OUTLINE OF REQUIREMENTS

Pest risk analysis (PRA) consists of three stages: initiating the process for analyzing risk, assessing pest risk, and managing pest risk (See Figures 1-3).

Initiating the process involves identification of pests or pathways for which the PRA is needed. Pest risk assessment determines whether each pest identified as such, or associated with a pathway, is a quarantine pest, characterized in terms of likelihood of entry, establishment, spread and economic importance. Pest risk management involves developing, evaluating, comparing and selecting options for reducing the risk.

PRA is only meaningful in relation to a defined "PRA area" considered to be at risk. This is usually a country, but can also be an area within a country, or an area covering all or parts of several countries [e.g. the area covered by a Regional Plant Protection Organization (RPPO)].

GENERAL REQUIREMENTS FOR PEST RISK ANALYSIS (PRA)

1.   STAGE 1: INITIATING THE PRA PROCESS

There are generally two initiation points for a pest risk analysis (see Figure 1):

-       the identification of a pathway, usually an imported commodity, that may allow the introduction and/or spread of quarantine pests

-       the identification of a pest that may qualify as a quarantine pest.

Either can involve pests already present in the PRA area but not widely distributed and being officially controlled, as well as pests absent from the PRA area, since both are covered by the quarantine pest definition.

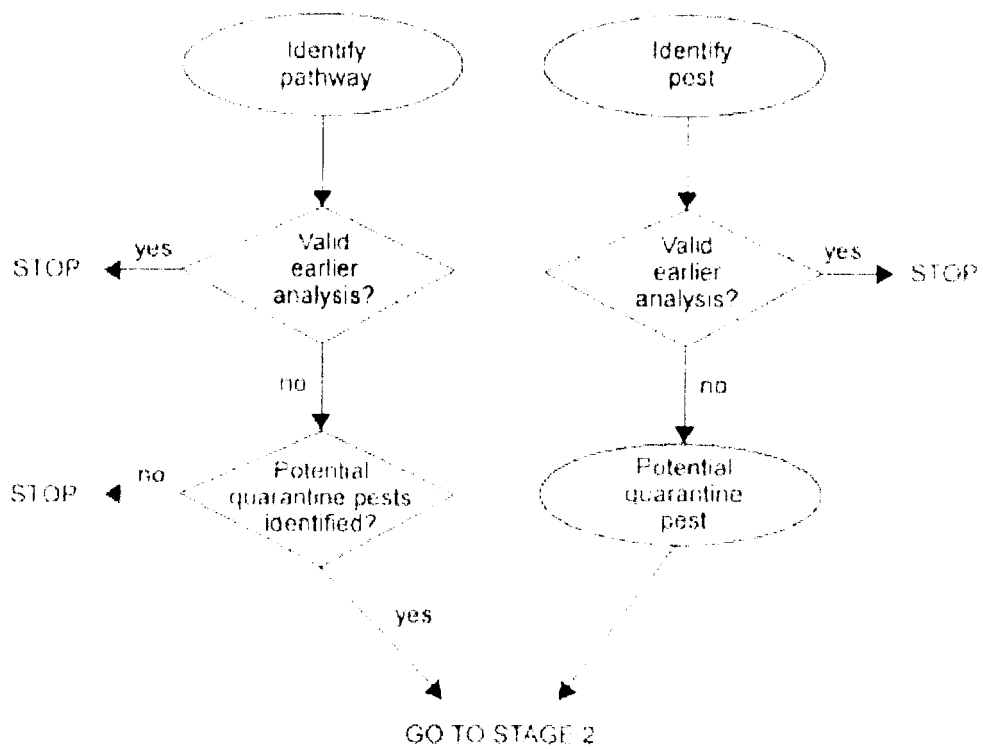### 1.1   PRA Initiated by a Pathway

A requirement for a new or revised PRA originating from a specific pathway will most frequently arise in the following situations:

-       International trade is initiated in a new commodity (usually a plant or plant product) or a commodity from a new origin. The PRA may be triggered by a request for import, or by the appearance in trade of consignments of a commodity. The pathway may concern a single area of origin or several.

-       New plant species are imported for selection and scientific research purposes

-       A pathway other than commodity import is identified (natural spread, mail, garbage, passenger's baggage etc.)

-       A policy decision is taken to establish or revise phytosanitary regulations or requirements concerning specific commodities

-       A new treatment, system or process, or new information impacts on an earlier decision.

