2. GENERAL CONSIDERATIONS

2.1 CONSIDERATION REGARDING JMPR CAPACITY AND RESOURCES

The Forty-second Session of the Codex Committee on Pesticide Residues (CCPR) held a discussion about the limited resources of the Joint FAO/WHO Meeting on Pesticide Residues (JMPR), and CCPR agreed that the United States of America (USA), with assistance from Cameroon and CropLife, will prepare a discussion paper on how to address JMPR resource issues for consideration by the next Session of CCPR in 2011. As this is an important subject for JMPR, this topic was discussed at the current meeting to give a view from its perspective.

Requests to JMPR for pesticide assessments for new compounds and for compounds within the periodic review programme of CCPR, as well as requests for assessments for additional maximum residue level recommendations, have increased in recent years. Also, the complexity of questions, the number of data provided per compound and the cost for meetings and publications have increased. In contrast, financial and staff resources for the work of JMPR and for the JMPR Secretariat at FAO and WHO have not increased, but rather have decreased. This has led to some backlog in the requested evaluations.

JMPR is an independent international scientific expert group. It serves as a scientific advisory body to FAO, WHO, FAO and WHO member governments, and the Codex Alimentarius Commission (CAC). Advice to CAC on pesticides is provided via CCPR. The outcome of the JMPR meetings feeds directly into national and international food standard setting, as well as into the development of WHO recommendations and guidelines. The Meeting also plays an important role in the continued improvement of risk assessment principles and methods, taking new scientific developments into account.

Procedures and responsibilities for JMPR (as risk assessors) and CCPR (as risk managers) are laid down in the risk analysis principles applied by CCPR[1].

Current JMPR working procedures

Procedural guidelines for JMPR have been published by WHO[2] and FAO[3]. Key procedural aspects are as follows:

- Preparation of meetings starts approximately 1 year before the meeting date with a public call for data.
- Experts are selected according to FAO and WHO rules for expert meetings (from a standing roster of experts), are invited as independent experts and do not represent their country or organization.
- Tasks are assigned to experts who prepare, in advance of the meeting, draft evaluation monographs, which also undergo an initial review.
- Final conclusions are reached at the meeting, and the final report is adopted before the close of the meeting.
- Conclusions and recommendations are by consensus.

Operational aspects are as follows:

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[1] Codex Alimentarius Commission (2010) Section IV in: Procedural manual, 19th ed. Rome, Food and Agriculture Organization of the United Nations, Joint FAO/WHO Food Standards Programme (ftp://ftp.fao.org/codex/Publications/ProcManuals/Manual_19e.pdf).

[2] http://www.who.int/ipcs/food/jmpr/guidelines/en/index.html

[3] http://www.fao.org/docrep/012/i1216e/i1216e.pdf

- In advance of the meeting, experts prepare and review working papers on a pro bono basis; no consultancy fees or honoraria are provided.
- During the preparation period, extensive interactions via electronic means occur between experts.
- The estimated average time investment for preparation of working papers is 2–3 months for each expert doing the preparatory work.
- Experts often work on their own time; in other words, they perform this work to a large degree in addition to their normal workload.
- Only the cost of participation at meetings (i.e., travel and per diem) is covered by FAO and WHO.
- Original study reports (electronic format) are at hand and are consulted during the meeting as needed.
- Frequent interactions and intense discussions within and between the groups (FAO and WHO expert groups) are critical and impossible to be replaced by telephone or video conferencing, in particular to resolve critical issues.
- Reports and evaluations (residue and toxicology) undergo technical editing to enhance consistency and clarity.
- Over the course of 10 days (Joint Meeting, plus 5 days pre-meeting for the FAO panel), final conclusions on safe intake levels, acceptable daily intakes (ADI) and acute reference doses (ARfD) (compared with chronic and acute exposures) and recommendations on acceptable maximum residue levels of pesticides in agricultural commodities are reached.
- For example, at the 2009 meeting, 31 experts evaluated a total of 24 pesticides for use in many different crops (2008: 28 pesticides; 2007: 31 pesticides; 2006: 30 pesticides; 2005: 21 pesticides; 2004: 31 pesticides), and several hundred maximum residue level, highest residues in edible portions of commodities found in trials used to estimate maximum residue levels in the commodities (HRs) and supervised trials median residues (STMRs) were recommended. The vast majority of these maximum residue level proposals have been adopted as Codex maximum residue limits (CXLs).
- Currently, JMPR evaluates on average, within a 1-year time frame (from call for data until final conclusion), between 25 and 30 pesticides and recommends several hundred maximum residue level (and HRs and STMRs) for many pesticide/crop combinations.
- The overall direct cost to FAO and WHO per meeting is estimated at US$ 370 000, excluding staff cost.
- With currently available resources, JMPR Secretariat and available experts, the meeting has reached maximum capacity. For example, for the WHO group, a maximum of 10 full evaluations per meeting are possible, considering one full evaluation per expert for preparing the working paper and deliberations at the meeting.

Recent improvements of JMPR working procedures

- The transparency of the decisions taken has been increased.
- Work sharing has been implemented to build on existing national/regional evaluations to the extent possible.
- Preparatory work via electronic means has increased.
- The FAO pre-meeting is working in two separate working groups to increase efficiency and to be able to accommodate the evaluation of more compounds.

- The principles and methods for the risk assessment of chemicals in food, including pesticide residues, have been consolidated and updated and were recently published as Environmental Health Criteria 240[4].
- The FAO manual on the submission and evaluation of pesticide residue data was updated in 2009[5].

Factors affecting efficiency of the current JMPR work

- It is largely based on the goodwill of experts who work on a voluntary basis.
- The workload of experts in their regular jobs has increased, and less time can be allocated to JMPR work.
- It is based to a large degree on employers' willingness to let experts participate in JMPR meetings.
- Extension of the current meeting (more experts, more compounds, longer time) is not feasible.
- In the end, overall conclusions have to be agreed upon in all aspects by all experts.
- Longer meetings would require an even longer absence of experts from their offices.
- The effort to increase transparency of the decision-making process has led to very detailed and lengthy reports and evaluations. The need for such detailed and lengthy reports and evaluations could be reviewed and the guidance for preparatory work and reporting updated accordingly.
- There is sometimes a lack of understanding by sponsors of the importance of submitting complete data packages for JMPR evaluations in a timely manner.

