1989

ENVIRONMENTAL ASSESSMENT

OF AGROFORESTRY II IN HAITI

by

James Talbot
Environmental Resources Management

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LIST OF ACRONYMS AND ABBREVIATIONS

AID	U.S. Agency for International Development
AOP	Agroforestry Outreach Project
CICP	Consortium for International Crop Protection
DESFIL	Development Strategies for Fragile Lands
EA	Environmental Assessment
EPA	U.S. Environmental Protection Agency
FAC	Fond d'Aide et de Cooperation (France)
FAO	Food and Agricultural Organization of the United Nations
IPM	Integrated Pest Management
IRG	International Resources Group, Ltd.
LD50	Lethal dose of a pesticide required to kill 50% of test organisms
LOP	Life-of-project
LRD	Local Resources Development
NGO	Non-governmental organization
NPA	National Program for Agroforestry
PADF	Pan-American Development Foundation
PID	Project Identification Document
PP	Project Paper
PVO	Private Voluntary Organization
STAB	Technical Secretariat for Watershed Management (French acronym)
TWMP	Targeted Watershed Management Project
WHO	World Health Organization

1.0 Summary and Recommendations

The USAID Mission to Haiti will redesign the Agroforestry Outreach Project (#521-0122) and refinance it as Agroforestry II (AFII). Building on the success of the eight-year old AOP and incorporating new initiatives aimed at soil conservation, environmental education, applied research, and conservation of indigenous tree species of economic value, AFII will be a five year, $30 Million project affecting over 400,000 farmers and 21,000 school age children.

This Environmental Assessment (EA) has examined the five key components of AFII: nursery production; seed and germplasm improvement; applied research and technology generation; extension; institution-building; and training. Positive environmental benefits are predicted to accrue from the various technical interventions proposed to improve soil fertility and to reduce soil erosion. Few, if any, negative or adverse effects are predicted.

The role of research will be to focus on farm practices which employ appropriately effective types of vegetative barriers and productive new systems of alley cropping on steep hillsides, which comprise over 70 percent of Haiti's farmlands. A pilot program in environmental education in three rural regions of the country will teach primary school students between the ages of 10 and 18 the values of trees in farming systems, the general ecology of Haiti and the problems of soil erosion and its causes and cures, as well as practical skills, such as fruit tree propagation in school-run nurseries and ways to manage trees on the student's family's farm.

The seed and germplasm improvement component will address several basic problems, such as: first, matching appropriate species/varieties with peculiar ecological site conditions, second, replenishing the supply of seed for indigenous tree species of potential economic value, many of which have been extirpated from native habitats throughout Haiti because of widespread deforestation, and third, preserving at least one (and maybe more, if additional species can be identified) species of the economically important and biological endangered species of neotropical oil palm, Attalea crassispatha.

Also, a comprehensive analysis of pesticides proposed for use in the centralized, high volume production, seedling nurseries was prepared in accordance with AID Reg 16 and the Agency's Policy on Pesticide Use. A number of "General Use" pesticides are recommended for procurement and use under AFII.

Based on the extensive review of project activities conducted during this EA, the following recommendations are made:

*Pesticides: Only pesticides included ir the list in Table 4-1 of the EA will be permitted for use or procurement with project funds. These pesticides are recommended as relatively safe, if used according to label instructions and under proper supervision, and in conjunction with the proposed training and IPM practices already begun under the AOP.

*Applied Research: Applied research on tree species-site relationships and appropriate soil conservation practices will be a critical link toward successful protection of soil resources on steeplands. CARE and PADF project staff should make every effort possible to develop practical applied research tasks with the research unit of AFII and quickly translate these results into their extension/outreach program. Monitoring of the implementation of soil conservation measures on private farmlands should be programmed to determine the effectiveness of extension/outreach based on the results of this research. The mid-project evaluation, planned for AFII, could further review the effectiveness of these practices.

*Environmental Education: This pilot program, as discussed in Section 6.4, should be implemented during years 1, 2, and 3, then evaluated for effectiveness, including content of messages and impact on target groups. Any redesign should be made during year 4 of this program.

*Seed and Germplasm: Elements of the seed and germplasm improvement component will have significant impact on the quality and quantity of germplasm outplanted in AFII It is critical to facilitate the continuation of the effort now in-progress by IRG under the AOP, without undue interruption. The timing of the nursery production activities planned by CARE and the Pan American Development Foundation (PADF) are dependent on the success of the establishment of the seedling seed orchards now underway in five regions, as well as the production of viable seed for known species provenances throughout Haiti. The germplasm component should be fully funded and priority given to rapid procurement to ensure the smooth transition from the AOP to AFII, without work stoppage.

2.0 Project Description

2.1 Purpose, Goals, Expected Accomplishments

The goal of AFII is to maximize the productive potential of Haitian hillside agricultural land and to reduce the ongoing degradation of the country's natural resource base. The purpose is to achieve sustainable increases in on-farm productivity and farmer income by introducing soil-conserving and fertility-enhancing perennial crops and cropping patterns into traditional Haitian peasant farming systems, in a variety of locally appropriate agroforestry systems. The project will build upon the successes of the soon-to-be-completed AOP, #521-0122 by continuing to institutionalize farmer interest in the pursuit of appropriate land-use practices, plant materials, and extension services begun through the AOP.

The specific objectives include:

*Generation and dissemination of technologies for agroforestry and agro-silvi-pastoral systems;

*Provision of necessary inputs such as improved seed and germplasm;

*Amelioration of soil microenvironments, which are experiencing fertility and erosion problems, through agroforestry practices;

*Production of wood products to meet national demand and household needs;

*Institutional strengthening of local non-governmental organizations (NGOs) to implement agroforestry outreach activities in their respective geographic areas of influence; and

*Consciousness-raising for all Haitian citizens about the deterioration of the rural physical environment through appropriate environmental education programs.

These objectives will be accomplished by the implementation of five key components: nursery production; seed and germplasm improvement; applied research and technology generation; extension; institution-building; and training. These are described in detail in the Project Paper to which this EA is appended.

2.2 Affected Environment

An excellent and comprehensive description of Haiti's environment is provided in the Haiti Country Environmental Profile (Ehrlich et al., 1987). The material that follows i meant to briefly summarize the affected environment in which project activities will occur. Ecologically, a high degree of environmental deterioration is evident throughout Haiti. Vegetation, soil, and water resources are more degraded now than they were prior to European settlement, and even more so than just one generation ago! Topography, climate, and historical factors, both natural and anthropogenic, have contributed to the observed malaise. Increasing population pressures and an absence of institutional and political leadership to address environmental problems also have influenced this situation.

The proposed project will undertake selected interventions to reverse trends in resource degradation on a limited scale by working with individual farmers on their private lands. Thus, the "affected environment" can best be described as the farm microenvironment, and to a limited extent small catchment areas, as more and more farmers participate in the agroforestry practices proposed.

2.2.1 Geography, Physiography and Climate

Haiti is located in the Caribbean on the western third of the island of Hispaniola in the Low Subtropical Region (18-20 degrees north latitude), which is free from frost at low elevations above sea level and where the temperature range is significantly wider than in the deep tropics. The highly varied topography, with elevations ranging from sea level to over 2680m, results in a large variability in rainfall and temperatures with a wide range of microclimates. Although most precipitation is brought by the Northeast Trade Winds, site specific rainfall patterns are influenced by orographic (i.e. related to topography) factors. Because most of the rainfall trends from the northeast and because high mountains intercept this precipitation, the highest rainfall areas are in the mountains of the north coast and southwest peninsula.

Rain shadow effects are evident throughout the country where valuable moisture is intercepted by north-facing slopes, leaving little for slopes facing south. Most of the country, however, receives at least 1000mm of precipitation annually, and a substantial portion receives at least 1500mm. Hargreaves and Samani's (1983) manual on rainfed agriculture in Haiti indicates that much of the country has a climate suitable for production of most cash and subsistence crops, given suitable soils and topography, and appropriate farm management practices.

The proposed project will attempt to improve the local soil and microclimatic conditions of certain farmlands by introducing vegetative practices designed to reduce deleterious effects of wind and erosion on landscapes. Tree planting and hedgerow schemes will form the basis of the interventions aimed at such improvements.

2.2.2 Soils and the Land

About 22,000 sq km of Haiti are in steep slopes or highlands. The rest are in slopes of less than eight percent grade and constitute the major plains of Haiti. Most of the highlands receive adequate rainfall for cropping. With regard to suitability for agriculture, 86 percent of the soils are thin and fragile and the remaining 14 percent are deep. Many of the limestone-derived soils have high natural fertility, as long as they are not mismanaged. About 70 percent of the arable land is on steep slopes. The national average for tropical America is somewhere around 25 percent.

High erosion hazard is common for soils on these steep slopes, although no soil loss data have ever been systematically collected by field measurements in Haiti. Ehrlich et al. (1987) estimated that about 7.4 percent of the country has "good" lands suitable for crop production with few restrictions, taking into account land/soil class, erosion characteristics, and crop agroecological zones and their suitability for particular kinds of agriculture. Unfortunately, none of these "good" lands are found in the mountains or on the steep slopes where most of the peasantry is obliged to make a living. The people living in the Cayes Plain, the Artibonite Valley, the Plain of Leogane, and the Cul-de-Sac are blessed with the highest percentage of good lands. The northwest of Haiti, where CARE operates, has the lowest percentage of good lands, even without considering the region's highly variable rainfall regime. Even so, mismanagement of soils because of erosion and loss of fertility results in the abandonment of nearly 6000 ha of arable land each year.

The proposed agroforestry project will attack the problem of soil degradation on mostly steep-sloped lands in selected regions of the country.

2.2.3 Water

Although Haiti has many rivers, the majority have little or no water during the dry season. Thus, surface water availability is limited on a site-by-site basis. Few storage facilities for water exist, with the exception of special catchment basins erected by enlightened communities or for hydroelectric power,

such as the impoundment creating Peligre Lake. All water for irrigation and domestic consumption must be provided by direct diversion of streams or by tapping groundwater at springs. Groundwater occurs in bedrock aquifers in the highlands and mountains and in alluvial sand and gravel aquifers of unconsolidated deposits in the plains. Groundwater is abundant and accessible in the coastal plains, with rates of 10 to 120 liters/second reported. Irrigation potential of the flatter areas is obviously greater than for the steeper slopes, leaving the farmers on hillsides with thin soils with inadequate water reserves.

Improvements are needed in the water retention capacity of the country's major watersheds. The proposed project will undertake more integrated agroforestry approaches which will apply techniques to conserve and retain rainfall that falls on steeplands.

2.2.4 Vegetation

Overall, forest area declined 59 percent between 1956 and 1977 at an annual rate of about seven percent. This was one of the highest rates in the tropical world. According to Pierce (1988), nondegraded dense forest cover constitutes less than 1.5 percent of the land area of Haiti. The demand for cultivable land and fuelwood is at the heart of the problem.

Reforestation efforts at their present level will not provide enough trees to meet fuelwood demand in the near future. Conservative estimates are that for every tree planted or regenerated, three to eight are cut or burned.

But the concern is not only for loss of wood resources. The systematic degradation of forests and landscapes has resulted in the loss of the requisite diversity of genetic resources to allow the landscapes to recover and people to make a living. Tree and shrub species which were prevalent in Haiti only a generation ago have been extirpated from many regions. Tree species such as the caimite (Chrysophyllum caimito) and mammey apple (Mammea americana) and even Haitian oak (Catalpa longissima), which contributed to the productive basis of peasant society, are no longer part of the farmer's repertoire of risk-aversion tactics designed to provide nutrition or a cash crop, when other sources of revenue fail. The loss of germplasm is as real as the loss of soil from the Haitian landscape.

The proposed project will continue to introduce exotic species, such as multipurpose trees and forage species, which

have potential for adaptation to the relatively harsh conditions of AFII environment. At the same time, the project will undertake the identification and mapping of superior individuals of indigenous species, and the collection and propagation of genetic material through a number of seedling seed orchards scattered around the country.

2.3 Target Beneficiaries

The project beneficiaries are mostly the rural poor who farm the steeplands where agroforestry outreach is practical. The Project Paper amply describes these people. A subset of beneficiaries will be the Haitian NGO staff who learn the techniques of nursery tree production and vegetative propagation, who receive training in agricultural extension, and who apply practices to reduce soil erosion, improve moisture retention and soil fertility, and increase production of animal forage. Many will learn the husbandry value of seed and seedling germplasm and will pass on the knowledge of selection of superior mother trees to their friends, relatives, and neighbors.

To some extent the measurement of these benefits is problematic. At the same time, the knowledge that this process of agroforestry outreach has touched, since 1982, nearly 200,000 Haitian farmers and many hundreds of animators, monitors, agronomes,and technicians, some of whom have benefited by exposure to project technology, is impressive. Under the proposed project, there is no reason to doubt that continued provision of agroforestry resources will directly benefit a broader, more representative cross-section of the rural population than ever before.

2.4 Relationship of Project to Other Environmental Activities in Haiti

AID/Haiti is implementing three other projects in the natural resources sector: Local Resources Development I (LRD I) at Maissade in the Central Plateau region and II (LRD II) at Leger, near Arachaie; and the Targeted Watershed Management Project (TWMP)in the watersheds in and around Les Cayes.

LRD I is aimed at reducing environmental degradation on hillsides of a local commune. It employs some of the nursery technology learned through the AOP, but focuses on participatory approaches to soil conservation and technology transfer. This project is viewed by many as one of the most successful natural resource projects as a result of: first, its ability to motivate farmers to implement soil conservation and protection based on land capability; and, second, its establishment of a comprehensive demonstration site, illustrating many of the farm

practices employed by local farmers. In LRD II, the component dealing with local tree production nurseries has borrowed technology elements from the AOP. The project provides nursery materials, seed and germplasm, and training, but relies on local labor and use of private farmlands to implement soil conservation and tree planting. Unless additional funding is found, both will end during 1989.

TWMP was designed to address the broader issue of watershed management by focusing on several major catchment basins in the southern peninsula and emcompasses a project are of 80,000 ha. Certain technical interventions aimed at improving soil fertility, reducing soil erosion, and testing new germplasm, such as forage grasses and multipurpose shrubs, have particular relevance to the proposed agroforestry project. Although TWMP is only 1.5 years into implementation, some of the lessons learned from the following could be of use to the technical staff of the proposed project:

*Alternative cultivation practices such as minimum tillage and contour furrowing;

*Diversified and intensified home gardening; and

*Establishment and management of hedgerows and strip crops on the contour, using trees, grasses and shrubs.

Through PADF, the AOP maintains direct linkages with several of the NGOs involved with TWMP, for example, DCCH. There is the potential for regular exchange of information via this linkage and by periodic technical seminars at which PADF, DCCH, and TWMP personnel attend.

Another major accomplishment of AID in the sector was the establishment of the Technical Secretariat for Watershed Management (STAB-French acronym) funded with PL 480 monies. Although work only continued through September 1988, STAB was able to establish itself as a workable institution with sufficient support and recognition to function effectively (Pierce, 1988). It successfully implemented four activites:

*Project Monitoring: An inventory of all ongoing watershed projects was completed.

*Project Evaluation: Several key donor projects were analyzed to determine how to combat the problems of soil erosion more effectively and how to assist in technology transfer beyond the target population.

*Data Base Development and Information Exchange: Results of the project inventory were entered into a computerized data base to aid in providing documentation to interested parties.

*Conflict Resolution and Policy Development: Through a Committee of Reflection, established with the participation of private and public sector members, issues such as Food-for-Work and other sensitive policy matters were discussed in an open forum. PADF's Director sat on this committee, as did other NGOs involved with the AOP, providing a direct avenue for dialogue with the government on matters of agroforestry.

Although AID is the major donor in the realm of agroforestry and natural resources, other countries and NGOs are addressing the problems of environmental degradation on a similar, but more limited, basis. France, through its Fonde d'Aide et de Cooperation (FAC), supported two watershed management projects in the area of Jacmel. FAO established and maintains an excellent training center for watershed management at Limbé, near Ca Haitien. The proposed AFII will use these facililities to conduct some of its extension agent training. Also, the World Bank, the Inter-American Development Bank, the Canadian International Development Agency, and some European countries are spending more and more resources on natural resource management projects in Haiti.

Perhaps the major AOP contribution to other donors has been their acceptance of the model of a modern tree production nursery and the inculcation of the principle that, to successfully plant trees, it is necessary to work on private farmlands. AID has reached over 170 NGOs in most regions of the country with a model concept of agroforestry. Many other donors have embraced elements of the tree production and extension system in their own programs. Information gained from the AOP has been shared in various ways with other donors through the NGO network, resulting in technology transfer and consciousness raising about the benefits of tree planting.

3.0 Scope and Purpose of the Environmental Assessment

3.1 Purpose of the EA

The purpose of this EA is to provide AID with a full discussion of the positive and negative impacts of AFII project activities on the natural and human environment. The EA

is prepared in accordance with 22 CFR Part 216, Environmental Procedures, or AID Regulation 16. Environmental assessment deals with the identification, measurement, interpretation and communication of impacts. It is conducted to ensure that environmental factors and values are factored into the AID decision making process. Due consideration has also been given to AID's recent Policy Paper on Environment and Natural Resources (April 1988) in the review of AFII.

Several approaches were taken to arrive at the analysis which follows. A "scoping of issues" was conducted by review of project documents such as the Project Identification Document (October,1988), by interviewing key staff who are implementing the existing AOP and who are likely to be involved with the proposed project, by discussion with members of the PP Design Team, and by direct observation. The consultant has also drawn on his extensive knowledge of Haiti gained from over four and a half years of direct field experience, which has included participation on the End-of-Project Evaluation Team for a review of the existing AOP in 1985 and preparation of the Haiti Country Environmental Profile (Ehrlich etal., 1987). Extensive field visits to AOP project sites were not possible during this 24-day consultancy. A short review of activities scheduled for the seed and germplasm component was undertaken by a one-day field visit with the Chief of Party responsible for these tasks.

3.2 Scoping of Issues

The key issues identified during the scoping exercise include the following:

*Use of pesticides in high production, containerized seedling nurseries;

*Allocation of agroforestry research inputs so that meaningful, practical results are obtained; and, how to monitor, track, and disseminate useful results throughout the Life of Project (LOP);

*Appropriate use of positive environmental interventions, such as soil conservation methods in the farming systems of Haiti;

*Need for and allocation of resources for environmental education in the context of the project; and

*Conservation of biological diversity through the seed and germplasm improvement component.

Pesticide use is a relatively minor component in terms of level of effort and funds allocated, but nevertheless requires a special analysis according to AID Reg 16. Section 4 is devoted to an analysis of pesticide use and recommends pesticides which are relatively safe to use, following AID guidelines. Each of the remaining issues will be addressed in the discussion of project alternatives (Section 5) and environmental consequences (Section 6) of the preferred project (Alternative II).

3.3 AID Policy on Pesticides

Since 1977 a series of stringent policies and procedures have been implemented by AID to reduce the quantity of pesticides provided through its development assistance funds. The Agency's policies, to its credit, have set a precedent for other bilateral and multilateral donors to develop guidelines on pesticide use in their own programs. In May 1978, AID's Bureau for Program and Policy Support issued its Policy on Pesticide Support, which is still fully supported by AID as an effective policy directive on pesticide use.

The policy states that AID will concentrate its pest management activities on efforts which minimize the use of pesticides, by developing effective integrated pest management (IPM) programs using alternatives to chemical control, such as biological, cultural, and mechanical methods. The policy encourages AID missions to increase availability of technical assistance to support IPM programs, to improve pesticide safety, and to monitor the effects of pesticide use on human health and the environment.

[INSERT TABLE 4-1 HERE]

The present EA includes a detailed analysis of pesticide use because it is felt that the careless use of hazardous and toxic materials by Haitian peasants would introduce unwarranted stress into a natural environment already severely stressed by severe deforestation and land degradation, and a human environment where poverty, disease and poor nutrition have reduced the average life expectancy to 52 years.

4.0 Pesticide Use Assessment

4.1 Basis for Selection of Requested Pesticides

The guiding principles for selection of pesticides used or procured on AID projects include: conformity with AID and host country regulations; effectiveness for demonstrated crop protection needs under prevailing environmental conditions; minimization of threat to human health and the environment; and promotion of (IPM) approaches.

The selection of pesticides under the proposed agroforestry project is based on effectiveness, relatively low hazard, and availability in Haiti. Table 4-1 presents the list of pesticides proposed for use under the new project. In order to understand the evolution of the presently proposed list it is instructive to review the history of pest management under the AOP.

Under the existing AOP the use of pesticides has evolved based on a recognition by CARE and PADF that some agrichemicals are necessary to treat certain pest problems in some instances. A decision was made early on by these organizations to limit the use of pesticides to the nursery environment and not to encourage pesticide use by farmers participating in the tree outplanting program. This is a commendable approach that has been fully enforced throughout the AOP.

The AOP started off in 1982 with the full intention that no pesticides would be needed. As pest and disease problems arose in the nurseries, modest use of the following pesticides has been required to avoid substantial losses: benomyl, captan, carbaryl, malathion, mancozeb, maneb+methylthiophanate, and trichlorfon. The focus on appropriate pest management practices was significantly aided by key consultancies arranged at the request of AID's Regional Environmental Management Specialist (REMS), resulting in the reports by Michel Cusson (1986) and Guy Tourigny (1987) and the execution of a seminal pesticide safety training course for project personnel by John Hellman, an extension specialist from the Consortium for International Crop Protection (CICP) in November, 1986.

In particular, the report by Tourigny helped focus insect pest and disease management on improving conditions in the nursery, increasing awareness of nursery personnel t identification of pests, and use of a suite of IPM options that lessened dependency on agrichemicals. The training course increased awareness about the real hazards associated with the use of chemicals in the nursery and led to the development of Creole training materials and a series of training courses on proper use, storage, handling, application, and disposal of pesticides. This training was offered to over 150 project personnel during the period 1987-89. In sum, one has witnessed the institutionalization of pesticide management into Haiti's major agroforestry project.

Under the new project, which is the subject of this EA, the above-mentioned pesticides, and some additional ones will be required in the high production forestry nursery environment. All of the pesticides listed in Table 4-1 are presently registered for General Use in the United States, are locally available for purchase, and are not considered to be too toxic for use on this project. Many of these have been used during the AOP and have been effective for most pest problems in the tree nurseries. In addition, nursery managers are familiar with each product's handling precautions and methods of application. The basis for use of any given pesticide is subject to the following decision framework:

*Problem Identification: The nursery manager first attempts to identify the insect or disease problem;

*Examination of Present Management: The nursery manager then examines how his nursery practices could have led to the observed problem, resulting in a diagnosis of biotic or abiotic causes of seedling loss or damage. Technical advice is available through PADF's nursery specialist, a position created in 1987 to address technical problems in the nursery, or through CARE's trained agronomists;

*Assessment of Seriousness of the Problem: Depending on the magnitude of the problem a number of options are available. For example, if a few caterpillars are observed, the nurseryman will instruct his staff to pick them off the leaves. If a large infestation is apparent, he will instruct them to use Dipel;

*Pest Management: The first line of defense is prevention through the use of cultural controls. The second line of defense is the use of natural pesticides such as neem-cake (which will be explained in Section 4.6) and other naturally available pesticides. The final defense, if all the above fail, is use of a chemical pesticide selected from the list in Table 4-1.

Pesticides to be applied under the proposed project will be done under the strict supervision of trained nursery managers.

The principal pest problems (Tourigny, 1987; Webb-Wilson letter, 1987) expected to arise in the agroforestry nurseries, and for which chemical control methods may be required, include many of the following (non-exhaustive listing):

Diseases Caused by Fungi

*Damping off and root rot, observed on Casuarina equisetifolia, Leucaena leucocephala, and Swietenia sp. and other tree species, caused by Pythium and Phytophtora spp., and Rhizoctonia sp. Root rot was a particular problem on Cassia siamea, the most important species in the current AOP..

*Sooty molds on Citrus sp., which grow on honeydew exudates of sap-sucking insects such as aphids, mealybugs, scales (observed on Citrus sp.), and psyllids (Heteropsylla cubana observed on Leucaena leucopcephala).

*Powdery mildews such as Oidium sp., observed on Eucalyptus camaldulensis, Cassia siamea, Acacia auriculiformis, Casuarina equisetifolia, and Carica papaya.

*Leaf spots from Cercospora sp, observed on Azadirachta indica, Acacia auriculiformis, Cassia siamea and some species of Citrus.

Plant Stress Caused by Nematodes

Nematodes are not a serious problem in most nurseries, according to PADF and CARE technicians. According to Tourigny (1987), nematodes may occur in some nurseries where unsterilized growing medium is used.

Insect Infestations

*Psyllids, or jumping plant lice, occur where Leucaena leucocephala and Saman samanea are grown. It should be noted, however, that there have been no major losses in the field to direct seeded Leucaena; and no serious problems in the nurseries with psyllids. Biological control by the ladybird beetle, Curinus coeruleus, looks promising. Five predators of psyllids have been identified in the field. Nursery managers have been encouraged to reduce spraying of psyllid infestations so as to promote population control by the predator beetles.

*Ants are a problem in many nurseries because they carry off newly planted seeds from the rooting containers.

*Crickets are problematic in that they cut off young Casuarina seedlings at the base immediately after sprouting.

*Caterpillars, seed maggots (Hylemya platura on Saman seedlings), and scale insects are minor problems in some nurseries.

4.2 Registration Status of Requested Pesticides

The pesticides listed in Table 4-1 are available in Haiti and are likely to be used by either CARE or PADF over the course of the project. In accordance with AID Regulation 16, Table 4-1 indicates whether each material is registered by the Environmental Protection Agency (EPA) for General Use, Restricted Use by certified applicators, or Cancelled for uses related to this project. It should be noted, however, that only General Use pesticides will be used on this project. The LD50, EPA, and WHO toxicity classifications are also provided for each product. Because these materials are to be used only on tree species produced in the nursery, either EPA registered crop uses and tolerance limits for each material, or WHO/FAO recommended Maximum Residue Limits are pertinent.

Metalaxyl (ridomil) is an effective and widely used product with a relatively low toxicity. However, it should be noted that there have been some problems with the development of resistance to this material. If metalaxyl is to be used extensively, the nursery managers, agronomes, and expatriate technical staff should make use of resistance management tactics and monitor the product's continued effectiveness.

4.3 Pesticide Use in the Context of Integrated Pest Management

It is encouraging to note that IPM programs are extensively promoted under the AOP and will play an important role in pest management in the proposed project. The stimulus for use of such practices has come from dedicated technicians at CARE and PADF, based on the technical advice from outside consultants (Cusson, 1986; Hellman, 1987; and Tourigny, 1987) and a general recognition by project staff that simpler pest management strategies must be promoted in Haiti.

The concept of IPM to be espoused under the proposed project is: use of any suitable techniques and information that reduce or maintain pest populations at tolerable levels, while providing protection against hazards to people, livestock, and local soil and water resources in the vicinity of the nursery environment.

The basic elements of IPM are offered to project staff through training seminars of a practical nature, which will be discussed in Section 4.11, and include:

Field Monitoring

Training in identification of insects and diseases likely to occur in the nursery; recognition of insect and disease problems caused or aggravated by environmental factors such as moisture, light, mineral deficiencies, transplating injury, grafting injury, and fertilization; and sampling to estimate nature and extent of the problem.

Management Tactics

Use of non-chemical and chemical tactics such as cultural practices aimed at preventing problems, natural pesticides of very low human toxicity, and purchased pesticides as a last resort.

The evolution of IPM during the existing AOP will enable the proposed project to :

*Address fungal disease problems by better watering, spacing, and shading of seedlings, for example, by better aeration in the nursery, treatment of certain surface water sources with chlorine before watering, and by use of Captan as a seed treatment for only certain tree species, not uniformly for all species.

*Promote use of locally available "natural" pesticides such as extract of neem (Azadirachta indica) seeds known as azadirachtin in an insect antifeedant, or

deterrent to species of phytophagous insects; of extracts of raw tobacco, chile peppers, and seeds from the various species of Annona and Derris indica (if enough seed can be found locally), which have exhibited insecticidal properties in Haiti and are being tested by CARE and PADF foresters on nursery trees.

*Control use of seed germplasm so that more resistant varieties are outplanted; for example, use of seed from provenances with high and uniform germination rates, and species and varieties of Leucaena resistant to psyllid infestations.

*Reduce potential resistance problems by alternating use of benlate and dithane for leaf blight infestations.

*Apply the "triage" approach of physical/mechanical, followed by cultural, and only as a last resort, chemical practices in managing pest problems in the nursery.

The current and proposed IPM training and technical assistance appear to be adequate to address the pest problems of the nursery, given the fact that insect and disease problems have evolved from moderate to serious during the early years of the AOP to low or practically non-exisitent, except for Cercospora and dampling off, in most of the presently operating nurseries of the proejct. This is not to dismiss the need to continually monitor pest issues regularly. The appropriate attitudes toward IPM have been promoted and will continue to be promoted by CARE and PADF, so that damages and losses can be minimized in the nursery enviroment of the proposed project.

4.4 Proposed Methods of Application, Availability and Use of Protective Clothing

If pesticides are used, the project would utilize hydraulic packpack sprayers for liquid formulations, and appropriate shakers for granular and powder formulations. CARE requires each of its nurseries to have this equipment. PADF requires that each NGO-operated nursery purchase this equipment. Protective clothing required by CARE and PADF includes: gloves, boots, masks, long-sleeved shirts, long pants, goggles, and hats. CARE buys the equipment and supplies its nurseries with as much as is necessary. PADF provides a starter set of equipment for each NGO at no charge initially, but sells replacement equipment to each NGO, as needed. Under PADF components, NGOs are free to purchase this equipment on the open market as well.

4.5 Ability of CARE and PADF to Monitor and to Regulate Distribution, Use, Storage, and Disposal of Pesticides

Both CARE and PADF have the responsbility to monitor and to regulate the use of pesticides to ensure that they are handled correctly and safely. Presently, here are no legislated pesticide safety rules and regulations in Haiti, placing the burden of responsibiilty on the individual and organization utilizing the material. As mentioned earlier, AID regulations require due diligence on the part of recipients of U.S. development assistance monies. CARE and PADF recognize this responsibility and are prepared to address the concerns regarding monitoring and regulating distribution, use, storage, and disposal of pesticides procured or used on the project.

Pesticides are procured locally in Haiti by CARE and PADF, usually no more than 100 pounds of any one chemical in any given year. CARE regulates the distribution in each of its central nurseries. PADF procures pesticides and sells small quantities as needed to the NGOs contracted to produce trees in their nurseries. Each NGO, however, is free to purchase any material from PADF's recommended -- and AID-approved -- list on the open market. No more chemicals than are needed in any one growing season are sold to the NGOs, thereby reducing the stock that may carry over from one planting season, or year, to the next.

Random observations by the nursery specialist for PADF and by Dr. Richard Pellek, Senior Forestry Advisor to the AOP, indicate that both CARE and PADF generally follow the rules about safe use of pesticides.

The key to safe handling, use, storage, and disposal of pesticides in the proposed project is the implementation of a thorough training program for key technical staff and the nursery managers and selected nursery workers. This program was put into effect in 1986 as a requirement for the above staff and is described in Section 4.11.

With regard to application, it is the nursery manager's responsibility to select one -- maximum two -- employee(s) to be responsible for handling, application, and cleanup of pesticides. Both the nursery manager and the handlers go through the pesticide safety training program offered by CARE and PADF. All have copies of the project nursery manual, Chapters 7 and 8, which are included as attachments to this EA because they cover pesticides (See Attachment A-2). In order to monitor compliance with use of appropriate application methods and protective clothing, PADF conducts periodic spot checks of pesticide operations at selected NGOs.

Although PADF has no direct power of supervision, each time the PADF nursery specialist visits an NGO nursery, a field sheet (attached - Fey Vizit Pepinye) records observations (See Attachment A-1). If negligent practices are observed, the PADF observer can recommend corrective action that in some instances could lead to the dismissal of the responsible party. CARE's nursery managers and applicators are direct CARE employees and are monitored as part of the routine employee performance evaluation.

With regard to storage, a locked depot is required at each nursery. Pesticides are stored in their original containers on shelves separating powders from liquids. Access to the chemicals is controlled by the nursery manager, who is the sole handler of the keys. PADF is considering use of a standard locked depot, which would be provided as part of the nursery package to each NGO. This would reduce variability in the means of storage presently found.

With regard to disposal, CARE and PADF take the normal precautions, as indicated in the nursery manual, with slight differences in directives to their respective nursery staffs. For example, CARE uses only five pesticides, all of which come in paper sacks. It recommends that these be burned in the open air. Human population densities are very low in the Northwest, CARE's region, and burning sites are located away from people and buildings. PADF recommends that most pesticides and containers be buried. Their procedure is to dig a deep hole, line it with clay or charcoal; break bottles, puncture containers, and tea bags; and then, dump the materials in hole and refill. Disposal sites are located away from people, water sources, and other areas where disturbance might be possible, but always on nursery property.

4.6 Acute and Long-term Toxicological Hazards

All pesticides are potentially hazardous to people and the environment and should be treated with caution, regardless of their relative toxicity. The potential health hazards depend on the toxicity and the amount swallowed, absorbed, or inhaled. The relative toxicity of a pesticide can be found by examining its LD50 value, which is the amount of the chemical necessary to kill 50 percent of the test animal population, usually laboratory rats. It is expressed in the weight of a pesticide per unit body weight, usually mg/kg, when swallowed (oral), absorbed through the skin (dermal), or inhaled. The latter value, inhalation toxicity, is expressed in parts per million per unit volume of air. It is only occasionally used in reporting relative toxicity.

Two types of hazard classifications are included in Table 4-1, the EPA and WHO systems. Any classification distinguishes between the more and the less hazardous forms of each pesticide, based on toxicity of the technical compound and on its formulations. Allowances can be made for the lesser hazards from solids, as compared with liquids. In the general assignment of a particular chemical to a "hazard class", acute oral LD50 values are used, except where dermal LD50 values are lower than oral values.

Table 4-2 summarizes U.S. toxicity categories and precautionary statements by such categories. All pesticide products must carry a warning and precautionary statements concerning the general areas of toxicological hazard to children, environmental hazard, and physical or chemical hazard (40 CFR Ch. 1 of 7-1-86 Edition). There are two groups: those required on the front panel of the labeling, and those which may appear elsewhere. CARE and PADF have taken a firm stand in considering all pesticides as potentially dangerous and have subsequently standardized special labels in Haitian Creole, which are affixed to each of their products. Copies of representative labels are included in Attachment A-3.

