Report on the Regional Training Workshop on Development of Pesticide Residue Monitoring Programme in Asian Countries

21-22 July 2015 **Beijing, P. R. China**

Report
on the
Regional Training Workshop on Development of Pesticide Residue Monitoring Programme in Asian Countries

21-22 July 2015

Beijing, P. R. China

Food and Agriculture Organization of the United Nations

Regional Office for Asia and the Pacific

Beijing, 2015

For any information on this publication, please write to:

Shashi Sareen
Senior Food Safety & Nutrition Officer
FAO Regional Office for Asia and the Pacific
Maliwan Mansion, 39 Phra Atit Road, Bangkok 10200
Thailand
Tel: (662) 6974143
Fax: (662) 6974445
E-mail: Shashi.Sareen@fao.org

FOREWORD

Agro-products, especially fresh agro-products, are an important food source and export product in many Asian countries. During the last few decades, food safety has become an issue of great concern. It encompasses a wide range of risks and challenges that occur at different points of the food chain from the production to the consumption of food. Pesticide residues, direct or indirect, have emerged as a major food safety issue and are posing threats to both human health and ecosystems. In the region, countries have been intensifying their efforts to control pesticide residues and improve food safety. However, many countries find it difficult to meet today's food safety standards because of insufficient research and lack of effective pesticide residue monitoring systems. The economic losses from trade rejection caused by high pesticide residues are considerable – for farmers, industry, governments and the people in the affected countries.

Many Asian countries have developed food safety regulations, some of which are linked to pesticide residue issues. But enforcement remains generally weak and pesticide residue monitoring plans have been evolving too slowly. Many countries are now realizing that the monitoring of pesticide residues is critical for effective food safety management. Increasingly, Asian countries have been requesting FAO's support in developing residue monitoring plans.

Reducing the risks of hazards from pesticide residues requires not only adequate expertise, but also systems and institutions to develop those policies, and to regulate, enforce and monitor them. South-South Cooperation offers the potential to facilitate sharing and adaptation of tested policies, systems and institutional arrangements to bridge the knowledge gap. As part of FAO's endeavour to strengthen the capacity of member countries to develop and implement pesticide residue monitoring, a regional training workshop was organized in Beijing, China from 21 to 22 July 2015 titled "Development of Pesticide Residue Monitoring Programme in Asian Countries".

This report summarizes the outcome of the training workshop based on the elements of the monitoring programme learned in the technical lecture sessions – including the technical lectures, the group exercises and the discussions.

I take this opportunity to convey FAO's appreciation to all resource persons and participants for their contribution to this important training programme. I hope that the report, which highlights the discussions held during the training and the experiences shared by the participating countries of the region, will be useful to governments in strengthening pesticide residue monitoring and food safety management in their countries.

Kundhavi Kadiresan
Assistant Director-General and
Regional Representative for Asia and the Pacific
Food and Agriculture Organization of the United Nations

CONTENTS

ABBREVIATIONS

1	ADI	Acceptable Daily Intake
2	ARfD	Acute Reference Dose
3	CAAS	Chinese Academy of Agricultural Sciences
4	CBMDD	China benchmark dose for Dichotomous Response
10	CCA	county-level competent authority
5	CCPR	the Codex Committee on Pesticide Residues
6	CFDA	China Food and Drug Administration
7	CFSA	China National Center for Food Safety Risk Assessment
8	cGAP	Critical GAP
9	CRM	Certified reference material
11	CXLs	Codex Maximum Residue Limits
12	EFSA	European Food Safety Authority
13	FAO	Food and Agriculture Organization of the United Nations
14	FAO RAP	FAO Regional Office for Asia and the Pacific
15	FQPA	Food Quality Protection Act
16	GAP	Good Agriculture Practice
17	GC	Gas chromatography
18	GCMS	Gas Chromatography–Mass Spectrometry
19	GC-MS (SIM)	Chromatography -Mass Spectrometer (Selected ion Monitor)
20	GC-MS/MS (MSM)	Gas Chromatography -Mass Spectrometer(multi-reaction monitoring)
21	GEMS	Global Environment Monitoring System
22	GMOs	Genetically modified organisms
23	GMP	Good manufacturing practice
24	GVP	Good Veterinary Practice
25	HACCP	Hazard Analysis and Critical Control Points
26	ICAMA	Institute for the Control of Agrochemicals, MOA
27	IESTI	International Estimated Short-term Intake
28	IGOs	Intergovernmental organizations
29	IQSTAP	Institute of Quality Standard and Testing Technology for Agro-products
30	JMPR	Joint FAO/WHO Meeting on Pesticide Residues
31	LC	Liquid chromatography
32	LCL	Lowest calibration level
33	LCMS	Liquid chromatography–mass spectrometry
34	LOD	Limit of detection
35	LOQ	Limit of quantitation
36	MCA	Municipal competent authority
37	MOA	Ministry of Agriculture
38	MRLs	Maximum Residue Limits
39	MRM	Multiple reaction monitoring
40	NGOs	Non-governmental Organizations
41	NHFPC	National Health and Family Planning Commission
42	NPRM	National Pesticide Residue Monitoring

43	NRM	National residue monitoring
44	NRP	National Residue Programme
45	PCA	Provincial competent authority
46	POPs	Persistent Organic Pollutants
47	PRM	Pesticide residue monitoring
48	QC	Quality control
49	QuEChERS	The QuEChERS method is a streamlined approach that makes it easier and less expensive for analytical chemists to examine pesticide residues in food. The name is a portmanteau word formed from "Quick, Easy, Cheap, Effective, Rugged, and Safe".
50	RASFF	The Rapid Alert System for Food and Feed
51	RM	Routine monitoring
52	SAS	Statistics Analysis System
53	SOP	Standard Operating Procedure
54	SPS	Sanitary and Phytosanitary
55	SPSS	Statistical Product and Service Solutions
56	TBT	Technical Barriers to Trade
57	UNEP	The United Nations Environment Programme
58	WHO	World Health Organiztion
59	WTO	World Trade Organization

EXECUTIVE SUMMARY

Within the context of South-South Cooperation on food safety, the regional training workshop on development of pesticide residue monitoring programme in Asia countries was organized jointly by Food Safety and Quality Unit of the Headquarters and FAO Regional Office for Asia and the Pacific (FAORAP) in collaboration with the Institute of Quality Standard and Testing Technology for Agro-products (IQSTAP) of Chinese Academy of Agricultural Sciences (CAAS), Beijing, China during 21-22 July, 2015. More than 30 persons covering management and technical levels attended including 18 participants from 9 Asian countries, Chinese experts related to the field of pesticide residues, and officials from FAO headquarters and RAP.

The training workshop consisted of five sessions including understanding international standards and guideline related to pesticide residue monitoring (PRM), country information sharing by countries on PRM, PRM programme from design to implementation, data application on PRM programmes and food safety management, and group work and discussion. The faculty for the training was drawn from academics and professionals with long standing experience in the field, CAAS and Ministry of Agriculture (MOA) of China.

The opening session commenced with the Opening remarks delivered by Ms Shashi Sareen, Senior Food Safety and Nutrition Officer, FAO Regional Office for Asia and the Pacific and Welcome remarks given by Mr. Zhongjun ZHANG on behalf of the FAO Representative in China and remarks given by Dr. Yongzhong QIAN on behalf of the Institute of Quality Standard and Testing Technology for Agro-Products, CAAS.

This was followed by technical interactive sessions consisting of key conceptual and factual lectures followed by group exercises enabling the participants to acquire new or advanced knowledge, and practical skills on the principles of pesticide residue monitoring programmes. How to design and implement a pesticide residue monitoring programme was discussed at the end of the workshop, allowing the participants to reflect on the knowledge accumulated throughout the workshop, apply new skills and report/exchange key lessons-learned.

Overall the training workshop was successful. 94 percent of participants evaluated the quality of the workshop very good/excellent. Most of participants thought the training workshop was useful and relevant to their need. The participants increased their awareness and basic knowledge on pesticide residue monitoring programmes, and also developed the basic capability on pesticide residue monitoring programme design and implementation to promote pesticide residue monitoring and control through the training.

1. INTRODUCTION

One of priorities of Asian countries' agricultural policies is increasing productivity. The use of pesticide together with other technologies can have significant impact on pest control. During the past decade, the use of pesticides is increasing in Asian region. The intensive and often poor control in use of pesticides in the agriculture sector has led to increasing food safety problems. This has resulted in greater attention being given to chemical residues in food.

Agro-products, especially fresh agro-products, are an important food and export goods for many Asian countries. It is often reported that overuse of pesticides is causing pollution and food safety problems. In addition, due to insufficient research backup and lack of regular and effective pesticide residues monitoring systems, many Asian developing countries find it difficult to meet the current market requirement of food safety. The economic losses of trade rejection caused by high pesticide residues are considerable to farmers, industry, governments and the populations of the affected countries.

In the Asian region, although many countries have included pesticide residues in their food safety regulations, the enforcement generally remains weak, and pesticide residue monitoring plans have been developed in few countries and that too only in relation to export sector. Countries have however been realizing that pesticide residue monitoring is an important issue for food safety management. The necessity to strengthen pesticide residue monitoring is becoming more apparent and many countries have been asking for support to develop residue monitoring plans.

An effective food safety management and reducing the risk of hazards from pesticide residues requires not only adequate skills but also systems and institutions to develop policies, regulate, enforce and monitor, namely the governance aspects. South-South Cooperation has the potential to facilitate the sharing and adaptation of tested policies, systems, institutional arrangements and bridge the required knowledge gap. As part of FAO's endeavour in strengthening capacity to develop and implement pesticide residue monitoring programmes in member countries, the regional training workshop on "Development of Pesticide Residue Monitoring Programme in Asian Countries" was organized on 21-22 July 2015.

The main objectives of the regional training workshop were to provide participants with:

- increased awareness and knowledge on pesticide residue monitoring programmes;
- develop capabilities on pesticide residue monitoring programme design and implementation to both promote pesticide residue monitoring and control in countries and enable its institutionalization.

The training workshop was organized jointly by Food Safety and Quality Unit of the Headquarters and FAO Regional Office for Asia and the Pacific (FAORAP) in collaboration with the Institute of Quality Standard and Testing Technology for Agro-products of Chinese Academy of Agricultural Sciences. The development of the course content was supported by the resource persons and consisted of lectures followed by exercises for the participants. The training workshop was an intensive, highly-interactive two day activity consisting of theoretical lectures and hands-on exercises on pesticide residue monitoring programmes. The training workshop agenda is given in **Annex 1**.

A total of 18 participants from 9 countries of Asia including Bhutan, Pakistan, Mongolia, Maldives, Cambodia, Nepal, Lao PDR, Myanmar, Bangladesh had attended the training workshop. They were from the management and technical levels.

The resource persons were academics and professionals with expertise and experience in monitoring programmes. The list of participants, resource persons and support persons is given in **Annex 2**.

The participants exercised how to design a PRM programme on the basis of a guidance document provided by the IQSTAP. In the context of Prioritization in a PRM Programme, an exercise using IESTI (International Estimated Short-Term Intake) method and UK veterinary drug residues risk ranking method was introduced. Three groups were organised and using the knowledge assimilated throughout the workshop, they designed their own pesticide residue monitoring programmes. The presentations by each group were followed by lively discussions and exchange of ideas and sharing of experiences by the participants and resource persons. The details of the group work are given in **Annex 6-8**.

2. MAIN PROCEEDINGS

2.1 Opening Session

Ms Shashi Sareen, Senior Food Safety and Nutrition Officer, FAO Regional Office for Asia and the Pacific, Bangkok (FAORAP) delivered the Opening remarks on behalf of FAO RAP. She extended a hearty welcome to Dr. Yongzhong Qian, Director of IQSTAP, the participants from nine countries of Asia and the resource persons to the training programme.

Ms Shashi observed that food safety has gained increasing importance over the years because of its significance both for health and the economy. The production of safe food is essential for protecting consumers from the risks of foodborne illnesses and is important both in the domestic food business and in increasing competitiveness in export markets. The primary production stage is the first point of the food chain where hazards may be introduced in the food, for example, pesticides residue at high levels. She brought out the need of addressing food safety right from production at farm level, which is specially relevant to the pesticide residue problem. She highlighted that this regional training on designing and implementing pesticide residue monitoring programme capacity in food safety, though a most important part of monitoring programmes was not well addressed in countries and FAO had been receiving requests for support on this and accordingly this programme was being organized.

Ms Shashi also mentioned that FAO has been focussing on food safety at the international level as well as regional level in areas relating to setting international standards as well as responding to the needs of individual countries and supporting them in strengthening capacities to develop and implement food control activities including standards and their implementation.

Ms Shashi concluded by wishing participants a successful training which would help them to increase their awareness and knowledge on pesticide residue monitoring programmes and develop capability on pesticide residue monitoring programme design and implementation to promote pesticide residue monitoring and control as well as its institutionalization. The full text of her speech is given at **Annex 3**.

Mr. Zhongjun ZHANG, Assistant FAO Reprensentative (Programme) in China observed that food safety has become an issue of great concern over the last few decades across the word, including in Asian countries as well as in China. Mr. Zhongjun Zhang also mentioned that the adverse consequences of pesticide residues have been and are posing significant threats both to the health of human and to the ecosystems. He highlighted that developing and enforcing a routine pesticide residue monitoring programme is one of the effective means to control pesticide residue in the context of the food chain. The full text of his speech is given at **Annex 4**.

Dr. Yongzhong Qian on behalf of the Institute of Quality Standard and Testing Technology for Agro-Products, Chinese Academy of Agricultural Sciences in his remarks noted that China is a huge country in terms of agricultural production and agro-products consumption. Chinese government has been attaching great importance to agro-product quality and safety control and put in significant efforts to establish such a control system and assure its effectiveness and efficiency, as this effort directly relates to public health, social stability and economic development. Pesticide residue monitoring is one of the major measures that play a critical role in this control system. He observed that IQSTAP which is dedicated to agro-product quality and safety control research at national level, has always been devoting its full efforts and resource in research and development of such endeavors as PRM for both domestic food supply as well as for exports. He hoped to work and collaborate more closely with global partners under the framework sponsored by FAO to mutually guarantee a more sustainable and safer agro-food supply. The full text of his speech is given at **Annex 5**.

2.2 Technical sessions

The technical sessions were spread over two days and consisted of lecture sessions, group work and discussion. Highlights of the lectures are given below and the power point presentations in the same order are given in **Annex 11**.

Session 1 Lecture 1a)

Ms Shashi Sareen – "Developing and improving food safety and pesticide monitoring (PRM) programme: FAO regional perspective"

Ms Shashi Sareen, Senior Food Safety and Nutrition Officer, FAO RAP, Bangkok in her lecture said that in today's era globalization, there is increasing transboundary movement and trade of food across countries, both imports and exports. The potential and probability of spread of different types of food contamination is high with the continuously increasing global food supply chain and transboundary movement of foods. This is posing an increasing challenge for government who have the mandate for ensuring health and safety of its citizen, and improving food safety management based on risk analysis. FAO has an important leadership role in advancing the food safety agenda in the region- including the concept of risk analysis.

There have been several cases of food contamination either of indigenous produce or of imported items. The major aspects of contamination are presence of residues of pesticides and/or contaminants, pathogens and spoilage microorganisms; zoonotic diseases; technology issues like nanotech, GMOs; physical contaminants; persistent organic pollutants like dioxins; food allergens; issues like mislabeling, incorrect claims and fraud.

As one of the important food safety issues, pesticide residue links to many issues. High pesticide residues affect consumer health and market access. It also increases food looses andwastes resulting in decreased food availability, lower stability and utilization. Further, high pesticide residues impact consumer confidence and national reputation negatively, and also have economic implications both public health and others.

Ms Sareen added that pesticide residue requirements (MRLs) are increasingly important in trade. Maximum Residue Levels (MRLs) are the upper legal levels of a concentration for pesticide residues in or on food or feed based on Good Agriculture Practices (GAPs) and which ensure the lowest possible consumer exposure, i.e. toxicological acceptability. The rules and disciplines for imposing standards/ measures by countries, including MRLs for pesticides, are laid down in Non-tariff Agreements – World Trade Organization (WTO) Sanitary and Phytosanitary Measures (SPS) and Technical Barriers to Trade (TBT) Agreements.

The issue of pesticide residue monitoring is also receiving critical attention in Asian countries. Agro-products, especially fresh agro-products, are an important food and export goods for many Asian countries. Ms Sareen presented the figures that showed the increasing trend of the yield and production of vegetable/fruits in Asia during 1994-2013. However, she highlighted that the intensive and often insufficient-controlled use of pesticides in the agriculture sector leads to increasing food safety problems. It is often reported that overuse of pesticides is causing food safety problems as well as environmental pollution. Due to insufficient research backup and lack of regular and effective pesticide residues monitoring system, many Asian developing countries find it difficult to meet the today's market requirements on food safety. The economic losses of trade rejection caused by high pesticide residues are considerable to farmers, industry, governments and the populations of the affected countries. Obviously, monitoring and controlling pesticide residue in food is an important step for food safety management.

PRM, as explained by Ms Sareen, can provide useful information to assess the safety to consumers of treated food, detect residues due to improper use of pesticides, and protect the credibility of exporters with their customers.

In certain Asian countries, regular pesticide residue monitoring programmes are being implemented. For example, Korea, Thailand and China have implemented pesticide residue monitoring programmes since many years. However, some countries are still implementing it on a random basis or only for exports and this area has been developing very slowly. In many countries, although the regulatory schemes are systematic, there are gaps between the policies and implementation in practice. The governments are concerned about pesticide residues in the food and the environment, but human and infrastructure facilities to conduct the necessary monitoring programs are not available. The relevant work is currently implemented in very limited aspects since there is a lack of technical staff and equipment. Further, some countries have no pesticide residue monitoring programmes, and some have not yet even established legal limits for residues. Many countries now have gradually been realizing that pesticide residue monitoring is an important issue for food safety management, and have been asking for support to develop residue monitoring plans.

In her talk, Ms Sareen informed that food safety approaches had been undergoing developments and some important concepts to be noted included:

- Food chain approach – hazards may arise at different stages of the food supply which required to be addressed at each and every stage;
- Preventative risk-based approach, which is followed rather than a reactive one based on sampling & testing (GAP, GMP, HACCP);
- Sound national food control and regulatory systems are essential which focus of standards as well as their implementation;
- Roles and responsibilities for food safety where the primary role for ensuring food safety of products lies with the food business operator – however, all actors in the food chain namely- farmer or producer, processor, handlers, government, consumer have their specific roles also.

Ms Sareen also introduced FAO's regional food safety and quality programmes briefly and mentioned that around 15-20 projects/programmes on food safety and quality at bot national and regional levels are implemented at a point of time. The programmes generally cover food safety policies and legislation; SPS/standards and norms/Codex; enforcement/surveillance activities;

certifications/accreditation; trainings/awareness/education etc. In addition, she presented some specific regional and country projects related to food safety and pesticide residue monitoring in Asia.