The pests which are likely to follow the pathway (e.g. be carried by the commodity) are then listed, and each is then subjected to Stage 2 in the PRA process[1]. If no potential quarantine pests are identified as likely to follow the pathway, the PRA stops at this point.

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[1] The list of pests may be generated by any combination of databases, literature sources, or expert consultation. Once the list of pests has been established, it is preferable to prioritize it by using expert judgement before the next step. According to the results obtained, it may or may not be necessary to conduct a risk assessment on all pests on the list.

FIGURE 1

PEST RISK ANALYSIS

Stage 1 Initiation

1.2 PRA Initiated by a Pest

A requirement for a new or revised PRA originating from a specific pest will most frequently arise in the following situations:

- An emergency arises on discovery of an established infestation or an outbreak of a new pest within a PRA area

- An emergency arises on interception of a new pest on an imported commodity

- A new pest risk is identified by scientific research

- A pest is introduced into a new area other than the PRA area

- A pest is reported to be more damaging in a new area other than the PRA area itself, than in its area of origin

- Audits reveal that a particular pest is repeatedly intercepted

- A request is made to import, as such, an organism, for example by researchers, educators, biological practitioners, businesses (pet store owners), the food industry (snails for consumption) or hobbyists (aquatic plants for aquaria)

- A policy decision is taken to revise phytosanitary regulations or requirements concerning specific pests

- A proposal is made by another country or by an international organization (RPPO, FAO)

- A new treatment system, process, or new information impacts on an earlier decision.

The specific pest identified is then subjected to Stage 2 in the PRA process.

1.3 Review of Earlier PRAs

Prior to proceeding with a new PRA, a check should be made as to whether the pathway or pest has already been subjected to the PRA process, either nationally or internationally. If a PRA exists, its validity should be checked as circumstances may have changed. The possibility of using a PRA from a similar pathway or pest, that may partly or entirely replace the need for this PRA, should also be investigated.

1.4 Conclusion for Stage 1

At the end of Stage 1, pests have been identified as potential quarantine pests, individually or in association with a pathway.

FIGURE 2

PEST RISK ANALYSIS

Stage 2 Assessment
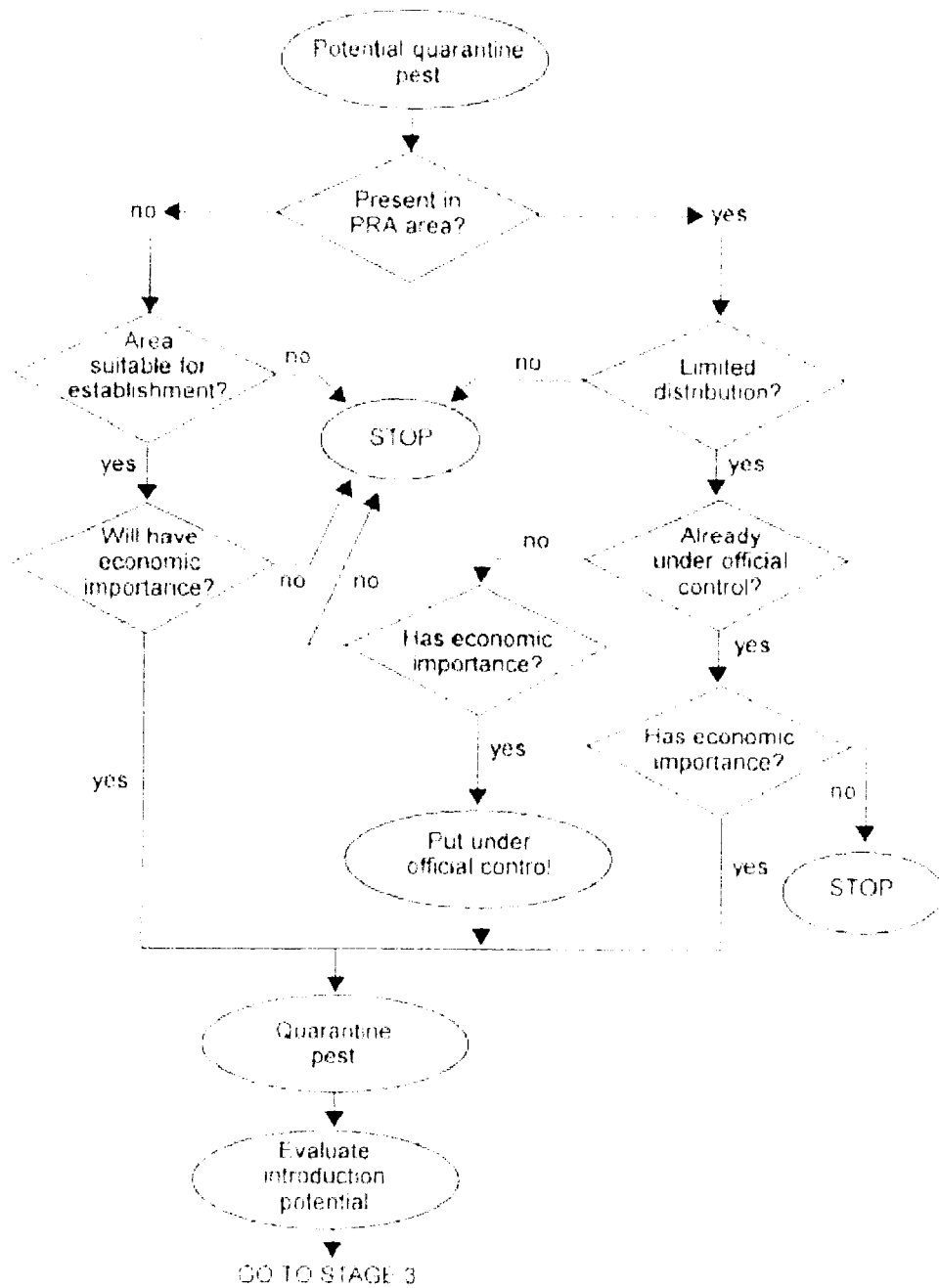
2.   STAGE 2: PEST RISK ASSESSMENT