All of the pesticides recommended for use on this project are registered for General Use in the U.S. This means that they are judged not to present an unacceptably high short- or long-term health risk to a user who understands and follows all label instructions, including the required interval before re-entry into a treated nursery. No pesticides proposed for use on the project are registered for Restricted Use. As mentioned in 4.2 the EPA has issued a "Special Review" status for one of the proposed pesticides, captan. This material may pose long-term toxicological hazards, which would be defined as routine exposure over a lifetime at some level.

Table 4 - 2

Toxicity Categories of Proposed Pesticides by Hazard Indicator

Hazard Indicators	I1/	II	III	IV
Oral LD50	50 mg/kg or less	50-500 mg/kg	500-5,000 mg/kg	|5,000 mg/kg
Inhalation LD50	.2 mg/liter or less	.2-2 mg/liter	2.0-20 mg/liter	|20 mg/ liter
Dermal LD50	200 mg/kg or less	200-2,000 mg/kg	2,000-20,000 mg/kg	:20,000 mg/kg
Eye Effects	Corrosive; corneal opacity not reversible within 7 days	Corneal opacity reversible within 7 days; irritation persisting for 7 days	No corneal opacity; irritation reversible within 7 days	No irritation
Skin Effects	Corrosive	Severe irritation at 72 hours	Moderate irritation at 72 hours	Mild or slight irritation 72 hours
EPA Signal Word	"DANGER"	"WARNING"	"CAUTION"	"CAUTION"

1/ The word "POISON" and also a picture of skull and crossbones appear on the labels of EPA registered in Category I.

Source: 40 CFR Ch. 1 (7-1-86 Edition), 162.10 Labeling Requirements.

The "Special Review" process is a continuing activity and the EPA will not take final action on a pesticide until the process is completed. Ultimately, the only valid source of information concerning legal use of EPA registered pesticides is the pesticide labels. The label should always be followed carefully, as this best assures minimum hazard to users.

The proposed pesticides are generally non-persistent and, if used according to the label instructions, should present no unusual hazards to the natural environment.

4.7 Effectiveness of Selected Pesticides for Proposed Uses

Pesticides selected for use on this project in some cases were found to be effective against identified insect and disease problems (Tourigny, 1987), In other cases, they are anticipated to be effective, or have been recommended by pest management experts to be effective, under environmental conditions similar to those in Haiti. The effectiveness of some of the natural pesticides such as neem extract will be tested under the proposed project. It is anticipated that some of these natural products will replace agrichemicals purchased under the project in the long term.

4.8 Compatibility of Pesticides with Target and Non-target Ecosystems

Many of the pesticides were selected for use under this project because of their low mammalian toxicity. Some, nevertheless, present significant potential hazard to non-target organisms. For example, Captan and Mancozeb are toxic to fish, necessitating special precautions to avoid contamination of surface water supplies. Most suggested insecticides are toxic to some of the natural enemies of nursery pests such as psyllids, or to honey bees. For example, CARE nurseryman have observed that mites become a problem when too much sevin is applied.

Psyllids, a common pest of Leucaena, can become problematic if heavy doses of insecticides such as sevin or malathion are applied. It is thought that populations of ladybird beetles, a natural predator of psyllids, are reduced from too much spraying of insecticides in certain nurseries, resulting in increased pest populations. Both CARE and PADF are aware of this problem and have employed IPM strategies to reduce impacts on predator populations in and around nurseries.

Some of these problems are unavoidable when pesticides are used indiscriminately. Minimal adverse effects can be observed when pesticides are used in combination with other control tactics, and when users are educated to the hazards and proper use of the materials. Both CARE and PADF have addressed these concerns through implementation of an IPM program and intensive training of all staff as to the hazards and safe use of pesticides.

4.9 Conditions Under Which Pesticides Are To Be Used

Under AFII, pesticides would be used in the nursery environment under the strict supervision of a trained nursery manager. Off site use of pesticides is not expected. An elaborate set of protocols have been developed to address pesticide safety during mixing, application, clean up, and

disposal. Storage of all materials, including equipment, is within a locked depot where all materials are labeled, kept off the floor, and separated from other chemicals and food.

For those pesticides in Table 4-1 carrying a WARNING label, only the following formulations as indicated by commercial name -- this does not imply endorsement of any given product by AID -- will be acceptable for use under this project:

Chorothalonil: Bravo 500, Bravo 720, Bravo F, Daconil 2787F

Metalaxyl: all formulations, except Apron FL which carries a DANGER label.

These formulations are considered to be relatively safe for use if all label instructions are followed. Project training courses will review these special label instructions.

4.10 Availability and Effectiveness of Other Control Methods

Presently, a wide variety of pesticides are available on the open market for purchase and use in Haiti. Some of them, such as dieldrin, lannate, and carbofuran, are particularly hazardous. Numerous instances of pesticide poisonings have been reported, especially during the routine training programs run by CARE and PADF on pesticide safety. Use of these more effective, but more toxic, materials will not be permitted on this project.

The project will only use broad spectrum, relatively less toxic, pesticides if the "triage" approach demands it. Prevention is the method of choice, employing mechanical and cultural practices, followed by use of biological controls such as Bacillus thuringiensis and natural pesticides such as extract of neem. Some of the non-chemical methods would include the following:

*Techniques to prevent pest outbreaks, such as avoiding overwatering and standing water, nursery sanitation such as: cutting weeds and cleaning up trash -- which attracts rats; improving ventilation by putting racks higher; cutting trees and other vegetation around nurseries to increase wind circulation; putting trees in the sun as soon as possible; protecting seedlings from rain and dew, and watching for signs of infections.

*Techniques of a mechanical nature such as trapping rats and mice, picking off insects by hand, and putting grease on poles to block ants.

*Cultural controls to reduce drought damage, fertilizer burn, over-shading, sun scorch, and over-watering, involving reduced watering, increased sunlight, and reduced time spent in shade to create stronger leaves.

Many of these techniques have been tried through the AOP and were found to be effective. Proven pest control measures will be employed under the proposed project. New techniques to be explored have been mentioned in previous sections.

4.11 Provisions for Training Users and Applicators

A formalized training program was developed by CARE and PADF in 1986 to address the concerns expressed by AID about pesticide safety on the AOP. The Consortium for International Crop Protection (CICP) offered a seminal training course which stimulated concern for more detailed training materials and methods in Creole to increase awareness for pesticide hazard, particularly in the nurseries.

PADF has trained over 150 people involved in their agroforestry program, including all team leaders, key agronomes, nurserymen and their assistants -- supervisors, managers, and sprayers. Every year a three-day seminar is held for new nurserymen employed by the NGOs participating in the project. Also, a three-day refresher course is offered each year for returning nurserymen. The training materials include the nursery manual, entitled Gid Pepinye in Creole, prepared by Scott Josiah, and other materials available from several sources, including the CICP Training Program for Pesticide Applicators. This training manual was recently translated into Creole for AID's Proje Sove Te (Granovsky et al., 1985). A portion of this training time covers pesticide safety, pest identification, and pest management. The proposed project will continue with this program.

CARE has implemented a somewhat different training program for the AOP, covering more or less the same material. Their approach includes FAO filmstrips, use of PADF's Gid Pepinye, some of the material from the Proje Sove Te manual, and extensive demonstrations and role playing. For the proposed project CARE will implement a "training-of-trainers" program initially to teach the basic principles of pesticide safety, pest identification, and pest management. CARE plans to conduct pesticide training in the larger context of its FARM project training modules.

Basically, a handful of CARE trainers will teach CARE Field Agents (FAs), who are the implementers of specific project activities, such as setting up nurseries. These FAs, in turn, will work with farmers on a monthly basis over a period of 30 months. An estimated 10 major training seminars would be held over the LOP. The FAs will be given the pesticide safety cours and will then instruct the farmers over the course of their 30-month involvement. Materials will be kept simple and training courses will rely extensively on demonstration and role playing.

5.0 Alternatives, Including the Proposed Action

5.1 Alternative I - Maintain Current AOP Levels and Activities

During the development of the PID it was debated whether or not to continue with the status quo by funding only AOP's current activities such as tree planting, hedgerow technology, and basic training for farmers in tree planting, maintenance, and harvesting. This is still one viable alternative route for the project to pursue. "If it ain't broke, don't fix it!" is the commonly heard epithet.

Since 1981, through its NGO network, the current AOP has established an extensive production and distribution system for fast-growing native and introduced hardwood species, as well as some fruit tree species. It promotes their outplanting on private farmlands and trains farmers in tree care and maintenance. Since 1985, CARE and PADF have been promoting the establishment of contour hedgerows using primarily Leucaena leucocephala for erosion control on steep-sloped lands. The project has also trained hundreds of extension agents in various tree nursery technologies, in safe use of pesticides, and in techniques for improving the survival of trees outplanted on farmers' fields.

Because the project is a success, as attested in the PID and other documents, the temptation is either to continue at present levels or to increase funding to do more of the same, but on a wider geographic basis. Some current project staff even believe that the project would be more successful by focusing any additional resources on one or two key catchment basins in each region of the country. The intensification of similar, proven techniques and training modules can be justified as a viable alternative to the proposed project.

5.2 Alternative II - Expanded Approach to Agroforestry as Elaborated in the PID/PP

The PID and the PP provide a complete description of this alternative, which is the preferred project option. In a nutshell, however, the proposed project is similar to the current AOP in its fundamental orientation to outplanting multipurpose trees on private farmlands, providing the rural farmer with an economically viable crop. Where the project differs from the current AOP, or Alternative 1, is that it will:

*Continue the seedling production and distribution program in terms of the technology, but will include a broader selection of perennial species of forages, grasses, and non-woody vegetation. This emphasis on vegetation other than trees will necessitate some additions to the presently elaborated nursery production system.

*Introduce a program of on-farm propagation techniques, tree management, and harvest schemes that will serve the needs of the more experienced farmers, who have participated in the AOP and who want to go beyond the present technologies and practices.

*Diversify interventions beyond simple hedgerow installation and management as a viable method of soil conservation and into development of: stable alley cropping systems; improvements in soil fertility by use of green manures, mulch, and livestock forage; and more use of indigenous seed and germplasm.

*Identify ecologic, topographic, and soil conditions where rehabilitation of the soil, i.e. reversing erosion and increasing fertility, is possible by better management on the farm, and, where it is not possible, perhaps opting for more extensive use of forestry on those poorer sites.

5.3 Alternative III - No Action

The "no action" alternative means not funding an agroforestry project in Haiti. This option would test the ability of the current infrastructure, network of NGOs, and technology base to continue the tree planting concept in Haiti without AID's involvement. In order to continue at present levels of tree planting, the NGOs would have to raise nearly $6 million annually to maintain production and distribution at

current levels. Although no alternative means of funding have been identified by the NGOs, it is anticipated that some NGOs would be able to continue with support from other donors. Many would stop production and momentum would be lost in attempting to seek alternatives. At a minimum, several planting seasons could be lost. PADF estimates that loss of tree production would be 80 percent and that one half of the existing NGOs now funded would not continue at all.

From AID/Haiti's point of view, the "no action" alternative is not in the best interests of their program in Haiti, nor in the best interests of the Haitian people, to whom they have a commitment.

6.0 Environmental Consequences of Project Interventions

6.1 Introduction

Each of the issues mentioned in Section 3.2, with the exception of pesticide use, is analyzed herein with regard to three basic concerns:

*Direct and indirect effects and their significance;

*Unavoidable adverse effects; and

*Relationship between short-term uses and maintenance of long-term productivity of the environment.

The objective of this approach is to demonstrate the underlying assets and liabilities of each major issue identified during the scoping exercise for the preferred project option, namely Alternative II.

For the purposes of this analysis, direct effects are considered to be primary impacts typically associated with qualifiable or quantifiable results or observations over the short term. Indirect effects are secondary impacts associated with longer term results or observations, either locally or beyond the project area. One indirect effect of a proposed intervention would be the "spread effect" of adoption of any given technology beyond the original project area, another would be the subtle changes in microclimatic factors that could occur where dense tree planting is introduced. In many instances there are little or no distinctions between direct and indirect effects.

6.2 The Role of Research

6.2.1 Background

The AOP identified the need for research that was "adaptive and practical" and implemented two phases through Title XII mechanisms. Phase I, executed by the University of Maine, undertook a characterization of traditional agroforestry systems; silvicultural studies; improvements in nursery techniques; species trials analyses; marketing studies and consumer preference for wood products; cost-benefit analysis of tree planting; and socioeconomic analyses of key farmer decision making for project trees. Phase II, conducted by a team from Auburn University, covers:

*Cost-efficient and appropriate systems for the production of vigorous planting stock;

*Establishment and maintenance of trees on small farms; and

*Economic and social aspects of crop and livestock associations with trees.

In addition, a seed and germplasm improvement component was designed and funded to address the problem of "garbage seed" and poor species performance in some areas. The seed and germplasm improvement component is discussed under the biodiversity issue in Section 6.5.

The proposed AFII will refocus the research needs toward applied research that will measure, enhance, and expand on-farm and off-farm impacts of the various technical interventions. The major elements of the research are described in the technical analysis of the PP. In summary, new directions will include efforts to:

*Understand hedgerow technology as a viable and practical means of soil conservation on steeplands;

*Characterize appropriate alley cropping systems in terms of crop management practices, spatial distribution, planting density, and other farming practices that will improve soil fertility on steeplands;

*Develop a range of recommended ecological, topographic, and soil conditions where rehabilitation of farmlands is possible, as well as areas where the investment is best made with only trees.

Additional focus on tree, forage, and shrub species-site relationships will continue as it has in the past, since very little is known about the majority of the 130 tree species outplanted, and even less about the new species and varieties of grasses that could be used on steeplands.

6.2.2 Direct and Indirect Effects

The direct effect of the information gathered under a research program of this nature is to improve our understanding of the ecological and edaphic conditions under which technical interventions can or cannot succeed in Haiti on a regional basis. Such information will be translated directly into corrective action through the extensive and viable NGO network established by CARE and PADF. Lessons learned during one season can be programmed for the immediate future into training programs and outplanting schemes.

Indirect effects would take place on a farmer's field over the medium term. Soil fertility, and subsequently yields, would be raised by better management using new systems such as green manures, livestock forage, mulch, alley cropping, and sloping terraces with hedgerows.

6.2.3 Unavoidable Adverse Effects

Under present systems of implementation, the hedgerow technology presents certain dangers to the farmer, which are identified in the technical analysis section of the PP. A well thought-out, applied research program would reduce the adverse effects of inappropriately applied technology, in many instances.

6.2.4 Relationship Between Short-term Uses and Maintenance of Long-term Productivity of the Environment

The underlying philosophy of an applied research program is to transfer data and information from carefully designed investigations into practical techniques for immediate use in the nursery or on the farm. By definition, it is short term in duration but long term in its usefulness.

The nursery and on-farm research may harm a portion of a farm's microenvironment by setting up demonstration plots that fail the test, for example, by inadequate spacing of hedgerows resulting in breakdown of vegetative barriers during any given

storm or adverse weather event. The long-term value of this information, however, will be used to save hundreds of farmers the risk of applying inappropriate technology. In the long term, however, the benefits outweigh the costs of short-term losses for any given plot of land.

6.3 Soil Conservation Enhancements

6.3.1 Background

During the AOP, a simple tree outplanting program soon identified the need to initiate soil conservation measures on farmlands of participating peasants. As indicated by Pierce (1988) and others, the history of soil conservation in Haiti is the history of some successes and many failures. Since the 1960s, soil conservation interventions have included raised berms along the contour, constructing rock walls, and digging contour canals to stem erosion on private and public lands. Dry-wall check dams have been constructed in ravines to halt gully erosion as well, usually as larger community participation projects. The AOP and other projects of the 1980s have attempted to promote the idea that land degradation is a function of soil erosion and loss of soil fertility. Project staff implemented the installation of vegetative barriers, usually referred to as hedgerows, but encompassing nearly a dozen very different techniques, summarized in Attachment A-4.

The proposed AFII will focus significant resources on constructing and improving selected soil conservation practices that are economical and "implementable" on participating farmers' private lands.

6.3.2 Direct and Indirect Effects

When installed along the contour the direct and indirect benefits of hedgerows have several distinct advantages over crop arrangements under traditional agricultural systems. There are improved water and plant relations, positive environmental effects, and measurable economic benefits. The research component of the project will qualify and quantify many of these over the LOP. In many instances, distinction between direct and indirect effects are not measurable and may best be interpreted rather as positive benefits.

Direct and indirect effects include the following (from Pellek, 1989, manuscript):

Water Relations

*Perennial crops with deep root systems increase the depth of penetration of surface water.

*Added depth of penetration of surface water increase storage efficiency in the solum.

*Perennial crops with deep root systems help break up hardpan which may inhibit water movement in the soil profile and into aquifers.

*Root channels of deep-rooted perennial crops improve infiltration rates and downward percolation of rainfall and irrigation water.

*Year-round transpiration of perennials increases the overall humidity in crop canopies.

*High humidity in the canopies of tall perennials increases the water use efficiency in the shorter annual plants.

*Root masses tend to improve the tilth and overall physical structure of the soil fabric.

*Soil fertility is maintained through nutrient cycling and organic matter deposition of perennial crops.

*Mineral cycling efficiency is improved as nutrients in the subsoil are pumped through plant tissues and are returned to the soil surface through the shedding of leaves and other plant parts.

*Litter layers on the surface decrease evaporation in surficial soils. The infiltration of water has been shown to be directly proportional to the thickness of litter layers.

*Thicker litter layers under perennials reduce the soil surface tempratures, improving moisture ocntent.

*Permeable litter layers improve gas exchange by maintaining tilth.

General Environmental Effects

*Contour barriers help to dissipate the force of verland flow of water, lessening the risk of erosion.

*Water that stays on the land longer is more beneficial to crops.

*Living terraces are soil and water conserving and as the slope gradient changes over time, they become more efficient.

*Vegetative barriers of multipurpose species become more productive with age, in some cases.

*As hedgerow trees increase in diameter, their stems become thicker and stronger, serving as better traps for soil particles.

Economic Factors

*Hedgerows are quick and easy to install by direct seeding.

*Hedgerows are long-lasting and require little or no maintenance, in some cases.

*Hedgerows are a source of fodder, green manure, and fuelwood.

*Hedgerows can be planted by a single farmer, using materials that are readily available.

*Income can be derived from hedgerow crops, or indirectly from savings resulting from fertilizer properties of the green manure produced, fodder for animals, and so on.

6.3.3 Unavoidable Adverse Effects

Some of the soil conservation practices are not suitable for steep slopelands. It will be a challenge to determine where vegetative, low cost, soil conservation techniques work and where they are inappropriate. This is one goal of the applied research component. During the LOP it is conceivable that some farmers will install hedgerows or alley cropping systems that will fail. The likelihood of widespread failure will be mitigated by the extensive research and field extension efforts of CARE and PADF. Unavoidable adverse effects would be reduced, or nonexistent in most cases.

6.3.4 Relationship Between Short-term Uses and Maintenance of Long-term Productivity of the Environment

The objectives of the soil conservation interventions are maintenance of long-term productivity of the steep slopelands of participating farmers. Interventions applied over the short term will have a lasting impact by reducing erosion and increasing soil fertility.

6.4 Environmental Education

6.4.1 Background

Environmental education has been a basic component of the AOP since its inception. Animators and farmers were inculcated with concepts emphasizing the role of trees in their own economies and in the economy of nature. The positive benefits of planting trees have been described in numerous training courses offered over the LOP. In June 1988, however, PADF undertook a formal pilot program in the Mirebelais area of Region 5. The goal was to establish a program in 10 schools in each of the following areas: Saut d'Eau, Desvarieux, Triano, and Boucan Carré. The initial reaction to the proposal from school directors and teachers was positive. The basic activities of the pilot program were to:

*Introduce basic concepts about the value of trees by use of the booklet Zanmi m' Pyebwa (My Friend the Tree);

*Establish plastic sack nurseries producing mango francique and other species;

*Form student clubs, called "Friends of the Trees" in each participating school; and

*Conduct training seminars and student workshops on tree production and ecology.

Aside from the booklet, a series of 12 lessons about tree ecology, nursery production, and care and maintenance were developed by a Haitian teacher under contract to PADF t implement the program. The idea for this basic course has been embraced on a wider scale and the demand for a more comprehensive program will be addressed in AFII.

The basic elements of the program are development and use of a three year curriculum in environmental concepts, establishment of fruit tree nurseries and demonstration sites for agroforestry species on or adjacent to school property, and site visits and training workshops on selected farm or demonstration sites to visit gardens and learn firsthand basic principles.

The target audience is primary school children in rural, not urban schools, between the ages of 10 and 18. There is a wide variance in the ages of primary school children of the same grade in many rural schools. The target number of students to participate in each region over the three year program would be:

Table 6-1
Target Numbers for Environmental Education Program

	Year 1	Year 2	Year 3	Year 4	Year 5
Course I	1500	1500	1500	1500	1500
Course II		1500	1500		1500
Course III			1500		
Total	1500	3000	4500	1500	3000

PADF Regions 1, 2 and 5 will implement an environmental education program modeled on the above. A training materials specialist, who will be hired by PADF to develop materials for all aspects of the agroforestry project, will dedicate a portion of his/her time to the development of course materials. The budget for the proposed program is presented below. In terms of staff, one full-time training assistant and three part-time monitors will be needed for each participating PADF region. The training assistant will: train school teachers in how to convey the course materials; organize seminars and field days for the students; oversee, with the help of monitors, the establishment of nurseries; and work with the training material specialist to refine any course materials developed.

Three types of training materials will be developed:Zanmi m' Pyebwa, a short book on the ecological history of Haiti; other materials, such as the Gid Animate Pyebwa, Liv Plante Pyebwa; and a booklet on hedgerows. Some funds will be needed to prepare the ecology book, but most of the other materials are completed. An initial search and inquiry to other educational institutions in the region, particularly in Martinique and Saint Lucia, wher Creole is spoken, will be made to identify any additional materials that may be available. Some funds will be required to print the materials. "One time" costs to prepare teaching materials, which will be used repeatedly, will be incurred initially, but will not figure into recurring budgets for years two and three. Thus, a three-year provisional budget for one region would be approximately $61,730.

Table 6-2
Environmental Education Program
Single Region: Budget Estimates One Year

Staff	
1 full-time assistant @ $450/month x 12	$ 5400
3 part-time regional monitors @ $50/month x 12	600
Transport	
motorcycle	2500
insurance	250
fuel @ $40/month x 12	480
Training	
60 teachers 2 x 2 day seminars/yr @ $7 each	840
site visits with selected groups of children from each region. 54 students @ $3 x 5 visits	810
special training for student club members involved in caring for school nurseries 22 nurseries x 3 students each x 3.50	230
Nurseries	
22 nurseries x 1000 seedlings x 0.025/sacks	550
purchase of chadec, citron, mango, corasol seeds	200
purchase of transport of specific materials i.e. Haiti-mix, tools	300
Training Materials	
preparation of new booklet on the Ecological History of Haiti for school children	5000
printing of 4500 copies @ $1.50 each	6750
Total	$23910

6.4.2 Direct and Indirect Effects

The direct effects of the environmental education program (EEP) will be the introduction of basic ecological principles into a situation where such reading materials and demonstration projects are lacking. Over 7000 students in each region will b trained over the LOP, thereby totalling over 21000 students nationwide. An effort will be made to avoid spreading the training too thin by concentrating on three to five communities within each region, and establishing 22 nurseries within these communities. In addition, 60 teachers will be trained in environmental principles. The basic goal of the education

program is to instill in the students the importance of trees and how they fit into their environment, what erosion is and how it can be minimized, and the value of new technologies such as hedgerows, which can increase soil productivity, if appropriately managed.

Indirect effects of the training could have significant positive effects on the way trees are managed on the students' farms. For example, the school nurseries will emphasize how to plant tree seedlings in plastic sacks, thereby transferring a simple technology for potential application on the farm. Also, children take care of animals on many farms, but are very careless about where they allow animals under their charge to graze or browse, resulting in trampled or eaten tree seedlings. The education of farm children in proper plant-animal relations and care of trees outplanted under the agroforestry project could enhance survival in some instances. Finally, farming in Haiti follows traditional methods, some of which are good for the land such as crop rotation and some of which have dubious value, for example indiscriminate burning. By helping farm children understand the positive and negative aspects of certain methods, improvements can be made in attitudes and some traditional ways can be modified.

Another indirect and longer term effect is that a cadre of students will receive training and motivation through the clubs. Some of these students are the teachers of tomorrow. Interest in environmental themes can be instilled at a young age, role models can be identified, and influence on career decisions in favor of the teaching profession could occur.

6.4.3 Unavoidable Adverse Effects

It is hard to imagine adverse impacts from an education program of this scope.

6.4.4 Relationship Between Short-term Uses and Maintenance of Long-term Productivity

The goal of exposing students to a three-year environmental education program is to send a clear message to schools in the region that environmental education is useful and fun. In certain areas, a concentrated message is being sent and children are learning the same lessons their parents are also learning through the extension-outreach elements of the agroforestry project. That message is that there are different farming systems available to them, such as contour systems and hedgerow/tree combinations, that help integrate trees and animal in more productive ways. Those rural children that remain on the land, who do not migrate to Port-au-Prince or abroad, may do a better job of managing the land.

6.5 Conservation of Biological Diversity

6.5.1 Background

Widespread deforestation has resulted in the extirpation of many tree species from areas where they were historically abundant and economically important. A needs survey for conservation of tropical forests and biological diversity was prepared by DeGeorges and Ford (1988) for AID/Haiti. It identified many areas of concern, and discussed the following themes in particular:

*Watersheds and agroforestry, i.e., the role of trees in soil conservation and as cash crops such as forage, fruits, medicines, firewood, and building materials;

*Forestry research, particularly species-site relationships, identification of seed sources that produce trees with desirable characteristics, and nursery management techniques that optimize production of seedlings; and

*Conservation of economically important species such as pine, mahogany, cedar, Haitian oak, and frene.

The AOP has undertaken, since 1987, a program to collect the germplasm of targeted, indigenous species (listed in Attachment A-5), propagate these individuals at a centralized nursery, and establish seed banks of living germplasm in seed orchards for superior phenotypes. Progeny testing is used to select out poor performers for growth and form. In situations where it is felt that there may not be sufficient quality or quantity of superior individuals in Haiti, a concerted collecting effort will be mounted to seek these same species in the Dominican Republic. This will offer a wider genetic base for the seed orchards and offer the possibility of discovering provenances better adapted to the diverse site conditions in Haiti. These efforts are backstopped by technical assistance from the USDA-Forest Service, Oxford Forestry Institute of the U.K., the Central America and Mexico Coniferous Forest Resources Coopperative (CAMCORE), and numerous academic and botanic institutions in the U.S.

AFII would propose to continue the work begun under the AOP with regard to seed and germplasm collection and its establishment in seedling orchards at particular localities. The goal and objectives of this program mesh nicely with the

recommended approaches to biological diversity conservation proposed in State Cable 032584 (February 3, 1980). AFII will undertake the conservation of economically important species an germplasm, including land races and wild relatives of agriculturally important tree crops, in seed and seedling banks throughout Haiti. One subcomponent, that on the oil palm, Attalea crasispatha, will address the status and protection of an endangered species and its conservation in its wild habitat and in orchards, if suitable propagation techniques can be developed.

6.5.2 Direct and Indirect Effects

Although endangered or threatened species are not ordinarily important in the economic life of a peasant farmer in Haiti, the challenge is how to preserve species that the Haitian peasant might not normally plant. The approach is from the perspective economic botany, i.e., based on utility, not on conservation themes. One species that has been identified as in need of conservation while at the same time has enormous economic implications for peasant households, is Attalea crassispatha, an endangered Haitian palm.

The direct effects of preservation of the existing populations of Attalea would be in situ conservation of the remaining individuals -- two specimens at Fond des Negres and 15 at Dumay, both in the southern peninsula. The consequences are important for the palm because a viable population is the best way of saving its germplasm.

The indirect effects must be borne out over the next few years. Methods of propagation must be identified. The oil-bearing properties and other values, such as for thatch, will be studied. If favorable propagation techniques and economic values can be identified, one objective would be to work this species into the agroforestry outplanting schedule, for example, by year four or five of AFII.

6.5.3 Relationship Between Short-term Uses and Maintenance of Long-term Productivity

Other species, of less importance biologically than Attalea, and listed in Attachment A-5, are nevertheless, important vehicles to address the issue of conservation of biodiversity. For most indigenous species in Haiti, little is known about their distribution, methods of propagation, pest and disease resistance properties, or market potential. Each of these species has different end-use potential and different levels of tolerance to the ranges of ecological conditions under which the Haitian farmers live.

In the short term, AFII will undertake novel approaches to promote long-term productivity of the selected indigenous species of the remaining vegetation. Rather than introduce more exotics, the seed and germplasm component will work on better ways to get indigenous species introduced into tree planting programs. One approach will be to have local peasant groups loo out for the naturally regenerating wild seedlings, begin the transplanting process by bare rooting, or other ways discovered during the course of the propagation trials at the central nurseries.

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LIST OF CONTACTS

CARE

John Mosher	- FARM proposal
Peter Welle	- Use of pesticides; soil conservation methods
Kathy Rorison	- CARE's training program in pesticide use

IRG

Joel Timyan	- Technical aspects of seed and germplasm component
Paul Cough	- IRG admininstrative procedures; worldwide network

ODH

Steve Gronski	- Seedling seed orchards; provenance trials

PADF

Stuart North	- Environmental education pilot program
Scott Josiah	- Nursery problems; pesticide use and training program
Lou Bergner	- Budget for environmental education

PP Team

David Gow, Ira Lowenthal, Jack DeMooy, Franz VanIsinga, Dick Pellek, June Magnaldi, Leroy Duvall, Ken Koehn, Rick Scott

SECID

Paul Starr, Gene Hunter, Kent Reid, and Pierre Rousseau on applied research themes (summary presentation on 2-2-89)

USAID/Haiti

Ron Ruybal	- Content of the EA

USAID/Washington

John Wilson	- Scope of work for EA

ATTACHMENT A-1

PESTICIDE SAFETY TRAINING WORKSHOP

I. INTRODUCTION

1. Circulate attendance list.

2. Seminar has two broad subjects.

   a) Pesticides and the effects on people.

   b) Pesticide safety during mixing, application, clean up, disposal and storage.

3. Who uses pesticides in nursery?

   - Nurseryman and one helper (2 maximum/nursery).

4. Why do we use pesticides?

   a) To control insects and diseases not able to be tolerated or controlled by other means.

5. Why do we need to be careful with pesticides?

   a) Dangerous poisons.
      1) can make you, your family or neighbors sick - quickly or much later in life and can kill you or members of your family, neighbors or community.

   b) Can pollute your soil and water.

   c) Pesticides are made to kill insects, unfortunately they can kill people too.

II. EFFECTS OF PESTICIDES ON PEOPLE

1. Pesticides vary in toxicity

Diazinon Sevin Malathion	↓	Decreasing Toxicity
Neem Soaps	]	Natural pesticides
Benlate Captan	]	Fungicides

2. Pesticides enter the body through

a) Skin - absorbtion

b) Mouth - via breathing, eating, smoking

c) Nose - via breathing

d) Eyes - absorbtion

3) Symptoms (signs) of acute pesticides poisoning

a) Headache
b) Dizziness
c) Blurred vision
d) Vomiting
e) Nausea
f) Stomach cramps
g) Small pupils
h) Salivation
i) Breathing difficulty
j) Pain in chest
k) Sweating
l) Tremors
m) Weakness
n) Diarrhea
o) convulsions
p) coma
r) death

These results from the body absorbing a lot of pesticides.

4) Damage to the body can occur a litte bit at a time, causing illness 10 or even 20 years later, ie cancer, liver damage, etc.

5) If you have pesticides on your skin, hair etc, and you touch others they may become contaminated.

For example: Nurseryman sprays but doesn't wash.
Goes home, pick up his child.
Child now has pesticides on his skin.
Child eats food + pesticides and could suffer from poisoning.

~~IV.~~ III. THE PESTICIDE LABEL

A) The label gives the following information:

1). What diseases or insects can be controlled.

2) Directions for use.

3) Safety directions.

B) Each time you have a problem and decide to spray read the label carefully before using the pesticide.

~~IV.~~ IV. PESTICIDE SAFETY

1. During Mixing

   a) Wear safety equipment (gloves, respirator, goggles, protective clothes.

   b) Is especially dangerous because he is working with undiluted pesticides.

   c) Don't smoke, drink or eat during mixing.

   d) Only trained people should do mixing.

   e) Mix outside, not in a depot.

2. During Application

   a) All safety equipment must be worn.

   b) Spray in early morning or late afternoon when there isn't much wind. Don't spray on windy days.

   c) Don't overapply - ~~1 spoonful/gallon is sufficient.~~ Follow the label directions exactly.
   - More may hurt the plants or the applicator. (too much pesticide)

   e) Don't smoke, drink or eat while spraying.

   f) Spray thoroughly - wet plant until it begins to drip.

   g) Mix a little soap with the water to aid sticking the pesticide to the leaves.

   h) Wait until pesticide has dried on the leaves before you re-enter the nursery.

3. During clean up

   a) Wash yourself thoroughly, with soap
      1) under fingernails
      2) hair

   b) Wash equipment thoroughly.

   c) Don't wash equipment in a river as it will contaminate the river water.

   d) Don't smoke, drink or eat while cleaning-up - wait until after cleaning is done.

e) Clothes should be washed separately from others.

f) Wash gloves and goggles in water, inside and out.

g) Change respirator filters as required.
- wash rubber parts of respirators carefully.

4. Pesticide Disposal

a) Dig a hole and drain extra unused pesticide already mixed.
1) not near water supplies or river

b) Never reuse old pesticide containers.

c) Never throw away old pesticide containers (in piles etc).
1) kid could play with them.
2) livestock (goats, pigs) could eat them.
3) they should be buried in a remote area not near water.
4) Never burn old pesticide containers, especially in populated areas. The smoke could poison someone.
5) Don't smoke, drink or eat while disposing of pesticides or containers.

d) Don't eat, drink or smoke during pesticide disposal.