Ms Sareen highlighted the challenges in pesticide residue issues in Asia as the following:

- Lack of suitable infrastructure, e.g. pesticide residue test labs being insufficient/inappropriate;
- Lack of systematic monitoring system/programmes;
- Lack of data on monitoring and surveillance and poor data sharing;
- Links between primary products and processing products in the food chain being weak;
- Food safety being a cross cutting area requires strong coordination between Ministries/ Departments and stakeholders;
- Increasing concerns related to food and risks associated with the pesticide residues – new hazards are constantly emerging;
- Training at various levels including administration, technical and producers needs to be strengthened;
- Awareness at different levels including government, research institutions, farmers needs to be strengthened.

In addition, Ms Sareen shared with participants some regional publications on food safety and important websites on which many of the publications could be found.

Session 1 Lecture 1b)

Ms Yongzhen Yang – "Importance of developing and improving national food safety and pesticide residue monitoring"

Ms Yongzhen Yang, Agricultural Officer, Pesticide Risk Reduction Team, FAO presented her report from three aspects: need for national pesticide residue monitoring (why?), key points in development and implementation of national pesticide residue monitoring (what?), practice /model of National pesticide residue monitoring (how?).

First of all, Ms Yang explained the need for national pesticide residue monitoring. She said that global fruit and vegetable production and trade has significantly increased. For example, fruit and vegetables have been consistently increased in the net exporter position of many countries. At the same time, global market volume for pesticides was estimated to reach 3.4 million tons by 2020 from 2.3 million tons in 2014, with a volume growth of 6.2 percent between 2015 and 2020. Asia-Pacific region is expected to emerge as the fastest growing market with a volume CAGR of 7.9 percent in 2015-2020.

Ms Yang added that more trade impeding effects are observed in the case of direct MRLs than for other types of measures of standards. She also introduced FAO activities related to pesticide management, such as International Code of Conduct on the Pesticide Management developed along with WHO and UNEP, Pesticide residue standards (MRLs) with WHO, etc.

She highlighted that residue monitoring is an effective method to manage the risk of chemical residues and environment contaminants, and it can help to build up and strengthen consumer's confidence in food safety and facilitate access to domestic and international markets. In addition, residue monitoring can assist government identify potential residue problems including failure to comply with good agricultural practices, and indicate where follow-up action is needed to prevent or solve the problems (maintain reputation as a supplier of clean produce). Moreover, it can also support a country's agriculture production and the food industry.

She brought out that defined residue monitoring aims to provide an estimate of the occurrence of residues in products (using systems based on sampling and statistical probability) and confirm (or otherwise) that residues in products meet the requirements.

Key points in development and implementation of national residue monitoring (NRM) include:

- Essential support (government support, cooperation and collaboration of different agencies, funding availability, qualified and accredited laboratories, experienced experts/staff, legal basis, report/publication mechanism);
- Technical requirements (comprehensive monitoring programmes, identifying target pesticides by considering authorized use, availability of analysis method (multi-residue method), identifying target crops (commodities), sampling and standard operation practices;

Annual reports are an important aspect and need to include results of compliance and violation; analysis of the results of the controls on pesticide residues provided in the country; statement of the possible reasons why the MRLs were exceeded, together with any appropriate observations regarding risk management options; and analysis of chronic and acute risks to the health of consumers from pesticide residues;

In her talk, Ms Yang introduced the U.S.A pesticide residue monitoring programme including National Residue Program (NRP), California Pesticide Residue Monitoring Program, EFSA- EU-coordinated monitoring Programme and Australia residue monitoring programme wherein she covered the purpose and background of each programme.

She concluded by highlighting that National Pesticide Residue Monitoring (NPRM) is an effective measure to improve food safety and very important to consumer health and to economical development. At the same time, it is a challenge and an opportunity for developing countries. Implementation of NPRM requires strong support in terms of regulations, institutions, finances, facilities, methods and expertise.

Session 1 Lecture 2

Dr Xiongwu Qiao – "Agro-product Safety Management: Role of PRM and Codex's requirement"

Dr. Xiongwu Qiao, Chairman of the Codex Committee on Pesticide Residues, the vice president of Shanxi Academy of Agricultural Sciences, P.R. China in his presentation highlighted that Codex Alimentarius Commission is an intergovernmental organization to find a consensus on the Codex Alimentarius, aimed to protect the health of consumers, and ensure fair international trade in food. It is represented by 99 percent of world population and has multiple partners characteristic (namely contact points, ministries, Codex Secretariat, FAO, WHO, NGOs, etc.) in a common project to develop and maintain a collection of international food standards, the Codex Alimentarius.

Dr. Qiao introduced that Codex Alimentarius Commission contains 186 member countries/ organization and 224 observers (NGOs, IGOs and UN). It has a Secretariat, an Executive Committee and 6 Regional Co-ordinating Committees. He pointed out that China is responsible for the pesticide residues committee, which has great significance for control of food production and reduce the risks to human health.

He introduced that Codex Committee on Pesticide Residues (CCPR) is the subordinate technical committee of CAC, and its main responsibility is to develop international standards on pesticide maximum residue limits in food and feed.

In his talk, he explained the flowchart of Codex MRL development. Based on the data of pesticide chemistry, toxicology, bioactivity, residue chemistry and environment impact, a pesticide is registered by the National Authorities. Then JMPR evaluation is performed in various ways including toxicology, monitoring data for special products and pesticides combination, and dietary patterns and exposure assessments. Finally, the Codex Maximum Residue Limits (CXLs) are formulated through the 8-step Codex Procedure.

Following the 8-steps procedure, Codex MRLs (CXLs) are adopted as international standards on pesticide residues in food or feed. The MRLs are first cleared by CCPR before adoption by CAC.Two basic principles are followed for approving Codex MRLs. Firstly sound scientific analysis and evidence are needed in order to ensure the quality of the standards. For establishment of Codex maximum residue limit, CCPR uses the risk assessment mechanism conducted by Joint Meeting on Pesticide Residues (JMPR), as FAO/WHO scientific advice. The CXLs are decisions based on good agricultural practice (GAP), while at the same time considering the pesticide toxicity and exposure (dietary intake) with a possibly accurate uncertainty. Secondly, as a subsidiary committee of CAC, CCPR tries making every effort to reach agreement on the adoption or amendment of standards by consensus.

So far, CCPR has had many achievements. About 3700 CXLs have been finished for around 250 pesticides.The risk analysis policy has been developed, including risk analysis principles applied by CCPR. Periodic review of the Codex CXLs are being done and prioritization of CCPR work as well. In addition, other related documents have been developed, such as Codex classification of foods and animal feeds, guidance on performance criteria for methods of analysis for the determination of pesticide residues. However, a lot of work is still needed to improve CXLs. Further, CCPR recommendations of CXLs from 2006 to 2015 were enumerated.

Dr Qiao briefly summarized the involvement of MRLs in Agro-product safety management, such as monitoring of products for risk assessment, surveillance on compliance with GAP, and safety quality inspection in food trade.

Dr. Qiao further highlighted the challenges to CCPR, such as speed and quantity of CXLs needed. There are approximately 1000 active ingredients of pesticides registered worldwide. Codex has elaborated 3700 CXLs, and these obviously cannot meet the demand of international trade in food, especially for developing countries.

The second challenge is that scientific assessment needs data support. The CXL recommendation is based on residue data from GAP and Dietary exposure for risk assessment. But the data supplied is often limited. Some key aspects on this included GAP, critical GAP, Data set size, GEMS/Food consumption cluster diets, long and short term dietary exposure assessment, MRL estimation & uncertainty, commodity grouping, etc.

Another challenge is difficulties to reach a consensus. As an intergovernmental forum, CCPR makes decision on a consensus basis. But there is no absolute unanimity. This is reasonably reflecting the differing interest of parties of CCPR. Some key aspects related to data sharing, level of protection (industrialized/developing, import/export countries), prioritization, national policy of pesticide use, etc.

Dr Qiao also discussed several expectations of the members and observers of CCPR. The first is expanding the residue data volume. Residue data set must be sufficiently large for getting an acceptable estimation of real residues in foods. For these reasons, submission of different residue trials data from members is appreciated. At least, integration of national trials data gained during pesticide registration into the dossier submitted by the sponsor for MRL recommendation are encouraged. JMPR could use these data through the extrapolation and proportionality principles on a case by case basis for accurate estimation of recommended MRLs.

The second expectation is refining the dietary consumption data. Food consumption cluster diets for dietary exposure assessment are based on international statistics. There are only 17 dietary consumption groups, for example, Cluster C09 for Bangladesh, Cambodia, China, DPRK, Guinea Bissau, Indonesia, Laos, Myanmar, Nepal, Philippines, Sierra Leone, Thailand, Timor Leste and Viet Nam. There is a false assumption that the 15 countries are cooking using one recipe. Large portion data are needed for short term dietary exposure assessment. There is now only data submitted from few countries. Therefore, the representativeness could be questioned.

The third expectation is establishment of national food safety standard system with risk analysis principles and capacity building. FAO, WHO and some members need to do more to help especially developing country members, to establish their own food safety system, pesticide registration and marketing system. This will build up common basis for MRL harmonization and appropriate levels of protection.

The last one is adoption of CXLs as national MRLs. Adopting CXLs as national food safety standard may be the best way for harmonization of MRLs. But there are always constraints such as limited amount of CXLs which do not cater to the country situation, differentiated GAP and dietary consumption pattern, which reduce the common acceptability of CXLs.

Session 2 Lecture 3

Dr. Yongzhong Qian – "Risk Monitoring Program for Agro-Product in China"

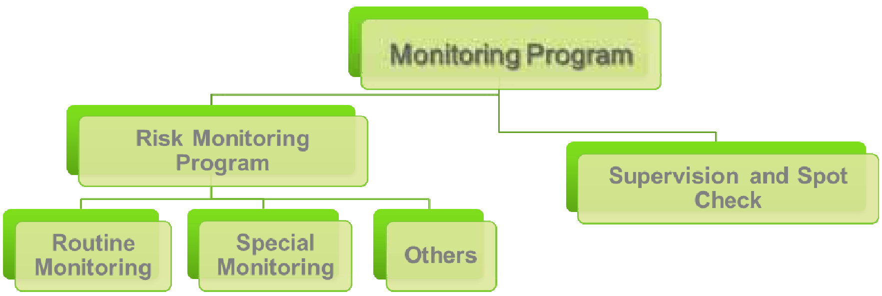
Dr. Yongzhong Qian, Institute of Quality Standard and Testing Technology for Agro-products, CAAS introduced Chinese risk monitoring programme for agro-product to the participants. He said that management of food safety in China is based on Food safety law (2015 Revised Edition) and Law on Quality and Safety of Agricultural Products (2006) which are concurrent and connected.

Based on Article 14 of the Food Safety Law, China establishes the food safety risk surveillance system, which monitors food-borne diseases, food contamination and other food-related hazards. Article 63 of theRegulation on the implementation of the food safety law, specifies that the edible farm product quality and safety risk monitoring and risk assessment shall be conducted by the agriculture administration of the people's government at or above the county level in accordance with the Law of the People's Republic of China on Quality and Safety of Agricultural Products. Under the Law on Quality and Safety of Agricultural Products, Article 34 state that the State shall establish a system for monitoring the quality and safety of agricultural products. The administrative departments for agriculture under the people's governments at or above the county level shall, in compliance with the requirements for ensuring the quality and safety of agricultural products, draw up plans for monitoring the quality and safety of agricultural products and organize implementation of the plans, and conduct regular supervision and make spot checks of the agricultural products under production or on the market.

Dr Qian further explained that the State Council was reformed and functional transformed in March 2013. It was decided to set up the National Health and Family Planning Commission (NHFPC) through merging the existing Ministry of Health with the National Population and Family Planning Commission; to elevate the status of the State Administration of Food and Drug to a general administration in order to improve food and drug safety. From then on, responsibilities for risk monitoring for food safety in China are with CFDA while risk assessment is with NHFPC and CFSA. For agro-product safety, responsibilities for both risk assessment and risk management are with MOA. Looking at the food industry chain, the administrative departments for agriculture are incharge of planting, raising, harvesting, pesticides and veterinary medicine; meanwhile the Food and Drug Administration is incharge of transportation, processing and selling.

Dr. Qian highlighted that there are three basic problems in agro-products: illegal adulteration with poisonous and harmful substances; residues of the pesticides and veterinary drugs; and pollution of producing surroundings. For this reason China developed monitoring programs for agro-product safety.

According to Regulations on Monitoring Program for Agro-product Safety (2012-10-01), there are two levels of monitoring programs: the MOA level and the administrative departments for agriculture above the county level. The aims of agro-product safety monitoring are to get an overall level of the agro-product safety situation; to assess the risk of agro-products; to test, analyse and evaluate the hazards persistently and systematically. The classification table of agro-product safety monitoring programs is shown as follows：



He explained that routine monitoring is the most important and basic work. Its results tell the overall level of the agro-product safety in China. Routine monitoring is done quarterly each year, and covers all the provinces and most cities and most groups of agro-products. It is based on a sound technology systems and getsvalid and objective results. The results of routine monitoring are used to show the status of agro-product safety to the government, provide basis for supervision policy making, provide data and evidence for agro-product risk assessment, and inform the media and public on the agro-product safety situation.

According to the need of special supervision, special monitoring is taken to extend and supplement the routine monitoring. A monitoring plan is made each year, focusing on certain products or areas. Special monitoring covers the species not included in the routine monitoring, like kumquat, royal jelly, swimming crab and so on. Moreover, the testing parameters of special monitoring are more flexible.

The supervision and spot check is taken for administrative enforcement of law, according to the risk monitoring results. It aims at serious problems discovered through supervision. In supervision and spot check, samples will be drawn by local administrations and analyzed by agriculture testing institutions. The test parameters are more targetted. And afer tesing, all the unqualified products should be disposed of timely by law enforcement agencies.

In the presentation, Dr. Qian explained technology support for risk monitoring. There are many kinds of technology requirements for risk monitoring, like unified programming, defined responsibilities, scientific sampling, and standard testing. Thus it is necessary to build testing systems, standards systems, and information systems as technology support. The testing systems in China have a rational layout, clear functions, various specialties, quick response system and efficient operating mechanism. The organization chart is shown as follows:

Dr. Qian explained that the standards system in China mainly contains standards for residue limits, sampling, analysis method, data processing and work procedure. In GB 2763-2014 National food safety standard - Maximum residue limits for pesticides in food, there are 387 pesticides, 10 groups of food, 160 analysis standards, 3650 MRLs for pesticides. The information system is the data base and information platform that is built for data acquisition/processing/analysis/upload both in nation level and province level.

Session 3 Lecture 4

Professor Min Wang – "A framework of routine monitoring program for agro-products by Ministry of Agriculture and its design"

Professor Min Wang, Institute of Quality Standard and Testing Technology for Agro-products, Chinese Academy of Agricultural Sciences introduced the framework of routine monitoring programs for Agro-products by Ministry of Agriculture and its design. Her presentation consisted of three parts: the origin of routine monitoring, the content and the management.

Professor Wang gave a brief introduction to the background wherein she mentioned that the emphasis for agricultural safety had enhanced with development of the economy. Once the food quantity issues were addressed successfully, the government began to shift its attention to quality and safety since 2001. In order to solve the food safety problems such as abuse of high-toxic pesticide and veterinary drug and excessive pesticide residues, the routine monitoring (RM) was started in 2001. During 2001-2002, Beijing, Tianjin, Shanghai and Shenzhen were choosen as pilot cities. Routine monitoring programme was extended to the whole country in 2003.

Professor Wang next introduced the design of a risk managemenprogramme which she indicated should consist of many aspects, such as: place, time, variety and quantity, sampling and testing methods, result analysis, proficiency testing, participants and organizers, results submission and consultation, reports, etc. 150 cities were covered in RM in China. These are the compulsory monitoring cities which include the provincial capital cities, municipalities directly under the central government and municipalities with independent planning status. In addition, two more cities in each province (autonomous region) are selected as monitoring sites for each type of products. The selected cities are not changeable in the year. Most of products are monitored once a quarter. Tea products are monitored in the second and fourth quarter, namely twice in the year. The samples of crop products include vegetables, fresh edible fungus, fruits, tea etc. The sites include vegetable planting base, wholesale market, farmer's market and supermarket. For vegetables and fresh edible fungus: 30 percent samples are taken from the planting base, 40 percent samples from the wholesale market (farmer's market as supplement) and 30 percent samples from the supermarket. For fruits and tea, 60 percent samples are taken from the wholesale and farmer's market and 40 percent samples from the supermarket.

Supervision Bureau for Agricultural Product Quality and Safety, the Ministry of Agriculture is in charge of organization and management. Center for Research Agricultural Products Quality Standard under the same Ministry is responsible for the technical management. Four testing centres of MOA organize the monitoring of different type of products. The other participating departments are chosen from the 277 national and agriculture ministerial level quality and inspection centres based on proficiency test and results of spot checks.

Prof. Wang finally introduced the mechanism of consultation on the result of RM. In order to improve the data evaluation, analysis of situation and information communication of monitoring results, a consultation system for routine monitoring had been established by the Ministry of Agriculture since 2009. The officers from relevant divisions of the Ministry of Agriculture, managers from the provincial Bureau of Agriculture are invited to discuss the results and propose further suggestions for RM.

Session 3 Lecture 5

Dr. Yanyang Xu – "Prioritization in a PRM programme"

Dr. Yanyang Xu, Institute of Quality Standard and Testing Technology for Agro-products, Chinese Academy of Agricultural Sciences presented the subject of prioritization in pesticide residue monitoring Programmes. He explained that the need for doing prioritization in PRM programmes is due tolimited resources and the need for the government to make the best use of these limited resources.

He went on to explain that the risk is decided by the severity and probability of the hazard. The toxicity to human health is a major issue to be considered, namely, the acute or chronic effects in the risk on the reproduction, development, inheritance and cumulative toxicity. Besides the toxicity effect on human health, there are other effects that should be considered, such as hazard effects on environment and toxicity in aquatic environment as well as physical and chemical properties of hazards.

Probability is another important issue. Important factors are the types of population exposed e.g. children and the elderlyshould be given special focus; consumption coverage, for instancemore people consume rice than people consume honey. Other factors that should be considered includedetectable rate and content level over the years, consumption habits (processing factors), approaches and effects of the exposure (exposed frequency, continued exposure duration), food-borne pathogens in terms of transmission, pathopolesis and lethal capacity.

Dr. Xu added that uncertain factors should be considered besides severity and probability. These uncertain factors mainly come from three sources, namely uncertainty of risk assessment, including uncertainty of the methods, uncertainty of modeling, and uncertainty of data; uncertainty of risk management as well as the uncertainty arising from risk communication.

He further explained the three types of risk ranking methods namely qualitative risk ranking, semi-quantitative risk ranking, and quantitative risk ranking. For qualitative risk ranking, he presented an example which was utilized by EU as a decision tree. Based on which the risk can be categorised as high, medium, low. For semi-quantitative risk ranking method, he presented an example of the EU monitoring programme. The monitoring is done at two levels: EU level and Member States level. The scope and parameters under the monitoring programme include types of samples (each year they cover 8-9 kinds of products, including beans, carrots, cucumbers, oranges and citrus); number of samples (12-93 samples of each food with a total of 11,610 samples per year); and types of pesticides which are based on previous monitoring results and RASFF notification options. The calculation for the acute exposure for agro-product is carried out utilizing IESTI (International Estimated Short-Term Intake) method to evaluate the food consumed over the past 24 hours. Clinical data needed to support this method includes daily food consumption (LP) of most people, single weight (U) of products, difference factor (V), highest residue (HR) and body weight (BW). The calculation method of IESTI is proposed by JMPR, and calculation is under 3 scenarios.