Advantages of JMPR work and format

- It is an effective mechanism for problem solving and scientific consensus building.
- Recommendations are agreed upon and finalized within a specific time frame by an independent international expert panel.
- Best practices are disseminated through involvement of participants from regulatory authorities and academia from many different countries.
- It serves as capacity building and training for national evaluators.
- Decisions are based on scientific considerations only, using the latest scientific knowledge in risk assessment.
- Maximum residue level recommendations serve as a basis for international safety-based standards, Codex MRLs, which are applied to facilitate international trade.

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[4] FAO/WHO (2009) Principles and methods for the risk assessment of chemicals in food. Geneva, World Health Organization; Rome, Food and Agriculture Organization of the United Nations (Environmental Health Criteria 240; http://whqlibdoc.who.int/ehc/WHO_EHC_240_1_eng_front.pdf).

[5] FAO (2009) Submission and evaluation of pesticide residues data for the estimation of maximum residue levels in food and feed, 2nd ed. Rome, Food and Agriculture Organization of the United Nations (FAO Plant Production and Protection Paper 197; http://www.fao.org/docrep/012/i1216e/i1216e.pdf).

Conclusions

- CCPR relies on the independent scientific advice of JMPR as providing the basis for recommendation of international standards for pesticide residues in food and feed, emphasizing the need for the continuing independence of this international expert meeting.
- JMPR/CCPR have improved and streamlined working procedures. This is now a very efficient system within Codex, with a large number of standards recommended each year and a short time frame between requests for scientific advice and establishment of global standards.
- Globally harmonized international standards for pesticide residues are of increasing importance, and experience from work-sharing exercises from previous JMPR meetings as well as from registration authorities needs to be followed up. Recommendations designed to improve efficiency should be implemented.
- Any changes to the current system, including increasing the frequency of JMPR meetings, would have profound impacts, including a financial impact, and would need to be carefully considered.
- In particular, implications for CCPR work also need to be considered with respect to timing of meetings, but also regarding the number of recommendations coming from JMPR for consideration by CCPR.
- The priority-setting process at CCPR needs to be strengthened, and existing criteria possibly need to be reviewed and then enforced.
- It needs to be clarified whether the current increasing number of requests for evaluation is only a temporary situation or is expected to be long term.

2.2 DIETARY RISK ASSESSMENTS CONDUCTED BY THE JMPR: NEED FOR APPROPRIATE CONSUMPTION DATA FOR FURTHER METHOD DEVELOPMENT

In the Codex Procedural Manual (19 ed., section IV, Working Principles for Risk Analysis for Application in the Framework of the Codex Alimentarius, para 23), the following is stated:

> ‘Constraints, uncertainties and assumptions having an impact on the risk assessment should be explicitly considered at each step in the risk assessment and documented in a transparent manner. Expression of uncertainty or variability in risk estimates may be qualitative or quantitative, but should be quantified to the extent that is scientifically achievable.’

The Meeting recognizes that evaluation of uncertainties in a risk assessment increases transparency and, therefore, the credibility of the process. Consequently, reliance on worst-case assumptions can be reduced and decision support improved. Uncertainty analysis can also identify important data gaps, which can be filled to improve the accuracy of the estimation[6].

JMPR performs both long-term (chronic) and short-term (acute) dietary risk assessments. In the majority of cases where there is an exceedance of a toxicological reference value, it is the ARfD that is exceeded, by the short-term exposure assessment. In 2006 and 2007 (Report 2006, General consideration item 2.4, and Report 2007, General consideration item 2.1), the Meeting discussed in detail the uncertainties in the calculation of the international estimated short-term intake (IESTI), as well as the interpretation of the outcome. Ways in which the dietary risk assessments could be refined, both for hazard and for exposure assessment, are provided in the JMPR Report at the end of each compound’s evaluation, in the section named ‘Dietary risk assessment’. From 2009 onwards, to

[6] IPCS ‘Guidance Document on Characterizing and Communicating Uncertainty in Exposure Assessment’ (WHO 2008)

improve dissemination, this information has also been listed at the end of Chapter 4, where the results of the dietary risk assessments are summarized.

However, it should be noted that the uncertainties addressed in these evaluations are compound specific, relating, e.g., to the derivation of the ADI, the ARfD, the MRL, the HR, STMR and processing factors. Generic uncertainties arising from the use of default parameters in the IESTI model, such as consumption values, are not addressed. Nor is the conservativeness of the model as used.

IESTI calculations are performed per pesticide × commodity combination with the outcomes compared to the ARfD. It is a routine screening assessment that does not require an analysis of uncertainty on every occasion, provided that appropriately conservative assumptions or safety factors are included to take into account uncertainty. The EFSA PPR panel in its Opinion on acute dietary intake assessment has shown that the IESTI methodology is, in general, sufficiently conservative when applied in the MRL setting process[7]. However in several fora (among others, JMPR) changes to the IESTI methodology are under discussion, e.g., the possible replacement of HR by MRL in the IESTI calculations. To ensure international harmonisation of methodology, changes cannot be implemented by JMPR alone, to address this, a FAO/WHO consultation is recommended, as the Meeting noted in 2006 and 2007.

In addition, whilst risk assessments by JMPR are aimed at the global population, the Meeting uses Large Portion data collected by WHO/GEMS/Food from only a limited number of countries. Moreover the GEMS/Food data are sometimes older than those used for the same country in regional assessments, e.g., Europe. The Meeting concluded that the IESTI calculations should be based on the best available data and therefore, in view of these potential limitations, the WHO/GEMS/Food Large Portion database and its related unit weight database should be updated (see also General consideration item 2.3).

In conclusion, that in order to strengthen its dietary risk assessments, the Meeting strongly recommends that:

FAO and WHO host a consultation, the main objectives of which would be the continued refinement of the estimation of the short-term dietary intake of pesticides and the interpretation of the outcomes of short-term dietary risk assessment conducted by JMPR, including characterization of uncertainties.

Codex Member States prioritize the submission of their most recent data on Large Portions and unit weights to WHO/GEMS/Food, to ensure that the JMPR uses the best available information in its dietary exposure assessments.