5. Pesticide Storage

a) Pesticide must have proper label.
- Demonstrate flour vs. Benlate sacs.

b) Pesticides must be kept in locked depot.

d) Pesticides must be kept off the floor (in a shelf).

e) Pesticides must be stored away from other things, preferably in a locked cabinet.

f) Never store food with pesticides.

V. RESPONSIBILITY OF NURSERY MANAGER

a). To protect himself and others in his family or village from pesticide poisoning.

b) To select one or maximum two people in the nursery solely responsible for pesticide use, application and clean-up.

d) To supervise the proper use of pesticides in the nursery.

e) To train new people as necessary in pesticide safety.

f) To know whether nursery problems are caused by insects, diseases, or cultural problems.

g) To be able to choose the right pesticide for the particular problem.

h) To know when to apply pesticides, and to know if a problem is serious enough to require spraying. Prevent problems by keeping a clean, well-ventilated, properly watered and shaded nursery.

Kevin J. Jones

PEST ID AND CONTROL WORKSHOP

I. INTRODUCTION

a) Objectives of Seminar

1. To learn to identify insects and diseases in the nursery.

2. To learn to control insects and diseases in the nursery.

3. To learn to prevent insects and diseases in the nursery.

b) Why do we need to care about nursery insects and diseases?

- Disease and insects kill hundreds of thousands of seedlings each season. - Affects PADF's entire program.
- Insects and diseases weaken seedlings which may die when outplanted.

II. INSECTS

a) Identification of Insects

- Cheni, beetles, leaf miners, spider mites, aphids, psyllids, nematodes, crickets.

b) Groups of Insects

- Not important
- Beneficial - spiders, ladybugs, wasps.
- Harmful - (those listed).

c) Insect feeding patterns

- Chewing (ie, cheni) }
- Sucking (aphids, psyllids) }different damage }patterns

III. DISEASES

a) Identification of Diseases

- Damping off, Root Rots, Powdery mildew, Leaf Blights (ie, Cercospora, Anthracnose, etc.).

b) What is Disease?

- Sickness within the plant.
- Caused by microbes in water, air, soil or seed, leaves and roots which attack and damage the seedlings.
- Most diseases need a lot of water, high humidity and poor air circulation to grow and attack plants.

IV. PROBLEM IDENTIFICATION

a) What's the difference between insect and diseases and other problems?

1. The nursery man needs to decide what is causing the problem:

a) Insect damage	look for insects, poupou insects, learn insects feeding patterns.
b) Disease damage	look for and learn disease patterns: spotted leaves, marginal leaf death.
c) Nutrient deficiencies and excesses	(Iron, manganese phosphorous, nitrogen).
d) Cultural problems	drought damage fertilizer burn over shading sun scorch over-watering

e) This is complicated and takes time to learn.

2. The nurseryman needs to decide if the problem is serious enough to spray or if other measures can be taken.

3. Questions that must be asked

a) How serious is the damage?

b) How many insects are present?

c) Is the damage on older leaves only - the newer leaves are not damaged.

V. GENERAL CONTROL METHODS OF INSECT, DISEASES AND OTHER PESTS

1. Chemical

a) chemical sprays, ie, Sevin, Malathion, Diazinon, Benlate, Captan, dithane (powders and liquids).

b) chemical drenches.

c) natural chemical sprays.

d) natural chemical drenches ie, neem extract, wood ashes, gliricidia leaves and stems, tobacco, soap, tomato stems and leaves).

2. Mechanical

a) trapping rats, mice.

b) picking off insects by hand.

d) putting grease on table poles to block ants.

3. Cultural Controls

a) reducing watering.

b) increasing sunlight (putting plants in sun).

c) reducing the time spent in shade to create stronger tougher leaves.

4. Biological Control

- permitting other insects to feed on bad insects.

5.. Prevention

a) avoid overwatering and standing water.

b) nursery sanitation (cut weeds, trees in nursery and clean up trash).

c) good nursery ventilation, put racks higher, cut trees around nursery, remove crowded rootrainers, thin young seedlings early).

d) putting trees in sun as early as possible.

e) early fertilization (with Cassia).

f) protect from rain and dew if possible, especially cassia.

g) be alert, watch for early signs of infection (ie, with cassia). If found reduce water and put in sunlight, spray with Benlate.

VI. SPECIFIC TREATMENT RECOMMENDATIONS

1) WHEN USING PESTICIDES, FOLLOW THE DIRECTIONS FOR USE EXACTLY AS WRITTEN ON THE PESTICIDE LABEL

2) Insects

1. CRICKETS (in Casuarina or Eucalyptus)
   a) spray seedlings with Sevin or Malathion and below racks as well, spray inside blocks too.
   b) cut all grass under racks and in nursery area.
   c) maintain a clean nursery. clean up all plastic - crickets hide under plastic.

2. PSYLLIDS (Leucaena)
   a) spray with Sevin, Malathion or neem spray if serious.

3. APHIDS
   a) spray with Sevin, Malathion or neem spray.

4. SCALE INSECTS/mealybugs
   a) spray with Malathion if serious.

STEP 4. SUMMARY

Conclude this activity with a summary of the pest control methods. Review the following key points:

1. Just as it is not always possible to prevent accidents (such as a house fire), it is not always possible to prevent a pest problem from occurring and growing. There are a number of methods of pest control.
2. Sanitation, or removing food wastes, debris and filth can prevent and control a pest problem.
3. Natural Control uses beneficial insects already present in the crop together with physical elements of the environment.
4. Biological Control, or releasing a pest's natural enemies, can control the number of pests in a crop area.
5. Mechanical Control involves setting traps or barriers to trap or discourage pests.
6. Resistant Varieties are crops that are not easily destroyed or damaged by pests. They can be planted to reduce the possibility of a pest problem.
7. Physical Control involves changing the environment in the crop or storage area to make it unfavorable for pests to live in.
8. Cultural Control involves methods in which we plant, grow and harvest our crops. These affect pests and can control pest populations.
9. Pesticide Use can be dangerous to man and the environment. Care should be taken when using this method!

The four categories are:

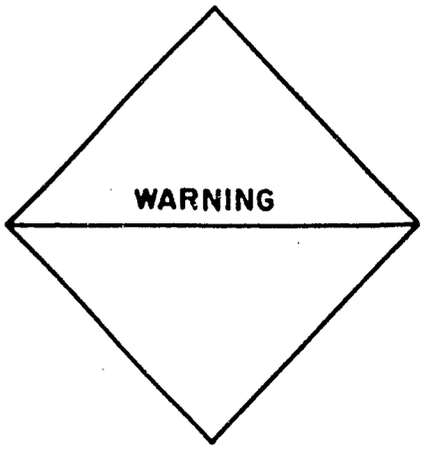
CATEGORY I - Highly Toxic

Pesticides with this symbol are the most dangerous. They are marked with the signal words "DANGER-POISON!" and have a picture of a skull and cross-bones to show how deadly these chemicals can be. The probable lethal dose (LD_{50}), or the amount of this product that would probably be needed to kill a man weighing 65 kilograms, is only a few drops to a teaspoon!

CATEGORY I PESTICIDE
Highly Toxic

CATEGORY II - Moderately Toxic

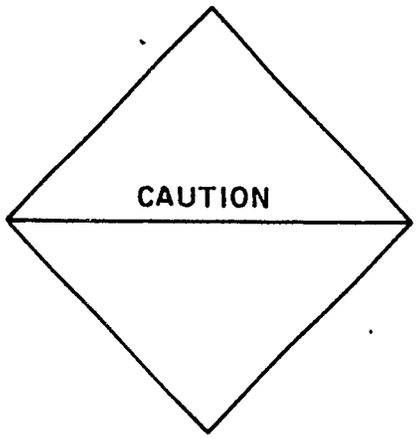
Pesticides in this category are considered "moderately toxic." They are marked with the signal word "WARNING!" It would take between one teaspoon to 10 grams of a Category II pesticide to kill a man weighing 65 kilograms.



CATEGORY II PESTICIDE
Moderately Toxic

CATEGORY III - Slightly Toxic

These pesticides are "slightly toxic." The signal word "CAUTION" appears on Category III chemicals. It takes over one ounce to one half liter (or one half kilogram) of these pesticides to kill a man weighing 65 kilograms.

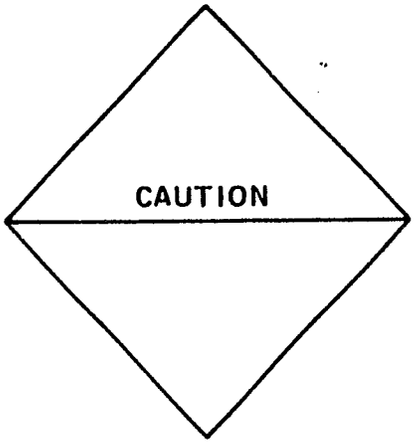


CATEGORY III PESTICIDE

Slightly Toxic

CATEGORY IV - Relatively Non-Toxic

Pesticides in this last category are considered "relatively non-toxic." However, the signal word "CAUTION" does appear on the label and care should be taken to keep these pesticides as well as those in the other three categories OUT OF THE REACH OF CHILDREN!



CATEGORY IV PESTICIDE

Relatively Non-Toxic

TO THE TRAINER: The concepts of signal words and symbols on labels are extremely important. The pictures of what each category looks like on the label should be enlarged and displayed so that the trainees can SEE what they look like as you talk about each one. Chart #1 should also be displayed to provide a general overview and help you summarize and conclude Step 3.

A: Tout Forestye PADF ak Asistan yo

DE: Scott Josiah, Espesyalis nan pepinye

SIJE: Rekomandasyon pou kontwol maladi

DAT: 19 Jiye 1988

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Pi ba-a, gen kek rekomandasyon pou tretmân ak kontwol maladi ki pi serye ki souvan atake ti plantil yo nan pepinye PADF yo. Nou seleksyone pwodwi chimik yo dapre espesifisite yo pou ka maladi yo an patikilye, osi byen ke disponibilite yo nan peyi-a.

Maladi yo	Fonjisid ki rekomande	To itilizasyon (Pwoposyon)	Konbyen fwa pou mete'l	Kontwol kiltirel
Sekospowa Maladi fey	Benlat plis Ditan (M-45)	2 kiye pa galon Fonjisid	2 fwa pa semen	- redwi dlo ke ou bay plant yo. - Mete yo nan soley - Bay plant yo bon vantilasyon.
Damping off Pouriti	Kaptan Kaptan plis Benlat	4 kiye pa galon 2 kiye pa galon pa Fonjisid	lel simen epi 2 fwa pa semen jiskaske danje-a pase.	- Pa bay twop dlo - Si maladi-a paret diminye kantite dlo-a - Bay plant yo bon vantilasyon.
Powdery Mildew	Benlat Ditan	2 kiye pa galon 2 kiye pa galon	2 fwa pa semen jiskaske pwoblem nan diminye	- Mete plant yo nan soley - Bay plant yo bon vantilasyon.

Yon kiye se laje yon gran kiye (Yon gwo kiye soup). Le wa'p aspeje pou damping off, si li posib, chwazi konbinezon Kaptan-Benlat nan plas Kaptan selman. Konbinezon sa-a kontwole Fonji damping off la pi byen pase Kaptan selman.

To : All Team Leaders
From : Scott Josiah, Nursery Specialist
Subject : Disease Control Recommendations
Date : June 7, 1988

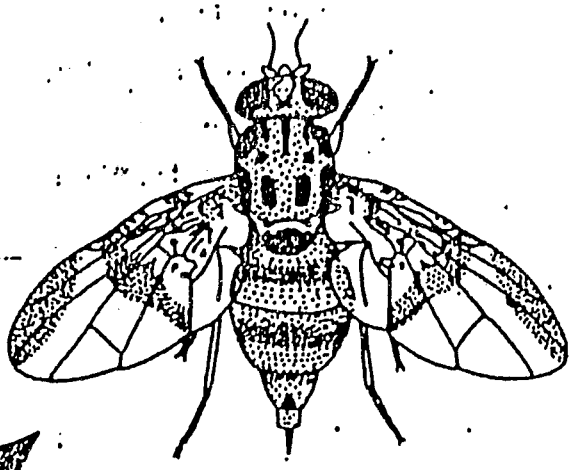
Below are recommendations for the treatment and control of the more serious diseases which often attack tree seedlings in PADF nurseries. The chemicals chosen were selected for their specificity for particular disease organisms, as well as their availability in Haiti.

Diseases	Recommended Fungicides	Application Rate	Frequency of Application	Cultural Control
Cercospora Leaf Blight	Benlate plus Dithane (M-45)	2 spoons per gallon per fungicide	twice/week	- Reduce watering plants - Place in sun
	or Ridomil (M2-58)	2 spoons per gallon	twice/week	- Provide good air circulation
Damping off	Captan	4 spoons per gallon	at sowing time and once/week until danger is past	- Don't overwater - If disease occurs, reduce watering frequency
	Ridomil (M2-58) plus benlate or Truban plus Benlate	2 spoons per gallon per fungicide 2 spoons per gallon per fungicide		- Provide good air ventilation
Powdery mildew	Benlate	2 spoons per gallon	Twice/week until problem diminishes	- Place plants in sun - Provide for

A spoon is a medium size tablespoon (a large soup spoon). When spraying for damping off, if possible choose the Ridomil-Benlate or the Truban-Benlate combinations over Captan. These combinations provide for better control of the damping off fungi than does Captan.

... Period . Lavi ensek

Me Kijan Kek ensèk grandi



gwo mouch

gran ensek yo, pon'n ze sou fwi, fèy, semans

Vè-a grandi anba tè. Li soti nan tè li vole Lwen. li Kwaze e Komanse fè menm bagay la

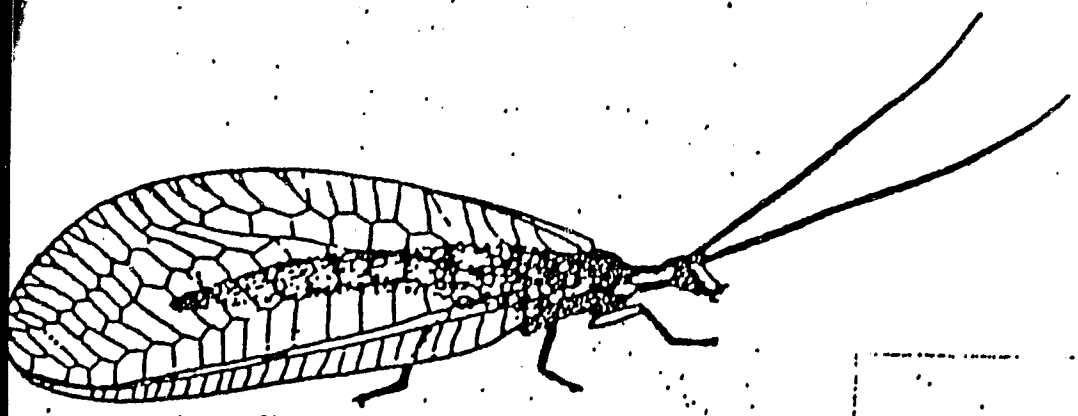
Ze yo

Ze yo Kouve e vin cheni. Cheni yo manje fwi e fey yo

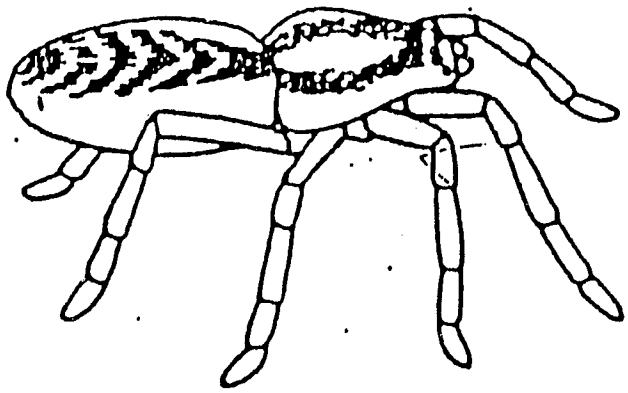
Cheni

Lè cheni yo vin vye, yo chanje fòm e yo domi

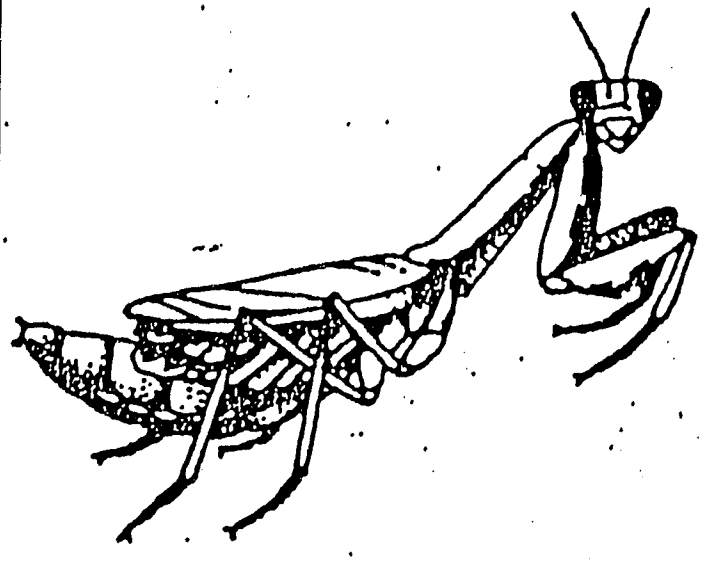
Vè nan Kokì



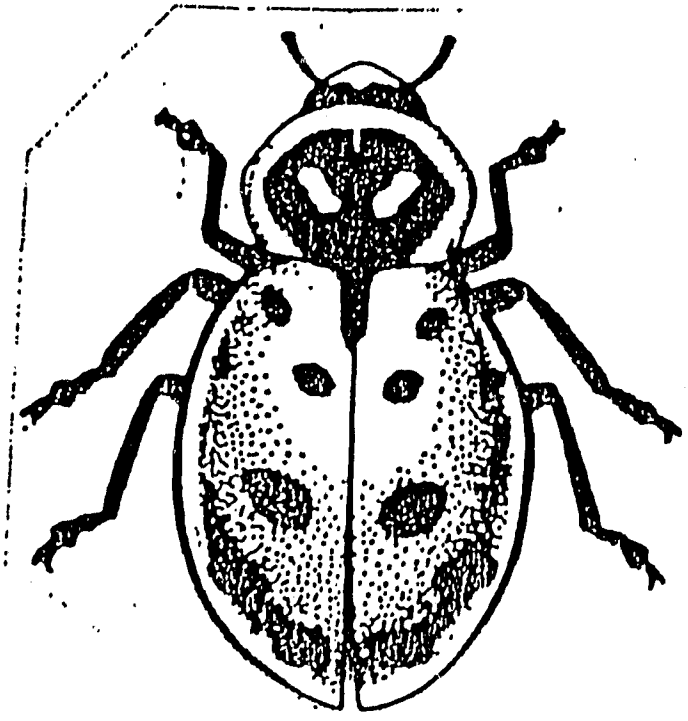
Léswing



Krab Arényén

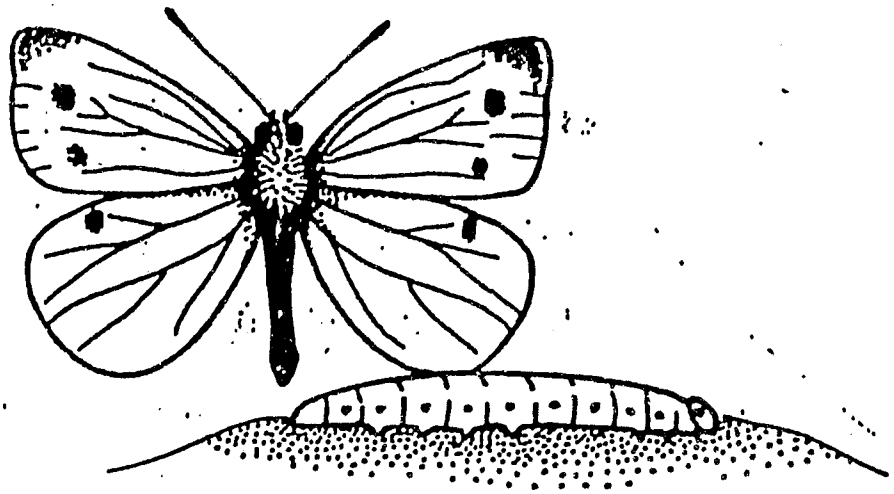


Chwal Bon Dyé

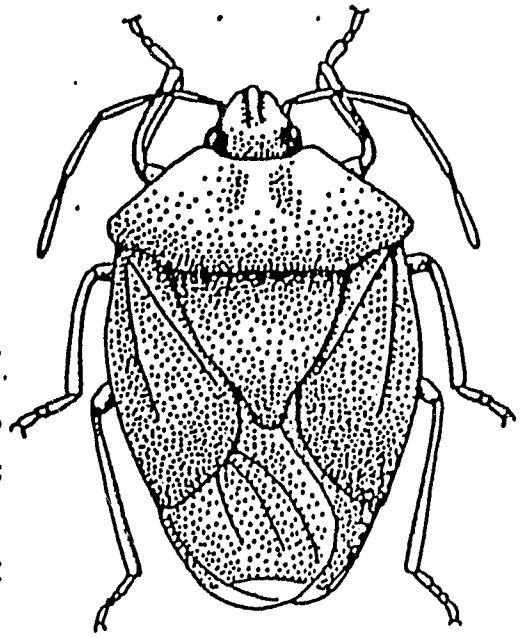


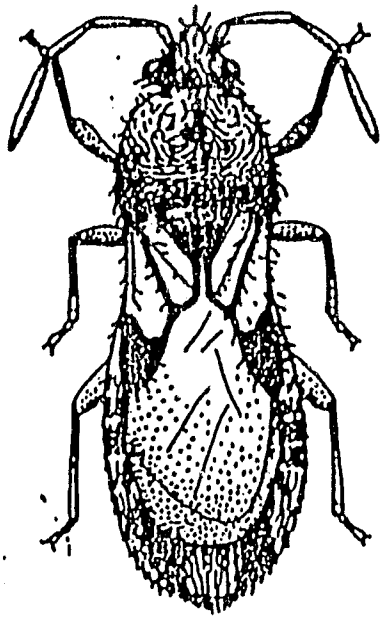
Kok Sinel

INSEK KI BON



Papiyon Cheni





INSEK KI PA BON

PAN AMERICAN DEVELOPMENT FOUNDATION / PROJÈ PYEBWA

Fèy Vizit Pepinyè

Pwojè : _____ Kontra # _____

Lokalite : _____ Rejyon : _____

Dat Vizit : _____

OBSÈVASYON :

1. _____

_____

2. _____

_____

3. _____

_____

REKÒMANDASYON :

1. _____

_____

_____

2. _____

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3. _____

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4. _____

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_____

5. _____

_____

_____

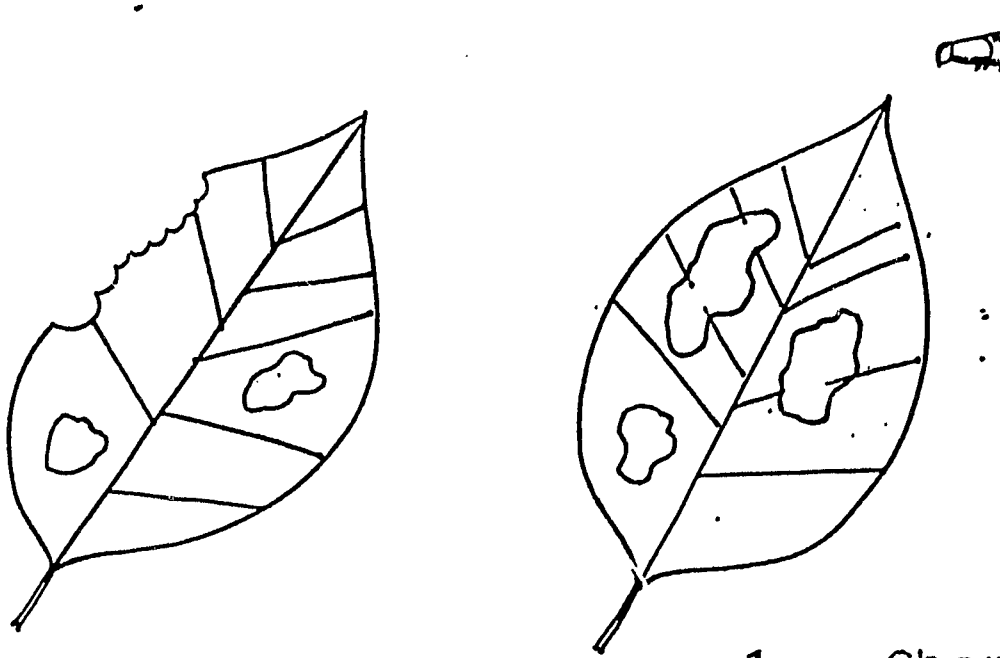
Kopi : Pepinyeris ☐
Forestye ☐
Lòt Moun ☐

Siye : _____
Spesyalis Pepinyè PADF

ATTACHMENT A-2
CHAPTERS SEVEN AND EIGHT OF THE PADF NURSERY MANUAL

Pepinyeris la fèt pòu konnen ki pwoblèm plantil la geyen anvan pou li ka trete li. Eske se pwoblèm ensèk, pwoblèm maladi, oswa lòt kalite pwoblèm? Kèk nan konsèy sa yo kapab ede ou rekonèt lakòz pwoblèm yo.

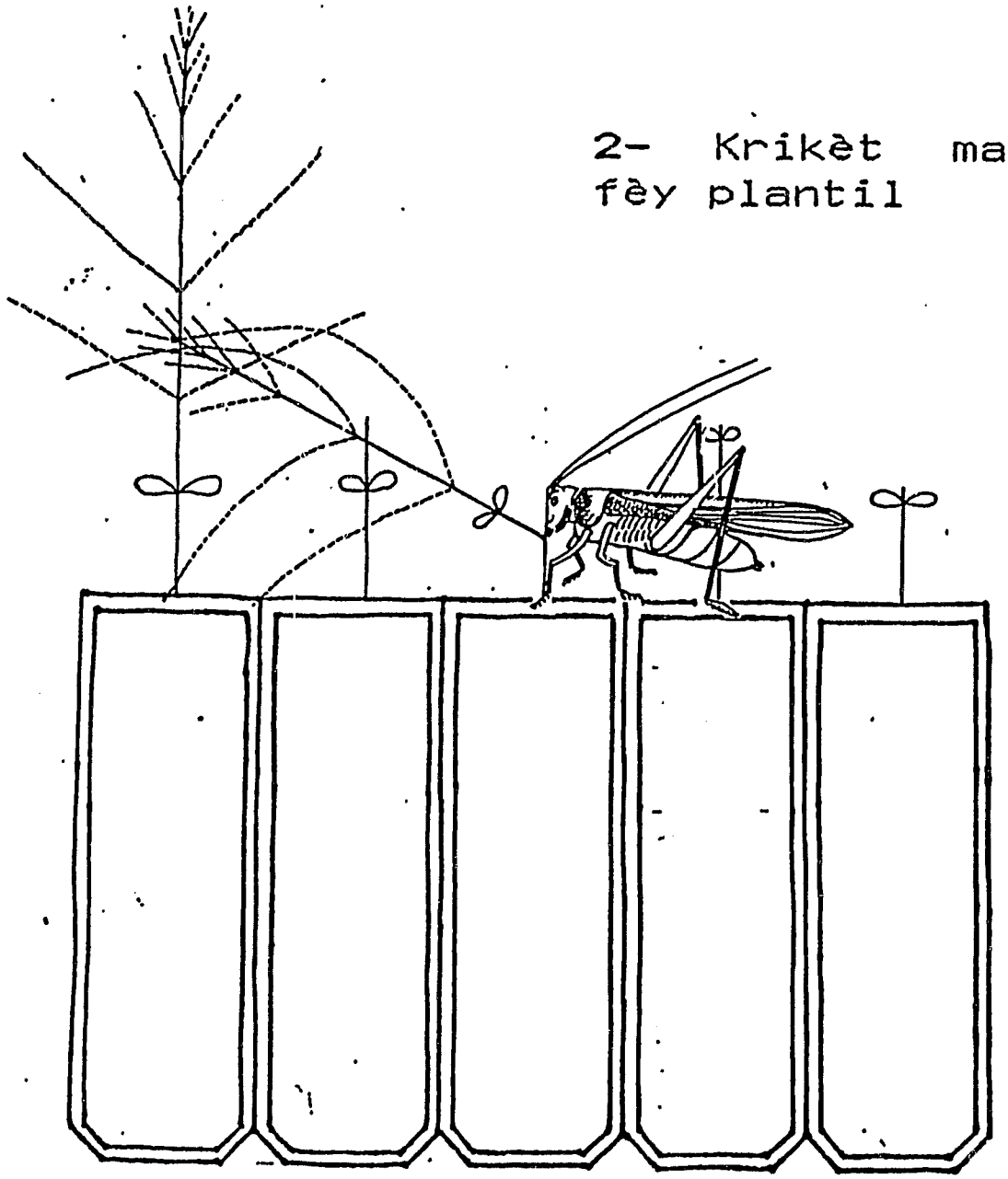
Ensèk: Obzève ensèk yo, ekskreman yo oswa kote yo tap manje nan plant la. Kèk ensèk atake fèy, lòt atake kò plant. Geyen ki atake rasin. Etidye (abitid manje ensèk enpòtan yo.



1- Cheni manje fèy plantil

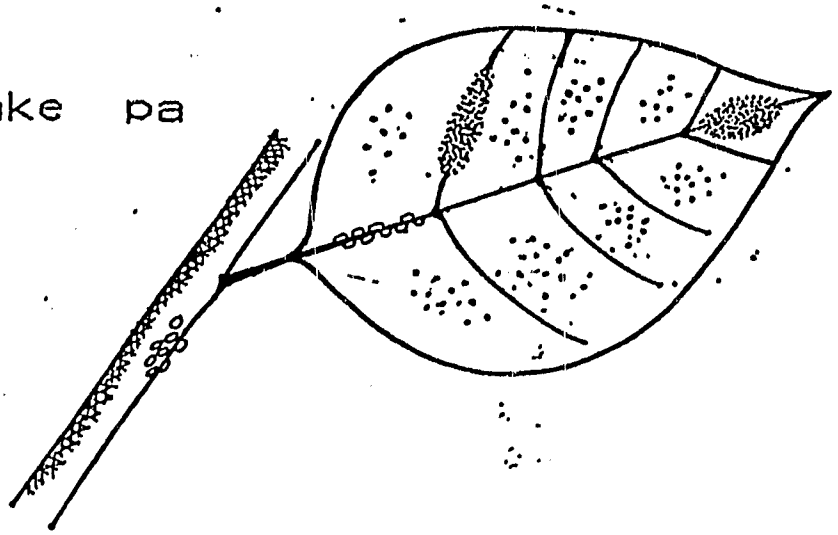
2- Krikèt manje fèy plantil

G.46-2



3- Fèy atake pa pichon

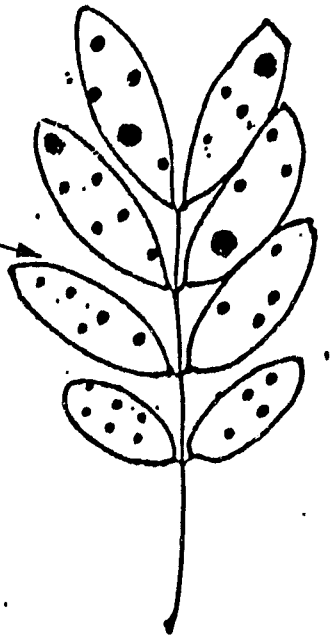
G-46-3



Maladi: Chak maladi gen pwòp siy li ou ka aprann rekonèt. Gen maladi ki fè tach nan mitan fèy yo; kèk lòt manje oswa rebò fèy yo, oswa tout fèy yo. Gen de lòt maladi ki atake oswa kò plantil la, oswa rasin li.