Scenario 1

Mixed sample residue data can reflect the residue level of the product consumed in a meal, single weight of the agricultural products is less than 25g. e.g. primary agricultural products (granule crops)

$$IESTI = \frac{LP \cdot HR}{BW}$$

Scenario 2

Mixed sample residue data cannot reflect the residue level of the product consumed in a meal. The eaten product may contain higher residue than the mixed samples and single weigh of food is higher than 25g. Such scenario includes two sub-scenario.

Sub-scenario 2a The edible parts of a single unprocessed food weigh less than the maximum consumption of an individual meal. Such as: peach, plum and other fruits.

$$IESTI = \frac{U \cdot HR \cdot V + (LP - U) \cdot HR}{BW}$$

Sub-scenario 2b The edible parts of a single unprocessed food weighs more than the maximum consumption of the food in an individual meal. Such as: watermelon, celery cabbage, etc.

$$IESTI = \frac{LP \cdot HR \cdot V}{BW}$$

Scenario 3

Unpackaged foods or mixed processed foods, where STMR-P represents the highest possible residue concentration such as fruit juice, milk etc.

$$IESTI = \frac{LP \cdot STMR - P}{BW}$$

The risk ranking for veterinary drug residues in UK was taken as an example. The impact factors were divided into six groups: Drug properties, Toxic effect, Exposure dose 1(determined by the proportion of foods containing the drug accounting for total diet), Exposure dose 2 (determined by the usage frequency of drugs), Exposure dose 3 (determined by whether there is any high exposure population), and amount of residue. An example as malachite green was taken for risk ranking. This methodology that UK use to identify the top 10 risk factors in veterinary residue monitoring has assessed nitrofurans as the top one with total score of 180.

Finally Dr. Xu presented the quantitative risk ranking method. In the quantitative risk ranking the hazard can be described by the name, type, as well as dose-response model and health measurement model. For the exposure part diet exposure types, processing method model can be taken into consideration to make the risk ranking precise.The iRISK system is based on MCA simulation technique which can be used in a single kind of hazard in different foods, as well as various hazards in different kinds of food. For IQSTAP they have also developed their own types of quantitative risk ranking model, for example they developed the method based on excel, as well as China benchmark dose for Dichotomous Response (CBMDD). He aslo highlighted that risk ranking is an inevitable trend globally and is the inevitable trend to ensure the quality and safety of agricultural products control.

Exercise Prioritization in a PRM programme

Professor Jing QIU and Dr. Yanyang XU, in the context of Prioritization in a PRM Programme introduced an exercise using IESTI (International Estimated Short-Term Intake) method and UK veterinary drug residues risk ranking method. 43 different pesticides (including detected value, mean value, MRL, ADI, ARfD, toxicity) were given in this material. The factors in risk ranking were explained and discussed after which results were calculated by participants. The exercise material is given at ***Annex 6.***

Session 3 Lecture 6

Dr. Zeying He – "PRM implementation: sampling techniques"

Dr. Zeying He, Agro-Environmental Quality Supervision and Testing Center, MOA (Tianjin), China presented PRM implementation: sampling techniques. His introduction consisted of four parts: principles of sampling, sampling design, conduct of sampling and sample preparation.

Dr. He explained that sampling in PRM is important as it enables a representative sample to be obtained from a lot for analysis and directly affects the quality of PRM results. According to the purpose of testing, there are different requirement for sampling. For compliance testing, which is for the surveillance of pesticide residues, representativeness of the sample is critical while for forensic testing, which is for the testing of existence of the specific property, timeliness is important.

He covered the fundamental principles of sampling to includerandomnesswhich means that the samples must be taken non-selectively; representativeness indicating that primary samples must consist of sufficient material to provide the laboratory sample(s) required from the lot and the lot can not be represented by a single unit; feasibility indicationg that the sampling procedures, tools, sampling quantity should be practical thereby making the sampling economic and effective; andimpartiality wher sampling should be done under the direction of organization in charge and sampling officers should take the samples in person.

While explaining sampling design, Dr He highlighted that background information should be investigated which includesresidue data, regional intelligence on pesticide use, dietary importance of the food, information on the amount of imported food and domestic food, chemical characteristics and toxicity of the pesticide and production volume/pesticide usage patterns. Based on this information, the commodities and pesticides could be decided.

Dr He also highlighted that sampling design should include: the purpose of the sampling (level monitoring or focused sampling); monitoring site (selection of monitoring site should consider geographic area, planting region, country side/city and population); sampling site (generally in production base, production enterprise, wholesale market, supermarket, farmers market); sampling time (for example in production base to take samples before harvest); sample quantity; sampling procedure setting (the procedures should be specified clearly); and sampling officer to be well trained and designated. He also gave several examples of sampling designs.

In the third part namely conduct of sampling, he highlighted some precautions to be taken such as contamination and deterioration of samples to be prevented, training given to sampling officers, etc. Sampling officer should be authorized by appropriate authorities, should be responsible, should be familiar with all the sampling procedures and consistently adhere to specified sampling procedures. After taking the primary samples and the bulk samples, if the samples are still larger than the requirement of the laboratory sample, this should be divided into several representative portions. A sampling device, quartering, or other appropriate size reduction process may be used, but units of fresh plant products or whole eggs should not be cut or broken. During the packaging procedure, there are several points that should be taken into consideration. Firstly, in order to avoid cross contamination, samples should be packed separately. Secondly, clean and inert containers are essential to protect the samples from contamination, damage and leakage. Finally, the container should be sealed and securely labelled, and the sampling record must be attached to the sample.

Sampling officers need to record the complete informationincluding sample name, sample number, samples status, sample size, sampling date and other needed information. Laboratory samples should not be opened during the transmission once packed. Specialized staff should be in charge of transmission or shipping. Fresh samples should be kept cool. Frozen samples must remain frozen. Receiving laboratories should check the information and status of samples.

The fourth part related to preparation of analytical samples which addressed pre-preparation namely removing debris in the sample and reducing the sample to appropriate size, storing appropriately, etc.

Session 3 Lecture 7

Professor Su Liu – "PRM implementation: testing mothod"

Professor Su Liu, Vegetable Quality Auditing and Inspecting Test Centre of the Agriculture Department (Beijing) presentated on the pesticide residue test technology.

He started his topic with an introduction on Chinese pesticide residue standards wherein he highlighted that the standard for pesticide residue limits GB 2763 covers 387 pesticides and 3650 limit values. He then covered the major steps of pesticide residue testing. He emphasized that environment check containing the temperature and humidity to satisfy test requirements is very important pior to test. This covers environment of the lab, the sample storage, the preliminary processing room and the instrument room should satisfy the temperature and humidity of the environment for testing requirements. Temperature of the preliminary processing room should be controlled to prevent reagents from over evaporation that may impact the accuracy of result. Instrument rooms in heavy humidity regions should be dehumidified. Secondly, reagents and chemicals should be checked before they are applied to avoid any potential interference with the test result. Under normal circumstances, reagents are concentrated 50 to 100 times before applied to test, to check the interference to the objective element.

The next step was preparation of samples for which he explained how to make samples, for grains, oil, brassica vegetables, leafy vegetables, root vegetables, melons, bean vegetables and fruit (solanaceous, citrus, pome, drupe and berries). Mix all lab samples and split in quarters, preliminarily treat samples as follows: for small size items (such as apple, nuts, prawn etc), remove the pedicle, skin, drupe, head, tail, shell etc and take only the edible part. For large size items with even shapes (such as water melon, wax gourd etc), they can be divided into halves or chopped into blocks along the symmetry axis or symmetry face. For samples with uneven shapes (such as fish, vegetables etc), small sections can be taken from different parts, or the whole sample can be chopped into sections. For grain and beans in granular, powder or similar shapes, samples can be split by cone and quartering (dump samples into a cone-press and flat-quarter the dump by two crossing lines-take the diagonal parts).

Professor Liu mentioned that the current methods adopted in pesticide residue testing include: NY/T 761-2008, using gas chromatography and liquid chromatography, which can test 105 pesticides in one time; GB/T 19648-2008, using gas chromatography tandem mass spectrometry, which can test 500 pesticides in one time; GB/T 20769-2006, using liquid-gas chromatography triple quadrupole tandem mass spectrometry, which can test 450 pesticides in one time. The three methods listed above share the same extraction and concentration steps, but have different filtration processes. The most worldwide popular method nowadays is QuEChERS.

Professor Liu introduced the procedure of testing pesticide residue.

- Weigh - Weigh 25.0g sample into a 150ml beaker. Sample should be stirred evenly to prevent sticking on the container.
- Extract - Add 50ml acetonitrile, and extract with a high speed tissue homogenate machine for 2 min. Tissue stirring also known as homogenizing takes advantages of convenience, quick progressing and excellent efficiency. During the extraction process, the extract time, extract process and quality control of each sample should be maintained as similar as possible, to guarantee quality control clearly which reflects the accuracy of the preliminary treatment operation.
- Filter - Mr. Liu gave an introduction about the filtering process and explained how to use a filter paper.
- Salt Out - Shaking frequencies and swings during the salt out need to be in consistency to guarantee parallelism of the samples.
- Concentrate – using either rotary evaporator or air flow and steam concentration device.
- Purify - When pesticides are extracted from organic solutions, the grease, wax, protein, chlorophyll and other pigments, amines, phenols, organic acids, sugars may also be

extracted and its will significantly impact the residual test. Therefore, before the pesticide is trace analysed, any of the above mentioned impurities must be removed.

- Formulate standard reagent
- Test – instruments commonly used include GC, LC, GCMS and LCMS.

He introduced the process of filterering and showed a series of pictures of solid phase leaching flow chart which explained the process more clearly .

As laboratory test personnel may come across many unexpected problems during the practical testing, and sometimes these are caused only by the substrate itself that is to be tested, then the substrate standard solution may address this problem.

Finally, Professor Liu presented an example of the testing result to the participants. It revealed the testing results of different types of pesticides in different kind of vegetables. He also displayed the comparison of graphs by GC-MS (SIM) and GC-MS/MS (MRM). He emphasized that preparing reagent blanks initially is necessary for every experiment, then quality control can be known through standard addition recovery rate or testing the standard substance and the recovery rate should be controlled between 70% and 120%. No matter what kind of testing methods are used, the standard solution should be freshly prepared for use.

Session 3 Lecture 8

Dr. Zeying He – "PRM implementation: quality control"

Dr. Zeying He, Agro-Environmental Quality Supervision and Testing Center, MOA (Tianjin) introduced the concept of quality control (QC) to cover two aspects. Firstly, QC procedures are specific tools that are used to obtain reliable laboratory data based on modern scientific management and statistical methods and second QC guarantees the analytical errors are within the allowed values, and good accuracy and precision are obtained to ensure the intended use of the data. The presentation consisted of four parts: principle of sampling, sampling design, conduct of sampling and sample preparation.

The essence of QC is to guarantee the traceability of testing results and achieving controllability of testing quality. QC in laboratory encompasses "quality management system documentation", "implementing quality policy", "fulfilling quality target", "maintaining quality management system" and constant improvement of these procedures. The aim of QC is to reduce experimental error.

Dr. He explained that errors can be classified into two kinds . One is random error, and second is systematic error. The systematic error will affect the accuracy, and the random error will affect the precision. Good precision does not ensure high accuracy; good precision result in good accuracy only if there is no systematic error. Accuracy is relative, and absolute accuracy does not exist. Errors are controllable, and controllable errors are acceptable. Laboratory technicians should be familiar with all the procedures involved in testing. Testing quality can be improved by effective quality management and control.

He introduced that there are two kinds of QC, one is within lab QC and is also known asin-house QC. The lab staff discovers the random error and new systematic error in testing. The second QC is the inter-lab QC. This is external QC, and the purpose is to discover systematic errors and the comparability between different labs. Comparing with standard laboratory is an effective way of calibration.

For within lab QC, all new analytical methods need to be validated and validation parameters include accuracy, precision, sensitivity, linear range, etc. If detailed procedures which could affect the testing results are missing in the new method, the detailed procedures should be written into Standard Operating Procedure (SOP) as supplement to the standard method. The SOP should include the detailed description of key conditions and procedures and description of method deviation.

He added that international organizations and domestic administrations have specified representative matrices for method validation. Appropriate matrices can be chosen from the table according to the matrix category. Selection of blank matrice is very important, and ideal blank sample should be the same matrix category as the sample to be tested. There should be no target analytes in the blank sample and the constitutions should not interfere with the testing.

Accuracy can be determined by different means - one way is by using certified reference material. Accuracy is evaluated by the use of certified reference material (CRM) subjected to the entire analytical process in replicates. This is commonly used in determination of persistent organic pollutants (POPs) in environmental samples. But for pesticide residue analysis, the CRM are generally unavailable.

There are different spiking level requirement at different conditions. For restricted and banned pesticides, the recommended spiking levels are: LOQ, 2*LOQ, 10*LOQ. For pesticides having MRL, the recommended spiking levels are: 1/2MRL, MRL, 2MRL. For multiresidue analysis, there are different MRLs, under these circumstances, the recommended spiking levels are: 1/2MRL (lowest MRL), MRL (lowest MRL), 2MRL (higest MRL).

Dr He further explained that there are two kinds of precisions. One is repeatability, and internal repeatability can be evaluated by duplicate analysis of parallel spiked samples. The other is reproducibility, which is again of two kinds - reproducibility within a lab in which a method is tested by different persons and at different times and the second is inter lab reproducibility. This is conducted by different person and using different equipment. Specificity is the ability of discriminate between the analyte and other compounds. This means that there must be no interference in the method. Sensitivity is described as LOQ. LOQ should be higher than 10*S/N and this LOQ should be based on matrix standard not solvent standard. LOQs should be validated not just calculated.

On linearity, Dr He explained that calibration is the most commonly used way for quantification. The calibration curve should cover the concentrations including 0.5*MRL, MRL, 2*MRL. Recoveries should be considered at lowest and highest calibration levels. If the residue is high than 20%, other calibration functions should be used such as the 1/x weighed function. Accurate results can be obtained when the response of analyte is close to that of single level standard and satisfactory recovery (<100%) can be obtained at lowest calibration level (LCL).

He added that there are several requirements for a QC sample. The QC sample must be of known composition and the content of analyte. The sample can be used for repeatability and can be used to evaluate accuracy during testing. Control sample is analyzed in an identical manner as a sample and is used to document laboratory performance. For each batch of samples, control samples must be analyzed. Reagent blank, blank sample and at least one of the other four control samples must be used.

For multiresidue analysis, spike all or part of the pesticides, when spiking part of the pesticides, all the pesticides must be spiked during half or one year period. Appropriate sequence arrangement must be made to avoid cross-contamination. Recommended injection order is: reagent blank, blank sample, spiked sample (incurred sample), blank sample (reagent blank) again, real sample, spiked sample (incurred sample).

Session 3 Lecture 9

Dr. Yun Li – "PRM implementation: data analysis and report formulation"

Dr. Yun Li, Insititue of Quality Standards and Testing Technology for Agro-products, CAAS, introduced the PRM data analysis and report formulation. Her presentation focused on three parts: understanding the types of data obtained from the PRM; the purpose of using data aquired from monitoring programs; and how to apply to big data effectively for different goals, and formulate the report.

The types and classification of data is as shown below:

- Residue data, which can provide basic information about samples, such as the crops to which applied and the pesticide residue in it, the registration number of pesticide, the orgin of location, the size of area treated, the certified applicator, the behavior of new or previously untested pesticides, as well as the key parameters relevant with testing, such as LOD, LOQ;
- Dietary data, which can provide basic information about consumption, such as commodities (agro-products and ready-to-eat processed foods), dietary patterns, frequency and consumptions of population (general and sensitive), processing factor, body weight, etc;
- In vivo and in vitro toxicity data, which can provide the basic information about hazard, such as routine toxicological data (acute and sub-acute toxicity, liver toxicity, developmental toxicity, etc);
- Simulated data, which can provide basic information that cannot be obtained from PRM and is simulated by relevant software, such as @ Risk, Crystal Ball, SPSS, SAS, etc. Monitor pesticide residues in fresh products, water, soil etc. throughout the Agro-foods supply.

Dr. Li introduced that the residue data can be obtained from PRM directly and mainly for monitoring the violation of pesticide in certain foods throughout the agro-foods supply chain. Further, the residue data can also be used for assessing the dietary risks, establishing the MRL, and keeping illegal residues out of the marketplace, etc. This data should be combined with the toxicity, dietary and simulated data which can not be obtained from PRM directly.

To demonstrate how to use these data for achieving different purpose and report it's application, Dr. Li Yun cited two examples shown as below.

Pesticide Data Program

The Pesticide Data Program is a national pesticide residue database program in US and mainly for obtaining the residue data. Surveys were conducted on a variety of foods including fresh and processed fruits and vegetables, infant formula, butter, salmon, groundwater, and drinking water. Through cooperation with state agriculture departments and related federal agencies, PDP manages the collection, analysis, data entry, and reporting of pesticide residues on agricultural commodities in the USA food supply. If residues exceed the tolerance levels, the results are reported to FDA and

EPA through monthly reports. In instances where a PDP finding is extraordinary and may pose a health risk by intaking those foods, FDA and EPA are immediately notified. Each year, USDA and EPA work together and with the responsibility to identify foods to be tested on a rotating basis. AMS partners with cooperating state agencies to collect and analyze pesticide residue levels on selected foods. The EPA uses data from PDP to enhance its programs for food safety and help evaluate dietary exposure to pesticides.

Food Quality Protection Act

Food Quality Protection Act (FQPA) is a law of USA and establishes a strong, health-based safety standard for pesticide residues in all foods. In addition to the residues data, the Act requires other data (toxicity data, simulated data, as well as in vitro and in vivo data) to support this purpose. It uses "a reasonable certainty of no harm" as the general safety standard.The target is to reassess and revise health-based standard (about 9,721 tolerances) within 10 years; determine safety factor by applying "10x child safety factor" for protecting sensitive person, where necessary; determine risks of combined pesticides in foods with similar toxicity mechanism.

Finally, Dr. Li stressed that a pesticide monitoring program cannot be used alone for food safety and must be integrated with effective risk management and risk communication. In addition, PRM may not even been able to independently complete risk assessment, because the plans is limited to acquiring data only. However, it is critical to establish a pesticide data program for ensuring food safety.

Session 4 Lecture 10

Associate Professor Qiu Jian – "The monitoring data application of pesticide residue in edible agricultural products"

Associate Professor Qiu Jian, researcher of the secretariat of Food Safety National Standard Pesticide Residue Committee, ICAMA Residue Review Division illustrated how to apply monitoring data to setting-up pesticide residue in edible agricultural products. The purpose of monitoring is to discover the potential risk, and improve the targeted risk management and source control. The monitoring data can provide information to determine regulation scope, emphasis, mode, as well as develop the risk management policy.