2.3 THE NEEDS OF JMPR CONCERNING FOOD CONSUMPTION DATA: UPDATE ON THE ACTIVITIES OF THE GEMS/FOOD PROGRAMME

For its dietary risk assessment, the JMPR relies on food consumption data as collected by the WHO GEMS/Food Programme. Although most parameters in the dietary risk assessment are dependent on the compound, the food consumption data are generic, and play a key role in the assessment and its related uncertainties (see General consideration item 2.2). It is therefore very important that the food consumption data are reliable and as current as practicable.

The chronic (long-term) dietary risk assessment (IEDI) is based on the 13 GEMS/Food Cluster diets, which were introduced in the JMPR automated spreadsheets at the 2006 Meeting (see General consideration item 2.3, JMPR 2006). The 13 clusters are globally representative and, as a

[7] Opinion of the Scientific Panel on Plant protection products and their Residues on a request from the Commission on acute dietary intake assessment of pesticide residues in fruit and vegetables (Question N° EFSA-Q-2006-114) adopted on 19 April 2007. *The EFSA Journal* (2007) **538, 1-88**
http://www.efsa.europa.eu/en/scdocs/scdoc/538.htm

consequence, are appropriate for use in Codex standard setting. The mean consumption values in the cluster diets are derived from FAO Food Balance Sheets (FBS). The cluster diets were last updated in 2006 and as new FAO FBS are now available the cluster diets should be updated.

In contrast, the acute (short-term) dietary risk assessment (IESTI) is based on national food consumption survey data. Individual countries have supplied their so-called ‘Large Portions’ (97.5th percentile of the consumption distribution, “consumers only” to GEMS/Food. Existing data need to be updated based on the latest national surveys available. Member States which have recently performed food consumption surveys should be encouraged to submit data in order to ensure a broader coverage of regions.

The current Meeting was informed of renewed activities in GEMS/Food programme. In order to improve the networking, the national contact points are in the process of becoming National Institutions recognized by the WHO. These institutions will then be able to develop multilateral collaborations with other data providers, as well as with the WHO GEMS/Food Collaborating Centres that also deal with methodological developments and training.

The structure of the GEMS/Food database will be improved with a new food classification for data exchange compatible with the *Codex Alimentarius* and through the inclusion of both raw agricultural commodities and processed foods. A new web-based system for data submission (OPAL-web) will also soon be implemented.

Recently, the WHO set up two expert groups; one considering occurrence data, the other, food consumption data. The conclusions and recommendations of these working groups will be used to improve the GEMS/Food programme with regard to data submission and data interchange.

The collection of data on the food consumption of individuals, with a particular focus on consumption by children, has become one of the major objectives of the GEMS/Food programme. This in addition to the collection of data for the cluster diets will enable the use of probabilistic modelling and, for pesticide risk assessment, the derivation of Large Portions in a harmonized while providing improved representation of the global population.

The current Meeting welcomed these recent developments in the GEMS/Food programme and also recommends consideration be given to collecting harmonised food consumption data for specific groups of the population in addition to children.

2.4 INFORMATION ON THE USE OF PESTICIDES REQUIRED FOR THE ESTIMATION OF RESIDUE LEVELS IN MINOR CROPS

The Forty-second Session of the CCPR recommended that when residue data on minor crops are submitted by developing countries, the application of pesticides should match the critical GAP and that an official letter would be acceptable if labels were not available.

As a follow-up to the discussions at the CCPR, reports of field trials on mango, okra and papaya were provided by the Pesticides Initiative Programme for evaluation by the current Meeting. However, no approved label or an official letter was provided from the responsible government agency. The general rules, as outlined in the FAO Manual, precludes the evaluation of residue data for estimation of maximum residue levels, STMR and HR values when critical information is missing.

However, the Meeting in acknowledging the need for Codex MRLs to be established for minor crops and the diverging practices in developing countries, evaluated the submitted residue data, and conditionally made recommendations for maximum residue levels, STMR and HR values for bifenthrin (mango, papaya and okra) and difenoconazole (papaya). The acceptability, or otherwise, of these recommendations can therefore be decided by the CCPR, noting the lack of information on official use patterns.

The Meeting emphasised that this exception should not be a general practice and that data submitters should comply with the requirements as specified in the FAO Manual[8].

Chapter 3 of the FAO Manual[9] on the submission and evaluation of pesticide residue data provides detailed information on the data requirements for the estimation of maximum residue levels. GAP summaries are intended as an aid to the evaluation of submitted data and are to be provided in addition to certified labels. It is emphasised that copies of original labels have to be provided by the manufacturer(s), or other data submitters, in addition to the summary information.

The most essential information, which could be provided for the registered/authorised use of a pesticide includes:

- Exact description of crops and use situations with English name and the commodity description given in the Codex Classification of Foods and Animal Feeds;
- The formulation of the pesticide product using the two-letter coding system used in FAO pesticide specifications and given in Appendix III of the FAO Manual;
- The concentration of active ingredient in the formulated product expressed in g/L for liquids and w/w basis as g/kg or % of active ingredient in the solid product;
- The type of treatment such as ULV or high volume spraying and the crop growth stage at the final application;
- Maximum application rate expressed as kg ai/ha or kg ai/hL, number of applications, interval between applications and pre-harvest interval corresponding to specified application rate, if relevant, and maximum total application rate per season where specified;

In cases where use details are given in g/hL or kg/hL (spray concentration), state the spray concentration but do not calculate the kg ai/ha equivalent with the average amount of spray liquid used per hectare.

Estimation of group maximum residue levels for plant commodities

The estimation of maximum residue levels for a commodity group, as opposed to individual commodities, is common practice by the JMPR. The aim of this approach is to cover minor and very minor crops by a group maximum residue level.

Many factors can influence the proposal of a group maximum residue level or an individual maximum residue level with the final decision being made on case by case basis. For support and comparability, the JMPR developed 14 (a – n) general principles to estimating group maximum residue levels which are described in detail in Chapter 6 of the FAO Manual (2009)[10].

In general, the 2010 JMPR confirmed these rules but discussed a revision of principle (a) which requires "*The use pattern...... should be the same and applicable for the whole group*."

The Meeting noted that a group maximum residue level can also be recommended for some cases where the GAP for the individual commodities is not identical and that principle (a) should be revised as follows:

"In general, the use pattern should be similar and applicable for the whole crop group. If the use patterns are different for the individual crops but produce similar residues, a group maximum residue level might be recommended."