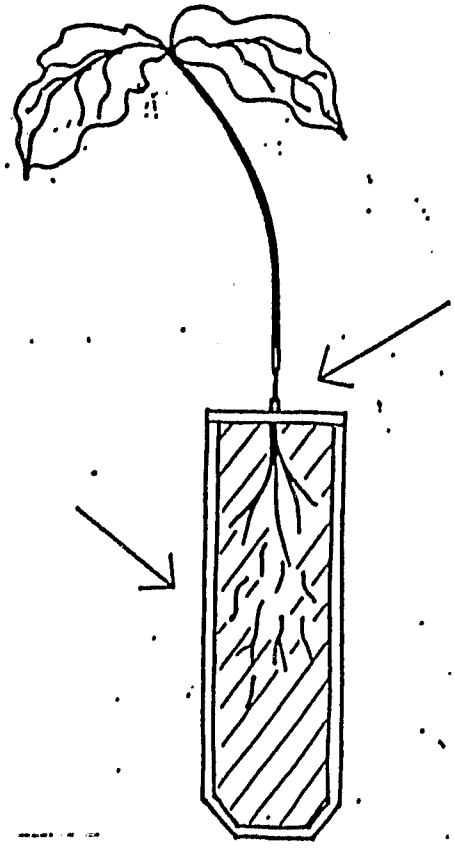
4- Fèy ki gen maladi tach

5- Maladi ki atake rebò fèy la



G46-4

G46-5

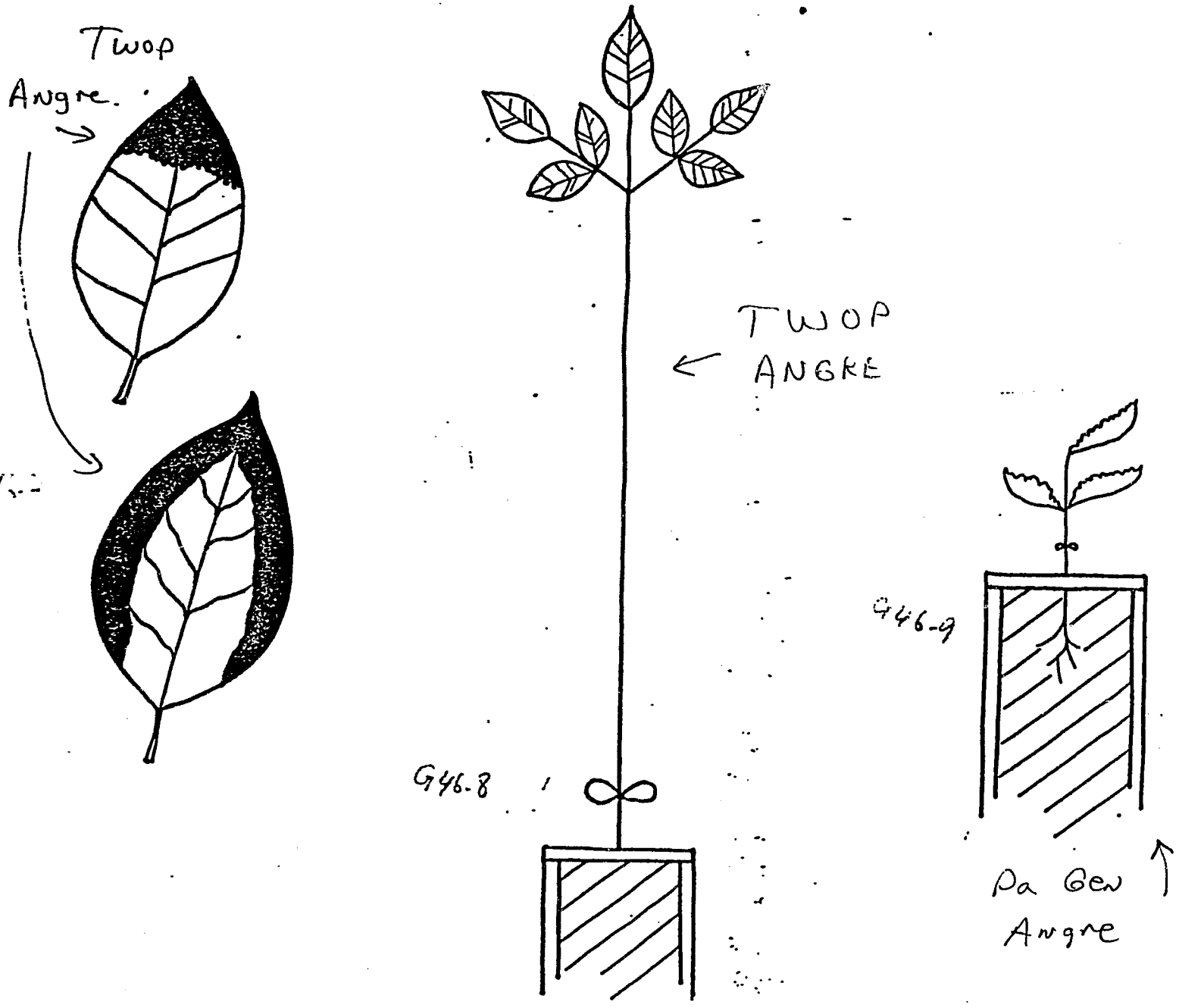


G-46-6

6- Maladi ki atake kò plant la

Pwoblèm Angrè: Si plantil yo pa jwenn kont angrè, yo pap grandi, oswa fèy yo ap vin jòn oswa mòv.

Si plantil yo jwenn twòp angrè, yo pouse twò wo, yo fèb epi yo mou. Twòp angrè ka boule plantil yo. Toujou wouze plantil yo anvan ou mete angrè pou evite yo boule.



Lòt Pwoblèm Lakilti:

Gen divès bagay ki kapab domaje yon plantil. Gen de pwoblèm ki pa ni pwoblèm ensèk, ni pwoblèm maladi, se pepinyeris la ki bay yo.

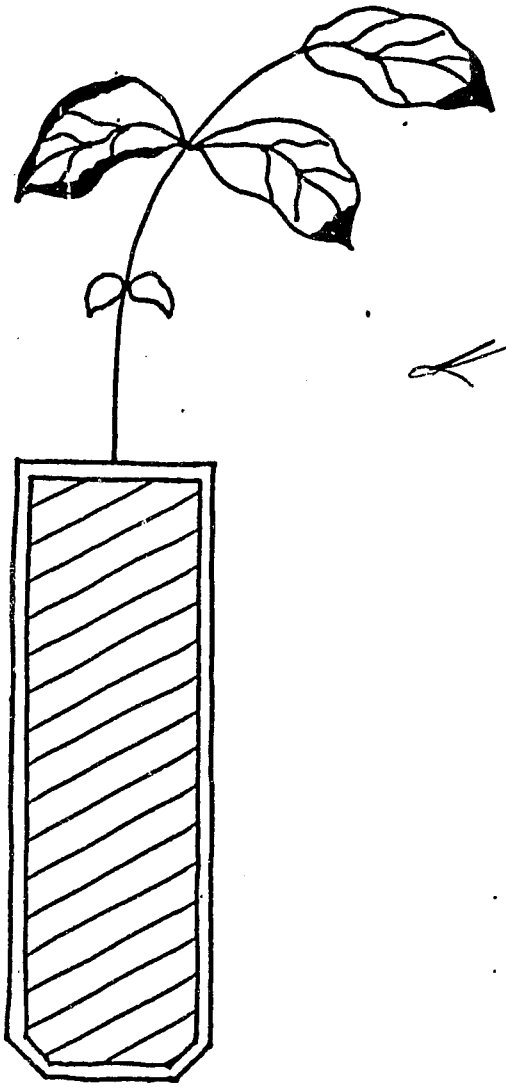
- Si plantil yo pa resevwa kont dlo, fèy yo ap seche epi boule.

- Si plantil yo resevwa twòp angrè oswa twòp pestisid, yo ka boule. Si ou bay angrè oswa pestisid nan mitan jounen an, plantil yo ka boule tou.

- Si plantil yo jwenn twòp lonbraj, yo va boule lè ou mete yo nan solèy.

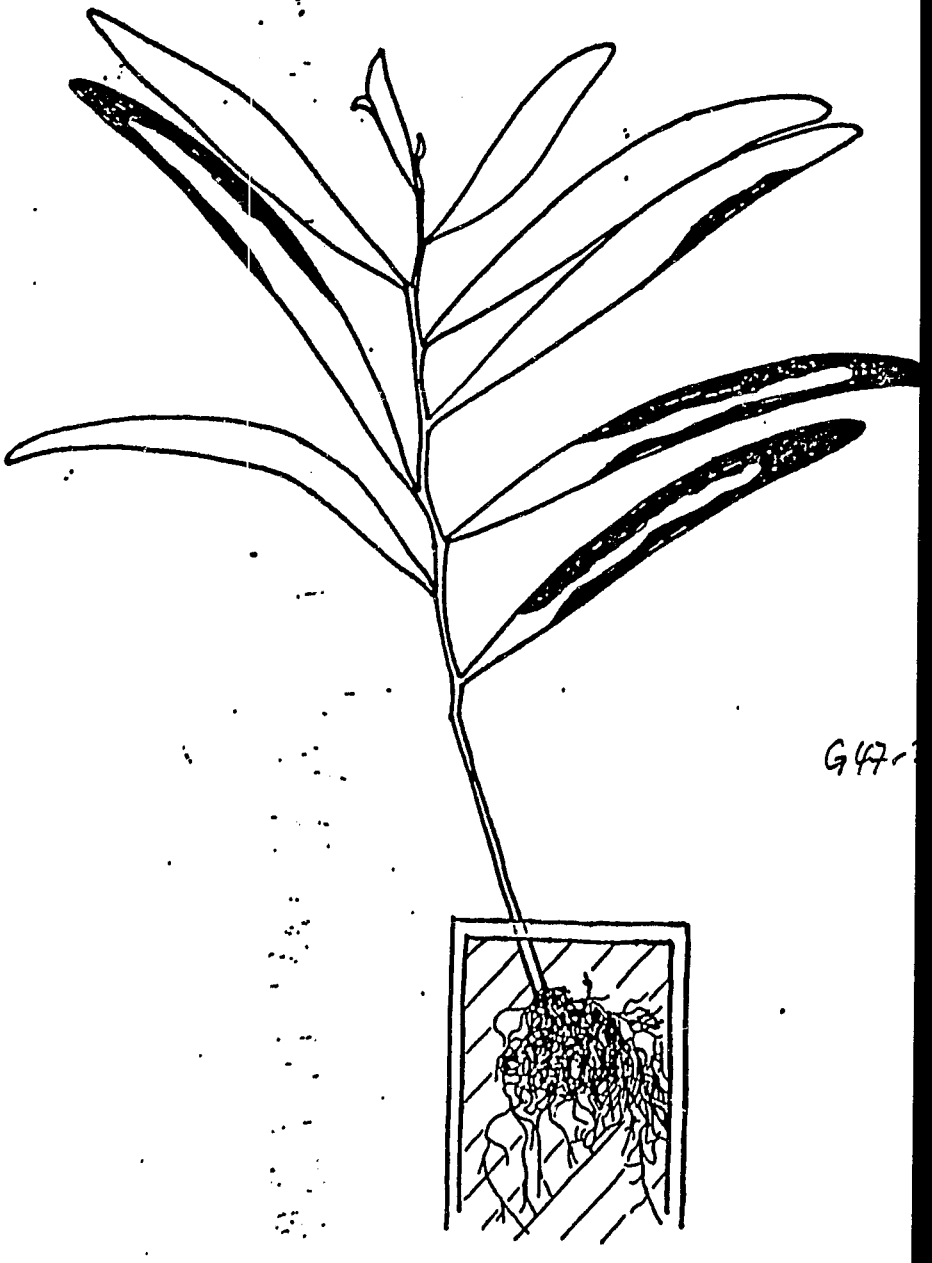
- Si plantil yo resevwa twòp dlo yo pap pouse twò vit paske rasin yo pap jwenn kont lè.

- Akòz fòt sa yo, maladi ak ensèk va atake plantil fèb sa yo.

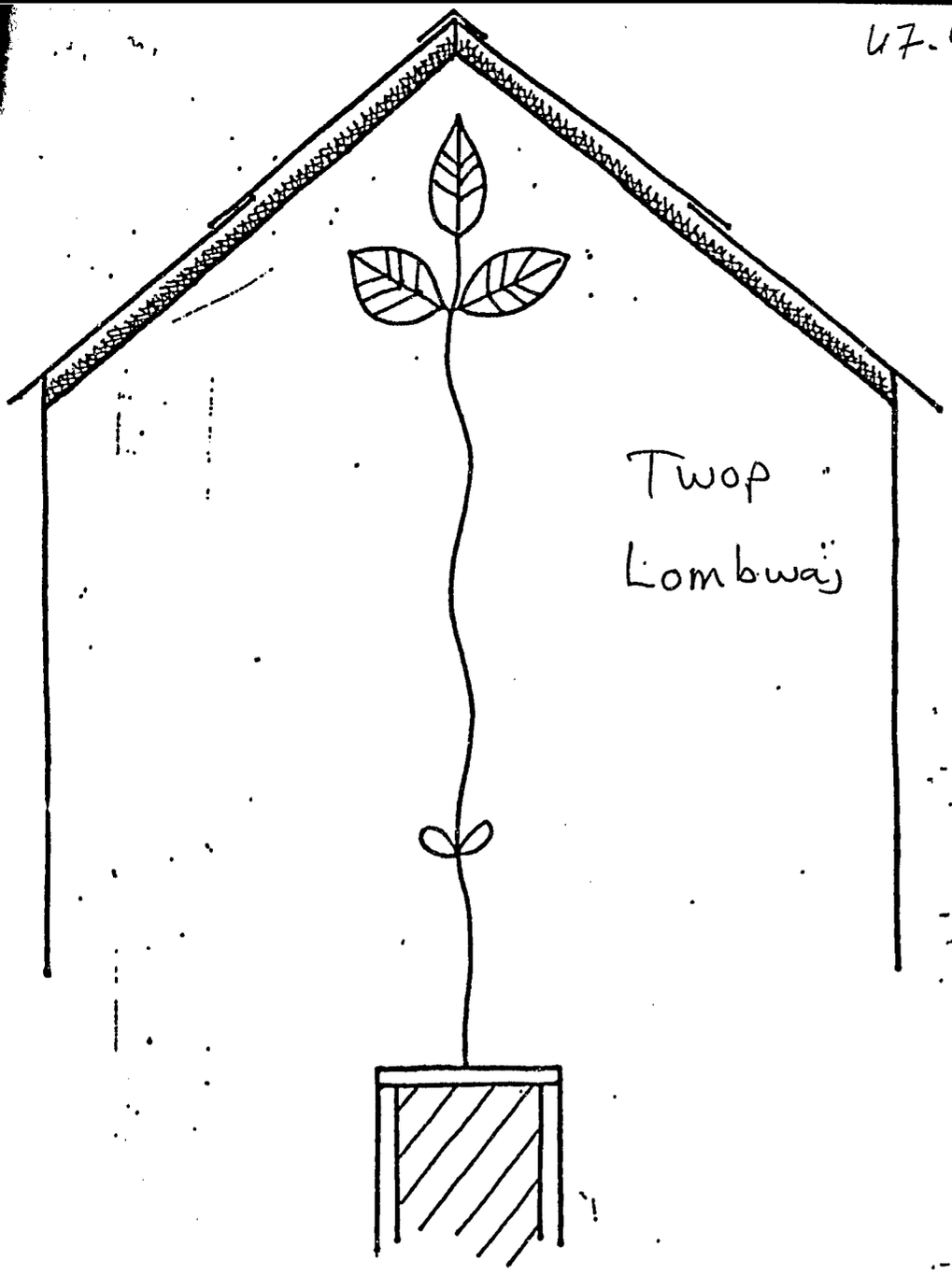


Fey Boulé akoz
yo manké dlo

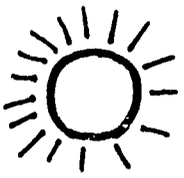
G47-1

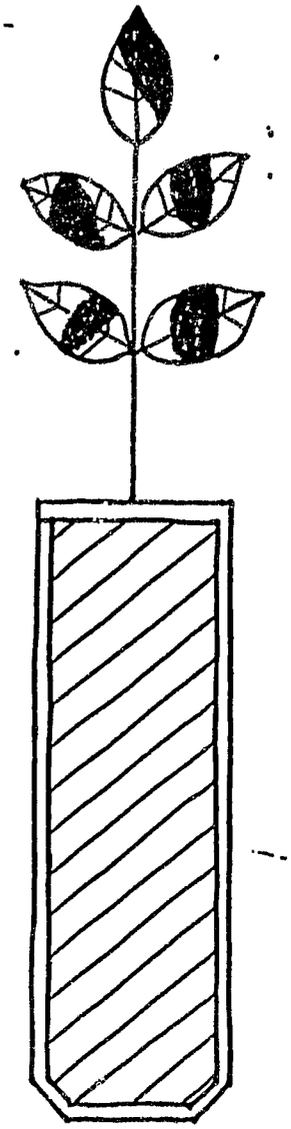


G47-

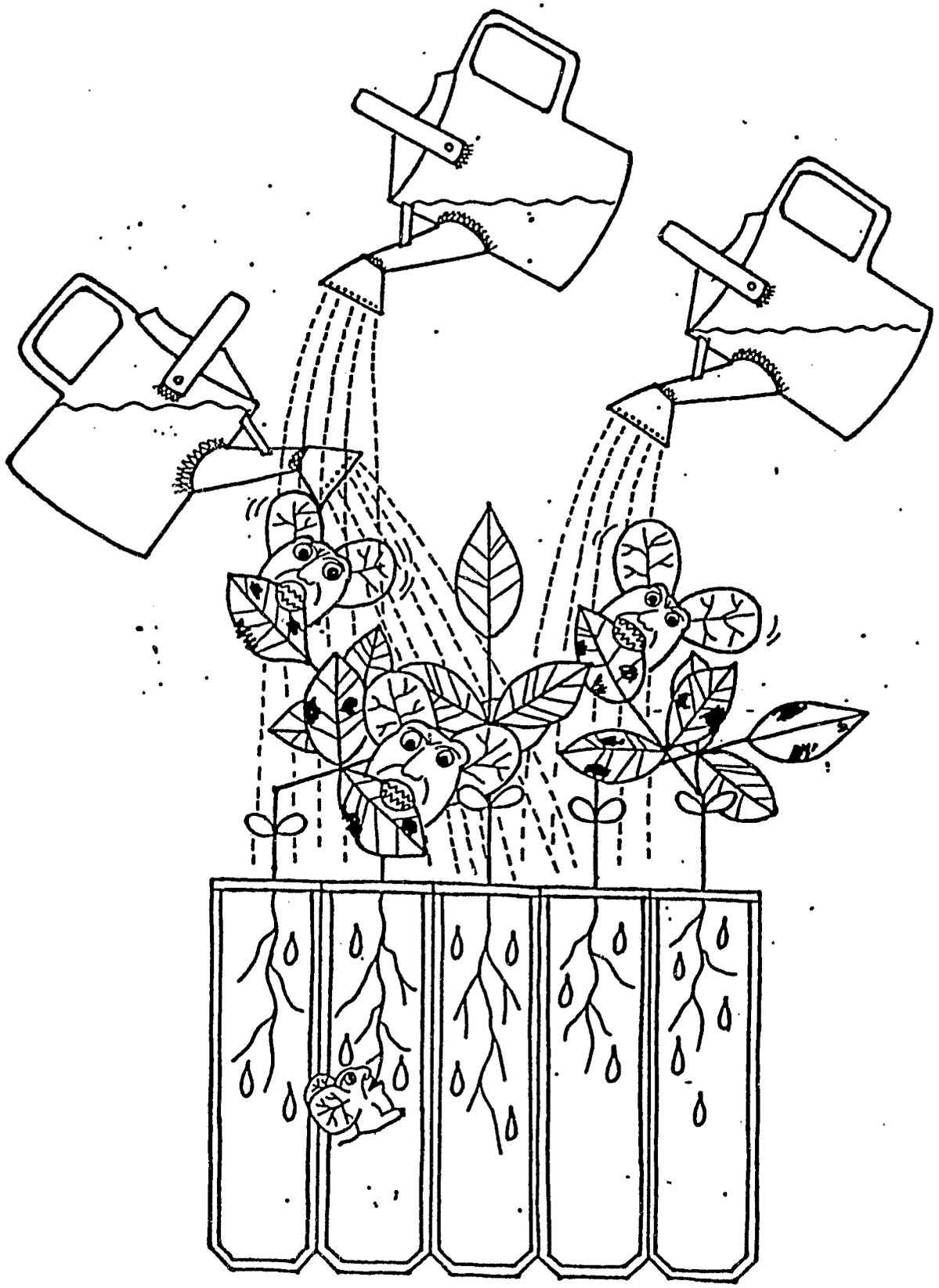


Twop
Lombwaj





Soley -la
two sho
Lap boule
fey yo



G47·5

Twop dlo

KONTWOL PWODWI CHIMIK

Si ou gen pou sèvi ak pestisid chimik pou kontwole ensèk ak maladi, sonje:

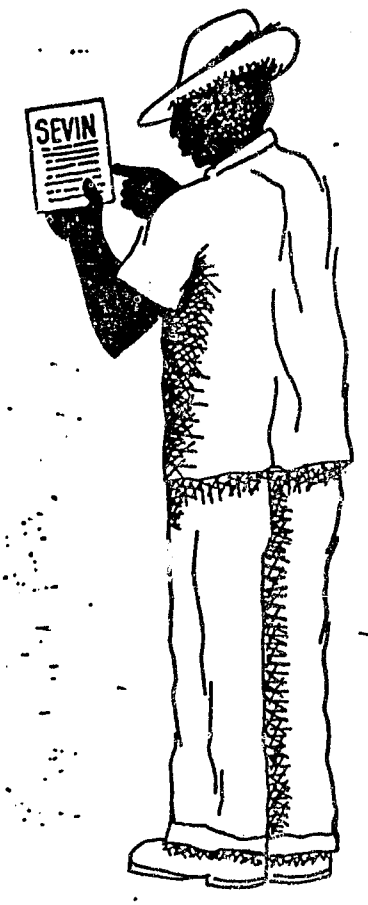
- Toujou li sa ki make sou bwat la, epi koute konsèy yo bay sou jan pou mele ak flite pwodwi a ak jan pou netwaye apre.

- Toujou mete rad espesyal ou sou ou.

- Pa jamè mele ansanm nan yon menm veso, ensektisid ak fonjisid. Kèk kalite melanj kapab boule plantil yo seryezman.

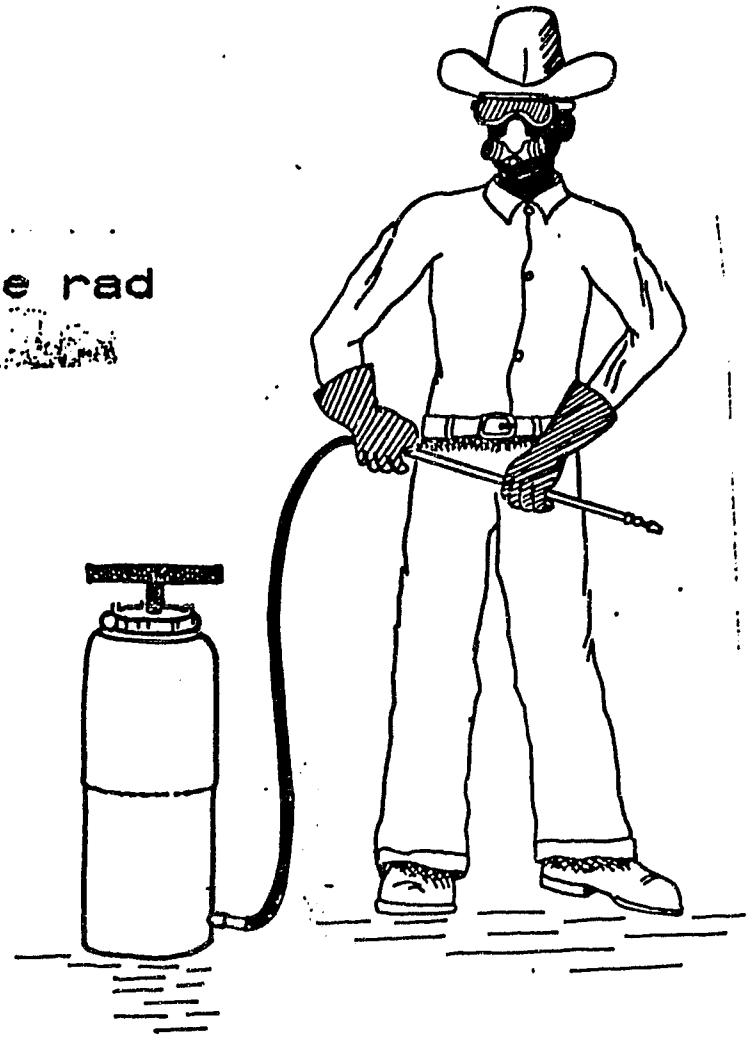
GS3-1

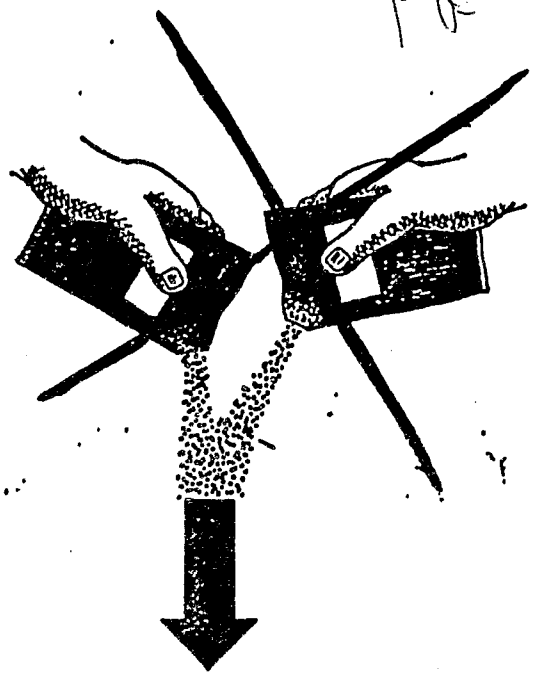
1- Li sa ki make



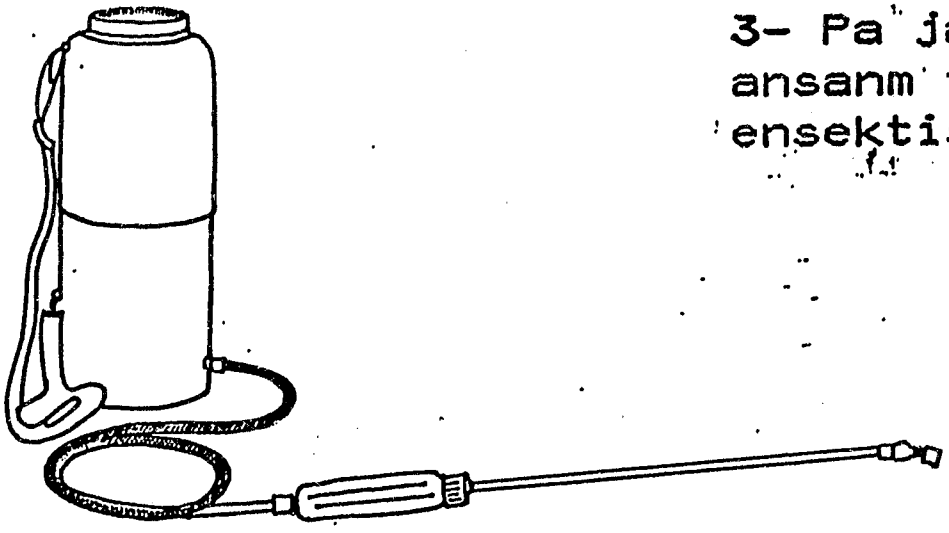
G53-2

2- Toujou mete rad espesyal





3- Pa janm mele ansanm fonjisid ak ensektisid

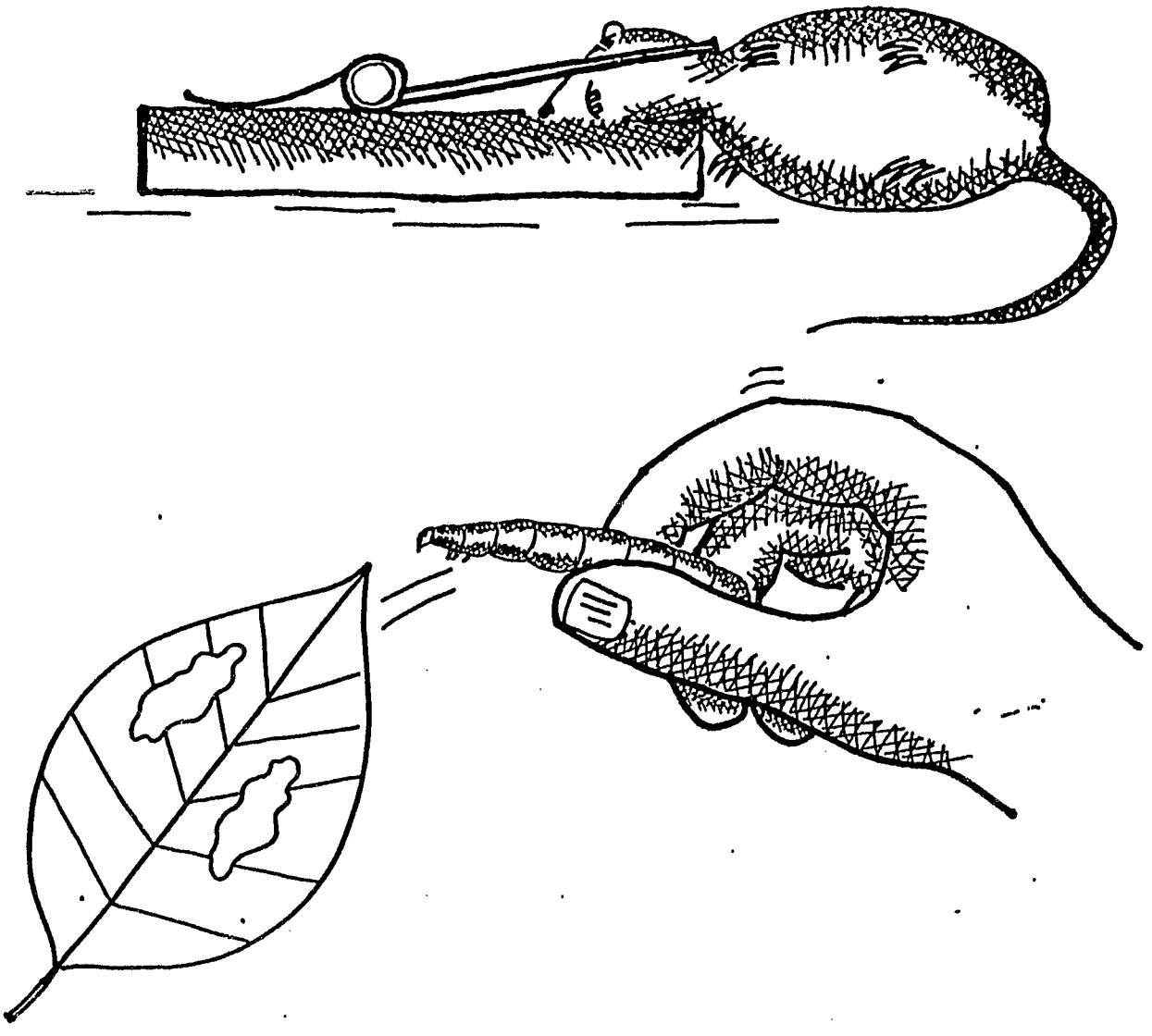


G53-3

METOD POU KONTWOLE ENSEK Ak Lot Pwoblem.

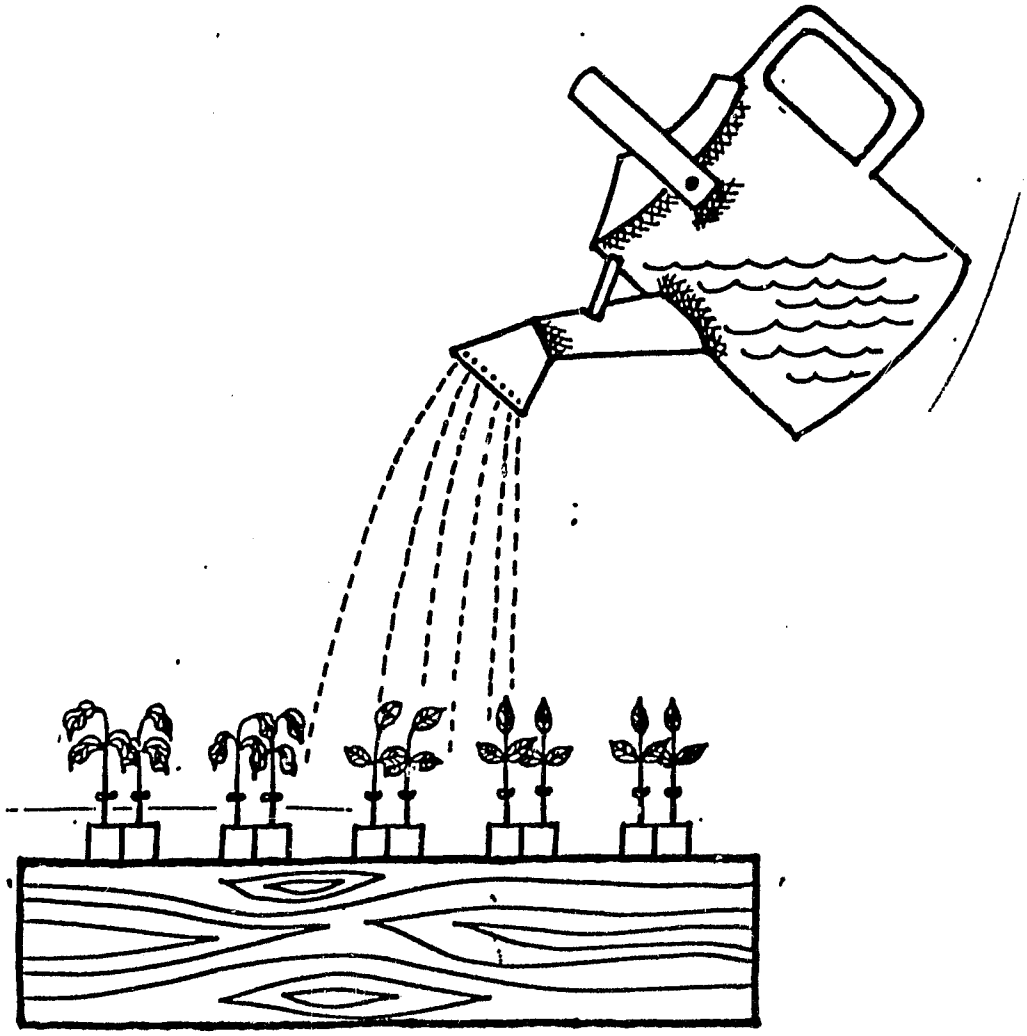
Gen dè lè, ou pa oblije sèvi ak pestisid. Gen kat (4) lòt metòd ki pa sèvi ak pwodwi chimik ou ka itilize pou kontwole ensèk ak maladi. Li pi bon pou eseye metòd sa yo anvan. Si pwoblèm la ta vin pi grav, lè sa a, ou oblije sèvi ak pestisid.