The monitoring scope includes pesticide varieties, edible agricultural products and the main producing areas and planting steps of edible agricultural products to be able to trace the sources.

The government has banned 33 varieties and restricts 17 varieties. These are those with acute toxicity, as well as those widely needed for sterilization . The edible agricultural products include fresh-eating agricultural products and those which are consumed in large amounts.

The application of monitoring data includes five aspects. The first one is to provide information for the source monitoring. Clause 49 of the Food Safety Law has stipulated strict implementation of the the stipulations on application safety interval or withdrawal period of the agricultural inputs, and forbids use of the agricultural inputs which are officially prohibited by the country. It also forbids application of toxic and high-toxic pesticides to vegetables, melons and fruits, tea, Chinese herbs, etc. The prohibitive and restrictive highly-toxic pesticides should be sold only in designated area.

The second aspect is on instructions regarding rotating the pesticide. In case of high-frequency detection of pesticide varieties, rotational application information is issued on pesticide usage. It is recommended to use the pesticides with different functional mechanism, and rotate to apply them. The logo on the product tag also shows the functional mechanism of pesticide.

The third aspect is to control measures on adjustment of pesticide residue. Revaluate the high-frequency pesticide varieties exceeding the standard. If it is a controllable risk, it could be considered to optimize the formulation or adjust the GAP in terms of the additive dose, times and the safety interval. If it is the uncontrollable risk, then it should be included in the elimination plan, and recommended to use alternative pesticide varieties.

The fourth aspect is revaluation of MRL: re-evaluate the dietary risk and revise the current MRL. Reevaluation of MRL is done under three conditions: firstly, there is significant change in the approved Good Agriculture Practices (GAP) ; secondly, new potential risks are proved in the toxicological study; thirdly, any intake risks are shown in the monitoring data.

The GB 2763 is the only mandatory standard on pesticide residue in food in China. There are 3650 limited amount indexes for MRL: 387 kinds of pesticide occurring in 284 varieties (kinds) of food, 162 detection method standards and 317 varieties of foodstuff classes.

The fifth and last application is the preparation of MRL in spice/seasonings for which there is no standard residue test data. It is important to provide the detailed planting, production status, as well as sufficient monitoring data so as to establish MRL.

Session 4 Lecture 11

Dr. Zhijun Chen – "Data collection at the national level: based on monitoring model"

Dr. Zhijun Chen, Insititue of Quality Standards and Testing Technology for Agro-products, CAAS, introduced how to collect pesticide residue monitoring data at national level.

He highlighted that pesticide residue monitoring is a key component in the pesticide risk management. In China, there are at least two monitoring programs concerned with Pesticide Residue Monitoring - one is the Ministry of Health's National Food Safety Risk Monitoring Plans and the other is the Risk Monitoring Program for Quality & Safety of Agricultural products by the Ministry of Agriculture.

In the presentation, he introduced the concept - Monitoring Elements, and showed a few common expressions used in monitoring.

- Management Layers. In China, there are four layers of monitoring: MOA (Ministry of agriculture), PCA (Provincial competent authority), MCA (Municipal competent authority) and CCA (County-level competent authority). The monitoring is organized and conducted by corresponding government branches, and for the vast territory of China, the number of governing branches are over 2000.

- Food Category and Encoding - This is a key element in the monitoring and it decides which category each product belongs. In China, the food products are managed by categories, thus the change of food category will influence the monitoring directly. For the monitoring work, food category will also determine how the statistical work is done in the future. In addition, computers are not able to handle words directly, especially when the word is considerably long so every product should be encoded. For promoting the internationalization of local products, giving multiple codes for a single product is being done to meet the different requirements at home and abroad.

- Pesticides Index - This is also a very important element in the monitoring, and it determines the risk spectrum to focus on. Increasing the number of pesticides in the index helps to better manage the risk, but this will also means additional costs of monitoring. An interactive Pesticides Index can be found on the Codex Alimentarius website.

- Maximum Residue Limits - In China, the Maximum Residue Limits is given in GB2763 standard which was issued in 2014 as an update to its previous 2012 version.

- Problems found during the application of the Maximum Residue Limits - Problems such as the Maximum Residue Limits tend to define the limit of some particular category but does not address other products. In this scenario it is required to extend the standard of the Maximum Residue Limits according to the Food Category mentioned above to ensure each product receives adequate attention.

- Monitoring System - China has 270 Ministry level testing centers, 98 risk assessment laboratories and 145 risk monitoring stations for the quality and safety monitoring of agricultural products. Each of these units performs its own functions and has a shared responsibility for the monitoring work including the pesticide residue risk monitoring.

- Monitoring links - In China, the whole procedure from field to table is divided into several steps for management. In addition, the pesticide residue monitoring has many other components including seasons, sampling, testing personnel, testing method, testing standard, etc. They are also called components of Monitoring Elements.

In short, the Monitoring Elements is single manageable components of the divided monitoring work. This dividing improves our understanding and acknowledging of the monitoring work and its nature.

Dr. Chen explained that monitoring model could have three purposes: to manage monitoring elements; to standardize monitoring procedures; and to customize specific monitoring tasks by configuration of monitoring elements. He took the MOA's Routine monitoring of pesticide residue in vegetables as an example to demonstrate the application of this monitoring model.

There are 37 ministerial level quality inspection centers engaged with one of them responsible for the organization. The monitoring work is carried out quarterly, i.e. four times per year. More than 100 cities are randomly selected nationwide for the sampling which involves 147 vegetables and 58 pesticides.

The deployment process of the Monitoring Model has the procedures below:

- Firstly, the management level should be clear - This is a ministry level work.
- Secondly, the testing centers are chosen and the unit responsible for the organization work is determined.
- Then, the products and pesticides to be monitored are determined.
- The next procedure is an important one with many details such as the testing personnel, testing method and sampling cities to be determined;
- Finallythe starting and ending time of the monitoring mission is determined.

The configuration of these Monitoring Elements is done in an information system. Once the tasks mentioned above are completed, the monitoring programs can be launched. The 37 testing center will receive their tasks through the information system.

In recent years, Dr Chen has carried out application practices during the development of the NICAS platform. The NICAS platform is an integrated working platform, and the major function of which can be divided into risk monitoring, risk assessment and risk communication. A mobile terminal has also been designed for the sampling personnel. The terminal can transmit sample information wirelessly and collect the longitude and latitude information of the sample automatically.

Using the big data analysis technology, MOA has been able to conduct multiple analyses of Pesticide Residue Monitoring results, including analyses based on geographic information system and dietary exposure risk. In the era of big data, everything is possible in the field of data analysis.

Session 5 Group work PRM: from Design to Implementation

*Under this Session, countries were asked to establish their organization/country pesticide residue monitoring programmes usingthe knowledge accumulated throughout the workshop, new skills acquired and key lessons-learned. The results of pesticide residue monitoring programme for each group are given at **Annex 8**.*

2.3 Training Evaluation and Feedback

The evaluation proformae were consolidated and presented during the Concluding Session. Overall, the result of the evaluation indicated that 94 percent participants evaluated the quality of the training workshop excellent/very good. 89 percentof participants thought the training workshop to be very useful and relevant to their need. The participants increased awareness and basic knowledge on pesticide residue monitoring programme, and also developed the basic capability on pesticide residue monitoring programme design and implementation to promote pesticide residue monitoring and control through the training.

All participants were satisfied with the workshop materials. And most of participants were satisfied with logistical arrangement. Details of the feedback and suggestions of participants for future programmes are given at **Annex 9**.

2.4 Closing Session

In the Closing Session, Ms Shashi Sareen invited the rapporteur to summarise and present the evaluation. She then invited Dr Qiu on behalf of the resource persons for his comments and observations of the programme. Dr Qiu expressed his congratulations to every participant for the successful accomplishment of this training workshop. Through the two days of well designed programme, the experts from relevant departments in China shared with participants their experiences and knowledge on the pesticide residue monitoring programme (PRM) topic. He hoped each participant had developed a good understanding on PRM, for which he believed would benefit every country in the future. CAAS would continue collaboration with global partners under the framework of FAO. Ms Sareen on behalf of FAO concluded the session. In her concluding remarks, she expressed great appreciation to the participants for their active and lively participation throughout the two days as also their very constructive suggestions, involvement and sharing their experiences. She hoped that the participants had benefitted from the exchanges and would be able to go back to their countries and implement the suggestions discussed. Ms Sareen committed to support further actions to strengthen pesticide residue monitoring programme in countries. She sincerely thanked all resource persons for sharing of experiences which she hoped would benefit participants. She thanked participants for their active involvement, FAO colleagues and IQSTAP for the support extended which contributed to the success of the training. She also thanked the rapporteur for his support. Finally, she added her best wishes to the participants for a safe journey back to their home countries.

2.5 Conclusion and Moving Forward

The regional training was very valuable in that it provided participants with an enhanced understanding of International Standards and Guideline Related to Pesticide Residue Monitoring (PRM) and, awareness and knowledge on pesticide residue monitoring programme. The lectures of the training demonstrated the whole procedure of a PRM programme from design, to implementation and data application. An efficient pesticide residue monitoring programme would be very important and useful for food safety management. A PRM programme would be a strong incentive for farmers to use chemicals wisely. The government and agricultural community could also use the data to examine pesticide practices and facilitate agro-products trade. A sound database would be an important aid in identifying issues and constraints when policies are being formulated to reduce the incorrect and excessive use of pesticides, both in agriculture and in public health programs. The extensive data produced by the PRM would be useful to governments and research agents to assess and policy-making to prevent the public exposure to illegal pesticide and high residue levels.

The working group sessions including risk ranking and PRM design facilitated participant understanding the key points on how to identify the priority and design a PRM plan. The training also helped to identify the capacity needs of countries in this important area based on the discussions.

Some areas for further support as identified during discussion are as below:

i) To consider providing more resources for a longer training programme that could expose participants to more detailed information;

ii) To consider further training projects on specific subtopics, which would be more helpful for participants to understand the technical knowledge step by step;

iii) To consider carrying out pilot projects and basic work based on the components of pesticide residue monitoring programme in specific countries.

- For the countries that have no any PRM, some basic surveys based on the component of PRM, prioritization/risk ranking could be carried out;
- For the countries that have scattered PRM programmes, it could be considered to take measures to revise or improve the existing programmes to improve the PRM plans and enhance the scientificity;
- Based on the proposal of future possible PRM programme in specific fields provided by the participant countries, pilot projects on PRM in some countries could be considered ;
- Further or additional training carried out for example, to consider providing more resources for a longer training programme that could expose participants to more detailed information; to consider the further training projects on specific subtopics,

which would be more useful for participants to understand and the technical knowledge in a step by step manner.

Annex 1

PROGRAMME OF THE TRAINING

Workshop on Development of Pesticide Residue Monitoring Programme in Asian Countries
21-22 July, 2015; Beijing, China

No. 2 Meeting Room, Beijing Friendship Hotel, P. R. China

21 July, 2015 (Day 1)	
Time	**Item**
09:00 – 09:20	Meeting registration
09:20 – 9:50	Opening session **Welcome and introduction** • Opening remarks, Ms Shashi Sareen, Senior Food Safety and Nutrition Officer, FAO Regional office for Asia and the Pacific • Welcome remarks, Mr. Zhongjun ZHANG, Assistant FAO Representative (Programme) in China • Remarks, Director General Yongzhong QIAN, Institute of Quality Standards & Testing Technology for Agro-Products, CAAS • Introduce Participants • **Group Photo**
Session 1	**Understanding International Standards and Guideline Related to Pesticide Residue Monitoring (PRM)**
09:50 – 10:15	Importance of Developing and Improving National Food Safety and Pesticide Monitoring from FAO Perspective Ms. Shashi Sareen, Senior Food Safety and Nutrition Officer, FAO Regional office for Asia and the Pacific Ms. Yongzhen YANG, Agricultural Officer, FAO Plant Production and Protection Division
10:15 – 10:40	Agro-product Safety Management: role of PRM and Codex's requirements Speaker: Dr. Xiongwu QIAO, Chairman of CCPR
10:40 – 10:50	Q & As
10:50 – 11:05	Coffee/tea Break
Session 2	**Country Information on PRM**
11:05 – 11:30	Risk Monitoring Program for Agro-products in China Speaker: Dr. Yongzhong QIAN, Institute of Quality Standard and Testing Technology for Agro-products, CAAS
11:30 – 11:40	Q & As
11:40 – 12:00	Country Information on PRM Participants share information
12:10	Lunch
Session 3	**PRM: from Design to Implementation**
13:45 – 14:30	A Framework of Routine Monitoring Programme for Agro-products by MOA and its Design

	Speaker: Professor Min WANG, Institute of Quality Standard and Testing Technology for Agro-products, CAAS
14:30 – 15:10	Prioritization in a PRM Programme Speaker: Dr. Yanyang XU , Institute of Quality Standard and Testing Technology for Agro-products, CAAS
15:10 – 15:45	**Exercise** Introduction and support from Professor Jing QIU and Dr. Yanyang XU, CAAS
15:45 – 16:00	Short Presentation of Group Work
16:00 – 16:15	Coffee/tea break
16:15 – 16:40	PRM Implementation: Sampling Techniques Speaker: Dr. Zeying HE, Agro-environmental Protection Institute, MOA
16:40 – 17:25	PRM Implementation: Testing Method Speaker: Professor Su LIU, Institute of Vegetables and Flowers, CAAS
17:25 – 17:35	Q & As
18:00	Dinner
22 July, 2015 (Day 2)	
Session 3	**PRM: from Design to Implementation (Cont'd)**
09:00 – 9:25	PRM Implementation: Quality Control Speaker: Dr. Zeying HE, Agro-environmental Protection Institute, MOA
09:25 – 09:50	PRM Implementation: Data Analysis and Report Formulation Speaker: Dr. Yun LI, Institute of Quality Standard and Testing Technology for Agro-products, CAAS
09:50 – 10:05	Q & As
10:05 – 10:20	Coffee/Tea Break
Session 4	**Data Application**
10:20 – 11:00	The Monitoring Data Application of Pesticide Residue in Edible Agricultural Products Speaker: Associate Professor Qiu JIAN, Institute for the Control of Agrochemicals, MOA
11:00 – 11:40	Data Collection at the National Level: based on Monitoring Model Speaker: Dr. Zhijun CHEN, Centre of Standards Research for Agro-Products Quality, MOA
11:40 – 11:55	Q & As
12:00	Lunch
Session 5	**Group Work and Discussion**
13:30 – 14:30	**Group work** Introduction and support from Professor Jing QIU, CAAS
14:30 – 14:50	Short Presentation
14:50 – 15:00	Completion of Evaluation Proforma
15:00 – 15:15	Coffee/tea break
15:15 – 16:00	Panel Discussion
16:00 –16:30	Closing session
18:00	Dinner

Annex 2

LIST OF PARTICIPANTS

BHUTAN

1. Yeshi Lhamo
Regulatory and Quarantine Officer, Bhutan Agriculture and Food Regulatory Authority (BAFRA), Ministry of Agriculture and Forests
Tel: + 97517591979
Email: ylhamo96@gmail.com

2. Dechen Om
Sr. Regulatory and Quarantine Inspector, Bhutan Agriculture and Food Regulatory Authority (BAFRA), Ministry of Agriculture and Forests
Tel: + 97517622227;
Email: dechen222@gmail.com;
dechen2220@hotmail.com

PAKISTAN

3. Riaz uddin
Food Quality and Safety Research Institute (FQSRI), Southern-zone Agriculture Research Center (SARC), Pakistan Agricultural Research Council (PARC), Karachi University Campus Karachi
Tel: + (92) (0332) 2481393
Email : riaz_1969@yahoo.com

4. Zia-ul-Hasan
Principal Scientific Officer, Food Quality and Safety Research Institute (FQSRI), Southern-zone Agriculture Research Center (SARC), Pakistan Agricultural Research Council (PARC), University of Karachi, Karachi,
Tel : + (92) (21) 99261555 / + (92) (21) 99261554-Ext-45/ (92) (321) 3786258
Email : karam_ahad@yahoo.com

MONGOLIA

5. Itgel Tsend
Senior inspector of plant protection and food safety inspection
Tel : + (976)99811739
Email : itgel4200@yahoo.com

6. Enkhbold Batjargal
Inspector of plant quarantine and quality inspection
Tel: + (976)99144828
Email: mhg_sht@yahoo.com

MALDIVES

7. Satheesh Moosa
Senior Scientific Officer, Maldives Food and Drug Authority, Male
Tel: + 7970933
Email: satish@health.gov.mv

8. Aminath Aroosha
Ministry of Fisheries and Agriculture, 7th Floor velaanaage, Ameer-Ahmed Magu, Male, Maldives
Tel : + (960)3329226/009607552495
Fax: + (960)3326558
Email: aminath.aroosha@fishagri.gov.mv

CAMBODIA

9. Lorn Socheata
National Agriculture Lab.
General Directorate of Agriculture
Tel: + (855)12871856
Email: Socheatalorn@yahoo.com

10. Chhin Sovandeth
Deputy Director, Department of Plant Protection and Phyto-sanitary, GDA/MAFF
Tel: + (855)12842936
Email: chhinsovandeth@yahoo.com

NEPAL

11. Suman Dhital
Food Research Officer, Department of Food Technology and Quality Control, Nepal
Tel: +9779842058220
Email: dhital8080@yahoo.com

12. Jit Bahadur Thapa
Plant Protection Officer, Plant Protection Directorate, Nepal
Tel: 9779848429116
Email: jdthapa1962@gmail.com

LAO PDR

13. Sitthiphone Phommasak

Pesticide Quality Control Monitoring Team leader, PPC
Tel: + 8562055675909
Fax: + 85621812764
Email: psitthiphone@yahoo.com

14. Vilosa Thalibouth
Head of Pesticide Quality and Residual Analysis Unit, PPC
Tel : + 8562055729049
Fax: + 85621812164
Email : Vilo_05@yahoo.com

MYANMAR

15. Khin Thida Nyein
Ministry of Agriculture and Irrigation， Plant Protection Division， Myanmar
Tel : + 959791101259/95931255253
Fax: + (067)550226
Email : Khinthidanyein2015@gmail.com

16. Wai Zin Phyu
Ministry of Agriculture and Irrigation， Plant Protection Division， Myanmar
Tel: + 95931255251
Fax: +(067)550226
Email: Waizinphyu2015@gmail.com

BANGLADESH

17. Md. Fakhrul Hassan
Plant Protection Wing, Department of Agricultural Extension, Khamarbari, Dhaka
Tel: + 8801711161400
Email: agrifakhrul@gmail.com

18. Sujit Kumar
Ministry of Fisheries, GoB
Tel: +8801711199014
Email: Sujit_lla29@yahoo.com

RESOURCE PERSONS

19. Mr Xiongwu QIAO
Chairman of CCPR
Tel: +86 13509730320
E-mail: CCPR_QIAO@agri.gov.cn

20. Mr Yongzhong QIAN
Institute of Quality Standard and Testing Technology for Agro-products, CAAS, China
Tel: +8610 82106298
E-mail: qyzcaas@163.com

21. Ms Min WANG
Institute of Quality Standard and Testing Technology for Agro-products, CAAS, China
Tel: +8610 82106546
E-mail: wangmincaas@126.com

22. Mr Su LIU
Institute of Vegetables and Flowers, CAAS, China
Tel: +8610 82109532
E-mail: liusu@caas.cn

23. Mr Zeying HE
Agro-environmental Protection Institute, MOA
Tel: +86 18698103026
E-mail: hezeying222308@163.com

24. Ms Qiu JIAN
Institute for the Control of Agrochemicals, MOA
Tel: +8610 59194253
E-mail: jianqiu@agri.gov.cn

25. Mr Jing QIU
Institute of Quality Standard and Testing Technology for Agro-products, CAAS, China
Tel: +8610 82106551
E-mail: qiuj2008@126.com

26. Ms Yun LI
Institute of Quality Standard and Testing Technology for Agro-products, CAAS, China
Tel: +8610 82106539
E-mail: gz-liyun@126.com

27. Mr Zhijun CHEN
Centre of Standards Research for Agro-Products Quality, MOA
Tel: +8610 82106562
E-mail: zhijunchen@vip.126.com

28. Mr Yanyang XU
Institute of Quality Standard and Testing Technology for Agro-products, CAAS, China
Tel: +8610 82106539
E-mail: xyycaas@163.com

FAO

29. Ms Shashi Sareen
Senior Food Safety and Nutrition Officer
FAO Regional Office for Asia and the Pacific
39 Phra Athit Road, Bangkok, Thailand
Tel: +66 854803991
E-mail: shashi.sareen@fao.org

30. Ms Yongzhen Yang

Agricultural Officer, Pesticide Risk Reduction,
Plant Production and Protection Division, FAO
Tel:+ 390657054246
E-mail: yongzhen.yang@fao.org

31. Mr. Zhongjun ZHANG
Assistant FAO Representative (Programme) in China
FAO China
Tel: +86 10 6532 2835
Email : zhongjun.zhang@fao.org

32. Ms Yamei QI
Food Safety and Quality Unit, FAO
Technology for Agro-products, CAAS
Tel: +39 06570 53308
Email: yamei.qi@fao.org

Annex 3

OPENING REMARKS BY FAORAP

Delivered by
Ms *Shashi Sareen , Senior Food Safety and Nutrition Officer*
FAO Regional office for Asia and the Pacific

Dr. Qian, Director General of IQSTAP, Mr Zhongjun Zhang, Assistant FAO Representative, training workshop participants from various countries of Asia, colleagues, friends, ladies and gentlemen, a pleasant good morning to all of you.