Stage 1 has identified a pest, or list of pests (in the case of initiation by a pathway), to be subjected to risk assessment. Stage 2 considers these pests individually (see Figure 2). It examines, for each, whether the criteria for quarantine pest status are satisfied:

> "a pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled".

In this context, "area" should be understood to mean:

> "an officially defined country, part of a country, or all or part of several countries",

and "endangered area" should be understood to mean:

> "an area where ecological factors favour the establishment of a pest whose presence in the area will result in economically important loss".

In doing so, the PRA considers all aspects of each pest and in particular actual information about its geographical distribution, biology and economic importance. Expert judgement is then used to assess the establishment, spread and economic importance potential in the PRA area. Finally, the potential for introduction into the PRA area is characterized.

In characterizing the risk, the amount of information available will vary with each pest and the sophistication of the assessment will vary with available tools. For example, one country may have elaborate pest databases and geographical information systems, another may depend on books, printed soil maps, and climate maps. In some cases, virtually no information may be available, or research may be needed to obtain it. Assessments will be limited by the amount of information available on the biology of a particular pest. Countries where the pest is present may provide available information for the country conducting the PRA, on request.

2.1   Geographical and Regulatory Criteria
For each pest subjected to the PRA process, the geographical and regulatory criteria in the quarantine pest definition should be considered:

-    If the pest is present in the PRA area and has reached the limits of its ecological range (i.e. is widely distributed), then the pest does not satisfy the definition of a quarantine pest and the PRA for the pest stops at this point

-    If the pest is present in the PRA area and has not reached the limits of its ecological range (i.e. not widely distributed), and the pest is subject to official control in the PRA area, then the pest satisfies this aspect of the definition of a quarantine pest

- If the pest is not widely distributed but is under consideration of future official control in the PRA area, then the PRA will determine whether the pest should be placed under official control. If the conclusion is reached that the pest should be subject to official control, then the pest satisfies this aspect of the definition of the definition of a quarantine pest.

- If the pest is not widely distributed but is not subject to official control or consideration of future official control in the PRA area, then the pest does not satisfy the definition of a quarantine pest and the PRA for the pest stops at this point

- If the pest is absent from the PRA area, then it satisfies this aspect of the definition of a quarantine pest.

2.2 Economic Importance Criteria

For potential economic importance to be expressed, a pest must become established and spread. Thus the risk of a pest, having entered, becoming established and spreading in the PRA area must be characterized. The factors to be considered are set out below [2].

2.2.1 Establishment potential

In order to estimate the establishment potential of a pest, reliable biological information (life cycle, host range, epidemiology, survival etc.) should be obtained from the areas where the pest currently occurs.