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[8] FAO Manual (2009), Submission and evaluation of pesticide residues data for the estimation of maximum residue levels in food and feed. FAO plant production and protection paper 197
[9] ibid. Chapter 3 Data and information required for JMPR evaluations.
[10] FAO Manual (2009), Submission and evaluation of pesticide residues data for the estimation of maximum residue levels in food and feed. 6.7 Estimation of group maximum residue levels STMR and HR values for plant commodities. FAO plant production and protection paper 197, p 97–101

For acute dietary intake purposes, the highest residue (HR) value of the commodity on which the maximum residue level is based, should be applied to the single commodities of the whole crop group. In cases when the ARfD is exceeded when using the group HR, a group maximum residue level cannot be recommended.

The examples below are based on evaluations of the 2010 JMPR and are explained in detail in the Report (5.2 and 5.22). Example 1 illustrates the derivation of a group maximum residue level and example 2 shows a case where no group maximum residue level could be recommended because of short-term intake concerns in one commodity.

Example 1: Thiamethoxam in berry fruits

Information on GAP and residue data

Cranberry

US GAP: WG formulation, foliar sprays at 0.070 kg ai/ha, 30 days PHI.

Six cranberry trials at GAP, where residues found were all < 0.01 mg/kg.

Blueberries

US GAP: WG formulation, foliar sprays at 0.070 kg ai/ha, 3 days PHI.

Nine blueberry trials at GAP, where residues found were: < 0.01, 0.05, 0.06, 0.06, 0.07, 0.07, 0.07, 0.07 and 0.11 mg/kg.

Caneberries

US GAP: WG formulation, foliar sprays at 0.053 kg ai/ha, 3 days PHI.

Six caneberry trials at GAP, where residues were: 0.01, 0.06, 0.10, 0.12, 0.19 and 0.20 mg/kg

Strawberry

US GAP: WG formulation, foliar sprays at 0.070 kg ai/ha, 3 days PHI.

Eight strawberry trials at GAP, where residues were: 0.02, 0.02, 0.05, 0.05, 0.06, 0.14, 0.22 and 0.26 mg/kg.

Grapes

Spain and Italy GAP: WG formulation, foliar sprays at 0.050 kg ai/ha, 21 days PHI.

Eleven grape trials at GAP, where residues were: < 0.02 (2), 0.02, 0.02, 0.02, 0.04, 0.04, 0.07, 0.13, 0.17 and 0.21 mg/kg

Recommendation

Residue data with suitable GAP were available for strawberry, cranberries, blueberries, caneberries and grapes. The Meeting noted that thiamethoxam residues were highest in strawberries.

On the basis of the foliar applications on strawberries in eight US trials, the Meeting estimated a maximum residue level of 0.5 mg/kg for thiamethoxam in berries and other small fruits.

Grapes are often evaluated separately because the crop is rarely included in a berries crop group as GAP and specific data are needed for its important processed commodities. However, the estimated maximum residue level for grapes closely agrees with that estimated for the other berry fruits, so the Meeting agreed to include the grapes with the berry fruits proposals.

Example 2: Bifenthrin residues in fruiting vegetables, other than cucurbits

Information on GAP and residue data

Peppers

US GAP 0.022–0.11 kg ai/ha, PHI of 7 days

Eleven pepper trials at US GAP, where bifenthrin residues were: < 0.055, 0.07, 0.09, 0.10, 0.11, 0.14, 0.17, 0.21, 0.23, 0.24 and 0.31 mg/kg.

Okra

Ivory Coast GAP: 2 × 0.04 kg ai/ha, PHI of 2 days

Four okra trials at the Ivory Coast GAP, where bifenthrin residues were: 0.04, 0.05, 0.09 and 0.11 mg/kg.

Tomato

US GAP 0.022–0.11 kg ai/ha, PHI of 1 day; Mexican GAP 0.06 kg ai/ha, PHI of 1 day

No residue trials at the US GAP were available

Seven trials at the Mexican GAP, where residues were: 0.03, 0.04, 0.06, 0.06, 0.09, 0.15 and 0.15 mg/kg.

Egg plant

US GAP 0.034–0.11 kg ai/ha, PHI 7 days

Three trials on egg plant at the US GAP: residues < 0.05 mg/kg (3)

Six trials on tomato at the US GAP for egg plant, where residues found were: < 0.05 (4), 0.07 and 0.10 mg/kg.

Recommendation

Residue data with suitable GAP were available for peppers, tomatoes, egg plant and okra to enable the estimation of a group maximum residue level for fruiting vegetables, other than cucurbits (except mushrooms and sweet corn) to be considered. The Meeting noted that bifenthrin residues were highest in peppers. The ARfD of 0.01 mg/kg bw was exceeded if the estimated group HR of 0.31 mg/kg based on the data on pepper was applied for egg plant (130% of the ARfD for children). Using the HR of 0.10 mg/kg for eggplant to calculate the short-term intake there was no exceedance of the ARfD. Therefore the Meeting concluded to estimate maximum residue levels for the individual crops as follows: peppers 0.5 mg/kg, tomatoes 0.3 mg/kg, egg plant 0.3 mg/kg, okra 0.2 mg/kg.

2.5 PRINCIPLES AND GUIDANCE ON THE SELECTION OF REPRESENTATIVE CROPS FOR THE EXTRAPOLATION OF MRLS

The Forty-second Session of the CCPR agreed to ask the 2010 JMPR for an opinion on the text of the proposed principles and guidance on the selection of representative crops for the extrapolation of MRLs to commodity groups. At previous meetings the JMPR has provided advice on the topic of the use of extrapolation of residues trials on crops to establish commodity group MRLs (General consideration item 2.8 2007, General consideration item 2.10 2008). The current Meeting has provided further guidance on how it estimates group maximum residue levels (General consideration item 2.5). The proposed draft “Principles and guidance on the selection of representative crops for the extrapolation of MRLs” (ALINORM 10/33/24 Appendix XI) is generally in agreement with the opinions expressed previously by the 2007 and 2008 Meetings of the JMPR. The Meeting especially welcome the recognition by CCPR that there will be, from time to time, the need to consider alternative representative crops for use in extrapolation of residues in one crop to estimate a group maximum residue level.

The guidance will be particularly useful during the planning stages of supervised trials that will produce data suitable for support of group MRLs.

The JMPR looks forward to the finalisation of this document.

2.6 STATISTICAL CALCULATION OF MRLS

The Meeting recalled that the 2009 CCPR had invited JMPR to provide input into the development of the "OECD MRL Calculator" and to test it when once available (ALINORM 09/32/24, para 34–40).