On behalf of the FAO RAP, and on my own behalf, it gives me great pleasure to welcome all of you to Beijing for this Regional Training Workshop on development of pesticide residue monitoring programme in Asian countries. I am extremely pleased that we have participants from 9 countries represented - covering both management and technical level and all working or proposing to be involved in such work in their countries.

I am also delighted that we have so many experts from China who will be presenting on various aspects in this meaningful training workshop. I am very thankful to them for sparing their valuable time.

Food safety has gained increasing importance over the years because of its significance both for health and for the economy. The production of safe food is essential for protecting consumers from the risks of foodborne illnesses and is important both in the domestic food business as well as for increasing competitiveness in export markets. The primary production stage is the first point of the food chain where hazards may be introduced in the food, for example, high pesticides residue levels. It is important therefore to address food safety right from production at farm level, especially for the pesticide residue problem.

Ladies and gentlemen,

There has been significant concern and increased attention on pesticide residues on agro-products specifically in the last few years. Agro-products, especially fresh agro-products, are an important food both for domestic consumption as well as for trade for many Asian countries. It is often reported that overuse of pesticides often causes food safety as well as environmental pollution and worker health and safety problems. In addition, due to insufficient research backup and lack of regular and effective pesticide residues monitoring system, products often do not meet the stringent standards on pesticide residues especially requirements of importing countries. The economic losses due to trade rejection caused by high pesticide residue levels in foods are considerable to farmers, industry, governments and the people of the affected countries.

In Asian region, many countries have laid down requirements for pesticide residues for various foods; however, the implementation of these standards and enforcement generally remains weak – due to either lack of implementation of GAP at primary production level especially in relation to use of chemicals, inadequate test facilities, lack of trained manpower. Pesticide residue monitoring plans are also generally not in place in many countries. Countries have now realized that pesticide residue monitoring plays an important role in food safety management. Many countries have been asking for support to develop residue monitoring plans. It has been recognized that an effective food safety management and reducing the risk of hazards from pesticide residues require not only adequate skills and technologies, such as detecting and analytical techniques, but also governance aspects such as systems and institutions to develop policies, regulate, enforce and monitor.

Obviously, effective monitoring system/programmes will be needed.

Ladies and gentlemen,

In response to requests for training, this programme is being organised under the context of south-south cooperation. This training on development of pesticide residue monitoring programme is a practical one, as it links pesticide residue monitoring with food safety management issues directly.

This training workshop aims to:
(i) increase awareness and knowledge on pesticide residue monitoring programmes;
(ii) develop capability on pesticide residue monitoring programme design and implementation to promote pesticide residue monitoring and control and its institutionalization.

The training workshop consist of several sessions, and it will provide participants an opportunity to understand the international standards on pesticides and pesticide residue monitoring (PRM), the PRM's role for food safety management etc., share/exchange information, and learn about how to design and implement a PRM.

After the training, participants could be able to understand the issues that need to be considered in the design and implementation of pesticide residue monitoring programmes.

We hope that the training workshop will be useful to assist the countries in Asia towards increasing awareness and improving the capacity on development/implementation of pesticide residue monitoring by bringing together governments and research organizations because they are very important for developing/implementing a pesticide residue monitoring programme.

Finally, I wish you all a successful training workshop and exchange of views and hope that this training will conclude with important and useful benefits to you and your countries and we would expect that once you are back in your countries you would be implementing this knowledge to develop or strengthen PRMs in your own countries.

Thank you very much and have a wonderful time!

Annex 4

WELCOME REMARKS BY FAO CHINA

Delivered by
Mr *Zhongjun ZHANG*, Assistant FAO Reprensentative (Programme) in China

Distinguished participants, colleagues, friends, ladies and gentlemen:

Good morning. Welcome you all to the "Workshop on Development of Pesticide Residue Monitoring Programme in Asian Countries". It gives me a great pleasure to address you on the opening session of the workshop, on behalf of FAO, and Mr. Percy Misika, the FAO Representative in China, DPR Korea and Mongolia, who unfortunately could not make it today, but send his cordial congratulations for the timely and successful organization of this important workshop.

Ladies and gentlemen,

As we all known, food safety has become an issue of great concern over the last few decades across the word, including in Asian countries and here in China. It encompasses a wide range of risks and challenges that occur at different points of food chain from the production to the consumption of food, from farmers to customers, and from farm to fork.

Pesticide residues, direct or indirect, represent one of the cases in which food safety risk have emerged as side effects of the intensification of agricultural production. In a boarder context, the adverse consequences of pesticide residues have been and are posing big threats to the health of both human and ecosystems.

Globally and in Asia Pacific region, countries have been intensifying their efforts to control pesticide residue and improve food safety. For instance, China, as one of the largest producers and consumers around the world, has been sparing no efforts in pesticide risk reduction. The initiative on Zero Growth in Fertilizer and Agro-Chemical Use by 2020, as announced by China's Ministry of Agriculture in March this year, mainfests a significant milestone on nationwide pesticide management in the country.

Ladies and gentlemen,

Like food safety, pesticide risk reduction also requires concerted action by actors alongside each and every part of the food chain. Developing and enforcing a routine pesticide residue monitoring programme is one of the effective means to control pesticide residue in the context of the food chain. In is very timely that this workshop is being convened as it is today to provide a timely and well justified platform for exchanging practical information and knowledge about pesticide residue monitoring. It was undoubtedly make a significant contribution to the ongoing dialogues in the Asian countries on improvements and actions needed in the field of pesticide risk reduction.

FAO stands ready, though mainly the Codex Committee on Pesticide Residue (CCPR) and Joint FAO/WHO Meeting on Pesticide Residues (JMPR), to serve as neutral meeting place, to put information within reach, to build up capacities, and to extend the technical know-how to the field on how to effectively and efficiently reduce pesticide risks. FAO would like to join hands with all stakeholders including government conterparts, academia, private sector, civil society, farming communities and the general public, to work together in well managing pesticide use and reducing pesticide risks, for greater food safety, better health, and more sustainable ecosystem and agriculture development.

I wish you all a fruitfull and successful workshop.

Thank you all for your kind attention.

Annex 5

REMARKS BY IQSTAP CAAS

Delivered by
Dr. *Yongzhong QIAN*, Director General, Institute of Quality Standards & Testing Technology for Agro-Products, CAAS

Ms Shashi Sareen, Mr. Zhongjun ZHANG, distinguished guests, ladies and gentlemen:

Good morning! It is my great pleasure to take part in the "Training Workshop on Development of Pesticide Residue Monitoring Program in Selected Asian Countries". First of all, on behalf of the organizer of this workshop, the Institute of Quality Standard and Testing Technology for Agro-Products, Chinese Academy of Agricultural Sciences, I would like to express my sincere congratulations to the successful convocation of this workshop and warmest welcome and greetings to all participants from different countries. Special thanks go to the Food and Agricultural Organization of the United Nations for the trust and support which has laid solid foundation for making this important workshop a successful one.

China is a huge country in terms of agricultural production and agro-products consumption. Chinese government has been attaching great importance to agro-product quality and safety control and spared no efforts to establish such a control system with assuring its effectiveness and efficiency, as this effort directly correlates with public health, social stability and economic development. Pesticide Residue Monitoring (PRM) is one of the major measures that play critical role in this control system. Today, experts in my institute will provide their experiences and considerations on PRM topic from different aspects. Meanwhile, we have invited senior experts working on PRM related topics from other departments in China to share as well. Through their well-prepared presentations and active Q&A sessions, I strongly believe this multi-dimensional brainstorm will present each participant with resourceful information on PRM, which will definitely benefit each member country to further enhance agro-product quality and safety control in the long run.

As the sole institution dedicating in agro-product quality and safety control research at national level, my institute has always been devoting its full efforts and resource in research and development of such endeavors as PRM domestically and internationally. We hope to work and collaborate more closely with our global partners under the framework sponsored by FAO to mutually guarantee a more sustainable and safer agro-food supply.

Finally, I wish you the very success of the training workshop and wish everyone good health and happy life! Thank you!

Annex 6

EXERCISE ON PRIORITIZATION IN A PRM PROGRAMME

1. Background

A total of 310 pear samples were collected at harvest time from eight provinces including Hebei, Liaoning, Xinjiang, Shandong, Henan, Anhui, Shanxiand Jiangsu. Pear production from these provinces accounts for some 70% of the country's total output (NBS 2013). Each sample (10 fruits) was based on collection of the fruit, on a random basis, from five trees in a single orchard. All products were sampled by trained and authorized inspectors from the National Agricultural Products Laboratories for the districts concerned. Sample collections were performed according to national guidelines (SAC 2008a). All samples and subsamples were homogenized using a food processor and put into sealed polyethylene bottles and kept frozen at -20 °C until analysis.

In the analyzed samples, 43 different pesticides were found (Table 1). Insecticides were the main pesticide residue in pears (46.5%), followed by fungicides (37.2%). Acetamiprid, carbendazim and cyhalothrin were the most frequently detected pesticides but concentrations were below the MRLs. However, the distribution of pesticide residues indicated that for most samples (70.0%), residues were at low concentrations of the order of 0.001–0.05 mg/kg.

Table 1 Pesticide residues detected in the pear samples

Category	Pesticide	No. of positive(exceeding) samples	Min – Max (mg/kg)	Mean (mg/kg)	MRL (mg/kg)
Insecticide	Acephate	3	0.0593 – 0.1013	0.0835	0.5
	Acetamiprid	77	0.0010 – 0.1592	0.0193	2
	Bifenthrin	17	0.0022 – 0.1702	0.0533	0.5
	Buprofezin	21	0.0007 – 0.0968	0.0156	0.5[a]
	Chlorbenzuron	14	0.0292– 0.4826	0.1811	3 b
	Chlordimeform	2	0.0011	0.0011	0.01
	Chlorpyrifos	57	0.0202 – 0.9450	0.1278	1
	Cyfluthrin	1(1)	0.1230	0.1230	0.1
	Cyhalothrin	74	0.0015 – 0.1915	0.0359	0.2
	Cypermethrin	40	0.0111 – 0.5164	0.0695	2
	Deltamethrin	3	0.0170– 0.0260	0.0213	0.1
	Dichlorvos	1	0.0880	0.0880	0.2
	Endosulfan	7	0.0015 – 0.0913	0.0264	1
	Fenitrothion	2	0.0362 – 0.1510	0.0936	0.5
	Fenpropathrin	8	0.0030 – 0.0530	0.0172	5
	Fenvalerate	39	0.0020 – 0.9200	0.0333	1
	Imidacloprid	66	0.0058 – 0.1165	0.0224	0.5
	Omethoate	2 (2)	0.0222 – 0.0473	0.0348	0.02
	Phosalone	1	0.1150	0.1150	2
	Profenofos	1 (1)	0.1610	0.1610	0.05
Fungicide	Azoxystrobin	38	0.0011 – 0.3060	0.0152	1[a]
	Carbendazim	191	0.0004 – 0.5766	0.0460	3
	Chlorothalonil	16	0.0030 – 0.0525	0.0427	1
	Difenoconazole	27 (2)	0.0061 – 1.6620	0.1569	0.5
	Dimethomorph	3	0.0003 – 0.0265	0.0092	0.5[c]
	Diniconazole	8	0.0014 – 0.0547	0.0143	0.1
	Fenbuconazole	2	0.0011 – 0.0012	0.0011	0.1
	Flusilazole	35	0.0005 – 0.0442	0.0051	0.2
	Imazalil	2	0.0430 – 0.1010	0.0720	5
	Iprodione	13	0.0035 – 0.0748	0.0362	5
	Myclobutanil	9	0.0034 – 0.0445	0.0127	0.5
	Prochloraz	5	0.0027 – 0.0331	0.0128	2
	Propiconazole	1	0.0020	0.0020	0.1

	Pyrimethanil	5 (1)	0.0011 – 1.9035	0.3935	1
	Tebuconazole	34 (1)	0.0020 – 1.0032	0.0645	0.5
	Thiophanate-methyl	15	0.0316 – 0.2898	0.1088	3
Acaricide	Clofentezine	3	0.0221 – 0.1209	0.0849	0.5
	Dicofol	34	0.0043 – 0.3844	0.0719	1
	Fenpyroximate	21	0.0010 – 0.0072	0.0025	0.3
	Hexythiazox	1	0.3630	0.3630	0.5
	Pyridaben	1	0.0121	0.0121	2
	Spirodiclofen	1	0.0191	0.0191	0.5[a]
Herbicide	Methomyl	10	0.0115 – 0.3036	0.1133	2

In brackets numbers of samples that exceed the MRLs were given.

a: Refer to MRL in citrus temporarily, b: Refer to MRL in cereals and vegetables temporarily, c: Refer to MRL in melons temporarily.

Table 2 ARfD ADI Toxicity

Pesticide	ARfD[a] (mg/kg bw)	ADI (mg/kg)	Toxicity
Acephate	0.1	0.03	Low
Acetamiprid	0.1	0.07	Moderate
Azoxystrobin	/	0.2	Low
Bifenthrin	0.01	0.01	Moderate
Buprofezin	0.5	0.009	Low
Carbendazim	0.1	0.03	Low
Chlorbenzuron	/	1.25	Low
Chlordimeform	/	0.001	Moderate
Chlorothalonil	0.6	0.02	Low
Chlorpyrifos	0.1	0.01	Moderate
Clofentezine	/	0.02	Low
Cyfluthrin	0.04	0.04	Low
Cyhalothrin	0.02	0.02	Moderate
Cypermethrin	0.04	0.02	Moderate
Deltamethrin	1.5	0.01	Moderate
Dichlorvos	0.1	0.004	Moderate
Dicofol	0.2	0.002	Low
Difenoconazole	0.3	0.01	Low
Dimethomorph	0.6	0.2	Moderate
Diniconazole	/	0.005	Low
Endosulfan	0.02	0.006	Moderate
Fenbuconazole	0.2	0.03	Low
Fenitrothion	0.04	0.006	Low
Fenpropathrin	0.03	0.03	Moderate
Fenpyroximate	0.02	0.01	Moderate
Fenvalerate	0.2	0.02	Moderate
Flusilazole	0.02	0.007	Low
Hexythiazox	/	0.03	Low
Imazalil	0.05	0.03	Moderate
Imidacloprid	0.4	0.06	Low
Iprodione	/	0.06	Low
Methomyl	0.02	0.02	Low
Myclobutanil	/	0.03	Low
Omethoate	0.02	0.0003	High
Phosalone	0.3	0.02	Moderate
Prochloraz	0.1	0.01	Low
Profenofos	1	0.03	Moderate
Propiconazole	0.3	0.07	Low
Pyridaben	0.01	0.01	Low
Pyrimethanil	/	0.2	Low
Spirodiclofen	/	0.01	Low
Tebuconazole	0.3	0.03	Low
Thiophanate-methyl	/	0.08	Low

2. Method for risk ranking

Method for risk ranking

The Ranking Method was developed by the Veterinary Residues Committee of the UK. It was referenced and adapted in this paper for classifying risk subgroups of pesticides and pear samples. In the scheme, the prioritization score is a combination of the toxicity score and exposure score. The toxicity score comprises separate scores for A and B, while the exposure score comprises four separate scores for C, D, E and F. The definition and score of categories A–F are given in Table 3. Each pesticide is assessed against specific criteria to arrive at a total score (TS) using equation (1).

$$TS = (A+B) *(C+D+E) *F \qquad (1)$$

A — Toxicity, score of the LD50 value.
B — Potency, score of the ADI value.
C — Score of the pear diet proportion in total.
D — Score of the frequency of dosing with a particular pesticide.
E — Score of the evidence of high exposure groups.
F — Score of the detectable pesticide residue level.

Table 3 Definition and score of A-F indices for risk ranking

Item	Definition	Score	Definition	Score	Definition	Score	Definition	Score
Toxicity	Low	2	Moderate	3	High	4	Hypertoxic	5
Effect(mg/kg)	>0.01	0	>0.0001-0.01	1	>0.000001-0.0001	2	<0.000001	3
Diet proportion (%)	<2.5	0	2.5-20	1	20-50	2	50-100	3
Frequency of dosing (%)	<2.5	0	2.5-20	1	20-50	2	50-100	3
Evidence of high exposure groups	No	0	Unlikely	1	Likely	2	Existing	3
Mean Residue level (mg/kg)	Nd	1	<1MRL	2	≥1MRL-10MRL	3	≥10MRL	4

Nd: No evidence of detectable residues.
pear diet proportion in total is 2.5%-20%;
Frequency of dosing(FOD)= T/P×100; P= 120d, T=3 times;
Evidence of high exposure groups is Existing

Annex 7

GROUP WORK - PRM: FROM DESIGN TO IMPLEMENTATION

Following the steps which listed below to design the pesticide residue programme.