The situation in the PRA area can then be carefully compared with that in the areas where it currently occurs and expert judgement used to assess the establishment potential. Case histories concerning comparable pests can usefully be considered. Examples of the factors to consider are:

- availability, quantity and distribution of hosts in the PRA area
- environmental suitability in the PRA area
- potential for adaptation of the pest
- reproductive strategy of the pest
- method of pest survival.

If a pest has no potential for establishment in the PRA area, then it does not satisfy the definition of a quarantine pest and the PRA for the pest stops at this point.

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[2] Fuller checklists of information which can usefully be considered in assessing the potential for establishment, spread and economic importance, are available from national and international sources.

2.2.2   Spread potential after establishment

In order to estimate spread potential of the pest, reliable, biological information should be obtained from areas where the pest currently occurs.

The situation in the PRA area can then be carefully compared with that in the areas where the pest currently occurs and expert judgement used to assess the spread potential. Case histories concerning comparable pests can usefully be considered. Examples of the factors to consider are:

-    suitability of the natural and/or managed environment for natural spread of the pest
-    movement with commodities or conveyances
-    intended use of the commodity
-    potential vectors of the pest in the PRA area
-    potential natural enemies of the pest in the PRA area.

The information on spread potential is used to estimate how rapidly a pest's potential economic importance may be expressed within the PRA area. This also has significance if the pest is liable to enter and establish in an area of low potential economic importance and then spread to an area of high potential economic importance. In addition it may be important in the risk management stage (see Figure 3) when considering the ease with which an introduced pest could be contained or eradicated.

2.2.3   Potential economic importance

The next step in the PRA process is to determine whether the pest is of potential economic importance in the PRA area.

In order to estimate the potential economic importance of the pest, information should be obtained from areas where the pest currently occurs. For each of these areas, note whether the pest causes major, minor or no damage. Note whether the pest causes damage frequently or infrequently. Relate this, if possible, to biotic and abiotic effects, particularly climate.

The situation in the PRA area can then be carefully compared with that in the areas where the pest currently occurs. Case histories concerning comparable pests can usefully be considered. Expert judgement is then used to assess the potential for economic importance. Examples of the factors to consider are:

-    type of damage
-    crop losses
-    loss of export markets
-    increases in control costs
-    effects on ongoing integrated pest management (IPM) programmes
-    environmental damage
-    capacity to act as a vector for other pests

- perceived social costs such as unemployment.

If a pest has no potential economic importance in the PRA area, then it does not satisfy the definition of a quarantine pest and the PRA for the pest stops at this point.

2.3   Introduction Potential

The final stage of assessment concerns the introduction potential which depends on the pathways from the exporting country to the destination, and the frequency and quantity of pests associated with them. Documented pathways for the pest to enter new areas should be noted. Potential pathways which may not currently exist should be assessed if known.

The following is a partial checklist that may be used to estimate the introduction potential divided into those factors which may affect the likelihood of entry and those factors which may affect the likelihood of establishment.

Entry:

- opportunity for contamination of commodities or conveyances by the pest
- survival of the pest under the environmental conditions of transport
- ease or difficulty of detecting the pest at entry inspection
- frequency and quantity of pest movement into the PRA area by natural means
- frequency and number of persons entering from another country at any given port of entry.

Establishment:

- number and frequency of consignments of the commodity
- number of individuals of a given pest associated with the means of conveyance
- intended use of the commodity
- environmental conditions and availability of hosts at the destination and during transport in the PRA area.

2.4 Conclusion for Stage 2

If the pest satisfies the definition of a quarantine pest, expert judgement should be used to review the information collected during Stage 2 to decide whether the pest has sufficient economic importance and introduction potential, i.e. sufficient risk, for phytosanitary measures to be justified. If so, proceed to Stage 3; if not, the PRA for the pest stops at this point[3].

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[3] Decision-making schemes, or expert systems, may be useful at this stage to assist expert judgement.

FIGURE 3

PEST RISK ANALYSIS

Stage 3 Management

from Stage 2

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      ╭───────────────╮
     ╱   Generate       ╲
    ╱     evaluate        ╲
   │    and compare        │
    ╲    management       ╱
     ╲     options       ╱
      ╰───────────────╯
              ┆
              ▼
      ╭───────────────╮
     ╱                  ╲
    │   Select option    │
     ╲                  ╱
      ╰───────────────╯
              ┆
              ▼
      ╭───────────────╮
     ╱   Monitor and    ╲
    │   evaluate after    │
     ╲  implementation   ╱
      ╰───────────────╯
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