The Meeting recalled that during 2009 and early 2010 the Draft OECD MRL Calculator had gone through a series of modifications, and that the March 2010 version (2010-03-30), circulated to interested parties for testing, was close to being finalised. In this version, a new paradigm has been adopted, to use a non-distributional approach to propose an MRL value based on the highest result selected from:

- the highest residue of the data set (HR),
- the mean of the selected data set plus 4 times the standard deviation of the data set ("Mean + 4*SD")
- 3 times the mean value (3*mean) and including a correction factor to accommodate the frequency of residue values below the LOQ.

A copy of this version was provided to JMPR for use at this Meeting (in conjunction with the current NAFTA Calculator) so that comments could be provided to CCPR on JMPR experiences in using the calculator.

The Meeting noted that the goals of the calculator are (1) to provide national regulators with a tool to estimate MRLs that reflect at least the 95th percentile of the underlying residue distribution and thus reduce the chance of non-compliance from pesticide use according to GAP and (2) to provide a mechanism for arriving at a harmonized MRL estimate when the same data are considered by different authorities and organizations.

The calculator was used by the Meeting when considering maximum residue levels for a number of compounds, and the proposed maximum residue level values were compared with the levels recommended using expert judgement[11]. The Meeting observed that the two estimates were generally in agreement. There was a tendency for the calculator to propose higher values, not unexpected due the higher levels of uncertainty associated with the small data sets often available to the Meeting.

The experiences of the Meeting when using the calculator were:

- The calculator is easy to use and the draft User Guide[12] provides clear and comprehensive information on the calculations used to propose maximum residue level values and on how to enter the data and retrieve the results. The warning messages relating to small data sets and high levels of left-censored data are particularly useful.
- Selection of the appropriate data set is a critical first step when using the calculator.
- The opportunity to compile multiple output columns for different commodities and for the output to display the derivation of the proposed value would be of particular help to JMPR.

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[11] See Section 2.1 of the 2009 JMPR Report "Transparency in Maximum residue level estimation process: further considerations"

[12] OECD MRL Draft Calculator User Guide – 13th March 2010

- In both the Users Guide and the related draft White Paper[13], considerable detail is provided on how to deal with data sets with a high proportion of left-censored data. The opinion of JMPR is that in most instances, the current JMPR practices[14] adequately deal with this matter.

The Meeting concluded that the tested version of the OECD Calculator is a helpful tool to supplement expert judgement and to promote consistency in the elaboration of MRLs. The Meeting looks forward to the publication of the final version and would be pleased to contribute to any further refinements of the current version, noting that several JMPR members have been actively engaged with the OECD calculator working group over the past two years.

2.7 APPROPRIATE VALUE FROM REPLICATE SAMPLES FROM A SUPERVISED FIELD TRIAL FOR USE IN STATISTICAL CALCULATION OF THE MRL ESTIMATE

Appropriate value from replicate samples from a supervised field trial for use in statistical calculation of the maximum residue level estimate

The Meeting noted that the instructions/background to the OECD statistical calculation of maximum residue levels spreadsheet recommends the input of the *average* result from each independent field trial. If more than one replicate composite sample is collected, the average result from the analyses of the replicates should be used. The OECD work group states that the average is the best estimate of the 'true' value of the residue level for the particular trial. The more replicates available, the more robust is the estimate.

The JMPR documented its practice in 2007 (General consideration item 2.5, JMPR Report 2007). It was recommended to use the highest value from replicate samples of a given field trial. This was intended to include a reflection of the *intra-trial* variability of trial results and to provide a sufficient maximum residue level estimate.

The current Meeting reconsidered the situation. The inter-trial variability is the value being measured for entry into the calculation. For a given pesticide, supervised trials conducted under the same use patterns in different locations will yield a range of residue concentrations on the crop commodity, and it is this range of results that are needed to derive a maximum residue level estimate. The range is reflected in the set of average values. The use of the high value from each trial will skew the estimate somewhat higher.

Replicate trial results are normally provided from only the NAFTA region, and then there are only two values. Two values do not provide a good measure of intra-trial variability for statistical calculations. Moreover, trials from the majority of countries/regions consist of one result, and there is no possibility of determining an average or a highest value. The single value may be higher, lower, or the same as a hypothetical replicate.

The Meeting therefore concluded to use the average of replicate field trial residue values in establishing the data set for statistical calculation of maximum residue level estimates. However, the interpretation of the estimate must take into account individual replicate values contributing to the data set that exceed the estimate. This practice will be implemented with the 2011 JMPR.

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[13] Draft OECD MRL Calculator White Paper. 14th July 2010

[14] JMPR Manual, Chapter 6.5

2.8 THE APPLICATION OF PROPORTIONALITY IN SELECTING DATA FOR MRL ESTIMATION

At the 2010 CCPR delegations suggested that JMPR could have recommended maximum residue level for a number of commodities when the supporting residue data were from trials involving treatments more than 25% higher than the authorized GAP maximum application rates in situations where there were no dietary intake risks (CCPR, Report of the Forty-second Session, April 2010, ALINORM 10/33/24, paragraph 72).

In the estimation of maximum residue levels, JMPR accepts that the nominal rate of application in a trial would normally be considered consistent with GAP when it is within approximately ± 25 % of the GAP rate, which includes the probable variation in commercial practice (2009 FAO Manual, Second Edition, available on the web[15].

The policy is similar to that adopted by regulators, for instance the OECD crop field trial guideline states “to date there are no definitive analyses that would allow trials with widely varying application rates or PHIs to be combined. However, variation of ± 25% of application rate is currently deemed acceptable (i.e., 25% rule)”.

A proportional relationship between pesticide application rate and residues on the harvested commodity would imply that residues from field trials with higher or lower application rates could be proportionately adjusted (or “scaled”) allowing estimates to be made of residues that would have been present if the application rate matched the maximum on the product label. Use of such a procedure would often increase the size of the residue database supporting an MRL and potentially allow better results from statistical methods for MRL estimation.

In the current Meeting residue trial evaluation reports of the JMPR for the period 2000 through 2009 were used to investigate the effect of application rates on residues, where side-by-side sets of field trials were available. A total of 1146 sets of trials were located where crops were treated in side-by-side trials with application rate or spray concentration being the only parameter varied. Data were located for 52 different active ingredients encompassing herbicides, insecticides and fungicides. Pre-harvest intervals (PHIs) ranged from 0 to 294 days.