1. Mekanik: Ou ka mete pèlen pou sourit ak rat, epi wete ensèk sou fèy yo ak men ou (.,cheni).

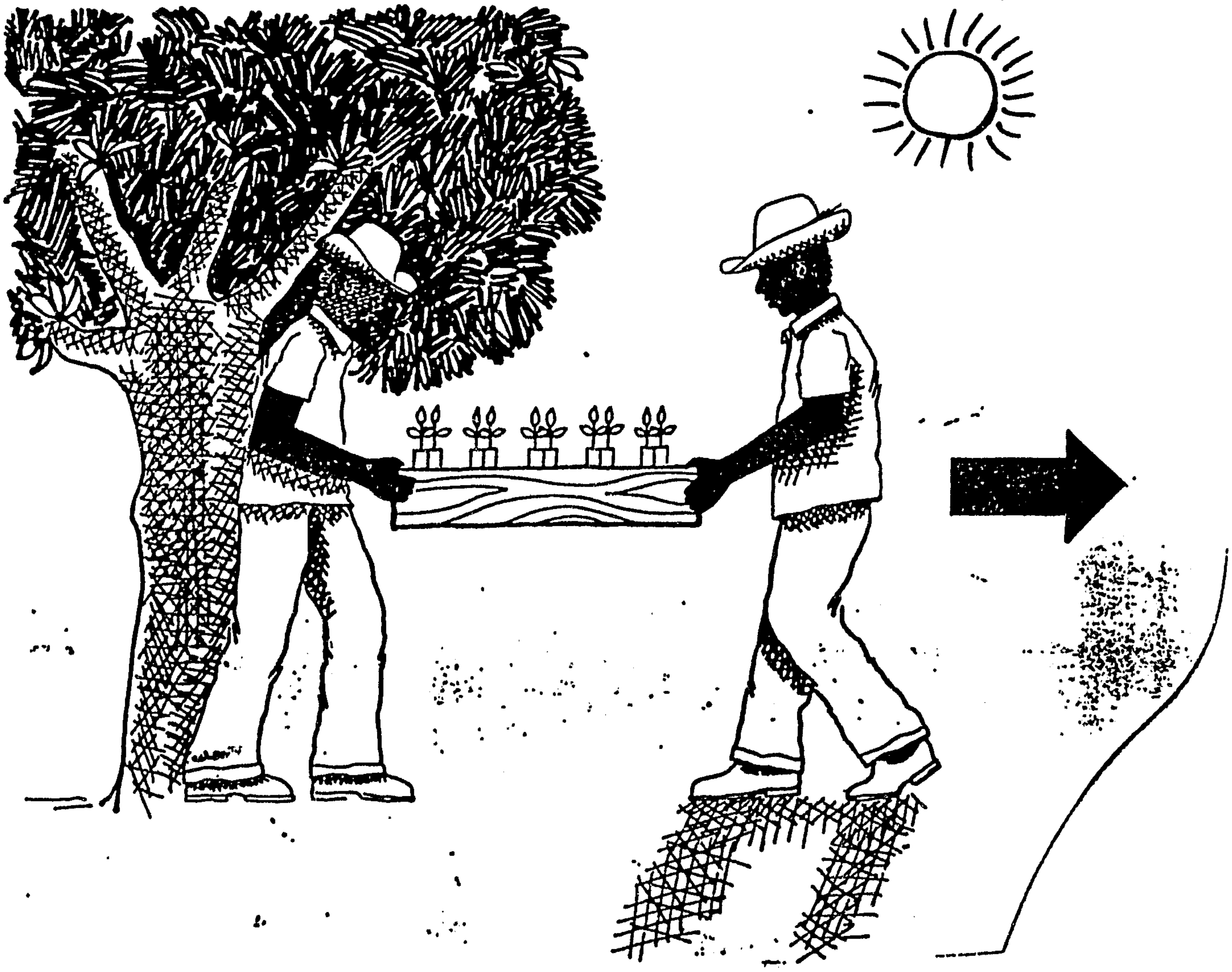


2. <u>Agrikol</u>: Pou kontwole kèk maladi (pouriti epi maladi fèy), diminwe awozaj epi mete plantil yo nan solèy.

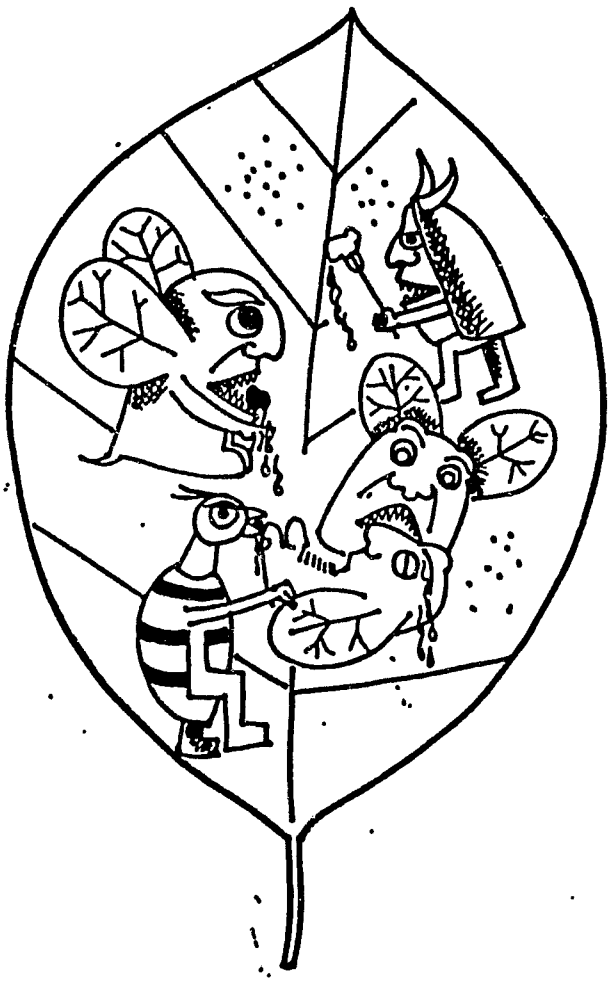
G57-3



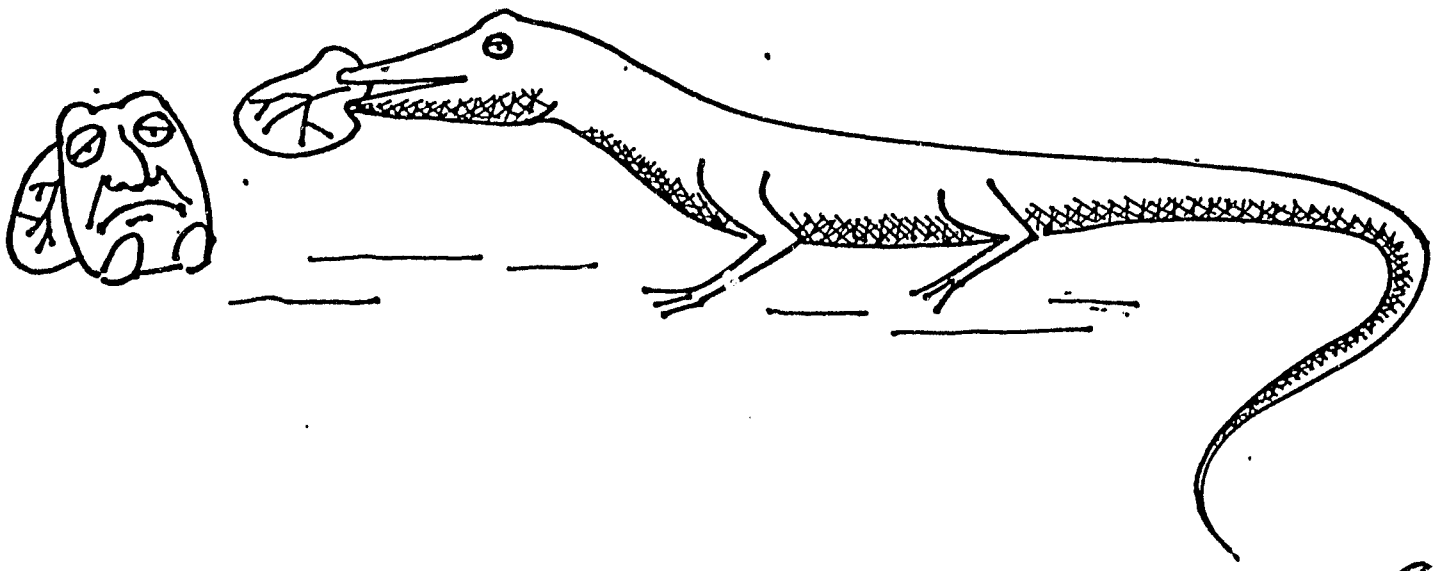
G57-4



3. <u>Byolojik</u> (natirel): Gen de bèt tankou krapo, zandolit ak zwazo ki manje ensèk nan pepinyè a. Bon bèt sa yo ede ou lite ak move ensèk ki ap manje plantil ou yo.



chanje desen



NIM : (ENSEKTISID NATIREL)

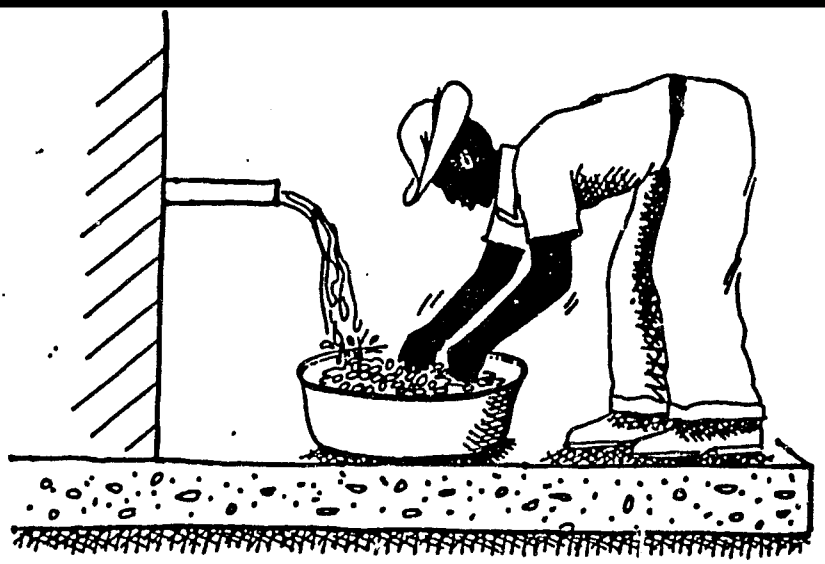
also Sections on Chilipeppers, Tobacco Concoct + Kashima Seed

Nim, se yon pyebwa ki gen ensektisid natirèl nan fèy ak nan grenn li yo. Ou kapab sèvi avèk li pou touye cheni, psilid, pichon, eskarabe, ti bèt ki manje fèy ak lòt ensèk. Li pi bon pou sèvi ak nim pase pwodwi chimik.

Jan pou prepare li

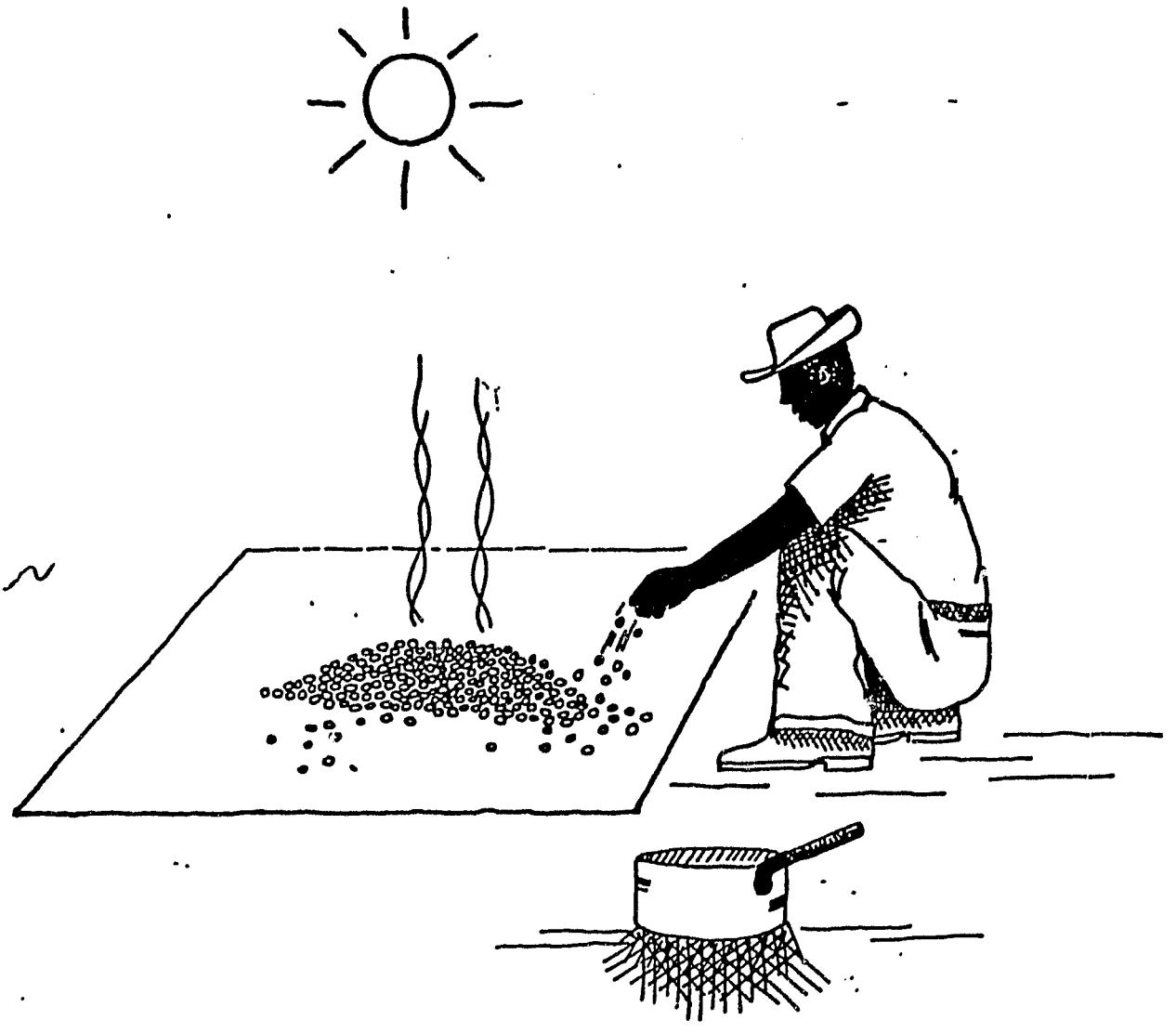
Ranmase grenn nim yo. Lave yo ak dlo dekwa pou retire po yo epi mete yo seche nan solèy. Kite grenn yo nan solèy pou plizyè jou. Lè yo sèk, mete yo nan panye oswa yon sak twal (pa jamè mete yo nan sak plastik), epi sere yo yon kote ki sèk.

Pou fè Poud ~~lwil~~ la, mete 6 gwo ponyen grenn nan yon pilon, pile yo jis yo tounen yon poud mawon fen. Lavèy jou ou ta vle flite plantil yo, mete poud la nan 10 lit (egal 2 galon 1/2) dlo epi kite li tranpe tout lanwit. Nan demen, pase melanj poud ak dlo an nan yon filt oswa yon moso twal. Vide li nan ponp flit la, epi flite plantil yo.



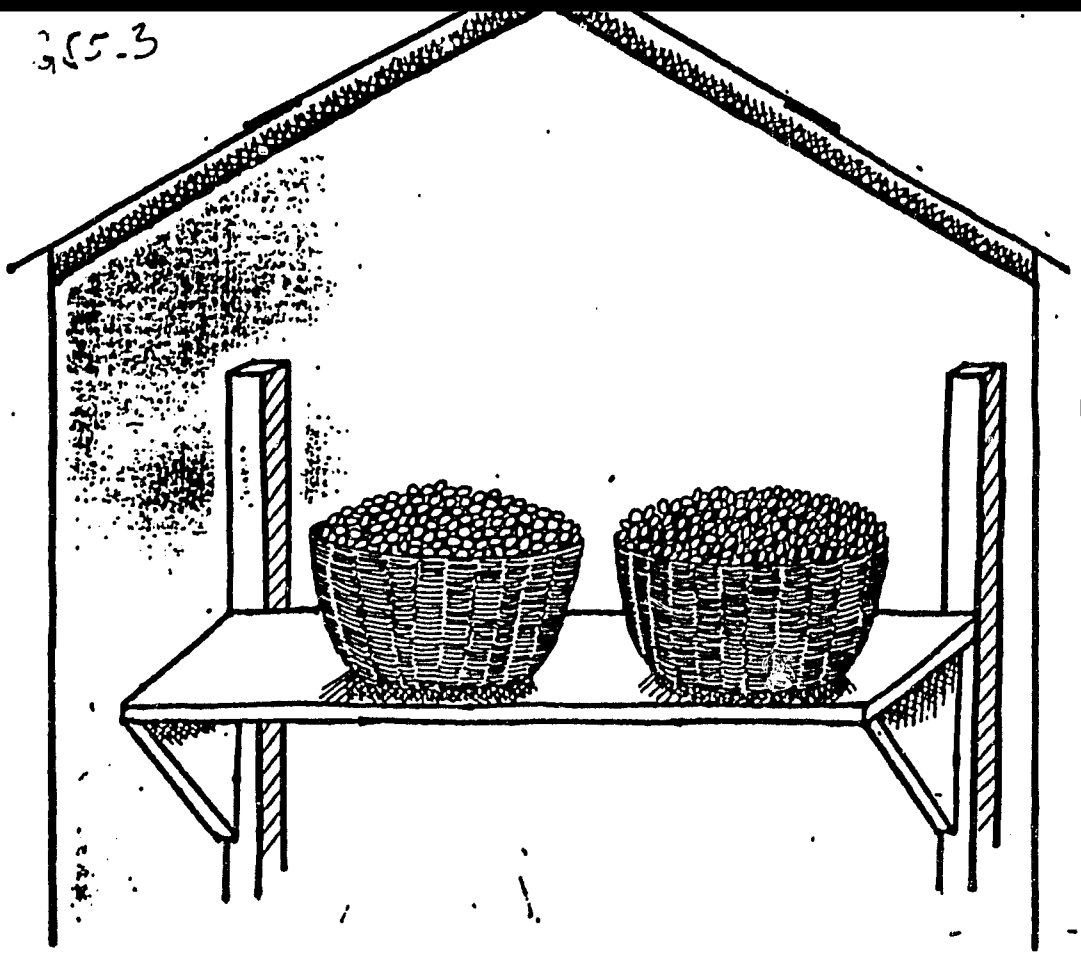
G55 -1

1- Lave grenn Nim yo ak dlo, retire po yo



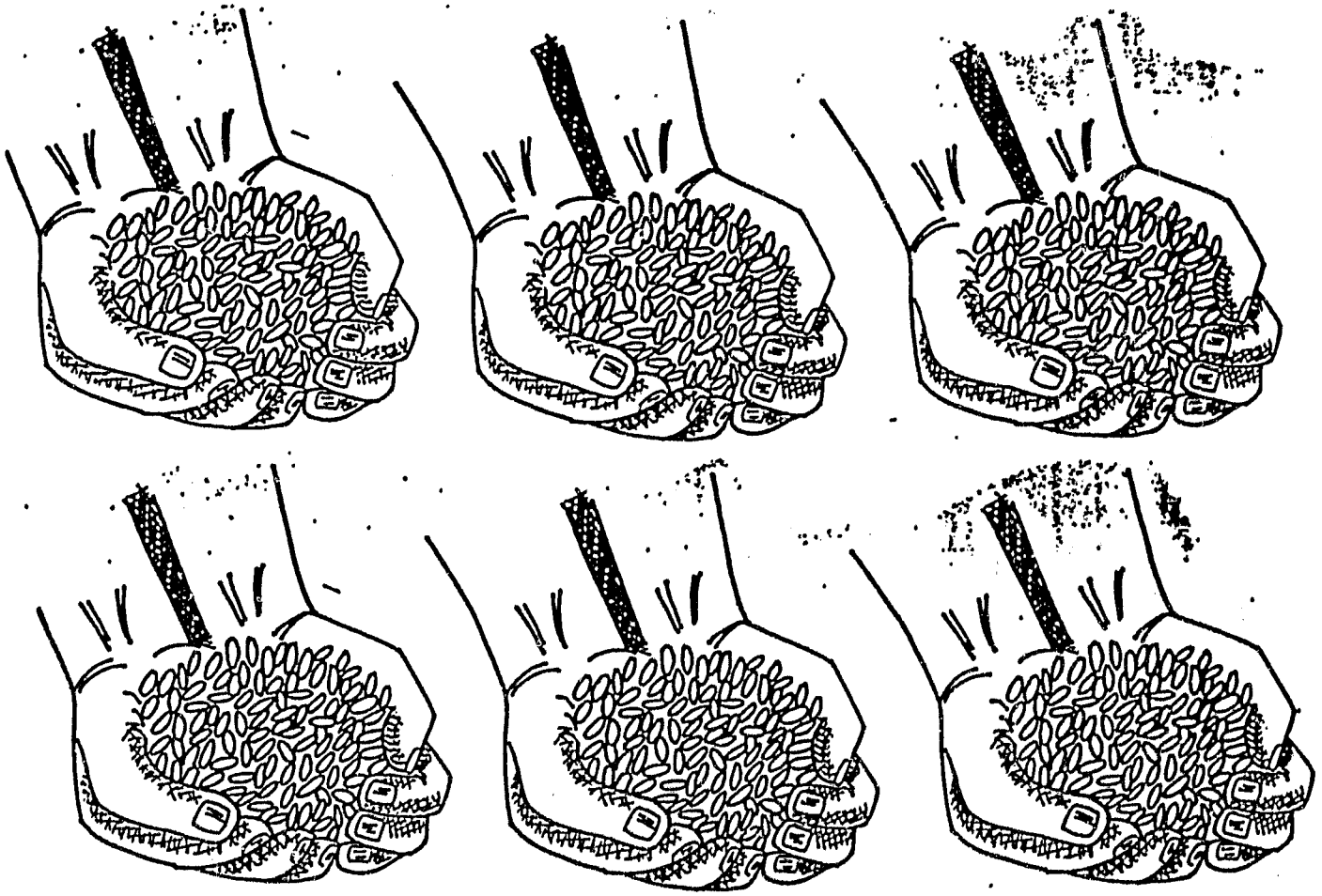
G55 ~

2- Mete grenn yo seche nan solèy plizyè jou



3- Lè yo sèk,

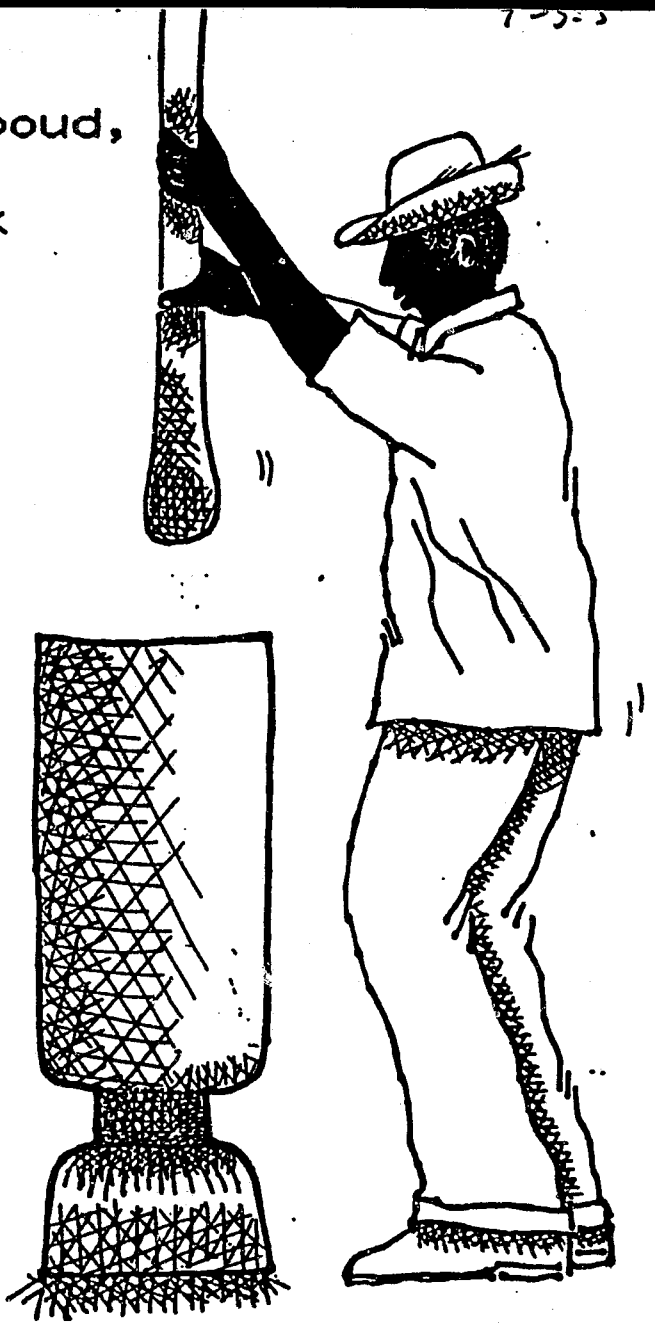
mete yo nan depo

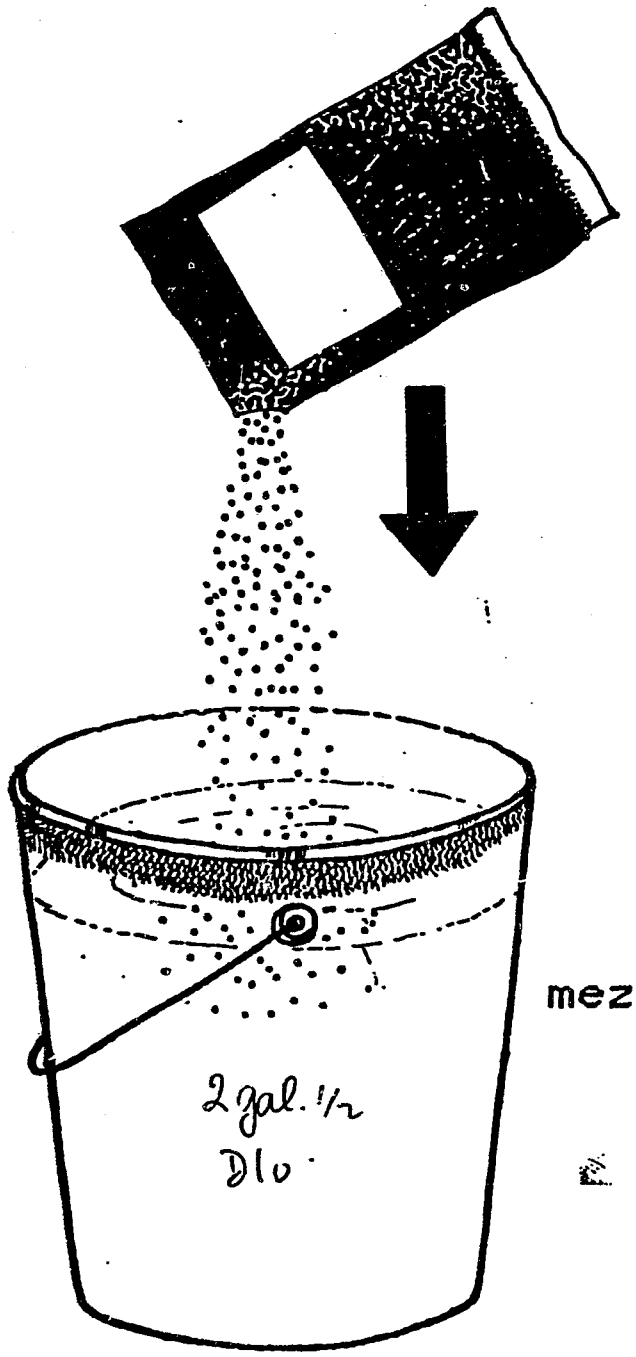


Pouvd -

4- Pou fè lwil, pran 6 ponyen grenn

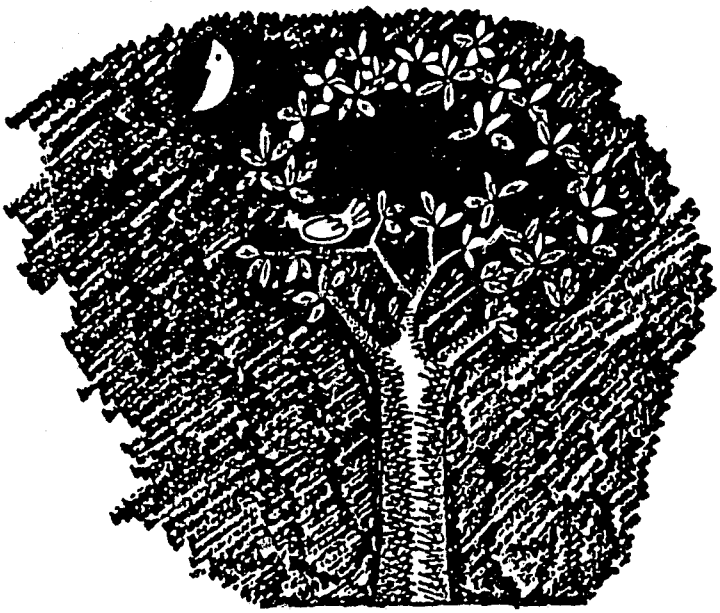
5- Pile grenn yo, fè yon poud,
mete nan ti sak plastik

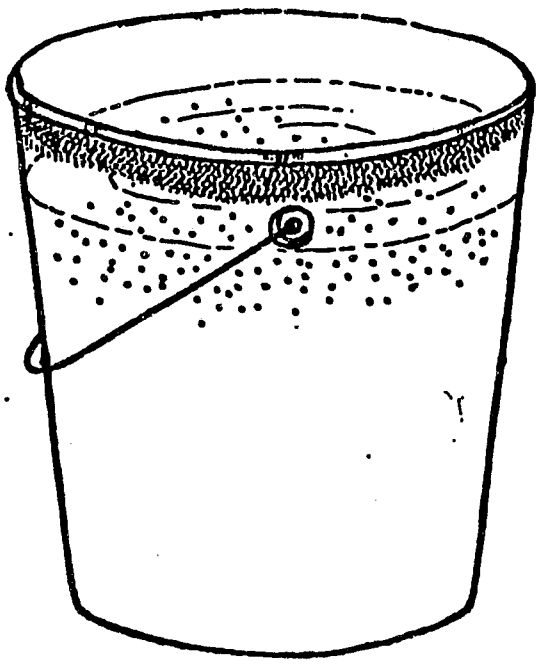


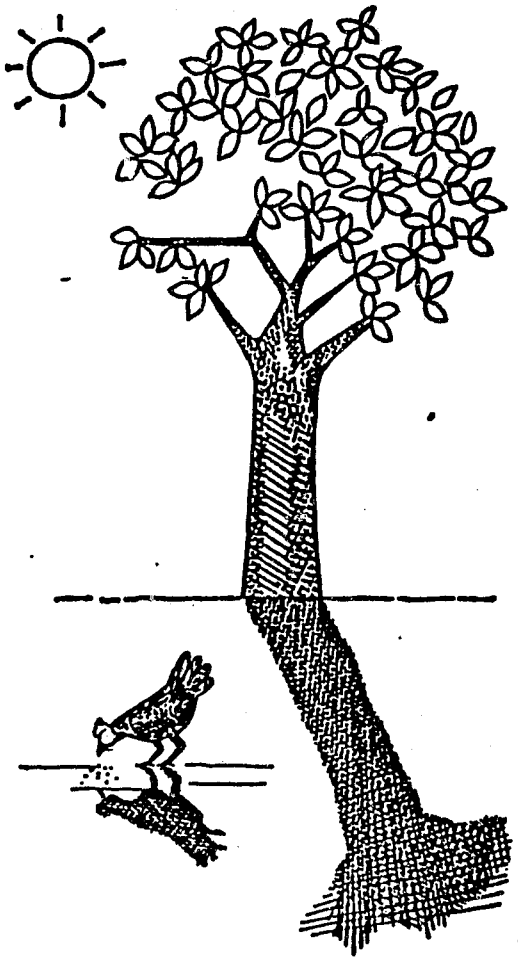


6- La vèy jou wap flite,
vide poud Nim nan
mezi 1 bokit dlo (2 galon 1/2)

G55-6

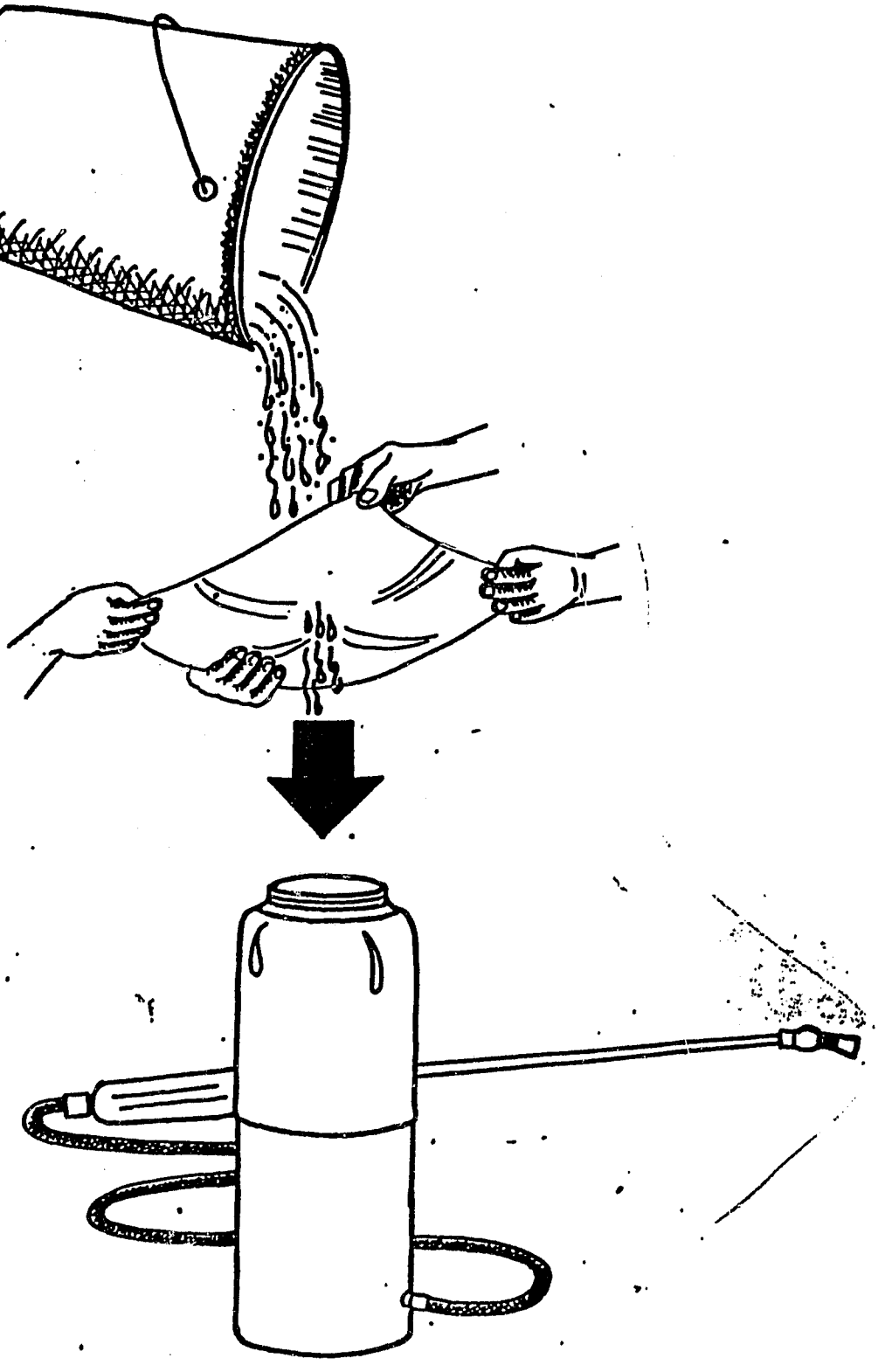






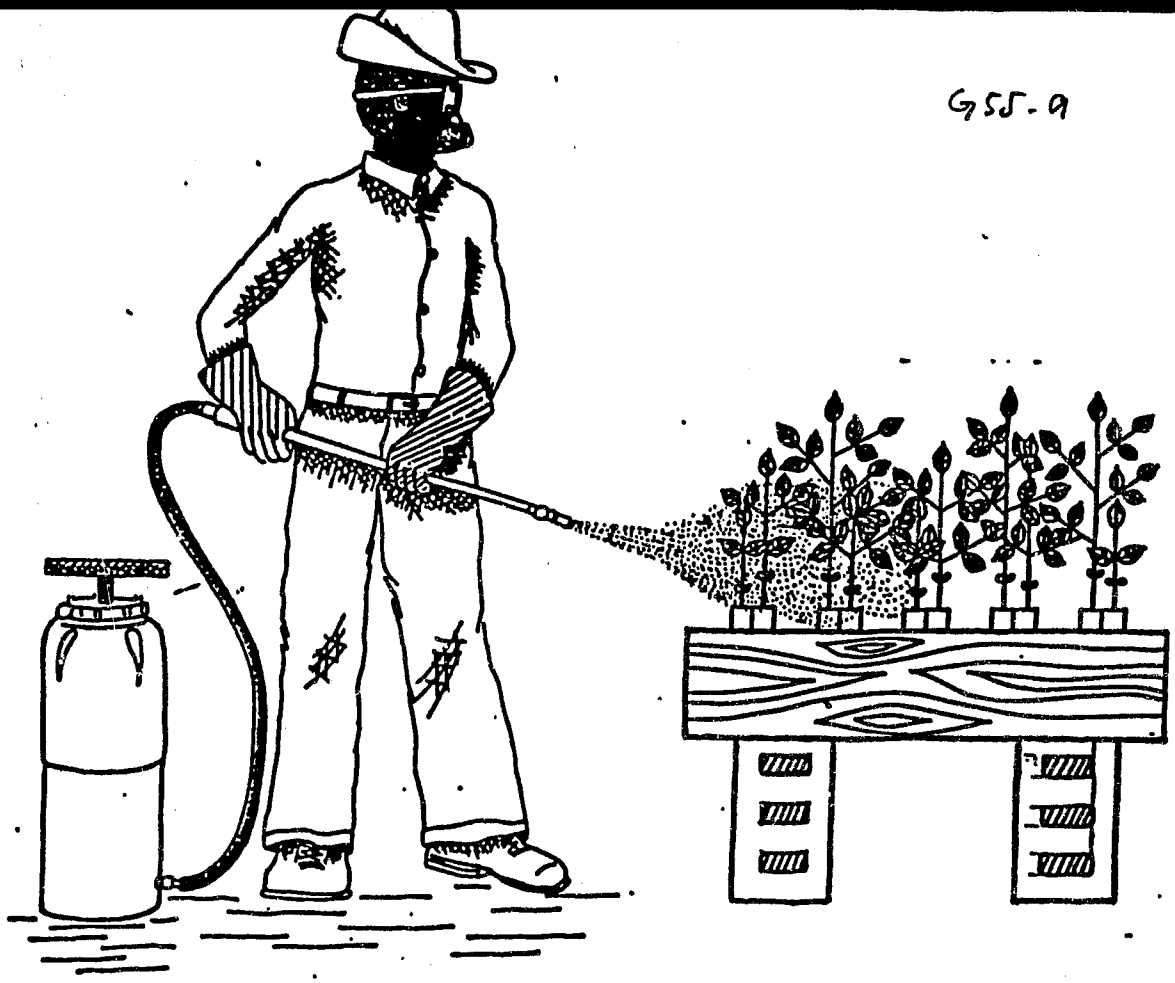
7- Fè melanj dlo ak poud Nim epi kite l repoze tout lannwit (12 zèd tan)

G55-8



8- Nan demen, koule dlo Nim la nan ponp flit la

G55.9



9- Epi flite plantil yo

4. Prekosyon: Evite pwoblèm nan pepinyè, se pi bon jan pou kontwole pwoblèm yo. Gade nan chapit ? kote yo bay ou konsèy pou sa.