1. Framework of PRM

Monitoring sites; Monitoring time; Monitoring variety, parameter and quantity; Sampling requirement; Testing requirement; Quality Control; Data Analysis and Report Formulation; Data Application to Food Safety Management; Data Collection and Application.

2. Identify the variety of pesticides

Identify target crops (commodities) by considering priority of domestic consumption, priority of export/import, specific risks regarding compliance with food standards and risks for consumer safety.

Identify target pesticides by considering authorized use; Qualitative risk ranking; Semi-quantitative risk ranking; Quantitative risk ranking.

3. Sampling Requirement

Principle of Sampling (Randomness, Representativeness).Background investigation; monitoring site; sampling site; Sampling time; Sample quantity; Sampling procedure setting; Transmission of the laboratory sample.

4. Testing Requirement

Pesticide Residue Limit Standards; Preparation Prior to Test; Make Samples; Extract; Purify; Test.

5. Quality Control

quality management system documentation; Quality Policy; Quality target.Validation of new analytical method(Selection of matrix; Selection of blank matrix; Accuracy; Precision; Specificity; Sensitivity; Linearity).QC during the process of testing.

6. Data Analysis and Report Formulation

Results of compliance and violative;Analysis of the results of the controls on pesticide residues provided in the country;Statement of the possible reasons why the MRLs were exceeded, together with any appropriate observations regarding risk management options;Analysis of chronic and acute risks to the health of consumers from pesticide residues (if possible)

7. PRM Data Application to Food Safety Management

Provide information for the source monitoring; Instruction on rotating to use the pesticide; Control measures on adjustment of pesticide residue; Revaluation of MRL;

8. Data Application and e-System

How to collect data (Food Category and Encoding, Pesticides Index, Maximum Residue Limits, Extended Standard); Monitoring Model.

9. Law and Regulation on the implementation of pesticide residue monitoring programme

Management system on food safety (law, regulation);

Standards system (standards for residue limits, standards for sampling, standards for analysis method, standards for data processing, standards for work procedure); Testing system (Rational layout, Clear functions, Various specialties, Quick responding system, Efficient operating mechanism); Information system (Data Base & Information Platform, Data acquisition/ processing/ analysis/ upload);

Annex 8

RESULTS OF EXERCISE AND GROUP WORK

Exercise

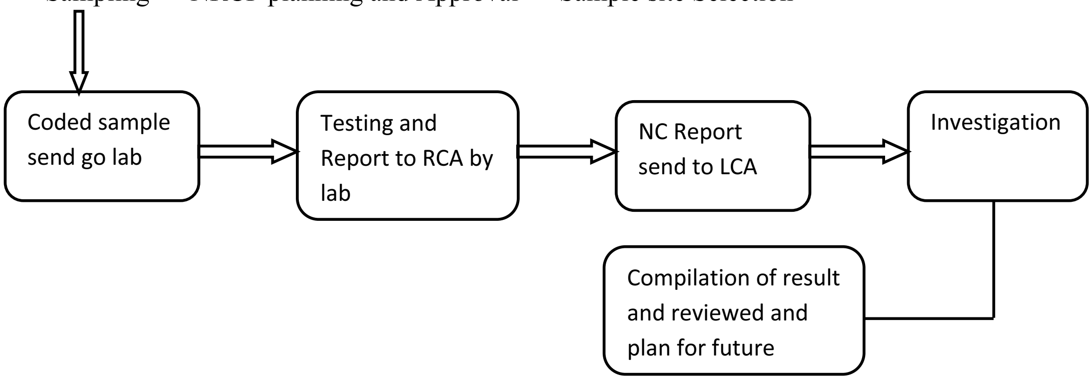
Professor Jing QIU and Dr. Yanyang XU, from Institute of Quality Standard and Testing Technology for Agro-products, CAAS introduced an exercise using UK veterinary drug residues risk ranking method to calculate the total score of the pesticides. Relative information about pesticides (including detected value, mean value, MRL, ADI, ARfD, toxicity) were given in this material. After explaining and discussing factors in this method step by step, most of the participants could give the correct results of the risk score.

Group work

18 participants from 9 Asian countries were divided into three groups, the participants from Bhutan, Pakistan, and Mongolia contain the 1st group, the participants from Maldives, Cambodia and Nepal contain the 2nd group, the participants from Lao PDR, Myanmar and Bangladesh contain the 3rd group.

1ST GROUP: MANAGEMENT OF PRM

Sampling – NRCP planning and Approval – Sample site Selection



- Name of variety: APPLE
- Quantity of pesticide: 5 Endosulfan, Difenconazole, Bifenthrin, Deltamethrin, Dichloros
- Monitoring sites: 100 sites. Eg. supermarket , orchard
- Monitoring times: Last week of Avgost – October .2015
- Sample requirement: 5kg per sampeling site
- Testing requirment: GC- ECD , NPD
- Quality control: Spiked samples will be analysed parallel with real samples
- Data analysis: The data generated will be evalvated statistically and compare the mean valve for each pesticide with respective MRL
- PRM Data application: To Food safety Management / Authority; Recommendation in the light of results

2nd GROUP: Pesticide Residue Monitoring Programme for RICE exported to EU from Cambodia

- Pesticides: Cyperrmethrin Acetamiprid
- Location: Battambang Province

- Sampling plan: Regular Samples from farms ,Regular samples from export consignments
- Testing:
  Quantify – QS per requirement
  Method – EU recognized method
- Quality control
  Lasoratory – accreditation of methods
  Avdits – Documentation and record keeping
- Data Analysis and report formulation :

Sample location	Commodily	no. of samples.	Compliance no.		Compliance %	
			no. of. c.	no. N/C	% C	% NC

- Date application to FSM :
  Based on data ostained revisions can be applied …
  eg: MRLs. GRP…etc
  Elimination plans
- Data Application and e-system
  According to National requirement e-system will be appropriately developed
- Law and Regulation or PRM : Ammendments to laws and regulations
  eg: incorporating provisions to PRM, MRLs, penalties … etc

3rd GROUP: Pesticide residue monitoring programme

- Monitoring site - Chittgong division
  Monitoring time - 2017-1 years plan, (1st Gan - 31st Aoc)
  Monitoring variety - Tomato
  Parameter - Acephate, 3 times
  Sampling - 80
  Requirement
- Target crops - Tomato
  Target pesticide - Acephate
- Sampling principle - Randomness
- Testing requirement - Pesticide residue limit
  Standards, Make sample,
  Extract, Purify, Test
- QC- QC during the process of testing
- Date analysis and Report formulation - Analysis of chronic and acute risks to health of consumers from pesticide residue
- PRM date Application to food safety Management - Control measures on adjustment of pesticide residue
- Date application - Monitoring model
  e-system - monitoring model with developed e-system
- Law and regulation - to be introduced or Ammended existing laws

Annex 9

SUMMARY OF TRAINING EVALUATION

Name: All participants (18) **Country: Consolidated**

1. How do you evaluate the quality of the Workshop in general?		
Excellent	Very good	Adequate
7	10	1

Summary
Quality of the workshop – Excellent 38.9% and Very good 55.6%

94% of participants thought the quality of the workshop was excellent or very good in general.

2. Was the subject of the Workshop useful and relevant to your needs?		
Very useful	Somewhat useful	Not useful
16	2	

Summary
Subject of the workshop – very useful 88.9% and somewhat useful 11.1%

3. Were the presentations useful and relevant?		
Very useful	Somewhat useful	Not useful
9	9	

Summary
Presentations – very useful 50% and somewhat useful 50%

4. Did you find the Group work sessions relevant and useful?		
Very useful	Somewhat useful	Not useful
12	9	

Summary
Group work sessions – very useful 66.7% and somewhat useful 33.3%

5. Were the organizational arrangements up to your requirements?

	Travel arrangement	Workshop material	Food & accommodation	Venue	Social programme
Yes	16	18	16	16	9
No	2	18	2	2	9

Summary
Travel arrangement – satisfied 88.9% and not satisfied 11.1%

Workshop material – satisfied 100%

Food & accommodation – satisfied 88.9% and not satisfied 11.1%

Venue – satisfied 88.9% and not satisfied 11.1%

Social programme – satisfied 50% and not satisfied 50%

6. Which of the following sessions were most useful to you – please rate in order of usefulness from 1-5:

	1 = not useful	**2**	**3**	**4**	**5 = very useful**

1. Understanding international standards and guideline related to pesticide residue monitoring (PRM)			7	7	4
2. Country information sharing on PRM		1	3	7	7
3. PRM programme: from design to Implementation			2	6	10
4. Data application: PRM programme and food safety management	2	1	1	12	2
5. Group work and discussion	1	1	3	7	5

Summary

Understanding international standards and guideline related to pesticide residue monitoring (PRM) – somewhat useful 38.9%; useful 38.9%; and very useful 22.2%

Country information sharing on PRM – somewhat useful 16.7%; useful 38.9%; very useful 38.9%

PRM programme: from design to Implementation – somewhat useful 11.1%; useful 33.3%; very useful 55.6%

Data application: PRM programme and food safety management – somewhat useful 5.6%; useful 66.7%; very useful 11.1%

Group work and discussion – somewhat useful 16.7%; useful 38.9%; very useful 27.8%

7. Do you feel that you will be able to design and implement a PRM for your country?		
Yes	Somewhat	No
8	5	5

Summary

Capability of design and implement a PRM – somewhat 27.8% and yes 44.4%

72.2% of participants knew or knew somewhat how to design and implement a pesticide residue monitoring programme through the training.

8. Please write down the three most important take-home messages from this workshop?

1) International Standards and Guideline Related to Pesticide Residue Monitoring (PRM)
2) Risk Monitoring Program for Agro-products in China
3) PRM Implementation: Quality Control
4) PRM Implementation: Data Analysis and Report Formulation
5) PRM Data Application to Food Safety Management
6) PRM Implementation: Testing Method

9. What specific priority actions you will take upon return to your country? (describe 2-3)

1) Share the information and knowledge on the PRM plan;
2) Set national MRLs;
3) Carry out prioritization/risk ranking;
4) Take measures to convince management to develop a PRM programmes or go about designing a PRM programme;
5) Set about baseline survey to collect relevant data;

10. Any other comments/suggestions for improvements/Any other topics that you would have liked more information on.

1) More time for the training lectures and sharing information will be useful;
2) More trainings on specific subtopics of the workshop will be useful, e.g. how to draft guideline, sampling, quality control of PRM, MRLs setting etc.
3) Field experience or study tour to learn and experience a PRM plan at an established country will be helpful.

Annex 10

FEEDBACK OF QUESTION SHEETS

Question sheet 1 ***challenges and concerns on standard-setting and international standards compliance/harmonization***

1. Is there any standard-based trade obstacles when your country export agro-products? If yes, please identify the main difficulties.

Participant countries except Maldives and Bhutan stated that there is standard-based trade obstacles when they export agro-products.

The main difficulties include:

- the exporting agro-products often can’t meet the importing countries’ phytosanitary and MRLs (pesticides, veterinary drugs, mycotoxin, etc.) requirements;
- lack of testing/analysis capacity;
- lack of accreditated laboratories;
- lack of trained manpower.

2. What challenges would you think your country faces in complying with international standards or guidelines on food safety? (please describe 2-3 items)

- **Technical aspect**: no standards/MRLs; testing methods and technical capacity;
- **Infrastructure aspect:** lack of testing facilities and pesticide residue testing laboratories
- **Capacity/manpower aspect:** implement and compliance with standards, no training manpower, no enough knowledge/awareness on pesticide use, inadequate qualified technical human resources
- **Systematic management aspect:** lack of PRM or relevant guidelines, lack of adoption of GAP etc., lack of certification or accreditation
- **no enough financial resources**

3. What constraints does your country face during developing national standards, e.g. maximum residue limits for pesticides? (please describe 2-3 items)

The participating countries face the constraints during developing national standards as the following:

- Lack of regulations;
- Lack of relevant research, knowledge, and data;
- Lack of laboratories and equipments;
- Lack of trained/skilled human resources;
- Lack of financial support;
- Lack of awareness and cooperation & collaboration of different agencies.

Question sheet 2 Country information on pesticide residue monitoring

1. Is there any regulations that links to pesticide residue monitoring in your country? If yes, please specify the regulations.

Generally, there is lack of regulations that links to pesticide residue monitoring in participating countries. Laos PDR, Pakistan, and Maldives have no regulations linked to PRM. Mongolia and Nepal have relevant regulations but not mention about PRM. In Bangladesh, only the fish and fish production (Inspection and quality control) rules 1997 (amended in 2008) have relevant articles on PRM. The pesticide law in Myanmar links to PRM and is in revision stage.

2. Has your country carried out any pesticide residue monitoring programme or relevant activities in recent 5 years? If yes, please describe the details, e.g. local or national level, products, pesticide, the standards used etc. If no, does your country have any plan for carrying out similar activities in the near future?

Participating countries are generally weak on PRM, and some of them had very limited PRM plans for specific agro-products, specific fields or some areas, e.g. PRM on exportable food commodities and scattered and small scale PRM at federal and provincial level in Pakistan, PRM for pulses and beans in Myanmar, fishery sector for exports in Bangladesh. Cambodia, Mongolia and Maldives don't have any PRM programmes.

3. In your opinion, what are the major bottle-necks to develop and implement a pesticide residue monitoring programme in your country? (please describe 2-3 items)

- Lack of regulations support;
- Lack of relevant research/study and data;
- Lack of infrastructure: insufficient laboratories, shortage of purified chemicals and reagent (analysis grade);
- Lack of coordination among different agencies;
- Weak awareness and lack of knowledge: the importance of PRM, knowledge on proper use of pesticides
- Lack of human resources: technical experts, skilled/trained manpower
- Limited financial support

Question sheet 3 Discussion

1. What requirements, in your view, should be satisfied to develop a pesticide residue monitoring programme in order to harmonize food safety management and facilitate trade?

management requirements:

- developing regulations/rules
- coordination & collaboration among different agencies

technical requirements:

- standards & MRLs setting-up;
- developing guideline on PRM;
- harmonization with international standards;
- analytical method for multi-pesticides residue

infrastructure requirements:

- network for PRM;
- analytical equipments for multi-pesticides residue;
- testing equipments;

manpower requirements:

- training on inspection and sampling;
- competent staff.

2. For developing and implementing a pesticide residue monitoring programme, what recommendations/specific suggestions do you have for your country/participating countries?

- Improvement of regulations/rules;
- Implement GMP, GAP, GVP in respective area;
- Data collection and information exchange;
- Harmonization with international requirements;
- Strengthen infrastructure construction, including testing laboratories;
- Human resource development, e.g. more training;
- Strengthen awareness;
- Find more support, e.g. international project, partner, foreign investors.

3. What, in your opinion, should be taken as the monitoring priorities when you design a national pesticide residue monitoring programme?

- Information on pesticide commonly used and requirements of exporting countries;
- Harmonization in terms of international and regional levels;
- Improve local laboratory capacity;
- Prioritization work (selection of products and pesticides);

- Human resource development and training staff;
- Financial support.

4. What agencies should be involved for participating countries during developing and implementing pesticide residue monitoring programme? (please describe 2-3 items)

Participants thought that Ministry of Agriculture, Food and Drug Authority, Ministry of Health, local governments, institutes and universities should be involved in a PRM programme.

Nepal:

- Department of food technology and quality control (DFTQC)
- Department of agriculture (DOA)
- Department of livestock (DOLs)
- farmers group/producer group etc.

Laos PDR

- Farmer
- Cooperative Association
- Provincial agriculture and forestry office (PAFO)
- Department of Agriculture (DOA)
-Food and Drug Department

Mongolia:

In developing and implementing pesticide residue monitoring programme should be involved related government organizations such as Ministry of Agriculture, Ministry of Environment and Health, Agency of Emergency situation also NGOs.

Bhutan:

- National plant protection centre
- National horticulture division
- National Post-harvest division
- Department of Agriculture
- Bhutan agriculture and food regulatory authority

Myanmar:

- Laboratory of ministry of commerce and health
- laboratory of union of Myanmar federation chamber of commerce of industry
- laboratory of qualified private

Bangladesh:

- Department of Agriculture Extension
- Bangladesh Agriculture Research Institute (BARI)
- Bangladesh Standard and Testing institute (BSTI)

Cambodia:

MAFF, MOC, universities

Maldives:

- Maldives food and drug authority
- Ministry of fisheries and agriculture
- Ministry of Economic Development
- Ministry of Environment and Energy
- Local government authority
- Maldives National University

Pakistan:

- Ministry of National food security and research
- Pakistan agricultural research council
- Four provincial agricultural research departments
- National institute of health

Developing and Improving Food Safety and Pesticide Monitoring (PRM) Programme - FAO Regional Perspective

at

Workshop on Development of Pesticide Residue Monitoring Programme in Asian Countries

Beijing, China (21-22 July 2015)

Ms. Shashi Sareen
Senior Food Safety & Nutrition Officer
FAO Regional Office for the Asia & the Pacific
E-mail: shashi.sareen@fao.org

Contents

Introduction

- Globalization - increasing demand by consumers for variety of foods
- Creation of global market - transboundary movement and trade of food across countries – imports/exports
- Potential for spread of contamination high with increasing challenges & risks to consumer health & safety
- Quality, health, safety, environmental issues, labelling, food fraud incidents acquiring global focus
- Governments mandate to ensure health & safety of populations (ensure safe food supply) – risk-based concept is important – risk analysis
- FAO has an important leadership role in advancing the food safety agenda in the region – including risk concept

A Snapshot of Q & Safety


Koreans Name Food Safety as Biggest Headache
Salmonella Outbreak Exposes Food-Safety Flaws
Source of Tainted Tomatoes May Stay a Mystery

- Residues/contaminants (pesticide residues)
- Pathogens & spoilage micro-organisms
- Zoonotic diseases
- Technology issues – nanotech, GMOs
- Physical contaminants
- Persistent organic pollutants – eg dioxins
- Food allergens
- Labelling & claims – incorrect, BB date
- Fraud

Significant issues related to pesticide residue

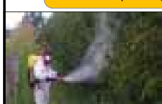
High pesticide residues affect:

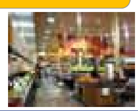
- Food safety and health of consumer - long term health impacts
- Impact market access – national/regional/international
- Increase food losses/wastes (destructions) resulting in decreased food availability, lower stability and utilization
- Have economic implications – both public health and others
- Impact consumer confidence and national reputation negatively

Significant issues related to pesticide residue

- Market access: pesticide residue requirements MRLs) are increasingly important in trade
  - Meet the international standards (Codex) and importing countries requirements for pesticide residue level
  - Rules & disciplines for imposing standards/ measures by countries laid down in Non-tariff Agreements – WTO SPS & TBT

Maximum Residue Levels (MRLs) are the upper legal levels of a concentration for pesticide residues in or on food or feed based on GAPs and to ensure the lowest possible consumer exposure./ toxicological acceptability





SPS *Article 3* Harmonization

- Encourage use of international standards

Food safety & Animal health — *Codex*

Animal health & zoonoses — *OIE*

Plant health — *IPPC*

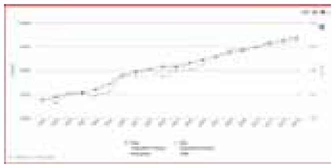
- SPS permits higher standards based on risk assessment

Max limit for pesticide residues – ~3700; covering 250 pesticides

Codex texts, available at Codex homepage : http://www.codexalimentarius.org/standards/en/

Importance of PRM from regional perspective

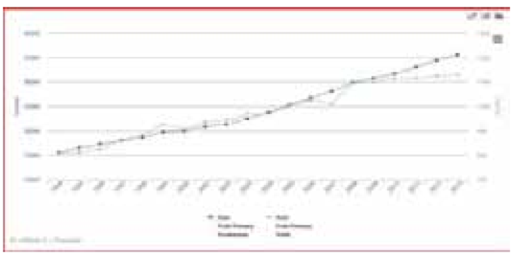
- Agro-products: important food and export products for Asian countries
  - According to FAOSTAT data, the export value of Asian fresh fruits and vegetable was about 6.2%-8.5% of its export value of total agricultural products during 1994-2012.