The analysis of residue trial data confirms the assumption that residues of insecticides and fungicides in plant commodities do indeed scale with application rate, allowing prognosis on residue levels resulting from field trials conducted using deviating application rates. Proportionality was found to be independent of the ratio of application rates, at least for the range 1.3× to 10× or their reciprocal, formulation type, application type (foliar spray, soil spray and seed treatment) , PHI, residue concentration, crop or pesticide (except herbicides or growth regulators).

The Meeting decided it would only consider the method of proportionality in cases, where residue data according to GAP are not sufficient for a recommendation or where additional information on residues in treated commodities useful for the evaluation may be achieved. When considering proportionality, the following aspects need to be taken into account:

General aspects

Active substances: Proportionality of application rates to the residue concentration was investigated mainly for insecticides and fungicides. For herbicides and growth regulators proportionality of residues is not probable, since changes in application rates may strongly interfere the plant development itself and thus with the resulting residue concentration remaining. The Meeting decided that the principle of proportionality may not be used in cases, where application of a pesticide may affect crop growth.

[15] http://www.fao.org/agriculture/crops/core-themes/theme/pests/pm/jmpr/jmpr-docs/en/

Commodity type: Proportionality may not apply to residues in commodities intended for trade, human consumption or animal feed purposes resulting from unpredictable residue transfer (e.g., as a side effect following mechanical harvesting or shuck-splitting).

Special consideration is required for scaling of residues in protected edible parts of the commodities for dietary intake purposes. While residues are generally proportional in the whole commodity (e.g., citrus fruit), careful application of scaling factors is required for the corresponding protected parts.

Type of application: Proportionality of residues was investigated for spray (foliar and soil) and seed treatments only. Based on the characteristics of the use as soil spray treatment, proportionality may also be assumed for related modes of application like drenching, drip irrigation or hydroponic application. For other forms of treatment (e.g., granular application) the effect on the proportionality has, as yet not been investigated.

Scaling of residue data

Guidance is required for the use of scaling in residue evaluation and for the selection of residue values from trials, where data for a range of application rates are available. As a general approach the scaling of individual trial results should be calculated according to the following equation:

$$\text{Scaled residue} = \text{Measured residue} \times \frac{\text{GAP rate}}{\text{Trial application rate}}$$

In the data investigated the differences in the ratios of application rates ranged up to a factor of ×10 for the field trials analysed. Due to the structure of the data a satisfying number of individual results were reported for a ratio of application rates of 1.15 to 4.4 only.

Under consideration of the likely larger relative uncertainty of low residues the Meeting decided to limit the up-scaling of residues to a factor of 3. On the other hand more reliable results obtained from overdosed field trials might be down-scaled by a factor of up to 5 (multiplication by a factor of 0.2), normally providing a more reliable data basis in comparison to measured low residues. This approach results in an acceptable range of scaling factors of 0.2 to 3. A general example for the scaling of residues is presented below:

Example 1: Application rate < GAP rate

	kg ai/ha	Commodities	Scaling factor	Pesticide A residue (mg/kg)
Trial	0.045	Gin trash		0.32

Example 2: Application rate > GAP rate

	kg ai/ha	Commodities	Scaling factor	Pesticide A residue (mg/kg)
Trial	0.225	Gin trash		1.9

Special consideration is required for field trial results below the LOQ of the analytical method. In general the LOQ represents the minimum amount of residue still being quantifiable with an acceptable certainty of measurement and identification. Normally this situation requires an appropriate substitution method for these results followed by sensitivity analysis to describe the impact of the respective trial on the overall assessment. It is proposed to not apply the method of scaling to residue data below the LOQ.

In cases of up-scaling the elevated uncertainty within multiplying non-detects to levels, where finite results may be possible, was considered no appropriate. Therefore data below the LOQ should be taken into account for up-scaling.

On the other hand down-scaling of residue data below the LOQ would result in even lower residues. For these cases the Meeting agreed that, as a conservative approach, the LOQ may also be used in the scaled dataset for an assessment.

Example 3: Application rate < GAP rate, residue below the LOQ

	kg ai/ha	Commodities	Scaling factor	Pesticide A residue (mg/kg)
Trial	0.045	Gin trash		< 0.01
Scaled residue according to GAP	0.07		No scaling possible	Do not use value

Example 4: Application rate > GAP rate, residue below the LOQ

	kg ai/ha	Commodities	Scaling factor	Pesticide A residue (mg/kg)
Trial	0.225	Gin trash		< 0.01
Scaled residue according to GAP	0.07		No scaling factor used	< 0.01

Reporting of scaled residues within the JMPR evaluation

The application of scaling is part of a part of the assessment process and should be reported in the appraisal. It is therefore proposed to separate the scaling into up to three steps, which include the reporting of the unadjusted data, the application of scaling factors and finally the combination of data generated with different application rates. For a better understanding one simple example (requiring only 2 steps) from the 2010 JMPR Report for chlorantraniliprole and an artificial consideration are presented below:

Example 1

Chlorantraniliprole field trials on alfalfa were made available to the Meeting from the USA (GAP: 73 g ai/ha, 1 application/cutting, PHI of 0 days and a maximum application per season of 224 g ai/ha).

Chlorantraniliprole residues on alfalfa forage treated at 1.5× the maximum rate were 2.0, 2.1, 3.0, 3.0, 3.2, 3.7, 4.1, 4.6, 4.8, 5.2, 5.3, 5.4, 5.7, 5.7, 5.7, 5.9, 5.9, 6.2, 6.2, 6.3, 6.7, 6.8, 6.9, 6.9, 7.5, 7.6, 7.6, 7.8, 8.3, 11 mg/kg (fresh weight basis). When corrected for reported moisture contents the residues were 9.5, 9.7, 11, 13, 14, 16, 19, 19, 20, 23, 23, 23, 24, 24, 25, 26, 26, 27, 29, 29, 30, 30, 31, 32, 33, 34, 34, 36, 42, 43 mg/kg (dry weight basis).