PREKOSYON

. PWÒPTE
. SAKLAJ
. VANTILASYON
. AWOSAJ
. SOLEY

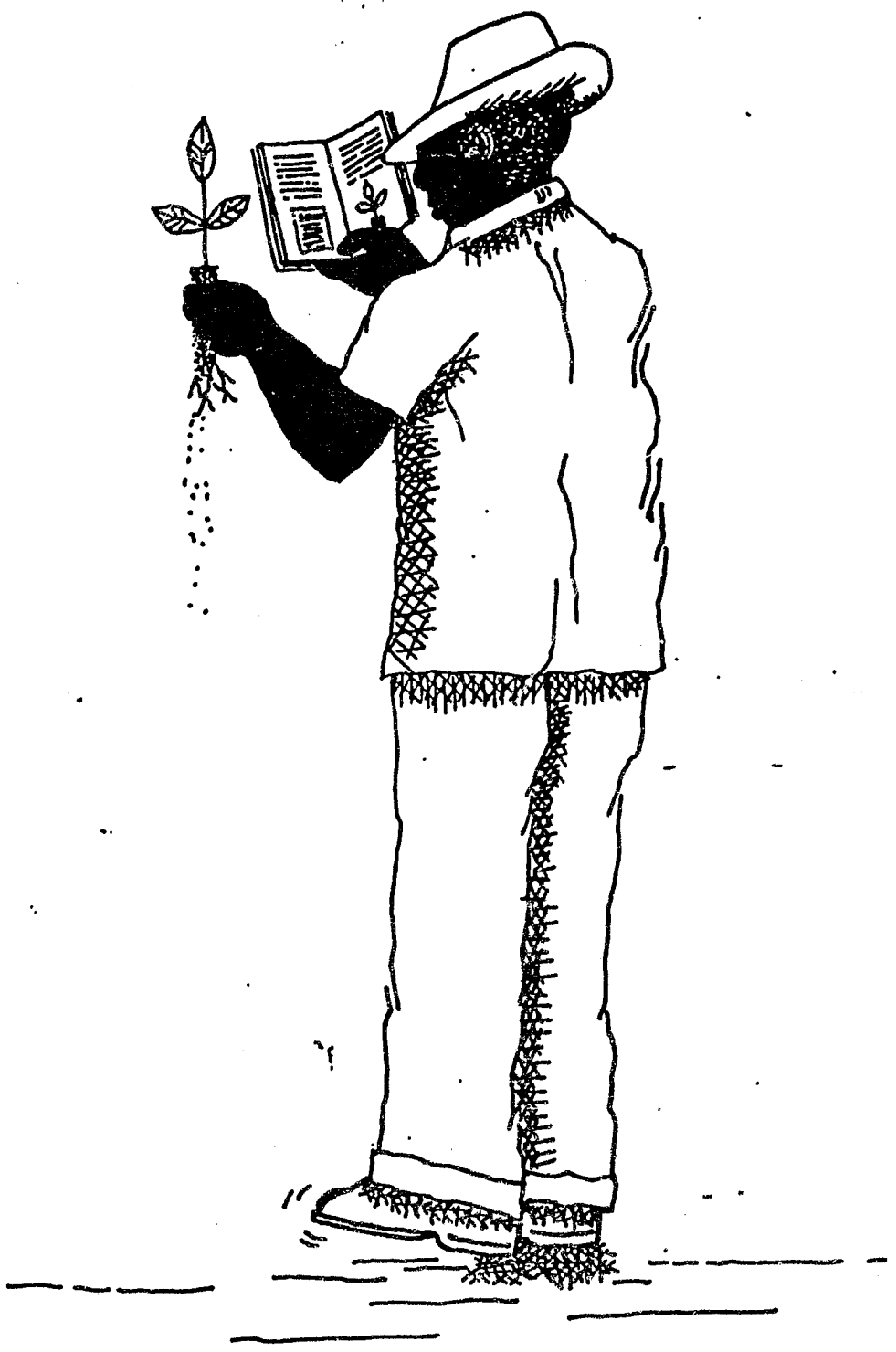
GID POU REKONET EPI KONTWOLE ENSEK AK MALADI

Nan paj kap vini yo, ou pral wè foto ensèk, maladi ak lòt pwoblèm ou jwenn touttan nan pepinyè.

Premye paj yo ap rezime tretman pou maladi ak ensèk ki pi enpòtan yo.

Pou sèvi ak gid la, pran yon plantil malad, epi chache sa ki sanble li sou foto yo. Apre, li sa ki ekri sou kote foto a pou ka jwenn:

- Non ensèk la oswa maladi a.
- Plantil li ka atake.
- Lakòz pwoblèm la.
- Metòd pou evite pwoblèm la.
- Tretman agrikol
- Tretman ak pwodwi chimik.



1- Pran yon ti plantil malad, epi chache nan gid la sa ki sanble maladi a

Non: Cheni
Espes li atake: Chèn
Koz: Yon milpat ki manje fèy chèn
Tretman agrikol: Wete cheni ak men
Tretman chimik: Flite ak ensektisid jis fèy yo degoute

PHOTO

Non: Krikèt
Espes li atake: Kazwarina
Koz: Krikèt kache nan zèb ki pouse wo, nan fatra toutotou pepinyè a, oswa nan blòk siman ki anba etajè yo.
Fason pou evite sa rive: Koupe zèb yo ra tè, epi kenbe pepinyè a pwòp. Wete tout fatra, espesyalman plastik.
Tretman agrikol: Koupe zèb yo ra tè, netwaye pepinyè a epi poze metè etajè yo pi wo.
Tretman chimik: Flite plantil yo, sa anba etajè yo, nan twou blòk siman yo ak ensektisid.

PHOTO

Non: Psilid
Espes li atake: Lesena, saman.
Koz: Ti bèt ranpan oswa ki vole, epi ki souse jij plant yo.
Tretman chimik: Flite ak ensektisid. Flite sèlman si pwoblèm la grav anpil paske ensektisid la touye bon ensèk ki manje psilid yo tou.

PHOTO

Non: Nematod
Espes li atake: Sitris.
Koz: Yon ti vè ki atake rasin yo. Kalite vè sa a peple nan move tè ak nan bagas.
Fason pou evite sa rive: Sèvi ak tè esteril.
Tretman chimik: Mete yon kiyè mwayènn Diazinon pou 1 galon dlo, epi wouze tè a byen ak mèlanj sa a.

PHOTO

Non: Lagal sitris (Citrus scale)
Espes li atake: Sitris, mango.
Koz: Yon ti ensèk ki viv sou arebò fèy oswa sou kò plantil yo.
Tretman agrikol: Touye fwonmi ki anpeche lòt ensèk manje ensèk ak kal yo.
Tretman chimik: Flite ak Diazinon (1 kiyè mwayènn pou 1 galon dlo). Tranpe zòn ki gen ensèk yo nan melanj la.

PHOTO

Non: Mouch saman (Saman maggot)
Espes li atake: Saman
Koz: Yon ti mouch ki ponn ze li nan semans saman ki fenk simen.
Fason pou evite sa rive: Kouvri semans saman yo (anvan yo jèmen) ak til, dekwa pou mouch pa ponn ze sou yo.
Tretman chimik: Mete yon ti poud ensektisid sou semans yo anvan ou simen yo.

PHOTO

Non: Pichon fèy (Leaf Miner)
Espes li atake: Chèn, kapab, sèd.
Koz: Yon ti vè ki manje andedan fèy yo.
Tretman chimik: Flite fèy yo ak ensektisid (1 kiyè mwayènn pou 1 galon dlo) jis yo tout byen mouye.

PHOTO

Non: Mit (Spider Mites)
Espes li atake: Sèd, saman, ak lòt espès.
Koz: Yon ti ensèk ki sanble zanreyen epi ki souse ji plantil yo.
Tretman chimik: Flite ak ensektisid (1 kiyè mwayènn pou 1 galon dlo) jislè kote ki gen bèt la byen mouye. Sonje flite anba fèy yo tou.

PHOTO

Non: Eskarabe (beetles)
Espes li atake: Sitris ak lòt espès.
Koz: Ensèk ak karapas ki manje fèy.
Tretman chimik: Flite ak ensektisid jislè fèy yo mouye, epi degoute.

PHOTO

Non: Pichon sitris (Citrus aphid)
Espes li atake: Sitris, kapab, chèn, sèd.
Koz: Yon ti ensèk ki souse ji plantil yo nan fèy ak nan kò yo.
Fason pou evite sa rive: Mete plantil yo nan solèy pi bonè ou kapab dekwa pou fèy yo byenvini.
Tretman chimik: Flite ak ensektisid lè plantil yo ap grandi.

PHOTO

GID PEPINYERIS - P. 58

Non: Pichon fèy (Cercospora Leaf Blight)

Espes li atake: Kasya, nim, akasya, kafe.

Koz: Yon mikwòb ki atake fèy yo lè gen anpil imidite, oswa lè manke angrè, oswa lè fèy yo boule akòz twòp angrè, oswa twòp ensektisid, osinon lè plantil yo pa jwenn kont dlo. Yon lòt kòz se lè ou sèvi ak dlo rivyè sal.

Fason pou evite sa rive: Fè lè sikile byen, redwi nan imidite a. Mete plantil yo nan solèy bonè. Bay yo angrè de (2) semèn apre yo jèmen. Pa kite fèy yo boule. Sèvi ak dlo pwòp.

Tretman agrikol: Mete plantil yo nan solèy, bay yo angrè konplè 20-20-20. Pa wouze twòp, epi pwòpte dlo sal ak klowòks.

Tretman chimik: Flite ak yon melanj Benlate ak Dithane M-45 (2 kiyè mwayènn chak fonjisid pou 1 galon dlo) 2 fwa pa semèn jislè fèy yo mouye epi degoute. Netwaye dlo sal ak 6 kiyè klowòks pou yon dwoum 55 galon dlo.

PHOTO

Tretman agrikol: Wete tout plantil malad. Redwi sou wouze.
Tretman chimik: Flite ak Captan (4 kiyè mwayènn pou 1 galon dlo), oswa Benlate (2 kiyè chak fonjisid pou 1 galon dlo) lè ou ap plante, oswa lè ou remake pwoblèm la. Flite chak 3 jou pandan 2 rive 3 semèn.

Non: Chanpiyon (Powdery mildew)
Espes li atake: Akasya, kasya, papay, kazwarina, kaliptis.
Koz: Twòp imidite, twòp lonbraj.
Fason pou evite sa rive: Diminye sou tan plantil yo pase nan lonbraj. Wouze sèlman le maten, si plantil yo bezwen dlo. Veye pou plantil yo jwenn bon sikilasyon lè.
Tretman agrikol: Mete plantil yo nan soléy.
Tretman chimik: Flite ak Benlate, Dithane M-45, oswa Bravo (2 kiyè mwayènn pou 1 galon dlo) chak 4 jou jislè maladi a disparèt.

PHOTO

Non: Chanpiyon (Sooty mold)
Espes li atake: Sitris, mango.
Koz: Lè pichon ak psilid fè sik, gen yon chanpiyon ki pouse sou sik la.
Fason pou evite sa rive: Touye ensèk yo.
Tretman chimik: Flite ensèk yo ak ensektisid (1 kiyè mwayènn pou 1 galon dlo) jislè plantil yo mouye epi degoute. Lè ensèk yo mouri, chanpiyon an va disparèt.

PHOTO

Non: Antraknoz (Anthracnose)
Espes li atake: Mango
Koz: Twòp imidite.
Tretman chimik: Flite ak Benlate, Dithane, oswa Bravo (2 kiyè mwayènn pou 1 galon dlo).

PHOTO

Non: Rasin pouri (Root rots)
Espes li atake: Tout espès.
Koz: Tè twò imid.
Fason pou evite sa rive: Bon kalite wouzaj, bon drenaj, bon sikilasyon lè.
Tretman agrikol: Wouze sèlman lè plantil yo bezwen dlo. Kite tè a seche ti kal 'anvan ou wouze ankò.
Trètman chimik: Wouze ak yon melanj Benlate ak Captan (2 kiyè mwayènn chak fonjisid pou 1 galon dlo) chak twa (3) jou jis plantil yo refè.

Non: Viris sitris (Citrus virus)
Espes li atake: Sèd, kapab, chèn, papay, sitris.
Koz: Se pichon ki gaye maladi a. Maladi a andedan fèy yo. Pestisid pa kapab fè aryen pou wete li.
Fason pou evite sa rive: Touye pichon yo. Koupe tout zèb yo ra tè. Kenbe pepinyè a pwòp.
Trètman agrikol: Touye pichon yo. Wete epi boule tout plantil ki malad.
Trètman chimik: Flite pichon yo ak ensektisid dekwa pou touye yo epi anpeche maladi a gaye.

PHOTO

Non: Boule akòz angrè
Espes li atake: Tout espès.
Koz: Plantil yo te resevwa twòp angrè, oswa angrè a pa te byen mele ak dlo a, oswa plantil yo pa te byen wouze anvan yo te resevwa angrè.
Tretman agrikol: Menm bagay ak enfòmasyon sou Ki fason pou evite sa rive.

PHOTO

Non: Manke angrè
Espes li atake: Tout espès.
Koz: Plantil yo pa jwenn kont nouriti.
Tretman agrikol: Bay plantil yo angrè de (2) fwa pa semèn. Si ou wè yo manke angrè toujou, ki vle di, si fèy yo vin mòv, jòn oswa vèt pal, gade si rasin yo an sante, epi gade pou wè si plantil yo te resevwa Rizobyòm, Frankya, oswa Mikoriz. Si plantil yo anfòm, kontinye bay yo angrè twa (3) fwa pa semèn.

PHOTO

Non: Twòp angrè.
Espes li atake: Tout espès.
Tretman agrikol: Redwi sou angrè a. Bay angrè yon (1) fwa pa semèn si ou remake plantil yo pouse twò wo oswa twò vit.

PHOTO

PWOBLEM AGRIKOL

CHAPIT 8

PESTISID AK PREKOSYON NAN LIZAJ YO

Pestisid (fonjisid ak ensektisid) nesesè anpil nan kontwòl ensèk ak maladi, men, yo se pwazon danjere tou. Si ou pa sèvi ak pestisid yo korèkteman, yo ka fè oumenm, fanmi ou ak tout vwazinaj ou malad. Pestisid yo ka pwazonnen tè ak dlo ou tou.

Pestisid fèt pou touye ensèk ak trete maladi. Se domaj yo ka fè ou malad oswa touye ou tou si ou pa fè atansyon.

Chak fwa ou ap sèvi ak pestisid, ou dwe swiv ekzakteman fason yo di ou fè a, dekwa pou pwoteje tèt ou, fanmi ou, ak vwazinaj ou.

SEVIN

G56-1

PWAZON **DANJE**

PESTISID KI ~~REKONÈT~~ REKONET Rekomande

Pestisid se pwazon. Genyen ki pi fò (pi danjere) pase lòt. Toujou sèvi ak pestisid ou Konnen ~~rekonèt~~ ki pi fèb la. Lè nou di pestisid, nou ap pale de ensektisid ak fonjisid tou.

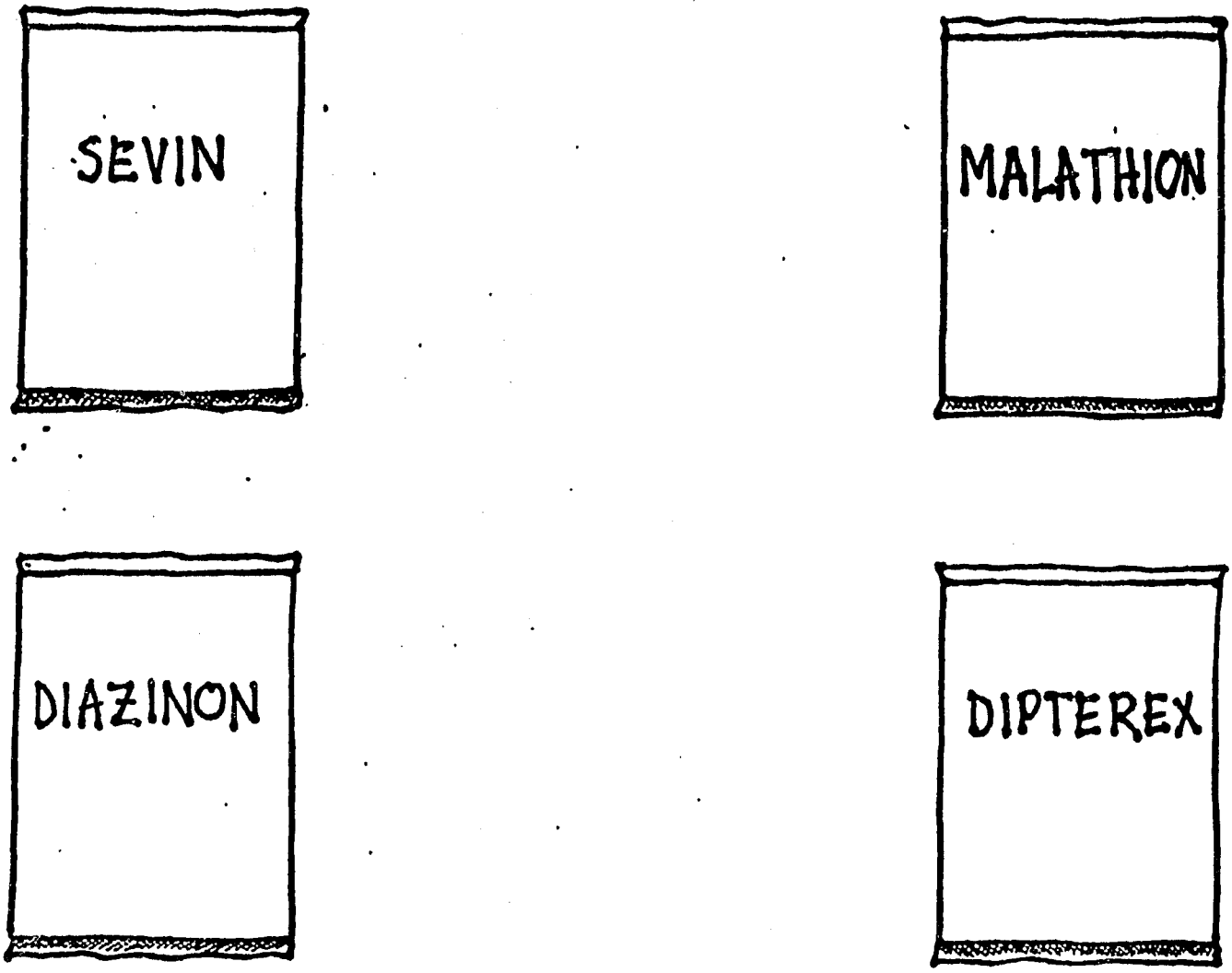
Ensektisid ki rekonèt (pou ensèk)

- Sevin (50 wp)
- Malathion (Lythion) (25wp)
- Diazinon
- Dipterex

Fonjisid ki rekonèt (pou maladi)

- Benlate (maladi fèy ak rasin)
- Ridomil (maladi fèy ak rasin)
- Captan (maladi rasin)
- Dithane (M-45) (maladi fèy ak rasin)
- Peltar (maladi fèy)
- Bravo (maladi fèy)

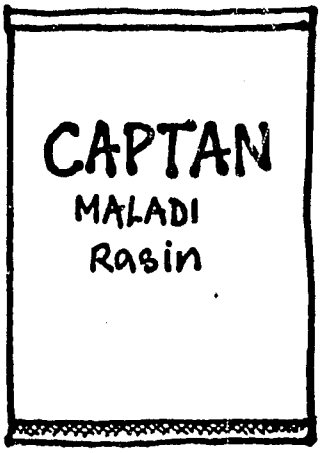
ENSEKTISID



G58-1


BENLATE
MALADI
fèy ak Rasin


RIDOMIL
MALADI
fèy ak Rasin


CAPTAN
MALADI
Rasin


DITHANE
M-45
MALADI
fèy ak Rasin


PELTAR
MALADI
fèy


BRAVO
MALADI
fèy

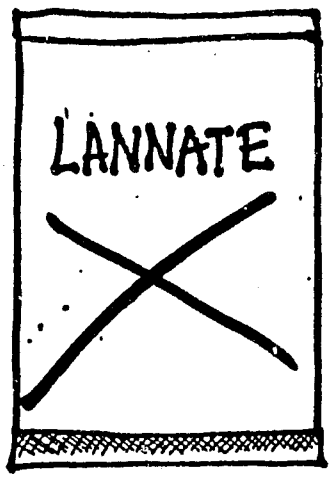
G58-2

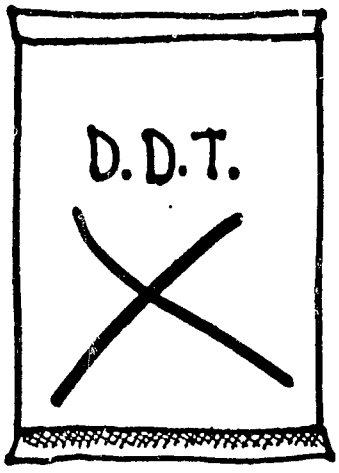
Pestidid ki pa ~~rekonèt~~ Rekomande

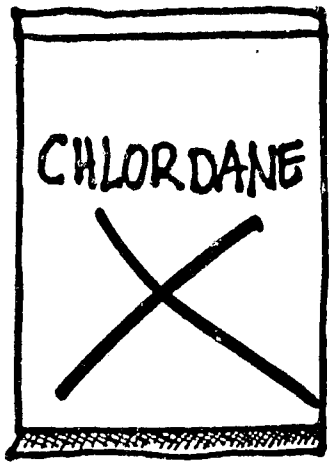
PA SEVI ak pestisid sa yo, yo twò danjere:

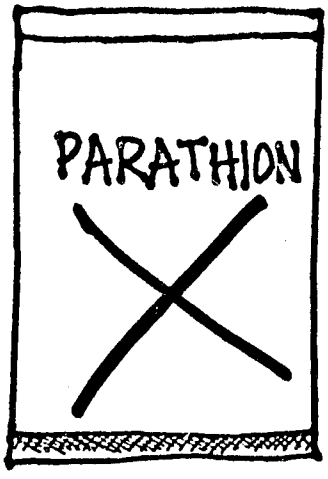
- Lannate
- DDT
- Chlordane
- Parathion (Folidol)
- Dieldrin
- Lindane
- Aldrin
- Aldicarb

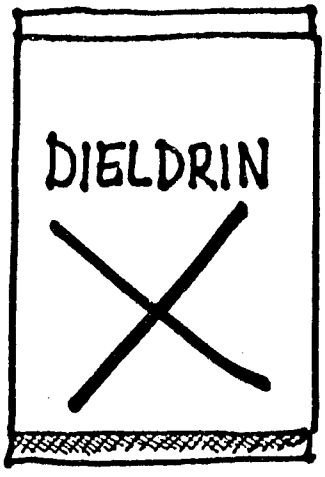
PESTISID KI PA REKONÈT

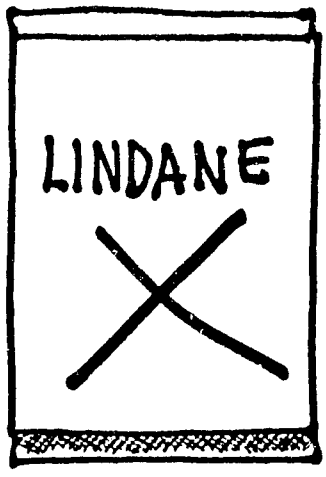


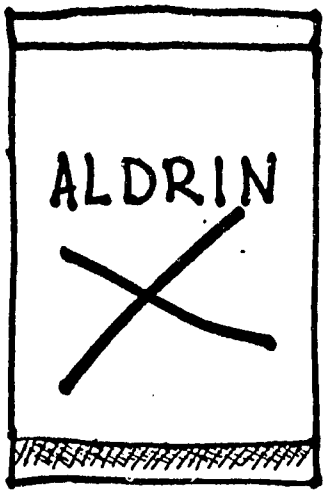


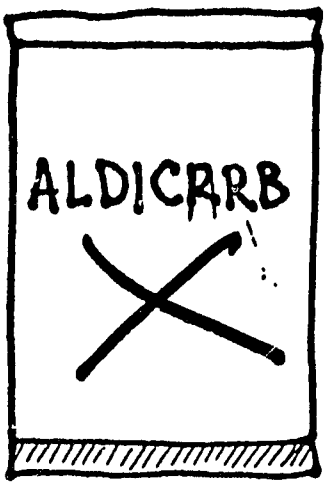












PESTISID SA YO PA BON

G58-3

ETIKET PESTISID

Sou etikèt pestisid la, ou jwenn anpil enfòmasyon enpòtan tèl ke:

- Non pestisid la.
- Fason pou sèvi ak pestisid la.
- Pou ki ensèk ak ki maladi pou sèvi ak pestisid la.
- Ki prekosyon pou pran lè ou ap sèvi ak li.

Toujou li tou sa ki make sou etikèt pestisid la anvan ou sèvi ak li.

Kole kopi etikèt pestisid yo sou panno depo ou.

MALATYON (25WP)

INSEKTISID POU TOUT INSEK YO

PWAZON  DANJE

DIREKSYON:

Pou tout insèk yo: Mete yon kiyè Malatyon nan yon galon dlo, epi melange'l byen. Flite plant-yo jiskaske tout fey-yo byen mouye.

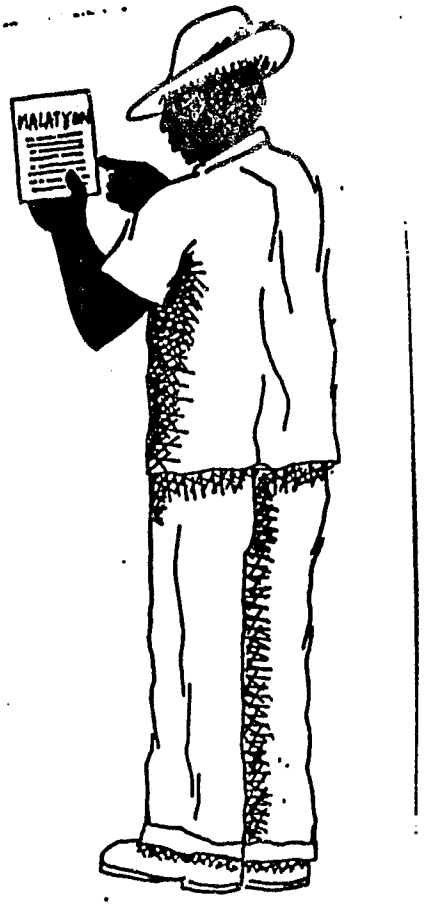
ATANSYON:

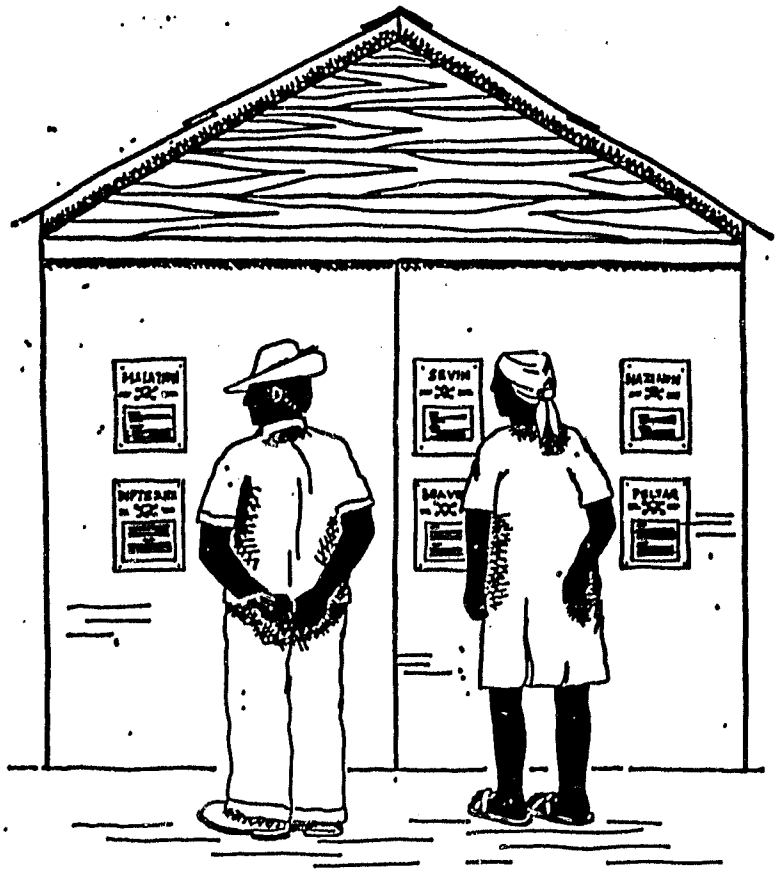
- ☞ Lè w-ap travay ak pestisid sa-a, toujou sèvi ak ekipman ki pou pwoteje-ou-yo.
- ☞ Pa jete rèst pestisid-la nan rivye-a. Fouye yon twou epi vide rès la ladan'l.
- ☞ Lè ou fini ak sache-a, antere'l, oubyen boule'l.
- ☞ Lè ou fin sèvi ak pestisid sa-a, ou pa fèt pou lave ni rad ki te sou ou, ni vèso ki te touche ak li nan rivye-a.