Source: FAOSTAT

Fig. 1 Production and Yield of Vegetables Primary in Asia during 1994-2013

Importance of PRM from regional perspective



Source: FAOSTAT

Fig. 2 Production and Yield of Fruit Primary in Asia during 1994-2013

Importance of PRM from regional perspective

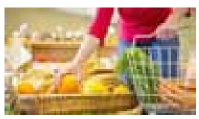
- However,
  - It's often reported that overuse of pesticides is causing pollution and food safety problems – long term health impacts
  - Many exporters in this region find it difficult to meet the market demand on safety.
  - The economic losses of trade rejection caused by high pesticide residues are considerable
  - Increased food losses/wastes (destructions)
  - Impact consumer confidence and national reputation

Monitoring and controlling pesticide residue in food is an important step for food safety management

Importance of PRM from regional perspective

- Role of PRM
  - provide useful information to assess the safety to consumers, and protect the credibility of exporters
  - residue monitoring data can also provide the basis to modify or taking enforcement action for food safety management

Status of PRM programme in Asia



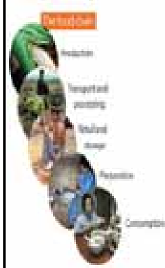
- Many countries have developed food safety regulations, and some are linked to pesticide residue issues;
- Certain countries are implementing PRM – especially for exports, for example, India, Korea, Thailand, China……

Status of PRM programme in Asia

- However, the enforcement generally remains weak, and pesticide residue monitoring plans have been developing very slowly.

- In many countries, the regulatory schemes are systematic. But in practice, there are gaps between the policies and implementation. The lack of facilities and trained analysts does not allow proper monitoring.

FAO's Regional Food safety & Quality Programme - Approaches



- **Food chain approach** – hazards may arise at different stages of the food supply
- **Preventative risk-based approach** is followed rather than a reactive one based on sampling & testing (GAP, GMP, HACCP)
- **Sound national food control & regulatory** systems essential – standards & implementation - **Codex standards –** referenced as baseline in SPS Agreement
- **Roles and responsibilities** for food safety - all actors in the food chain namely- farmer or producer, processor, handlers, government, consumer

FAO's Regional Food safety & Quality Programme

- Around 15 - 20 projects/ programmes on food safety & quality (national/ regional) & tools & GL developed
- Broadly cover:
  - **Food safety policies, legislation,** governance (including coordination mechanisms)
  - **SPS/standards & norms/ Codex** related activities
  - **Enforcement/surveillance**-inspection, testing, FBDS
  - Food safety in various agro food supply chains (including street foods/ retail); linkage to **primary production**
  - Food safety **emergency** management/ recall systems
  - **Certifications** and **accreditation**
  - **Trainings/ awareness/ education**

FAORAP's activities

- Activities related to food safety and pesticide residue Monitoring of FAO in Asia Regional & country **projects**
  - Good Agriculture Practice (GAP) Standards & Certification Scheme (**SAARC**)
  - Support to CB & Implementation of International Food Safety Standards in ASEAN Countries"(**ASEAN**)
  - Promotion of rural development through development of Geographical indications at regional level in Asia (**GMS**)
  - Evidence-based food safety decision making & policy development using multi criteria approaches, with **Thailand** as a pilot country
  - Enhancing Lab Capacity on Food Safety in Primary Production (**Thailand**)
  - Improving food safety & Institutionalization of Food Safety in Bangladesh for safer Food (**Bangladesh**)
  - Enhancing SPS Capacity of Ginger Exports through PPP and Policy assistance for **bio-secure** agro-food supply chain (**Nepal**)
  - Strengthening SPS capacity for trade – improving safety & Q of fresh vegetables through value chain approach (**Vietnam**)

FAORAP's activities

- Activities related to food safety and pesticide residue Monitoring of FAO in Asia – **other activities**
  - Training manual on Implementing ASEANGAP in the fruit and vegetables sector (2014)
  - Regional Consultation on Guidelines for Development of Food Safety Policies for Countries in Asia (Bangkok, 2012)
  - Regional Consultation on Enhancing Inter-ministerial Coordination for Strengthening Food Safety (Bangkok, 2015)
  - Regional Training on Enhancing Risk Communication In Food Safety (Bangkok, 2015)
  - Technical Training on Risk Analysis for SAARC Countries (India, 2013)
  - Technical WS on Chemical Risk Analysis in the Food Chain (Beijing, 2013)
  - Training WS on Food recall and traceability -Application in National food safety control: (Thailand, 2013)
  - Strengthening Capacity in Data Collection and Generation for Food Safety Risk Analysis (Japan, 2013)
  - Guidelines for risk categorization of food & food establishments (ASEAN, Bangladesh)
  - Guidance for Harmonizing Pesticide Regulatory Management in SE Asia (Bangkok, 2012)
  - Implementation, Monitoring and Observance of the International Code of Conduct on the Distribution and Use of Pesticides (Bangkok, 2005)

Important Challenges in Pesticide Residue issues in the Region

Lack of suitable infrastructure – p.r test labs insufficient/ inappropriate

Lack of systematic monitoring system/ programmes

Lack of data on monitoring & surveillance, poor data sharing

Links b/w PP & processing – food chain

Cross cutting area - coordination – whose role

Increasing concerns related to food & risks associated with the p.r – new hazards

Awareness at different levels - government, research institutes, farmers

Training at various levels - administration, technical & producers

Some regional publications on food safety

Workshop reports

Guidance documents

Case studies

Important websites

- FAO Food Safety and quality home page http://www.fao.org/food/food-safety-quality/home-page/en/
- Web page on Vet & Public Health, Feed & Food Safety; www.fao.org/ag/AGAinfo/programmes/en/A6.html
- Emergency prevention & early warning in area of food safety (EMPRES Food Safety): EMPRES-FS@fao.org
- INFOSAN – International food safety authorities network – for dissemmination of important global food safety information – INFOSAN Community Network https://extranet.who.int/infosan/
- *FAO Regional office for Asia and the Pacific http://www.fao.org/asiapacific/rap/home/en/
- *Capacity Building and implementation of international food safety standards in ASEAN countries http://foodsafetyasiapacific.net/
- Food retail network in Asia http://foodretailnetwork.asia

Thank You !

Importance of Developing and Improving National Food Safety and Pesticide Residue Monitoring

Workshop on Development of Pesticide Monitoring Programme in Asian Countries

July 21-22, 2015 Beijing

Yong Zhen Yang
Pesticide Risk Reduction
AGP, FAO

Importance of Developing and Improving National Food Safety and Pesticide Residue Monitoring

Outline of the presentation

- Needs for national pesticide residue monitoring (why)
- key points in development and implantation of national pesticide residue monitoring (What)
- Practice /model of National pesticide residue monitoring (How)

Importance of Developing and Improving National Food Safety and Pesticide Residue Monitoring

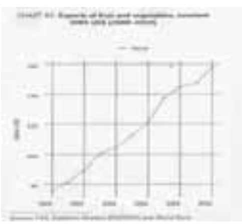
- Global fruit and vegetable production and trade has significantly increased

--Output has been growing at an annual rate of about 3% over the last decade. In 2011, almost 640 million tons of fruit and more than 1 billion tons of vegetables were gathered throughout the world.


Importance of Developing and Improving National Food Safety and Pesticide Residue Monitoring

- Fruit and vegetables have been consistently increased in the net exporter position of many countries. This product aggregate has become the most important in value terms.
- Over the 2000–2010 decade, the fruit and vegetables sector has grown by more than 11 percent per year at the global level


Importance of Developing and Improving National Food Safety and Pesticide Residue Monitoring



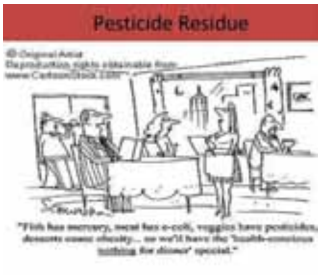
(Source: FAOSTAT ,2015)

(Source: OECD Agricultural Specific Trade Facilitation Indicators ,2015)

Importance of Developing and Improving National Food Safety and Pesticide Residue Monitoring

- Global volume market for pesticides estimated to reach 3.4 million tons by 2020 from 2.3 million tons in 2014, with a volume growth being 6.2% between 2015 and 2020. Asia-Pacific is expected to emerge as the fastest growing market with a volume CAGR of 7.9% in 2015-2020.
- Worldwide consumption of Pesticides in Crop-Based applications is the largest, estimated at 1.9 million tons in 2014. The consumption of pesticides in fruit and vegetable crop applications is about 5.5% (volume) and 6.2% (value) over the 2015-2020


Importance of Developing and Improving National Food Safety and Pesticide Residue Monitoring

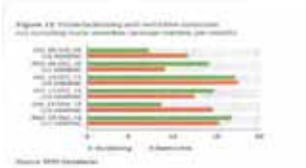


Importance of Developing and Improving National Food Safety and Pesticide Residue Monitoring

More trade impeding effects in the case of direct MRLs than for other types of measures of standards

--increasing of number and stringency of standards more than(60%) of the regular notifications were related to food-related products (food safety)

-- Increasingly comprehensive and stringent food standards in developed country markets amplified the challenges for developing countries on agro-products



Importance of Developing and Improving National Food Safety and Pesticide Residue Monitoring

- **Importance :**

residue monitoring in animal and plant products

- to manage the risk of chemical residues and environment contaminants
- to build up /strengthen consumer's confidence in food safety
- facilitate access to domestic and international market
- assist government identify potential residue problems including failure to comply with good agricultural practices, and can indicate where follow-up action is needed to prevent or solve the problems (maintain reputation as a supplier of clean produce).
- support country's agriculture production and food industry

Importance of Developing and Improving National Food Safety and Pesticide Residue Monitoring

- Residue monitoring aims to:
- provide an estimate of the occurrence of residues in products (using systems based on sampling and statistical probability)
- confirm (or otherwise) that residues in products are below set limits
- alert responsible government authorities and industry if, and when, limits are exceeded, so that corrective action can be taken.

Importance of Developing and Improving National Food Safety and Pesticide Residue Monitoring

key points in development and implantation of national residue monitoring (NRM)

- Essential support

-- government support

-- cooperation and collaboration of different agencies

-- funding available (government budget, levies, contracted direct funding)

-- qualified (accredited) laboratories

-- experienced experts/staff

-- legal basis (relevant regulation; MRLs)

-- report/publication mechanism

Importance of Developing and Improving National Food Safety and Pesticide Residue Monitoring

- Technical requirements

-- comprehensive monitoring programme

-- identify target pesticides by considering authorized use; availability of analysis method (multi-residue method)

- -- identify target crops(commodities) by considering priority of domestic consumption, priority of export/import, specific risks regarding compliance with food standards and risks for consumer safety (e.g. fresh fruit and vegetables)

-- sampling (random or specifically designed sampling protocols

-- standard operation practices (SOPs) for lab analysis

Importance of Developing and Improving National Food Safety and Pesticide Residue Monitoring

Annual Report includes the following information:

- results of compliance and violative
- analysis of the results of the controls on pesticide residues provided in the country ;
- statement of the possible reasons why the MRLs were exceeded, together with any appropriate observations regarding risk management options;
- analysis of chronic and acute risks to the health of consumers from pesticide residues (if possible)

Importance of Developing and Improving National Food Safety and Pesticide Residue Monitoring

- Practice of monitoring (example 1) : U.S.A (started in 1967)

National Residue Program (NRP) - administered by USDA,

Conducted by Food Safety and Inspection Service (FSIS) cooperation and collaboration with several agencies (EPA, DHHS, FDA), Federal budget

NRP is designed to: (1) provide a structured process for identifying and evaluating chemical compounds of concern in food animals; (2) analyze chemical compounds of concern; (3) collect, analyze, and report results; and, (4) identify the need for regulatory follow-up subsequent to the identification of violative levels of chemical residues.

Importance of Developing and Improving National Food Safety and Pesticide Residue Monitoring

Importance of Developing and Improving National Food Safety and Pesticide Residue Monitoring

California Pesticide Residue Monitoring Program

Pesticide Residue Monitoring Program is designed to meet the goals:

- Monitor pesticide residues in **fresh produce** throughout the California food supply.
- Identify specific **fruit and vegetable commodities** that have a higher incidence of illegal pesticide residues.
- Generate sample analysis data requested by DPR's Medical Toxicology Branch to help them assess the dietary risk of certain pesticides.
- Help keep produce with illegal residues out of the marketplace.

In 2013, collected 3,483 samples of more than 155 different fruits and vegetables, from the channels of trade, including wholesale and retail outlets, distribution centers, and farmers markets.

Importance of Developing and Improving National Food Safety and Pesticide Residue Monitoring

- Practice monitoring (example 2): EU (started in 1990)

Responsible authorization: EFSA- EU-coordinated monitoring Programme,

Special process: conduct dietary exposure assessment for the pesticides covered in the monitoring

In 2012, more than 78,390 samples of more than 750 different food products were tested for approximately 800 different pesticides.

Importance of Developing and Improving National Food Safety and Pesticide Residue Monitoring

- Practice monitoring (example 3): Australia (started in early 1960s)

--Residue monitoring is part of an overall strategy of Australian government to minimize chemical residues in agricultural produce.

-- Monitoring can identify potential problems, including inappropriate use of chemicals, and can indicate where follow-up action by state or territory regulators is required.

Importance of Developing and Improving National Food Safety and Pesticide Residue Monitoring

- National Residue Survey (NRS) – an operational unit within the department of agriculture, funded by Australia's primary industries through levies or through contracted direct funding (industry-funded)
- The core work of the NRS is to facilitate the testing of animal and plant products for pesticide and veterinary medicine residues, and environmental contaminants. Product testing is done through either random or specifically designed sampling protocols.
- 2013-2014 analyzed in total 22854 samples

Importance of Developing and Improving National Food Safety and Pesticide Residue Monitoring

NRS summary results for all random monitoring programmes in 2013-14

Commodity	Samples tested	Compliance with relevant Australian Standards (%)
Animal products (30 products sampled)		
Meat, eggs, honey and aquatic species	12 635	99.81
Plant products (27 products sampled)		
Grains	6 137	99.17
Horticulture	1 087	99.45

Importance of Developing and Improving National Food Safety and Pesticide Residue Monitoring

Conclusion

- National Pesticide Residue Monitoring (NPRM)
  - effective measure to improve food safety
  - important to consumer health and to economical development
- Implantation of NPRM requires strong support

- regulation, insinuation, finance, facilities and expertise

- Challenge and opportunity for developing countries

Thank you very much for your kind attention!

22

Workshop on Development of Pesticide Residue Monitoring Programme in Asian Countries, 21-22 July, 2015, Beijing

Agro-product Safety Management:

Role of PRM and Codex's requirment

Xiongwu QIAO

Codex Committee on Pesticide Residues,
Shanxi Academy of Agricultural Sciences, PR China
(CCPR_QIAO@agri.gov.cn)

CODEX MRLs (CXLs) International Food Standards on Pesticide Residues

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS — WORLD HEALTH ORGANIZATION

Codex Alimentarius Commission

An intergovernmental organization to find a consensus on the Codex Alimentarius

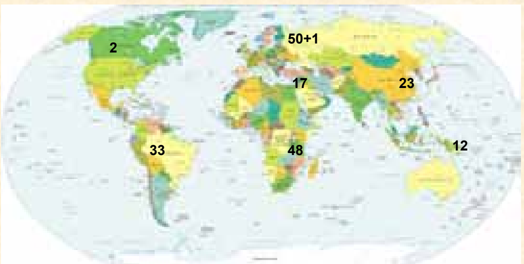
Multiple partners characteristic(contact points, ministries, Codex Secretariat, FAO, WHO, NGOs, etc.) in a common project to: Develop and maintain a collection of international food standards (the Codex Alimentarius)

Aimed to protect the health of consumers, and ensure fair international trade in food

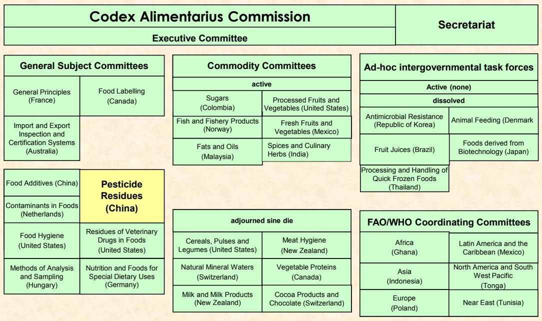
CODEX MRLs (CXLs) International Food Standards on Pesticide Residues

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS — WORLD HEALTH ORGANIZATION

186 member countries/organization, and 224 observers(NGOs, IGOs & UN)



CODEX MRLs (CXLs) International Food Standards on Pesticide Residues



CODEX MRLs (CXLs) International Food Standards on Pesticide Residues

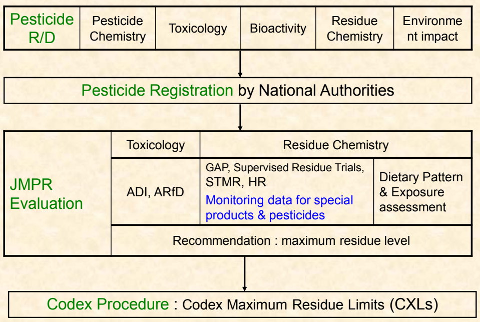
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS — WORLD HEALTH ORGANIZATION

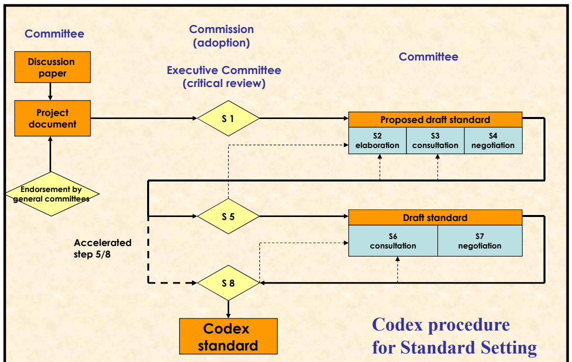
Member participation of CCPR sessions

CCPR Sessions (year)	members	observers	Delegates
39th (2007)	53	7	199
40th (2008)	59	8	227
41st (2009)	73	10	246
42nd (2010)	50	7	193
43rd (2011)	58	7	189
44th (2012)	69	6	253
45th (2013)	59	7	244
46th (2014)	60	10	240
47th (2015)	50	6	230

CODEX MRLs (CXLs) International Food Standards on Pesticide Residues

Flowchart of Codex MRL development





Codex procedure for Standard Setting (8-steps procedure)

CODEX MRLs (CXLs) International Food Standards on Pesticide Residues

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
WORLD HEALTH ORGANIZATION

Following the 8-steps procedure, CODEX MRLs (CXLs) are international food safety standards on pesticide residues in food or feed, those are adopted by CCPR before approved by CAC based on 2 basic principles.