The residues scaled to the same application rate as GAP were calculated by dividing by 1.5 and are (n = 30): 6.3, 6.5, 7.3, 8.7, 9.3, 10.7, 12.7, 12.7, 13.3, 15.3, 15.3, 15.3, 16, 16, 16.7, 17.3, 17.3, 18, 19.3, 19.3, 20, 20, 20.7, 21.3, 22, 22.7, 22.7, 24, 28, 28.7 mg/kg. Using the data scaled for application rate, the Meeting estimated an STMR value for chlorantraniliprole in alfalfa forage of 17 mg/kg (dry weight basis).

Example 2

Pesticide A is registered on green beans with one spray application of 0.073 kg ai/ha with a PHI of 0 days.

Supervised field trials conducted at different application rates are available resulting in the following residues in green beans after a PHI of 0 days:

Application rate 0.03 kg ai/ha: < 0.01, < 0.01, 0.05, 0.07, 0.08 mg/kg

Application rate 0.06 kg ai/ha: 0.02, 0.03, 0.09, 0.15 mg/kg

Application rate 0.12 kg ai/ha: < 0.01, 0.11, 0.19, 0.19 and 0.2 mg/kg

Additional supervised trial data were available on green beans treated at rates of 0.02 kg ai/ha, which would require scaling higher than the maximum factor of 3 for up-scaling to comply with GAP.

Scaled residues of Pesticide A in green beans after a PHI of 0 days were:

Application rate 0.03 kg ai/ha scaled to GAP (scaling factor: 0.073 kg ai/ha / 0.03 kg ai/ha = 2.4): 0.12, 0.17, 0.19 mg/kg

Application rate 0.06 kg ai/ha (± 25% GAP, no scaling required): 0.02, 0.03, 0.09, 0.15 mg/kg

Application rate 0.12 kg ai/ha scaled to GAP (scaling factor: 0.073 kg ai/ha / 0.12 kg ai/ha = 0.61): < 0.01, 0.067, 0.12, 0.12, 0.12 mg/kg

The Meeting concluded that scaled residues in green beans treated at different application rates are not significantly different and may be combined for a recommendation. The combined scaled residues of Pesticide A in green beans were: < 0.01, 0.02, 0.03, 0.067, 0.09, 0.12(4), 0.15, 0.17 and 0.19 mg/kg.

The Meeting estimated a maximum residue level, and STMR and an HR for Pesticide A based on scaled residue data on green beans of 0.3, 0.12 and 0.19 mg/kg, respectively.

2.9 FURTHER CONSIDERATION OF EXPERT JUDGEMENT IN EVALUATING RESIDUE TRIALS

The Meeting considered the use of expert judgment in evaluating supervised residue trials at the 2009 Meeting and provided an item describing in general terms how this occurs. A paper has recently been published that contains information that may be of use in informing expert judgment (MacLachlan and Hamilton 2010[16]). The authors have assembled a database of residues on crops receiving a single foliar spray application normalized to an application rate of one kg ai/ha (or one kg ai/hL for spray concentrations). The approach is similar to that used for many years in the estimation of residues on vegetation used in initial tiers of environmental risk assessment (Hoerger and Kenaga 1972[17]; Fletcher *et a*l. 1994[18]; Pfleeger *et al*. 1996[19]). It is assumed that provided the interval between application and measurement is short, the measured residues provide a good measure of the volume of spray intercepted by the part of the plant that is of interest when normalized for application rate.

It is anticipated that the crop specific information on residues at day of application can be used in two ways to assist the work of the JMPR:

- to derive expected median and highest residues on the day of a spray application; and
- to predict likely median and high residues following multiple applications at various intervals after the last spray. The latter is only possible for those pesticides for which the decline of

[16] Maclachlan DJ and Hamilton D. 2010. A new tool for the evaluation of crop residue trial data (day zero-plus decline), Food Additives & Contaminants: Part A, 27:347 — 364

[17] Hoerger FD, Kenaga EE. 1972. Pesticide residues on plants, correlation of representative data as a basis for estimation of their magnitude in the environment. Environ Qual. 1:9–28.

[18] Fletcher JS, Nellessen JE, Pfleeger TG. 1994. Literature review and evaluation of the EPA food-chain (Kenaga) nomogram, an instrument for estimating pesticide residues on plants. Environ Toxicol Chem. 13:1383–1391

[19] Pfleeger TG, Fong A, Hayes R, Ratsch H, Wickliff C. 1996. Field evaluation of the EPA (Kenaga) nomogram, a method for estimating wildlife exposure to pesticide residues on plants. Environ Toxicol Chem. 15:535–543

residues in supervised trials follow simple first order kinetics and for which information is available on DT_{50} values.

The likely median and high residues can be compared with results from actual supervised residue trials and estimates provided by statistical calculators to support recommendations for maximum residue levels.

It was generally felt the tool might be suitable for use in 20% of cases. The day 0 residue database only applies to foliar application of pesticides.

The paper provides details of how the information may be used.

At the present Meeting the approach was as an adjunct to other considerations and statistical calculations in estimating maximum residue levels used in the evaluation of chlorantraniliprole residues in oranges and cabbages.

2.10 USE OF THE OECD FEED TABLE

The OECD feed table from the OECD Overview Guidance[20] is currently used by JMPR to calculate the dietary burdens for the purpose of interpreting the results of feeding studies. The latest available version of the OECD feed table is included in the 2009 FAO Manual, Second Edition (Appendix IX) and is available on the web[21].

The consumption information from the OECD feed table is combined with estimates of residues on the feed items (STMR or HR values, as appropriate) to arrive at estimates of the total dietary burden of beef cattle, dairy cattle, broilers, and laying poultry for the pesticide under consideration. These values are then compared to the results of feeding studies to arrive at estimates of the levels of pesticides in milk, eggs, meat, fat, and edible offal. Results for cattle and poultry will be extrapolated to all relevant livestock. The detailed procedure is described in the 2009 FAO manual.

The JMPR procedure maximizes livestock dietary-intake burdens of the pesticide by taking into account the feed items from different Codex classes, e.g., forage, grain and byproducts, and emphasizes the use of diverse feed items with maximum pesticide residues. This calculation is performed for every region for which information on livestock burden is available, the intention being to arrive at estimates that are inclusive of livestock burdens worldwide.

The 2009 JMPR decided that some modification to the OECD feed table would be needed for the version placed in the FAO Manual. The OECD had grouped feed items into four broad categories: forages; roots and tubers; cereal grains/crop seeds; byproducts of processing. The category “forages” as used by OECD includes virtually all plant commodities other than grains and roots and tubers (forage, fodder, silage, hay, straw, leaves and tops, and grasses), and thus encompasses a much wider selection of commodities than the Codex definition.