Prepare pa Pan American Development Foundation - Projè Pyebwa 23/5/88

G 59-1

2- Toujou li sa ki make sou etikèt pestisid la





3- Kole etikèt pestisid sou panno depo yo

AKSYON PESTISID SOU MOUN

Pestisid kapab rantre andedan kò ou, fason sa yo:

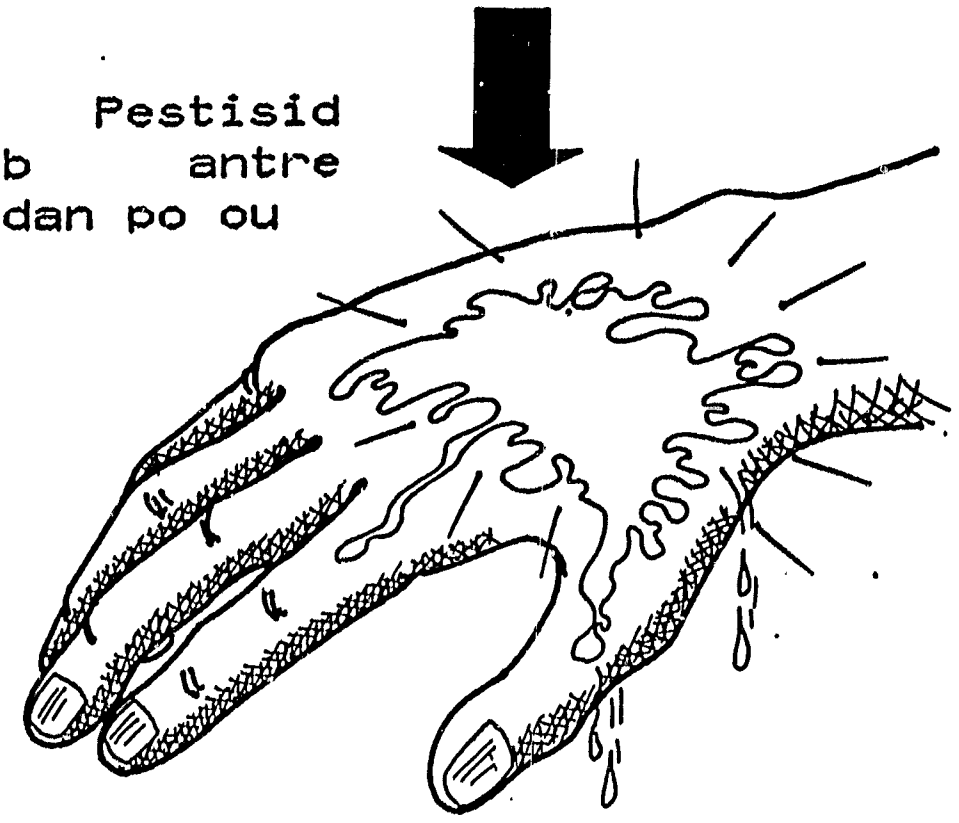
- Pa po ou.
- Pa bouch ou - lè ou ap respire, manje, fimen.
- Pa nen ou - lè ou ap respire.
- Pa je ou.

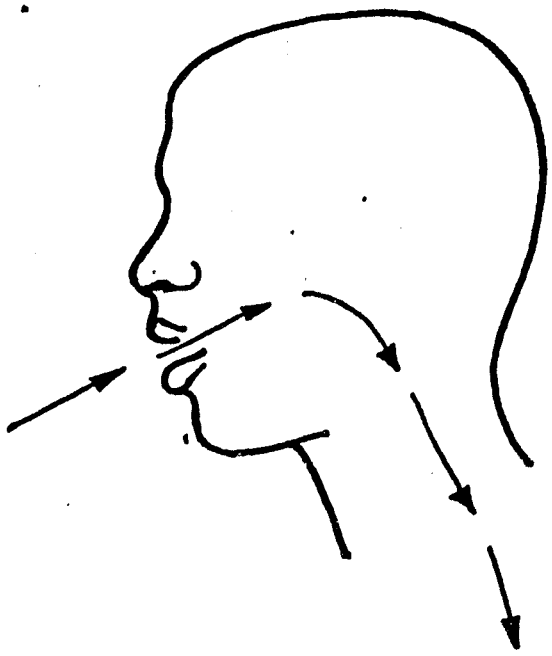
Toujou pwoteje kò ou lè ou pral sèvi ak pestisid. Pa kite pestisid rantre nan kò ou.

Toujou sèvi ak rad espesyal pou pwoteje ko ou le ou ap sevi ak pestisid.

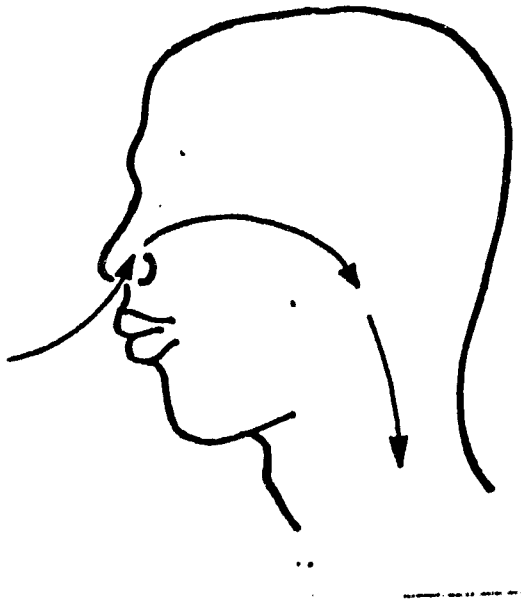
1- Pestisid kapab antre andedan po ou

G60-1

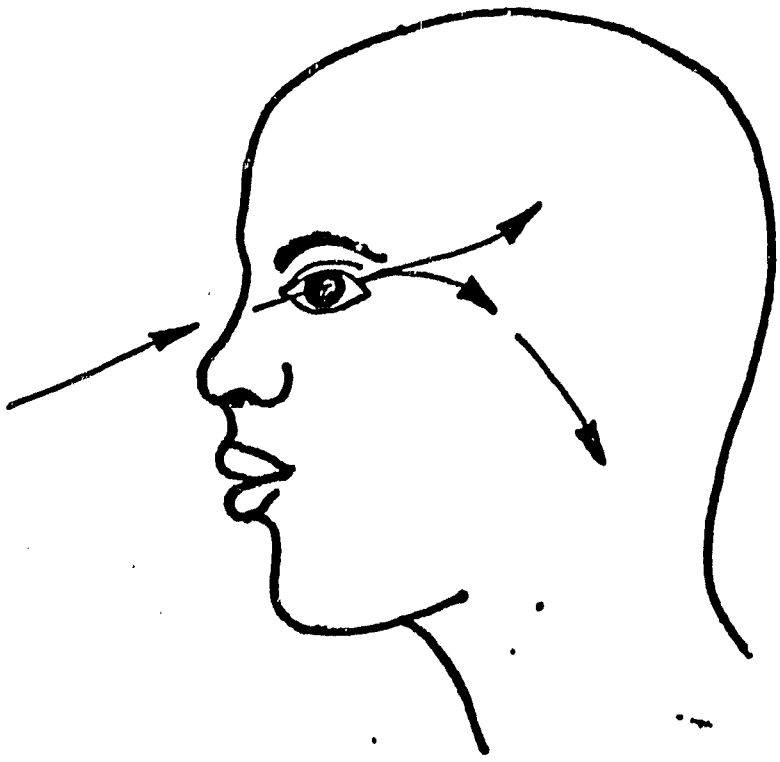




2- Pa andedan bouch ou



3- Pa twou nen w



4- Pa andedan je w

AKSYON PESTISID SOU MOUN (res)

Si yon moun ta vin gen twòp pestisid nan kò li, li lap tounen pwazon pou li. Moun sa a ka gen pwoblèm sa yo:

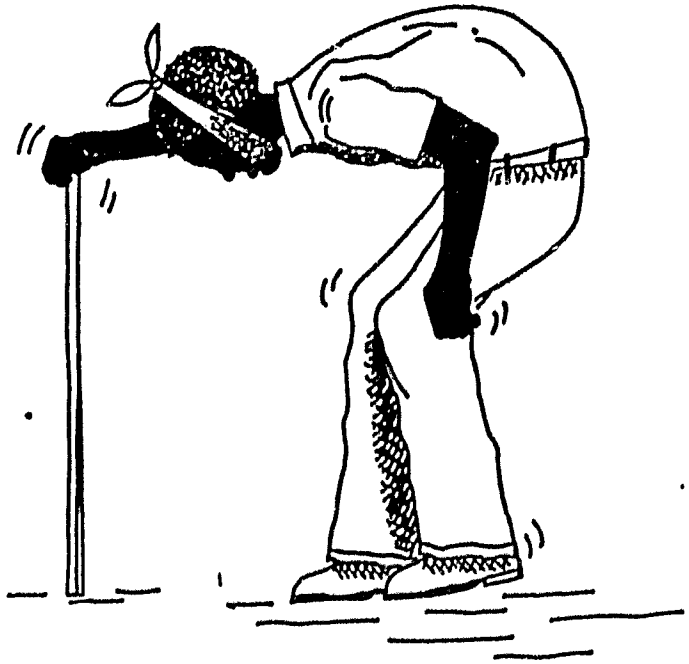
- Doulè nan pwatrin
- Toudisman
- Wè twoub
- ~~Konvilsyon~~
- Swè
- Doulè nan lestomak
- Krache anpil
- Pwoblèm pou respire
- tèt fè mal
- Anvi vomi
- La tranblad
- Feblèss
- Dyare
- Vomisman
- ~~Koma~~
- Lanmò

Pou ou malad konsa, fòk se anpil pestisid ki nan kò ou.

Si se pa ti kras, sou 'plizyè lane, pestisid la rantre nan kò yon moun, li ka pa malad touswit. Si pestisid la rete nan kò li, li kapab vin malad plizyè lane apre.

G.61_1

1- Si yon moun gen pestisid nan kò li, li kapab gen vomisman



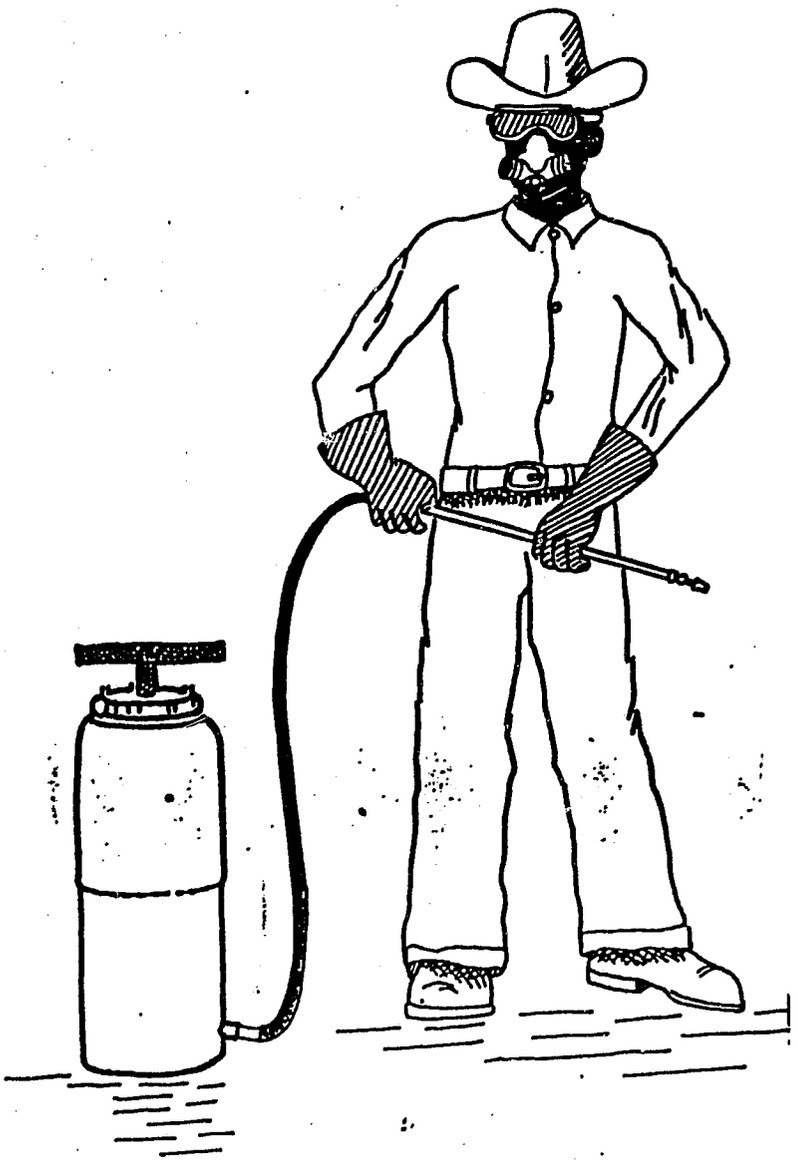
2- Li kapab kokobe

G 61-2

PREKOSYON LE OU AP SEVI AK PESTISID

Pou pestisid pa anpwazonen ou, sèvi ak rad espesyal ki fèt pou pwoteje ou.

- Mete yon mask pou pwoteje bouch ou ak nen ou.
- Mete linèt espesyal pou pwoteje je ou.
- Mete rad ki kouvri tout kò ou pou pwoteje po ou.
- Mete bòt kawoutchou pou pwoteje pye ou.
- Mete chapo pou pwoteje tèt ou.



BON

G62-2

SAN PWOTEKSYON PA BON

PREKOSYON LE OU AP KOUPE PESTISID

Se lè ou ap ~~koupe~~ debouche pestisid la ki pi danjere paske lè sa a, ou an afè ak pwazon fò ki konsantre.

Toujou mete rad espesyal ou pou pwoteje ou (gan, mask, rad, linèt, chapo, bòt) lè ou ap koupe pestisid.

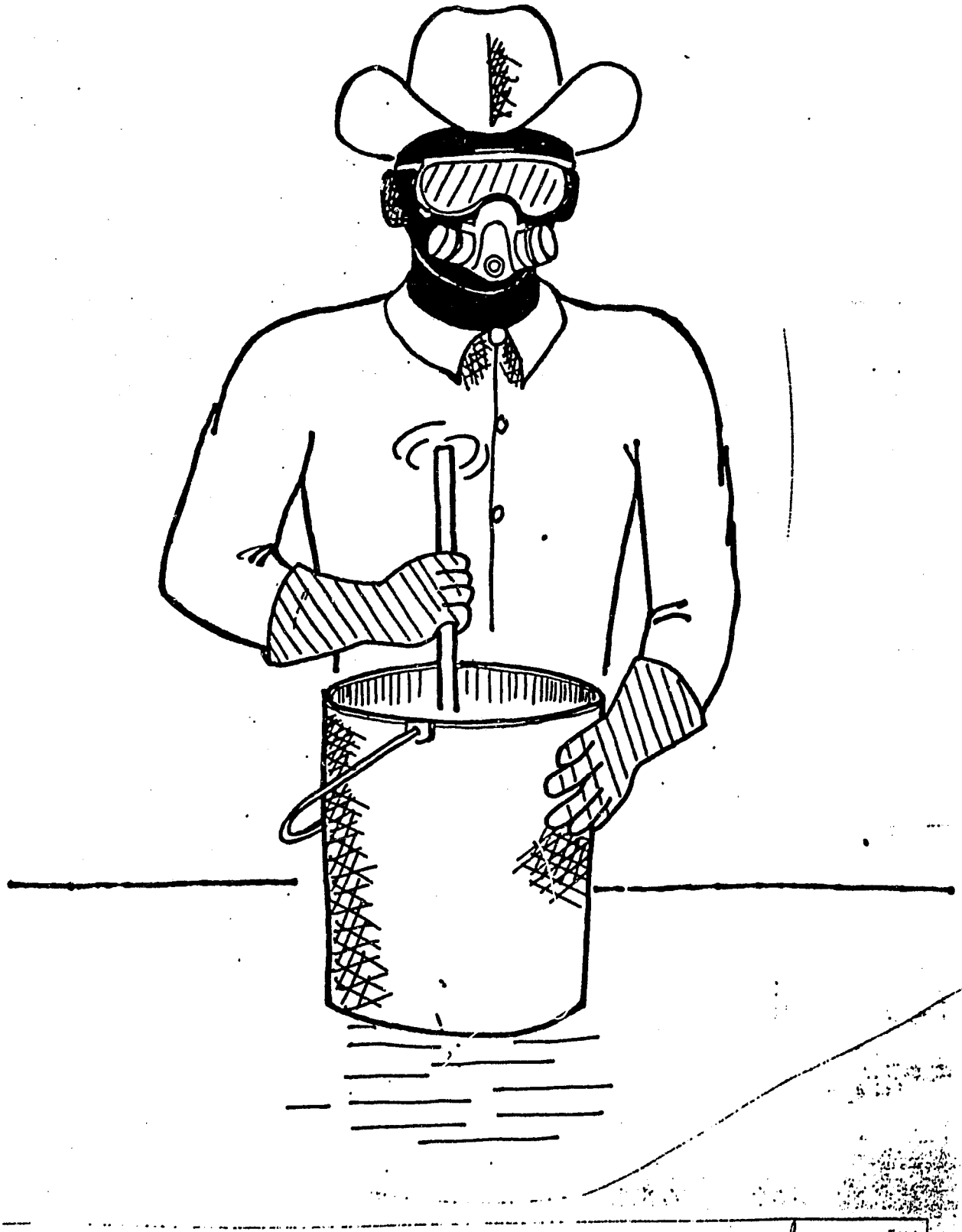
Toujou koupe pestisid deyò depo a. Pa ~~jamè~~ janm fè sa andedan depo a.

Pa jamè fimen, bwè oswa manje lè ou ap koupe pestisid.

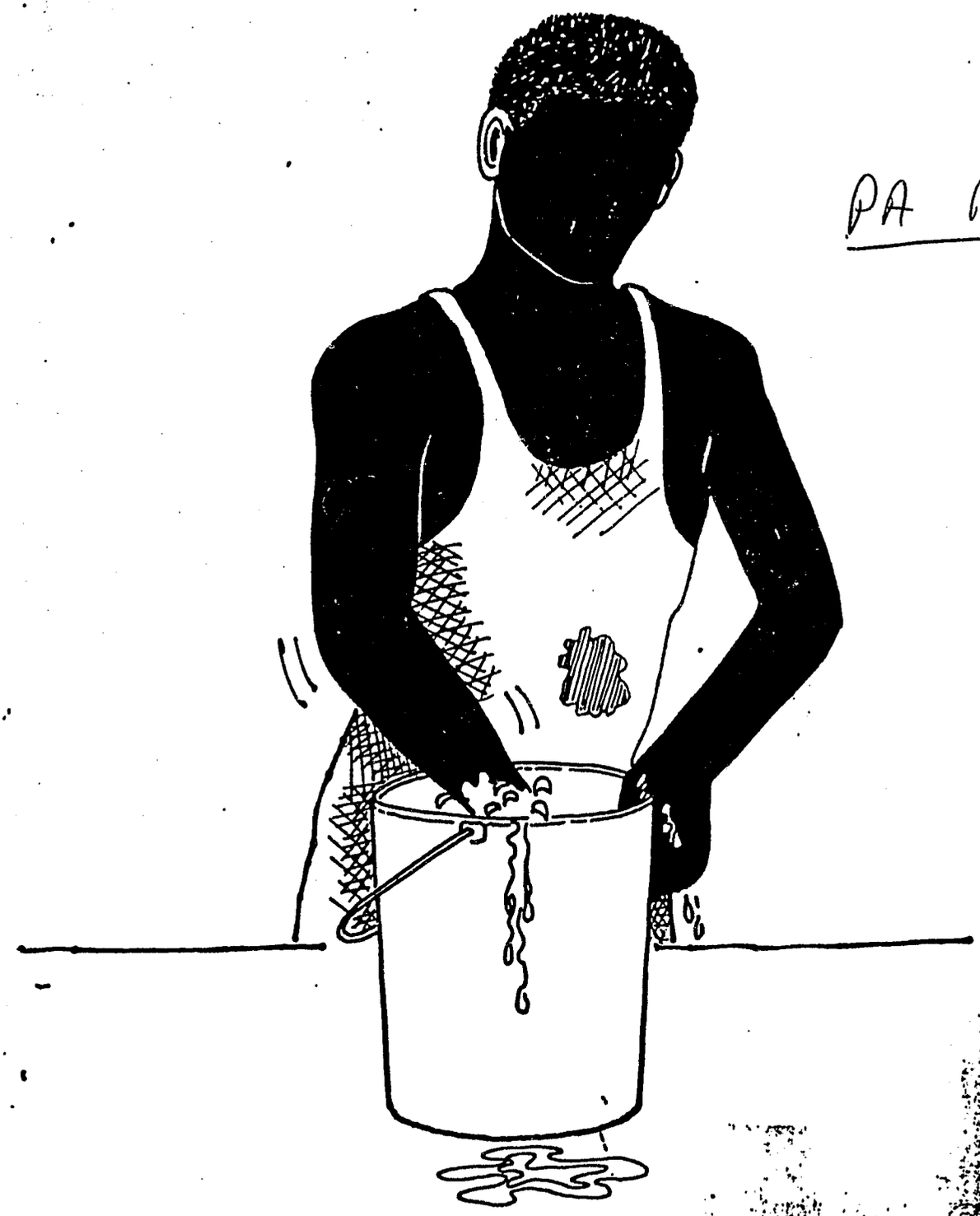
Li etikèt la byen. Toujou swiv sa yo di ou fè a lè ou ap koupe pestisid.

Li pa bon pou mete plis pestisid pase sa yo di ou mete nan 1 galon an. Kantite ou ta mete an plis la kapab boule plantil ou yo. Mete ekzakteman kantite pestisid yo di ou mete pou 1 galon dlo.

G63-1



1- Mete rad espesyal sou ou lè wap ~~koupe~~ brase pestisid ak dlo



PA BON

2- Sonje, pa janm met men ou nan pestisid

PREKOSYON LE OU AP FLITE AK PESTISID

Toujou sèvi ak rad espesyal ki fèt pou sa (gan, mask, linèt, chapo, rad, bòt).

Flite bonè nan maten, oswa ta nan apre midi lè pa gen van. Pa jamè flite lè gen anpil van.

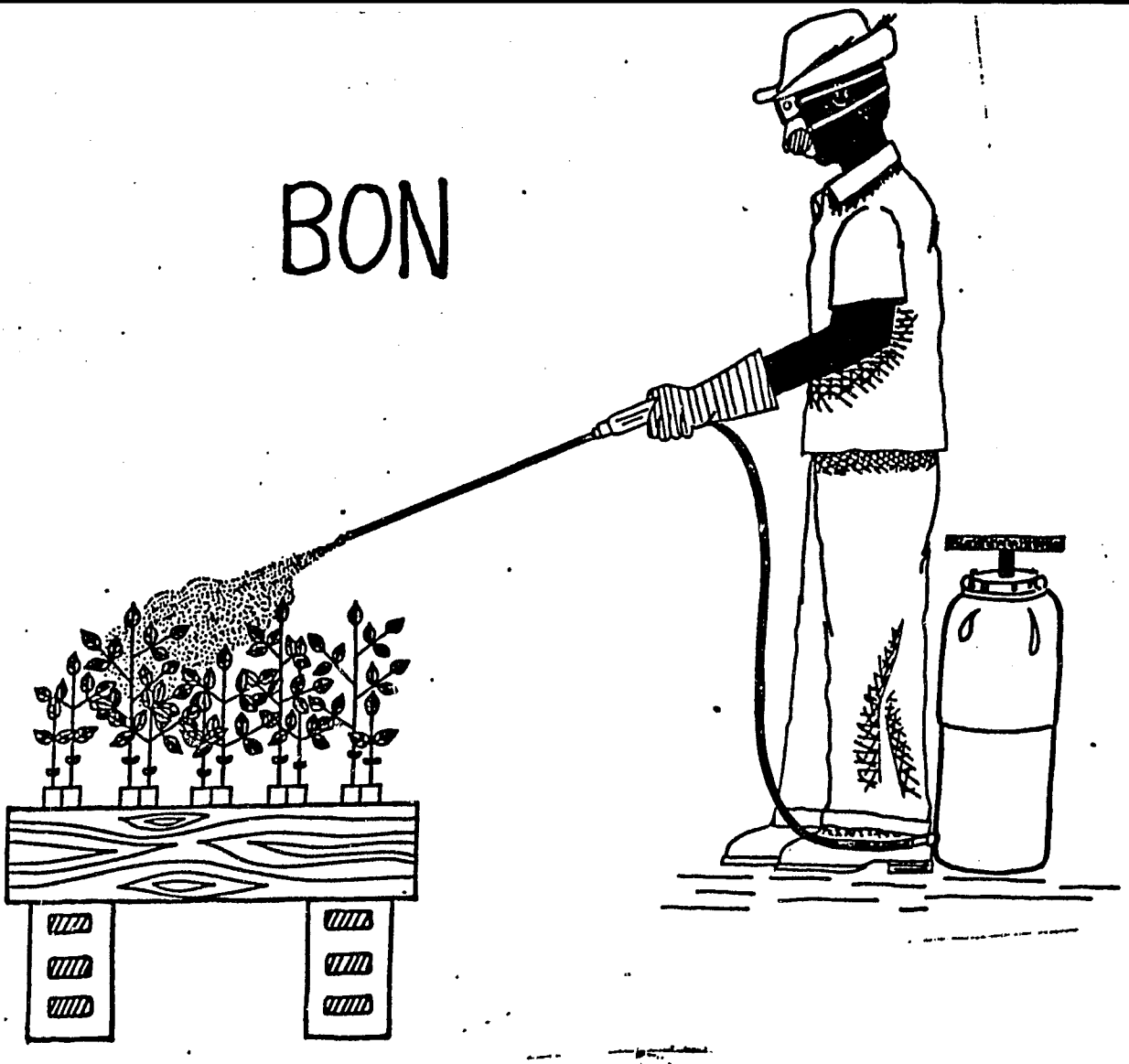
Pa ~~jamè~~ Janm fimen, bwè, oswa manje lè ou ap flite.

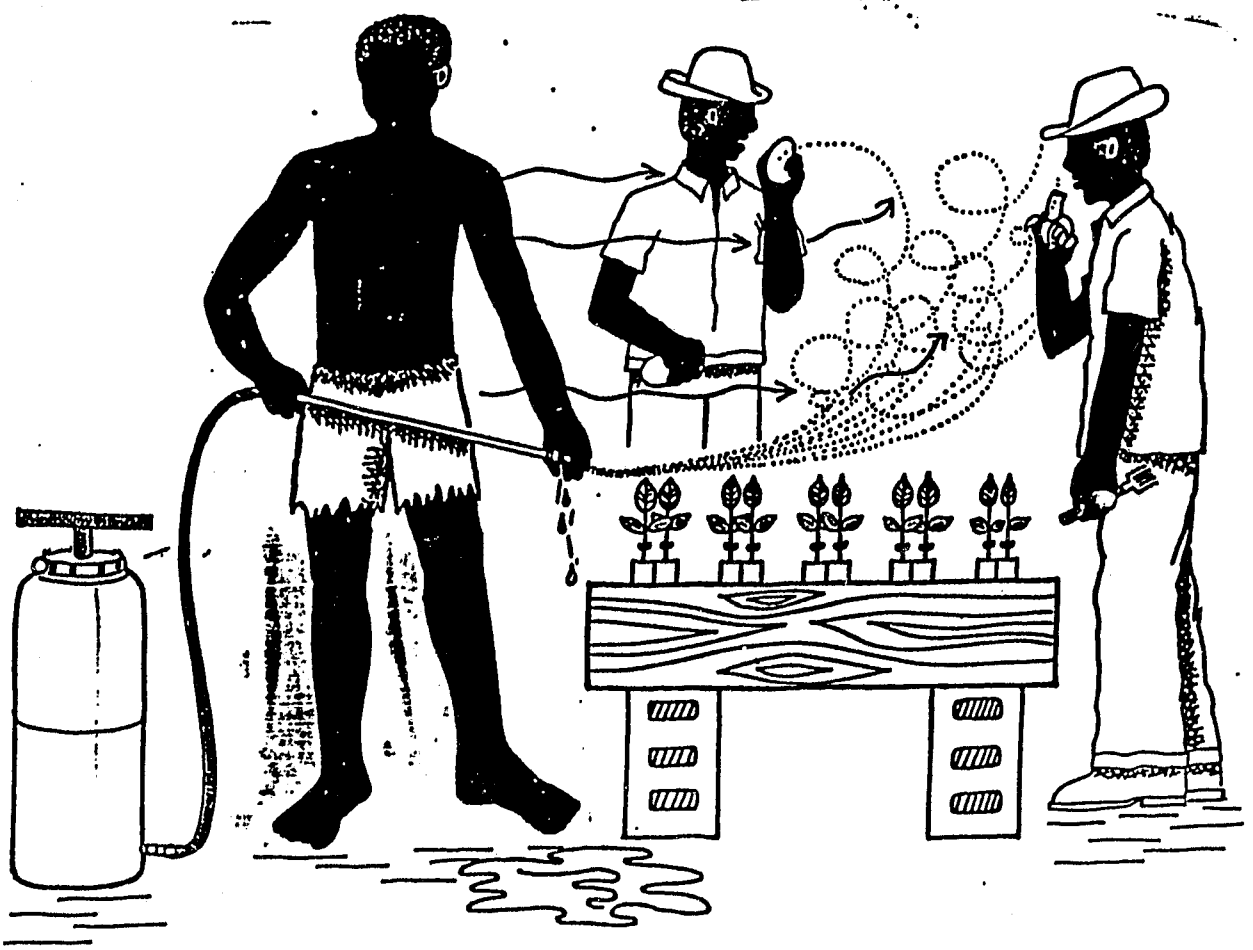
Pa fèt pou gen moun nan pepinyè a lè ou ap flite. Pèsonn pa dwe retounen andedan pepinyè a toutotan plantil yo pako seche.

Fòk flit la mache byen. Ranje pati ki koule oswa kote ki ta bloke Pa ~~jamè~~ Janm soufle ak bouch ou nan tib flit la pou retire yon bagay ki ta bloke li.

G64-1

BON





PA BON

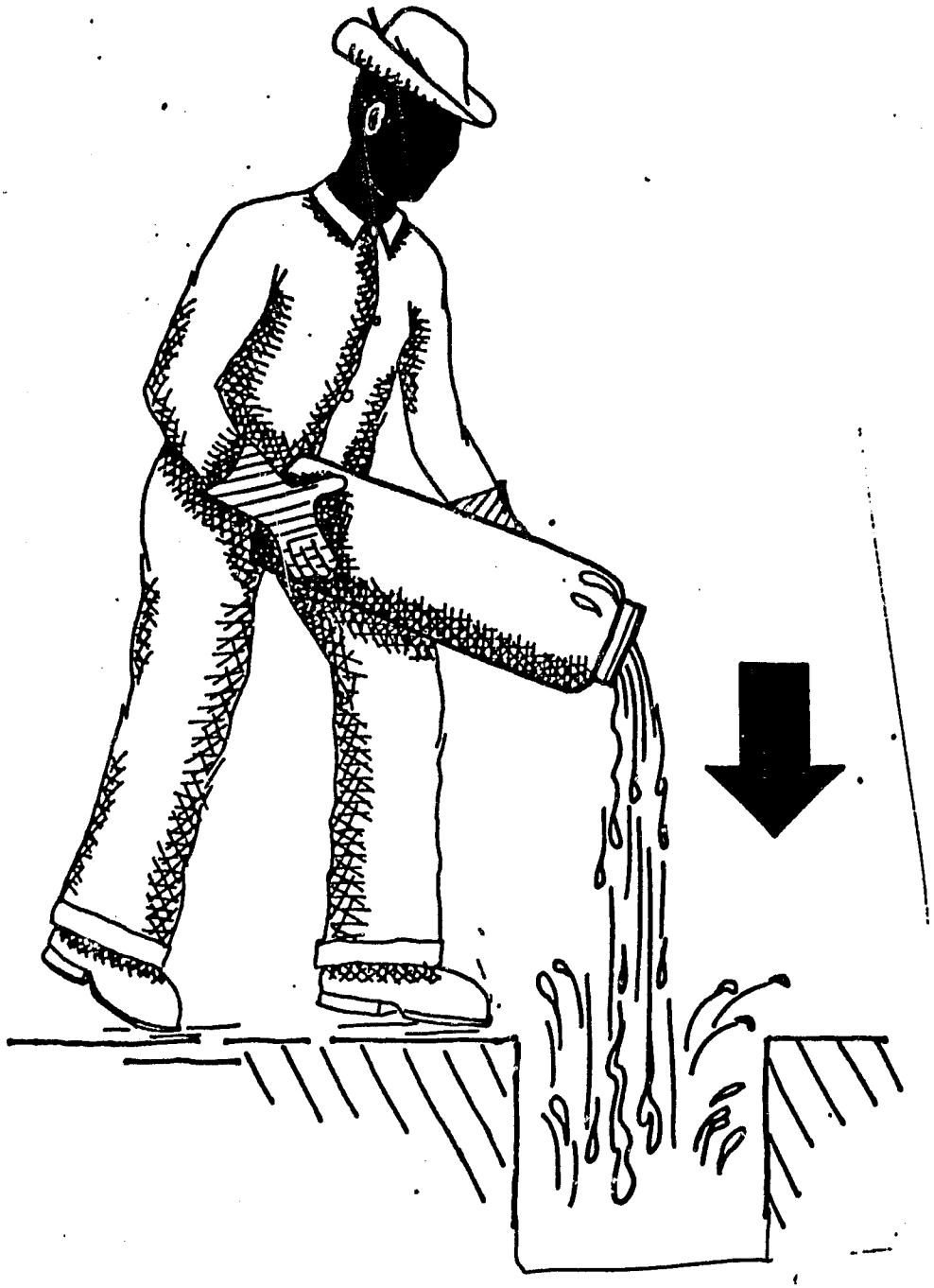
PRÈKOSYON LE OU AP JETE RES PESTISID

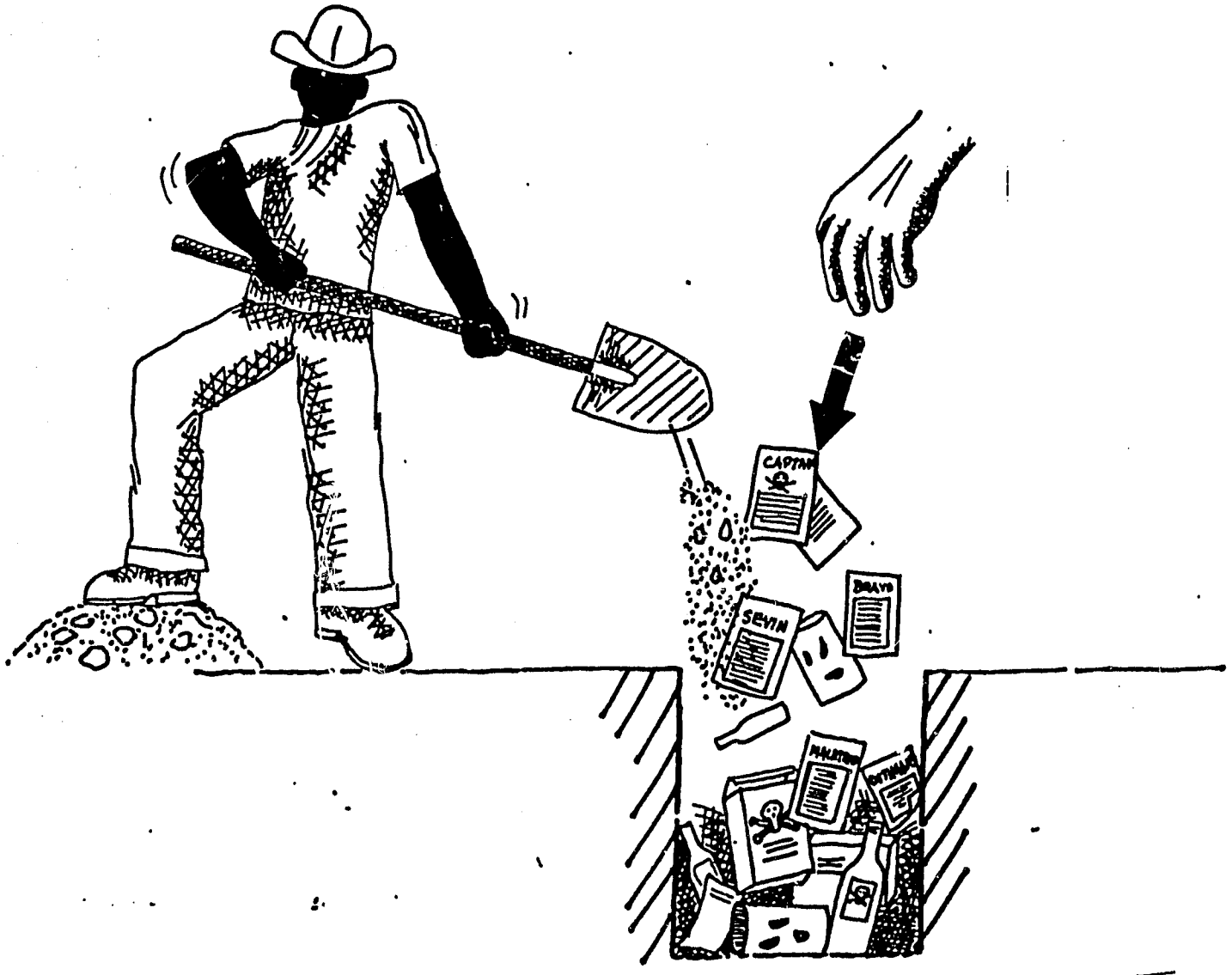
Pou jete pestisid ki rete lè ou fin flite, fouye yon twou, epi mete li ladanl. Pa ~~jamè~~ Janm jete rès pestisid nan larivyè.