The 2009 JMPR modified the OECD feed table to denote the Codex Commodity Code for each feed item listed in the OECD table and if such a code was not available the Codex Group Code (Appendix IX, 2009 FAO manual, Second Edition). This is important because in performing the calculation of livestock dietary burden, the total burden for the group is considered as well as the burden coming from each individual commodity. For example, if residues occurred in clover, alfalfa fodder, and bean fodder (the group of legume animal feeds), they should be considered in sequence,

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20 OECD Environment, Health and Safety Publications. Guidance Document on overview of residue chemistry studies. Series on Testing and Assessment No. 64 and Series on Pesticides No. 32. Revised February 2009, Environment Directorate, Paris.

21 http://www.fao.org/agriculture/crops/core-themes/theme/pests/pm/jmpr/jmpr-docs/en/

beginning with the calculated highest residue in the dry-weight feed. The detailed procedure is described in the 2009 FAO Manual.

The Meeting of the 2010 JMPR decided that some further modifications in the OECD feed table are needed to avoid situations where commodities with unique codes might be treated as separate feed items. The 2010 JMPR replaced the Codex Commodity Codes allocated to the OECD feed items in 2009 by the more general Codex Group Codes and corrected some of the Codex Group Codes allocated by the 2009 JMPR. The Codex Group Code allocation is only for the benefit of dietary burden calculations conducted by JMPR. The allocation of Codex Group Codes to OECD feed items does not have any impact on the existing Codex Classification System, nor does it have an impact on the OECD feed table.

The OECD feed table "FORAGES" group corresponds to the Codex Group numbers 050, 051 and 052 (see the table below) for forage and fodder crops. The individual commodities in the OECD feed table were assigned to Codex Group Codes AL, AF/AS, AM/AV as appropriate. For the purpose of dietary burden calculation the AF and AS (forage/straw) and AM and AV (fodder/forage) were taken as one group. Commodities having a different Codex Group Code like VB (head cabbages) or VL (rape greens) were reallocated as AM/AV.

The OECD feed table "ROOTS & TUBERS" group corresponds to the Codex Group number 016 (see the table below). The individual commodities in the OECD feed table were given the Codex Group Code VR as appropriate.

The OECD feed table "CEREAL GRAINS/CROPS SEEDS" corresponds to the Codex Group numbers 015 and 020 (see table) for pulses and cereal grains. The Meeting of the 2010 JMPR decided that oilseeds (Codex number 023), should also be allocated to this group. The individual commodities in the OECD feed table were given the Codex Group Code VD, GC and SO as appropriate.

The OECD feed table "BYPRODUCTS" group corresponds to the Codex Group numbers 058, 059, 065, 069 and 071 (see table) for processing by-products. The individual commodities in the OECD feed table were assigned to Codex Group Codes AB, CM/CF, DM, or SM as appropriate. For the purpose of dietary burden calculation the CM and CF (cereal milling fractions) were taken as one group.

The Meeting decided that sweet corn cannery waste better fitted with the forages group, while the alfalfa meal better fitted in the byproducts group.

For dietary burden calculations there are 11 groups to consider: AB, AF/AS, AL, AM/AV, CM/CF, DM, GC, SM, SO, VD, VR. A revised version of the OECD feed table is to be made available on the web. The 2010 JMPR already used the revised allocation groups in the calculation of livestock dietary burden.

OECD	Codex Group No	Codex Group name	Codex Group Code
Forages	050	Legume animal feeds	AL
	051	Straw, fodder and forage of cereal grains and grasses (including buckwheat fodder)	AF (forage) AS (straws and fodder, dry)
	052	Miscellaneous Fodder and Forage crops	AV (forage) AM (fodder)
Roots & Tubers	016	Root and tuber vegetables	VR
Cereal Grains/ Crop Seeds	015	Pulses	VD
	020	Cereal Grains	GC
	023	Oilseed	SO
Byproducts	058	Milled cereal products (early milling stages)	CM
	065	Cereal grain milling fractions	CF
	059	Miscellaneous secondary food commodities of plant origin	SM

OECD	Codex Group No	Codex Group name	Codex Group Code
	069	Miscellaneous derived edible products of plant origin	DM
	071	By-products, used for animal feeding purposes, derived from fruit and vegetable processing	AB

2.11 TRAINING OF SCIENTISTS FROM DEVELOPING COUNTRIES FOR THE ESTABLISHMENT OF PESTICIDE MAXIMUM RESIDUE LEVELS IN FOODS AND ASSESSMENT OF THE RISK FROM DIETARY INTAKE OF RESIDUES

The need for training in the evaluation of pesticide residues has become apparent in recent years as procedures have become more complex and the interest in the operations of JMPR and the Codex Committee on Pesticide Residues have increased.

FAO has received requests for a training manual and the FAO Secretary of the JMPR initiated a project to produce a JMPR Training Manual and for its use in a training course in 2010.

The Training Manual is intended to be suitable for use in training workshops and also for self-guided study. The FAO/WHO Training Manual on Pesticide Specifications, first issued in 2008, was also an inspiration to produce a training manual on pesticide residues.

The main objectives of the training programme are:

- To train scientists to become potential members for the FAO Panel of Experts. Participants will be trained in the process of evaluation of residue data for estimation of maximum residue levels and estimation of dietary exposure.
- To respond to the requests of developing countries to play a greater role in establishing Good Agricultural Practices (GAP) and health-based pesticide criteria for their own countries which are more reflective of local diets.
- To augment the experience of developing countries in the working procedures of the JMPR and thereby increase their effective participation in the international forums which regulate pesticide residues in international trade.

The contents of the Training Manual reflect the sections of a typical residue evaluation, including pesticide identity and properties, metabolism, supervised residue trials, food processing and consumer exposure to residues.

The Training Manual chapters:

- specify the purpose of the particular step in the evaluation process;
- make reference to the relevant chapters and sections of the FAO Manual;
- explain the process with practical examples illustrating the usual procedure and give examples for ‘difficult’ cases which require special consideration;
- Case studies are designed for exercises by the participants of training programmes under the guidance of the trainers.

The Training Manual will be published on the FAO web site after practical experience in the first training course.