Pa jamè sèvi ankò ak veso ki te gen pestisid ladanl (mamit oswa sak). Fè twou nan mamit yo dekwa pou si lòt moun jwenn yo, yo paka sèvi ak yo. Ou kapab boule yo mèN pa ~~jamè~~ Janm respire la fimen an.

Pa jamè fimen, manje oswa bwè lè ou ap jete rès pestisid.

G 65-1




CAPTAIN
SEVIN
BRAVO

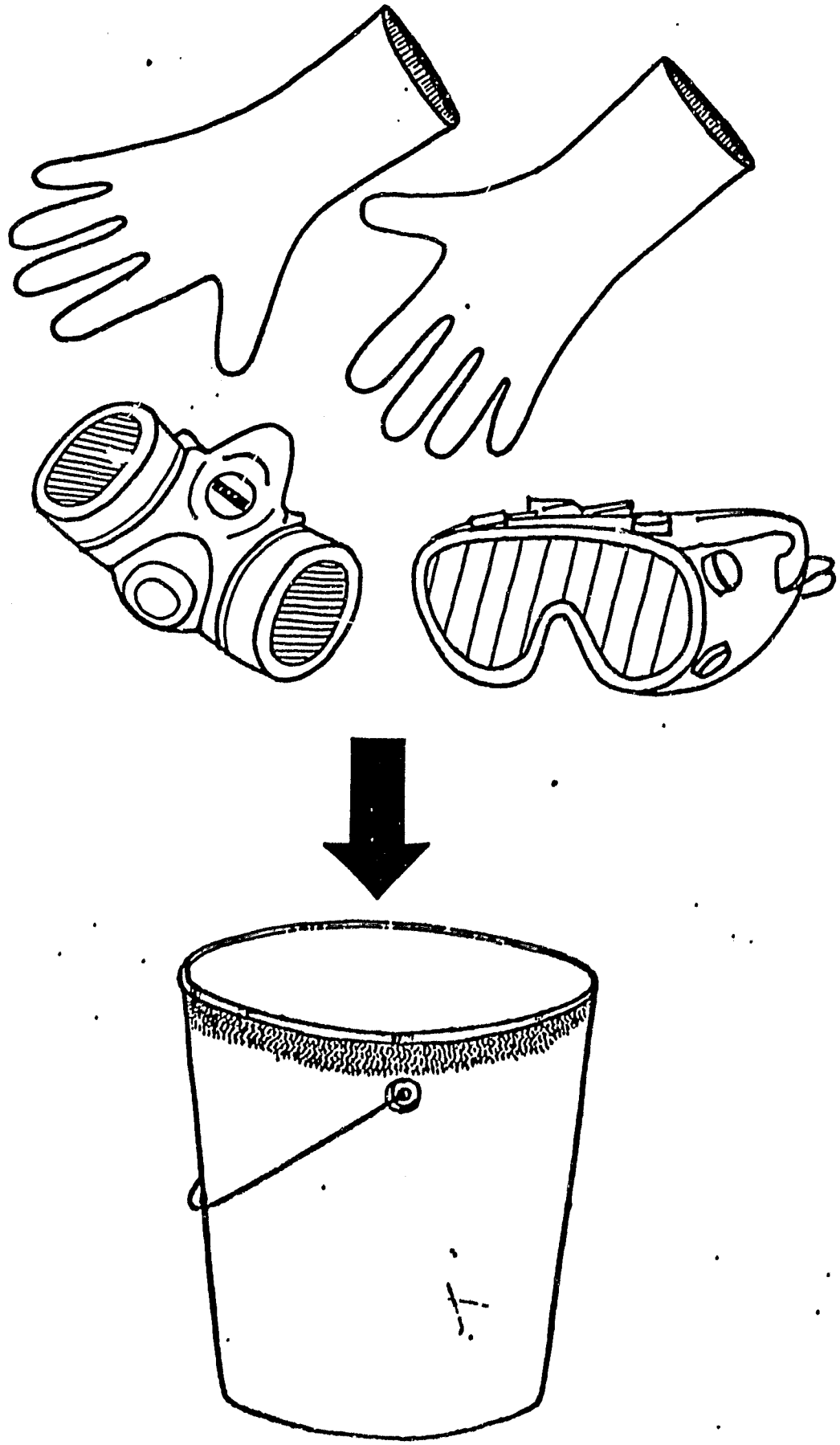
PREKOSYON NAN NETWAYAJ
APRE ~~ITILIZASYON~~ PESTISID

- Lave tout kò ou byen ak savon.
- Lave anba zong ou epi cheve ou.
- Lave rad espesyal ou chak fwa ou fin sevi ak li. Pa ~~jamè~~ lave li nan larivyè. Sa kapab anpwazonen larivyè an.
- Pa ~~jamè~~ fimen, manje oswa bwè lè ou ap netwaye tèt ou ak rad ou.
- Lave mask la chak fwa ou fin sèvi ak li (wete filt yo anvan). Lave gan yo andedan tankou andeyo. Lave linèt yo ak bòt yo.
- Lave rad espesyal ou pou kont li. Pa lave li ansanm ak lòt rad.

G66_1

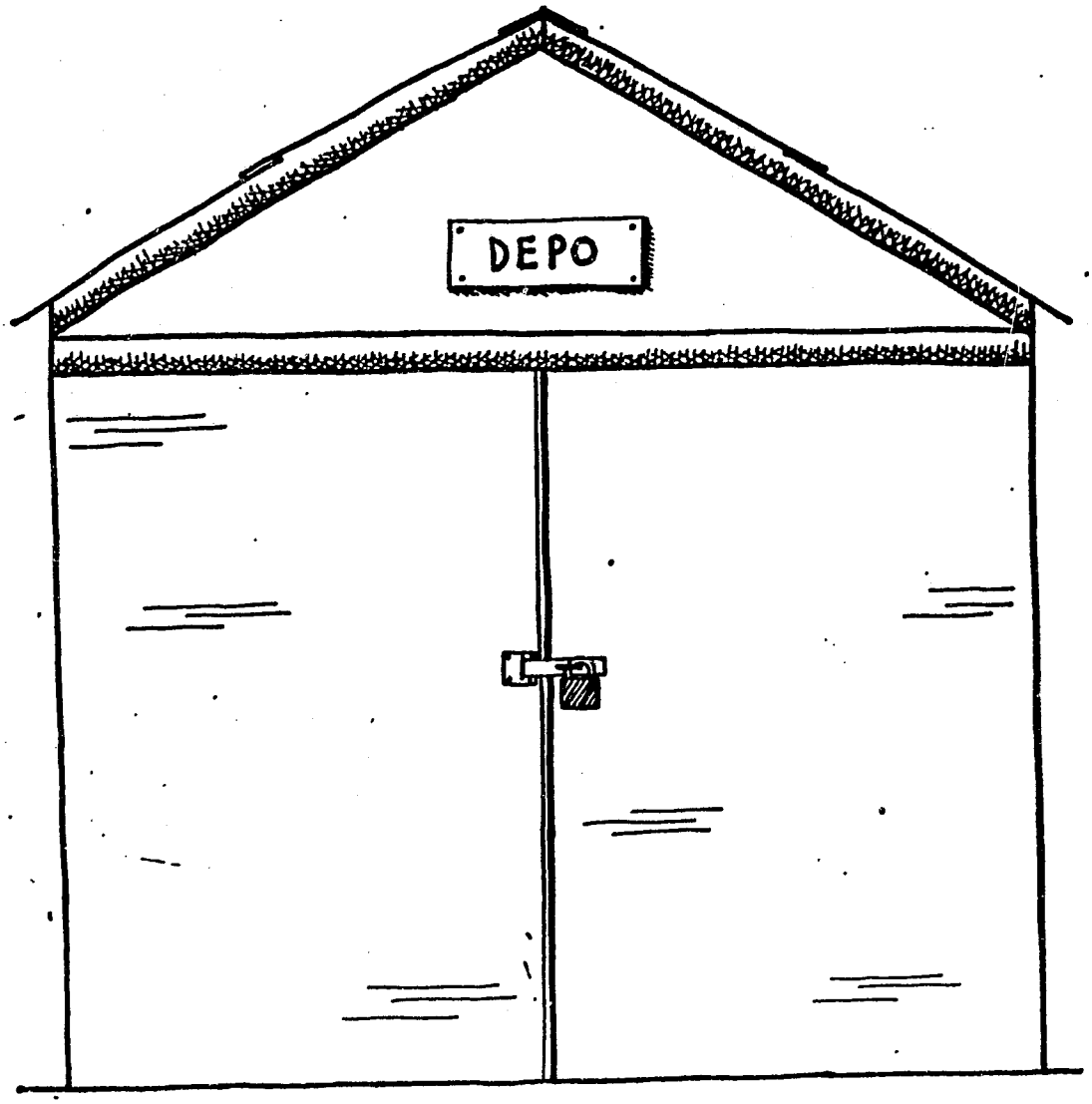
G 66.-2

Li fa dwe pwoteje

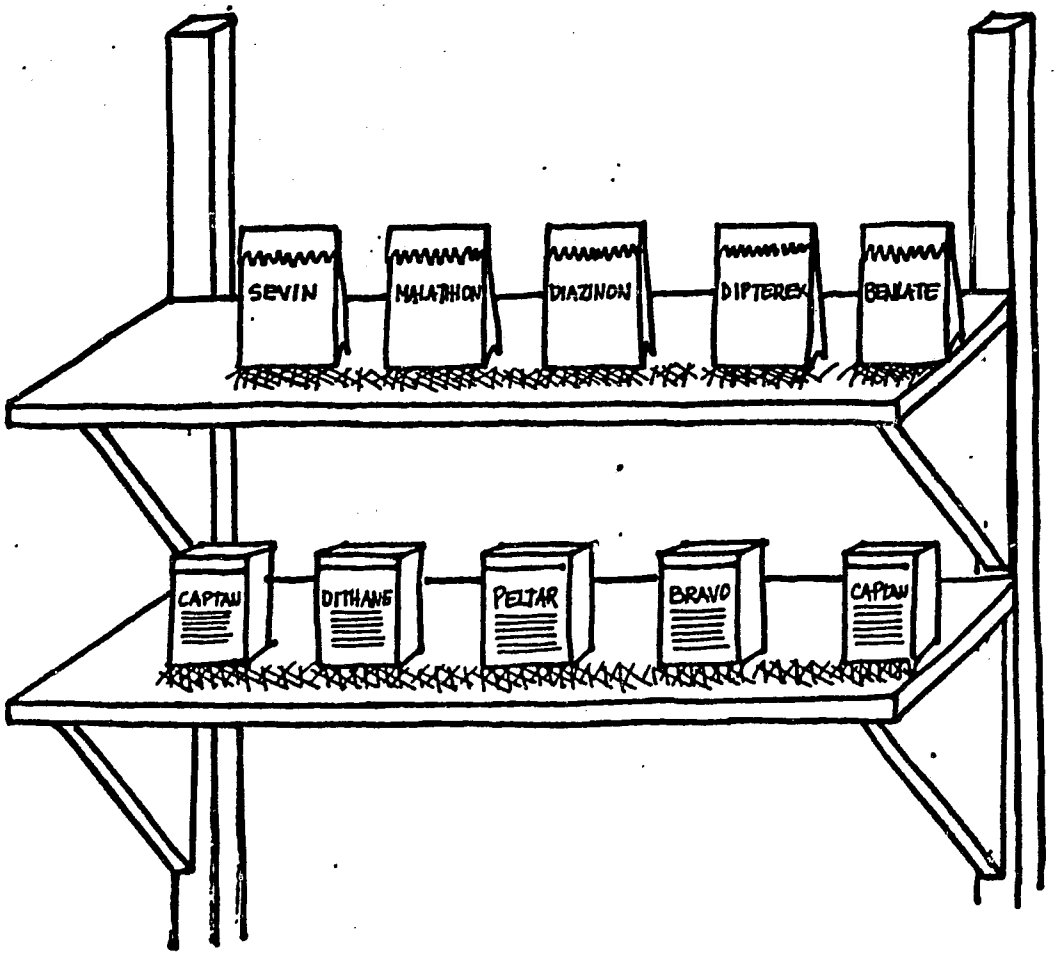


PREKOSYON LE OU AP SERE PESTISID

- Toujou fèmen depo an a kle.
- Mete tout pestisid nan yon bwat fèmen andedan depo an.
- Pa kite pestisid yo a tè.
- Pa ~~jamè~~ Janm sere pestisid ansanm ak manje.
- Toujou gade si pestisid la gen bon jan etikèt sou li. Si etikèt pestisid la ta pèdi, pa chèche konnen ki sa ki nan veso an. Jete pestisid la kareman.



967-1


SEVIN
MALATHION
DIAZINON
DIPTEREX
BENLATE
CAPTAN
DITHANE
PELTAR
BRAVO
CAPTAN

ANTRETYEN PONP FLIT

Toujou kenbe ponp ou anfòm. Si ponp la pa mache oswa koule, ranje li, oswa fè ranje li san pèdi tan. Pa tann ou bezwen li pou flite nan' pepinyè a. Si ou tann, li ap twò ta. Ou pap kapab swiv plan ou.

Men sa ou dwe fè pou ponp flit ou toujou nan bon kondisyon:

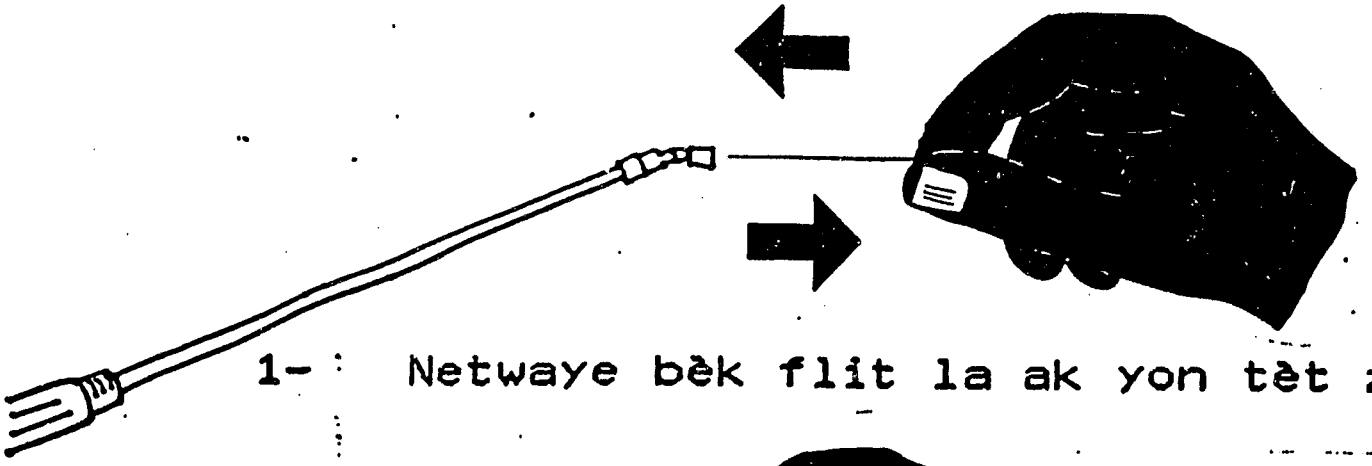
1. Toujou netwaye li, andedan tankou deyò ~~a~~ chak fwa ou fin sèvi ak li. Plen rezèvwa a 3 fwa ak dlo, chak fwa, flite ti kras dekwa pou rense ni rezèvwa a, ni bèk flit la.

2. Sere ponp la sou letajè oswa kwoke li andedan yon depo kouvri. Pa kite li ni a tè, ni nan soleèy.

3. Chak 6 mwa konsa, mete yon ti grès tout kote ki gen kawotchou won oswa lòt fòm kawotchou andedan ponp flit la dekwa pou kenbe yo byen mou.

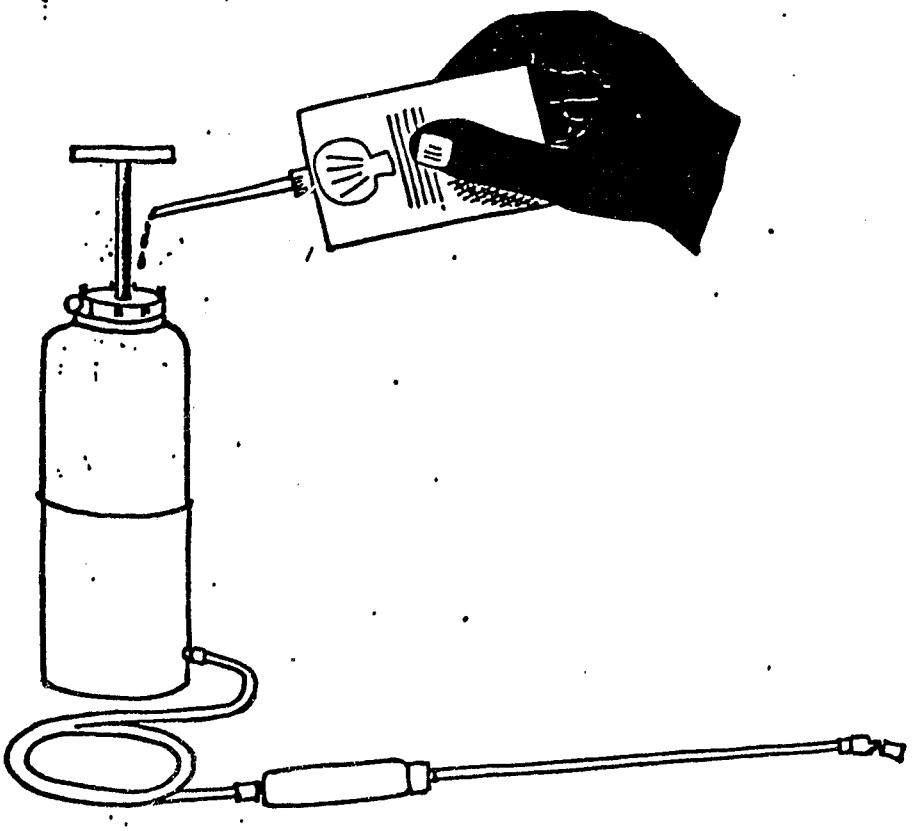
4. Kenbe bèk flit la pwòp. Netwaye li ak yón zepeng oswa yon bout fil fè. Pa ~~jamè~~ Janm soufle ladanl si ou ta bezwen debouche li.

5. Fè melanj pestisid yo ak dlo pwòp. Pa jamè sèvi ak dlo labou oswa dlo sal. Salte a va bouche bèk flit la.



G71-1

1- Netwaye bèk flit la ak yon tèt zepeng



G71-2

2- Chak sis mwa, mete yon ti lwil kote ki gen kawotchou

ATTACHMENT A-3
WARNING LABELS FOR PESTICIDES

SEVIN (50WP)

INSEKTISID POU PRESKE TOUT INSEK YO

PWAZON  **DANJE**

DIREKSYON:

Pou preskè tout insèk yo: Mete de kiyè Sevin nan yon galon dlo, epi melange'l byen. Flite plant-yo jiskaske tout fey-yo byen mouye.

Sevin bon pou touye cheni, formi, afid, silid, pichon, epi kèk lòt insèk.

Pou kriket pestisid ki rele Malatyon-nan pi bon pase Sevin. Ou met sèvi ak Sevin kont kriket si ou pa gen Malatyon.

ATANSYON:

- ☞ Lè w-ap travay ak pestisid sa-a, toujou sèvi ak ekipman ki pou pwoteje-ou-yo.
- ☞ Pa jete rèst pestisid-la nan rivye-a. Fouye yon twou epi vide rès la ladan'l.
- ☞ Lè ou fini ak sache-a, antere'l, oubyen boule'l.
- ☞ Lè ou fin sèvi ak pestisid sa-a, ou pa fèt pou lave ni rad ki te sou ou, ni vèso ki te touche ak li nan rivye-a.

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MALATYON (25WP)

INSEKTISID POU TOUT INSEK YO

PWAZON  DANJE

DIREKSYON:

Pou tout insèk yo: Mete yon kiyè Malatyon nan yon galon dlo, epi melange'l byen. Flite plant-yo jiskaske tout fey-yo byen mouye.

ATANSYON:

- ☞ Lè w-ap travay ak pestisid sa-a, toujou sèvi ak ekipman ki pou pwoteje-ou-yo.
- ☞ Pa jete rèst pestisid-la nan rivye-a. Fouye yon twou epi vide rès la ladan'l.
- ☞ Lè ou fini ak sache-a, antere'l, oubyen boule'l.
- ☞ Lè ou fin sèvi ak pestisid sa-a, ou pa fèt pou lave ni rad ki te sou ou, ni vèso ki te touche ak li nan rivye-a.

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KAPTAN (50W)

FUNJICID POU MALADI FE, POURITI, EPI MALADI RASIN

PWAZON  **DANJE**

DIREKSYON:

Pou maladi feg: Mete kat kiyè Kaptan nan yon galon dlo, epi melange'l byen. Flite plant-yo jiskaske tout feg-yo byen mouye.

Pou pouriti epi maladi rasin: Mete kat kiyè Kaptan nan yon galon dlo, epi melange'l byen. Awose byen tout plant-yo ki gen maladi rasin oubyen pouriti.

ATANSYON:

- ☞ Lè w-ap travay ak pestisid sa-a, toujou sèvi ak ekipman ki pou pwoteje-ou-yo.
- ☞ Pa jete rèst pestisid-la nan rivye-a. Fouye yon twou epi vide rès la ladan'l.
- ☞ Lè ou fini ak sache-a, antere'l, oubyen boule'l.
- ☞ Lè ou fin sèvi ak pestisid sa-a, ou pa fèt pou lave ni rad ki te sou ou, ni vèso ki te touche ak li nan rivye-a.

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BENLAT (SOW)

FUNJICID POU MALADI FEY, POURITI, EPI MALADI RASIN

PWAZON  **DANJE**

DIREKSYON:

Pou maladi feg: Mete de kiyè Benlat nan yon galon dlo, epi melange'l byen. Flite plant-yo jiskaske tout fey-yo byen mouye.

Pou pouriti epi maladi rasin: Mete de kiyè Benlat nan yon galon dlo, epi melange'l byen. Awose byen tout plant-yo ki gen maladi rasin oubyen pouriti.

ATANSYON:

- Lè w-ap travay ak pestisid sa-a, toujou sèvi ak ekipman ki pou pwoteje-ou-yo.
- Pa jete rèst pestisid-la nan rivye-a. Fouye yon twou epi vide rès la ladan'l.
- Lè ou fini ak sache-a, antere'l, oubyen boule'l.
- Lè ou fin sèvi ak pestisid sa-a, ou pa fèt pou lave ni rad ki te sou ou, ni vèso ki te touche ak li nan rivye-a.

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DITAN (DITHANE M-45)

FUNJICID POU MALADI FEY, ESPESYELMAN POU SEKOSPORA

PWAZON  **DANJE**

DIREKSYON:

Pou maladi feyi: Mete de kiyè Ditan nan yon galon dlo, epi melange'l byen. Flite plant-yo jiskaske tout fey-yo byen mouye. Flite plant-yo twa fwa pa semenn jiskaske nouvo fey-yo pa gen maladi-a.

ATANSYON:

- ☞ Lè w-ap travay ak pestisid sa-a, toujou sèvi ak ekipman ki pou pwoteje-ou-yo.
- ☞ Pa jete rèst pestisid-la nan rivye-a. Fouye yon twou epi vide rès la ladan'l.
- ☞ Lè ou fini ak sache-a, antere'l, oubyen boule'l.
- ☞ Lè ou fin sèvi ak pestisid sa-a, ou pa fèt pou lave ni rad ki te sou ou, ni vèso ki te touche ak li nan rivye-a.

Prepare pa Pan American Development Foundation - Projé Pyebwa 6/6/88

ATTACHMENT A-4
AGROFORESTRY (AF) AND SOIL CONSERVATION (SC) INTERVENTIONS AND APPLICATIONS (RICHARD PELLEK)

The following general descriptions pertain to the agroforestry (AF) and soil conservation (SC) interventions in current use in Haiti; more importantly, the descriptions amount to de facto definitions as I interpret the terms.

1. **Terrasses Vives (living terraces) (AF), (SC)**

   The planted grasses, shrubs or perennials on the contour, particularly in moderately sloping to strongly sloping land, for the purpose of erosion control, production of fodder, green manure and/or edible commodities.

2. **Haies Vives (hedgerows) (AF)**

   Similar to living terraces, but may also be found on land that is not particularly sloping. The emphasis in "hedgerow" technology is on the layout, architecture and species composition of the hedgerow itself. They are generally established on the contour and used as filter strips.

3. **Bandes Enherbees (AF) or (SC)**

   Similar to Haies Vives and Terrasses Vives, the 'bandes enherbees' are interventions of which I have no personal experience. The choice of species, height, rationale and efficacy are subjects which should be publicized.

4. **Alley Cropping (AF)**

   A complementary land use system wherein the chief emphasis is put on the crops between the adjacent hedgerows which comprise generally fast growing legumes. They are pruned regularly to decrease competition with cultivated crops. The leaves are generally used as green manure. Due to the novelty of the alley cropping systems in Haiti (or in other places in the Western World for that matter) the complementarity of alley cropping and hedgerows has not yet been demonstrated or elaborated.

5. **Rampe de Paille (Litter Terraces) or fascinage (SC)**

   A traditional Haitian techniques whereby straw, sticks and dead branches or other material is interwoven in contoured lines on the hillside. The 'rampes de paille' are anchored with pegs that are driven into the ground, also along the contour.

6. **Clayonnage (Wattle Fence) (SC, AF)**

Similar to rampe de paille or fascinage, the clayonnage is used to plug small gullies. The sticks are generally stronger than those used for the former, and are selected for their ability to sprout in the soil.

7. **"Structures Mecanique", Cordon de Pierre and Structures Bio-mechaniques (SC)**

All of the above "structures mécaniques" are soil conservation interventions which employ stone, dry masonry, or, in some cases, concrete contour walls, gulley plugs and check dams to impede overland flow of water and to trap the soil behind them. In the case of "structures bio-mechaniques," shrubs, grasses or perennials are also planted either above or below the structure to take advantage of the impeded moisture to promote more rapid growth. Developing roots also stabilize the structures themselves. In Haiti mechanical structures have proven largely ineffective in some cases because of the high rate of in situ infiltration and percolation of rainwater, and also because of the general absence of soil fines, particularly clay, that could act as a barrier to the movement of soil particulate matter, and finally because of the lack of maintenance.

The practice of constructing mechanical devices persists as a holdover of institutional policy within "development organizations," and stems from the fact that such soil conservation practices work effectively in the soil types of other countries where peripatetic conservationists may have worked.

8. **Canal de Contour (SC)**

A moderately deep trench (30-60 cms.) dug into the soil along the contour to trap and diffuse rainfall. Although contour canal digging could be justified on its own merits, in most cases the canal itself is part and parcel of the "terrasses vives", "bandes enherbees" and "structures bio-mecaniques". The canal itself is overlooked where it is part of the more sophisticated approaches undertaken.

9. **Billonage (Earthen ridges) (SC)**

They are the complements of the canals de contours and are built on the contour between the canals. Whereas the canals themselves hold water and prevent overland flow, the ridges enhance root development by providing tilled, free draining seedbeds for the target crops. They also protect the soil against rill erosion.

10. **Bassin de Sedimentation (sediment basin) (SC)**

These small basins are dug in the downstream sections of ravines and gullies. They trap sediment and store water, therefore, increasing the infiltration rate of water in mid stream while decreasing sediment deposits on usually valuable land.

11. **Greffes (grafting) (AF)**

An adjunct intervention which pays soil conservation and potential cash income benefits in the purported agroforestry strategies in Haiti. Grafting is done on high value fruit trees primarily. Also, most grafting is done off-site by skilled grafters at a relatively high cost per grafted tree. Some on-site grafting on farmers' lands is also being promoted.

Applications of Terminology

It must be said that terms such as "living terraces'" or its common variants, e.g. "rampes vivants", "leucaena hedgerows", etc. are not really synonyms, nor are they true terraces. The "terraces" are seldom more than 1/2 meter wide. True terraces are rarely seen in Haiti, but where they exist are quite effective.

There is little or no hard data on the efficacy of any agroforestry or soil conservation interventions as practiced in Haiti. In light of the enormous attention being given to the promotion of the wide variety of interventions, and to the actual expenditures being made, it would be justified to call for some fundamental research.

ATTACHMENT A-5
SPECIES LISTS OF THE IRG HAITI SEED AND GERMPLASM IMPROVEMENT PROJECT

SPECIES LIST 1.

SPECIES SELECTED FOR TREE IMPROVEMENT AND SEED ORCHARDS IN HAITI

INDIGENOUS SPECIES	PADF REGION					CARE REGION				
	1	2	3	4	5	1	2	3	4	5
Catalpa longissima										
Colubrina arborescens										
Simarouba glauca										
Cedrela odorata										
Lysiloma latisilque										
Ocotea spp.										
Mammea americana										
Malpighia pumicifolia										
Fagara martinicensis										
Sideroxylon foetidissium										
Dipholis salicifolia										
Chrysophyllum cainito										
Cinnamomum zeylanicum										
Achras zapota										

SPECIES LIST 2.

SPECIES SELECTED FOR PROVENANCE TRIALS IN HAITI.

INDIGENOUS SPECIES	PADF REGION					CARE REGION				
	1	2	3	4	5	1	2	3	4	5
Cedrela odorata										
Simarouba glauca										
Pinus occidentalis										
Colubrina spp.										
Catalpa longissima										
EXOTIC SPECIES										
Azadirachta indica										
Acacia auriculiformis										
Cassia siamea										
Casuarina equisetifolia										
Casuarina cristata										
Callophylon braziliensis										
Enterlobium spp.										
Leucaena leucocephala										
Leucaena diversifolia										
Eucalyptus camaldulensis										
Eucalyptus grandis										
Eucalyptus tereticornis										
Eucalytpus microtheca										

Grevillea robusta
Gliricidia sepium
Mimosa scabrella
Pinus caribaea var. bahamensis
Pinus caribaea var. caribaea
Pinus caribaea var. hondurensis
Swietenia macrophylla

SPECIES LIST 3.

SPECIES SELECTED FOR SPECIES INTRODUCTIONS TO HAITI.

SPECIES	PADF REGION					CARE REGION				
	1	2	3	4	5	1	2	3	4	5
Acacia albida										
Acacia mangium										
Acacia mearnsii										
Calliandra calothyrsus										
Cordia alliodora										
Derris indica										
Erythrina poppigiana										
Markhamia platycalyx										
Pinus elliotii										
Pinus taeda										
Pinus tecunumanii										
Tabebuia rosea										
Khaya senegalensis										
1.										
2.										
3.										