1. Science:

Sound scientific analysis and evidence, in order to ensure the quality of the standards. Since 1995 **Risk Analysis Principles** has been introduced.

For establishment of Codex maximum residue limit (MRL = CXL), CCPR uses the risk assessment mechanism conducted by Joint Meeting on Pesticide Residues(JMPR), as FAO/WHO scientific advice.

CODEX MRLs (CXLs) International Food Standards on Pesticide Residues

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
WORLD HEALTH ORGANIZATION

The CXLs are decisions based on good agricultural practice (GAP), while at the same time considering the pesticide toxicity and exposure (dietary intake) with a possibly accurate uncertainty.

2. Concensus:

As a subsidiary committee of CAC, CCPR tries making every effort to reach agreement on the adoption or amendment of standards by consensus.

CODEX MRLs (CXLs) International Food Standards on Pesticide Residues

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
WORLD HEALTH ORGANIZATION

Outputs of CCPR:

---- ca. 3700 CXLs, for ca. 250 pesticides.

---- Risk analysis policy:
Risk analysis Principles applied by CCPR,
Periodic review of the Codex CXLs,
Prioritization of CCPR works.

---- Other related documents:
Codex classification of foods and animal feeds,
Guidance on performance criteria for methods of analysis for the determination of pesticide residues

CODEX MRLs (CXLs) International Food Standards on Pesticide Residues

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
WORLD HEALTH ORGANIZATION

CCPR recommendation of CXLs (2006-2015)

CCPR sessions (year)	CCPR's recommendation			
	Step 8	Step 5/8	Step 5	revokation
38th (2006)	284	207	5	174
39th (2007)	4	183	7	124
40th (2008)	18	261	17	92
41st (2009)	13	228	29	114
42nd (2010)	6	211	52	95
43rd (2011)	35	282	22	125
44th (2012)	20	251	23	59
45th (2013)	36	331	0	146
46th (2014)	1	345	0	105
47th (2015)	0	348	5	84

CODEX MRLs (CXLs) International Food Standards on Pesticide Residues

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
WORLD HEALTH ORGANIZATION

Involvement of MRLs in Agro-product safety management

1. Monitoring of products for risk assessment

2. Surveillance on compliance with GAP

3. Safety Quality inspection in food trade

CODEX MRLs (CXLs) International Food Standards on Pesticide Residues

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS — WORLD HEALTH ORGANIZATION

Challenges to CCPR:

1. Speed and Quantity of CXLs

Ca.1000 active ingredients of pesticides are registered world wide. Codex has elaborated CXLs only for ¼ of them with ca. 3700 MRLs. These Couldn't obviously meet the demand of international trade in food, especially for developing countries.

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS — WORLD HEALTH ORGANIZATION

Challenges to CCPR:

2. Scientific assessment needs data supports

The CXL recommendation is based on residue data from GAP & Dietary exposure for risk assessment. But the data supplied are often limited.

Some key words about this issues: GAP, cGAP, Data set size, GEMS/Food consumption cluster diets, long & short term dietary exposure assessment, mrl estimation & uncertainty, commodity grouping, etc.

CODEX MRLs (CXLs) International Food Standards on Pesticide Residues

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS — WORLD HEALTH ORGANIZATION

Challenges to CCPR:

3. Difficulties on the way to reach a concensus

As a intergovernmental forum, CCPR makes decision on a concensus basis. But there is no absolute unanimity. This is reasonably reflecting the interest differentiation of parties of CCPR. Some key words related : Data sharing, level of protection (industrialized/developing, import/export countries), prioritization, national policy of pesticide use, etc..

CODEX MRLs (CXLs) International Food Standards on Pesticide Residues

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS — WORLD HEALTH ORGANIZATION

Expectation to the members and observers

1. Expanding the residue data volume

Residue data set must be big enough for getting an acceptable estimation of real residues in foods. For these reason, submission of different residue trials data from members are very appreciated. At least, integration of national trials data gained during pesticide registration into the dossier submitted by the sponsor for mrl recommendation are encouraged. JMPR could use these data through the extrapolation and proportionality principles on a case by case basis for accurate estimation of recommended mrls.

CODEX MRLs (CXLs) International Food Standards on Pesticide Residues

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS — WORLD HEALTH ORGANIZATION

Expectation to the members and observers

2. Refining of the dietary consumption data

GEMS/Food consumption cluster diets for dietary exposure assessment are based on international statistics. There are only 17 groups, for example, Cluster C09 for Bangladesh, Cambodia, China, DPRK, Guinea Bissau, Indonesia, Laos, Myanmar, Nepal, Philippines, Sierra Leone, Thailand, Timor Leste, Viet Nam. There must be a false assumption that 15 countries are cooking using one recipe. Large portion data are needed for short term dietary exposure assessment. There are now only data submitted from fewer countries. The representativeness could be quetioned therefor.

CODEX MRLs (CXLs) International Food Standards on Pesticide Residues

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS — WORLD HEALTH ORGANIZATION

Expectation to the members and observers

3. Establishment of national food safety standard system with risk analysis principles and capacity building

FAO, WHO and some members strived to do more to help members, especially developing members, to establish their own food safety system, pesticide registration and marketing system. This will build up common basis for MRL harmonization and appropriate level of protection.

CODEX MRLs (CXLs) International Food Standards on Pesticide Residues

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

WORLD HEALTH ORGANIZATION

Expectation to the members and observers

4. Adoption of CXLs as national MRLs

Adopting CXLs as national food safety standard may be the best way for harmonization of MRLs. But there are always restraints. For example, limited amount of CXLs, differentiated GAP and dietary consumption pattern, that would reduce the common acceptability of CXLs.

CODEX MRLs (CXLs) International Food Standards on Pesticide Residues

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

WORLD HEALTH ORGANIZATION

Thanks for your attention

CODEX MRLs (CXLs) International Food Standards on Pesticide Residues

Risk Monitoring Program for Agro-Product in China

Yongzhong Qian

Institute of Quality Standard & Testing Technology for Agro-Products
Chinese Academy of Agricultural Sciences

Outline

◆Management System on Agro-Product Safety in China

◆Monitoring Program for Agro-product Safety

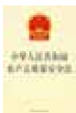
◆Technology Support on Risk Monitoring

Management of food safety in China

Law-based Management

Basic Law | Special Law

Concurrent & Connected



Food safety law
(2015 Revised Edition)

Law on quality and safety of agricultural products
(2006)

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Management system on food safety in China

Food safety law

Article 14 China establishes the food safety risk surveillance system, which monitors food-borne diseases, food contamination and other food-related hazards.

Regulation on the implementation of the food safety law

Article 63 The edible farm product quality safety risk monitoring and risk assessment shall be conducted by the agriculture administration of the people's government at or above the county level in accordance with the Law of the People's Republic of China on Quality Safety of Agricultural Products .

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Management system on food safety in China

Law on quality and safety of agricultural products

Article 34 The State establishes a system for monitoring the quality and safety of agricultural products. The administrative departments for agriculture under the people's governments at or above the county level shall, in compliance with the requirements for ensuring the quality and safety of agricultural products, draw up plans for monitoring the quality and safety of agricultural products and organize implementation of the plans, and conduct regular supervision and make spot checks of the agricultural products under production or on the market.

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Management system on food safety in China

Mar 2013 *Reform and Functional Transformation of the State Council*

-- set up the National Health and Family Planning Commission through merging the existing Health Ministry with the National Population and Family Planning Commission;

-- elevate the status of the State Administration of Food and Drug to a general administration in order to improve food and drug safety.

Responsibilities on Monitoring & Assessment

Food Safety:

Risk Monitoring — CFDA

Risk Assessment — NHFPC，CFSA

Agro-product Safety:

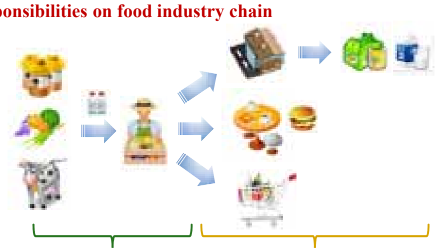
Risk Monitoring — MOA

Risk Assessment — MOA

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Management system on food safety in China

Responsibilities on food industry chain



The Administrative Departments for Agriculture

Food and Drug Administration

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Management system on food safety in China

The real problems of agro-product safety in China

Illegal adulteration of poisonous & harmful substances
- Illegal use of the restricted pesticides, veterinary drugs, feed additives
- Illegal adulterations, e.g. melamine

Residues of the pesticides and veterinary drugs
- Limit of production scale & capability
- Producers' lack of knowledge and technology

Pollution of producing surroundings

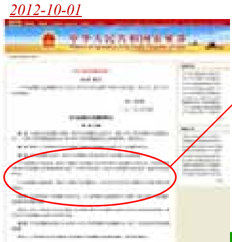
Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Monitoring Program for Agro-product Safety

According to above-mentioned situations ,
how to find and solve the problems of agro-product safety?

➡ Regulations on Monitoring Program for Agro-product Safety

2012-10-01



Monitoring Programs

- MOA
- The Administrative Departments for Agriculture above the County Level

➢ to grasp the agro-product safety situation

➢ to assess the risk of agro-products

➢ to test, analyses & evaluate the hazards persistently and systematically

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Monitoring Program for Agro-product Safety

Monitoring Program for Agro-product Safety

- Monitoring Program
  - Risk Monitoring Program
    - Routine Monitoring
    - Special Monitoring
    - Others
  - Supervision and Spot Check

National Level

➢ Research Center of Quality and Standards for Ago-product, MOA

➢ Science and Technology Development Center of MOA

Local Level

➢ Agriculture testing institutions

➢ Other local administrations

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Monitoring Program for Agro-product Safety

Routine Monitoring

➢ Basic & important work

➢ The results tell the overall level of the agro-product safety in China

- Monitored quarterly each year
- All the provinces and most cities
- Most groups of agro-products
- Sound technology system
- Valid and objective results

Show the status quo of agro-product safety to the government

Provide basis for supervision policies making

Provide data and evidence for agro-product risk assessment

Acquaint the media and public with agro-product safety situation

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Monitoring Program for Agro-product Safety

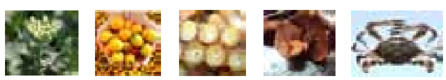
Special Monitoring

➢ According to the need of special supervision

➢ Extend & supplement the Routine Monitoring

- Made monitoring plan each year
- Focus on certain products or areas
- Species absent from the Routine Monitoring
- Flexible test parameters

eg,



Brassica campestris L kumquat royal jelly pork liver swimming crab

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Monitoring Program for Agro-product Safety

Supervision and Spot Check

- Administrative enforcement of law
- According to the risk monitoring results
- Aim at serious problems discovered from supervision

- Samples drawn by local administration
- Samples analyzed by agriculture testing institutions
- Test parameters are more targeting
- Unqualified products should be disposed of timely by law enforcement agencies

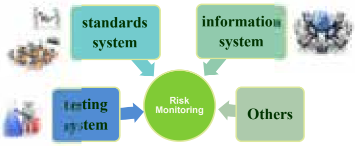
Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Technology Support on Risk Monitoring

Technology Requirements:

- Unified programming
- Defined responsibilities
- Scientific sampling
- Standard testing

Supporting Systems

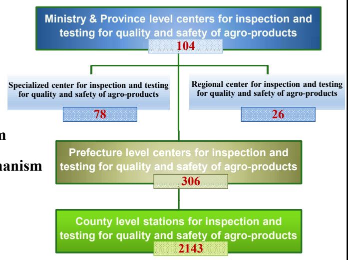


Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Technology Support on Risk Monitoring

Testing System

- Rational layout
- Clear functions
- Various specialties
- Quick responding system
- Efficient operating mechanism



Institute of Quality Standard & Testing Technology for Agro-Products CAAS

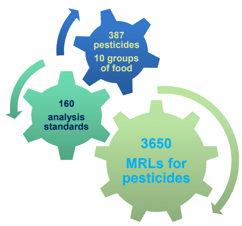
Technology Support on Risk Monitoring

Standards System

- standards for residue limits
- standards for sampling
- standards for analysis method
- standards for data processing
- standards for work procedure

- National Standards } 7964
- Industry Standards
- Provincial Standards >10,000

GB 2763-2014
National food safety standard
—Maximum residue limits for pesticides in food



Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Technology Support on Risk Monitoring

Information System

- Data Base & Information Platform
- Data acquisition/processing/analysis/upload

Nation-wide Data

Province-wide Data

Institute

Thank You for Your Attention!

Institute of Quality Standard & Testing Technology for Agro-Products
Chinese Academy of Agricultural Sciences

A Framework of Routine Monitoring program for Agricultural products by Ministry of Agriculture and its design

—— pesticide residue in crop products

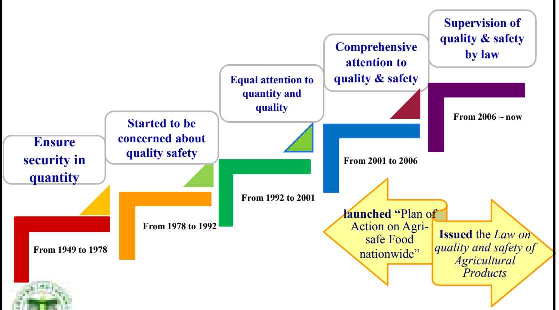
Professor Min WANG

Institute of Quality Standard & Testing Technology for Agro-Products
Chinese Academy of Agricultural Sciences

Outlines

- Origin of routine monitoring
- Main contents of monitoring
- Implementation and management of plan

Background 1: Development steps of Quality and Safety of Agricultural Products in China



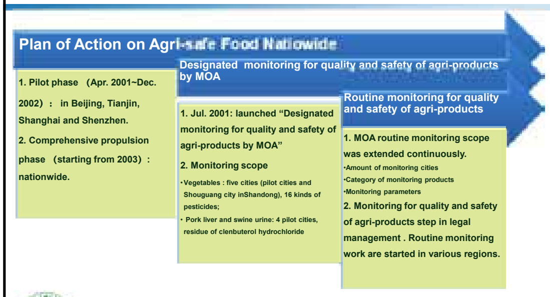
Background 2: "Plan of Action on Agri-safe Food Nationwide "

- In April, 2001, the Ministry of Agriculture launched the "Plan of Action on Agri-safe Food Nationwide with approval of the State Council.
  - Reasons of the plan:
    - The quantity shortage of agricultural products was solved. However, the quality problems are relatively serious.
    - Due to the acceleration of industrialization and urbanization, the situation of producing area pollution is more serious.
    - The problem of pollution in agriculture itself is neglected in pursuit of quantity.
    - With the improvement of economic globalization and trade liberalization, more attention is paid on quality and safety of agricultural products.
    - The export of agricultural products are frequently stumbled because of quality and safety problems since China participated into WTO in 2001.

Background 2: "Plan of Action on Agri-safe Food Nationwide "

- Working ideas
  - With the "vegetable basket" products as a breakthrough, to solve the problems of highly toxic pesticides, illegal use of veterinary drugs and excessive residues which are concerned about by people;
  - With the management of three segments including agricultural inputs, agricultural production and market access as key points, to promote the entire processing supervision from farmland to market;
  - With the routine monitoring as an approach, to enhance the quality and safety awareness and to implement managing responsibility in various regions;
  - With the promotion of agricultural standardization as a carrier, to improve the production and management levels for agricultural quality and safety.

The origin and development of routine monitoring work



Legislation for monitoring quality and safety of agricultural products

- *Law of the People's Republic of China on Quality and Safety of Agricultural Products (issued on April 29th, 2006 and implemented on November 1st.)*
  - Article 34: The State establishes a system for monitoring the quality and safety of agricultural products. The administrative departments for agriculture under the people's governments at or above the county level shall draw up plans for monitoring the quality and safety of agricultural products and organize implementation of the plans, and conduct regular supervision and make spot checks of the agricultural products under production or on the market.
- *The administrative measures on monitoring agri-product quality and safety (made by the Ministry of Agriculture, issued on August 14, 2012 and implemented on October 1.)*

The main types of monitoring for the agri-products quality and safety

Monitoring of agri-products

- Risk monitoring
  - Monitoring and analysis evaluation of the adverse factor on the quality and safety of agricultural products
    - It aims to have a good command of quality and safety of agricultural products dynamically and to carry out risk assessment of quality and safety of agricultural products timely.
    - It must be planned, be focused, be sustained and be systematic.
- Supervision and spot checking
  - Sampling for the purpose of law enforcement
    - It usually focuses on serious problems of the quality and safety of products and locations with relatively concentrated problems.
    - It is carried out at regular or irregular intervals with random sampling.

The main types of monitoring for the agri-products quality and safety

Monitoring of agri-products

- Risk monitoring
  - Routine monitoring
    - Routine monitoring for quality and safety of agri-products by the MOA (state-level, organized and implemented by the MOA)
    - Provincial level, prefecture level, county-level Routine monitoring for quality and safety of agri-products
  - Special monitoring
    - It is the supplement and extension of routine monitoring.
    - -- the supplement to products or parameters
- Supervision and spot check

Outlines

- Origin of routine monitoring
- Main contents of monitoring
- Implementation and management of plan

The main contents of monitoring plan

1. Monitoring sites	7. Undertaking department and leading department
2. Monitoring time	8. Proficiency testing
3. Monitoring variety and quantity	9. Recheck
4. Sampling requirement	10. Results submission and consultation
5. Monitoring projects and inspection standard	11. Report of monitoring results and summary analysis
6. Judgment basis and principle	12. Announcements

Monitoring sites and time

- Monitoring sites
  - Monitoring sites are selected in the major large and medium-size cities with the total amount of about 150 in China. The city fixed as monitoring site is invariable in one year.
    - Provincial capital cities, municipalities directly under the central government and municipalities with independent planning status are compulsory monitoring cities.
    - Except for several provinces, two prefecture-level cities in each province (autonomous region) are selected as monitoring sites for each type of products.
- Monitoring time
  - Once per quarter, a total of four times in one year
  - For tea, monitoring time is only in second and fourth quarter, a total of twice in one year.

Monitoring varieties

- Crop products
  - Vegetables, edible mushrooms, fruits and tea
- Animal products
  - Pork, beef, lamb, poultry
  - Pork liver and eggs.
- Fishery products
  - Local mass breeding fishery products

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Sampling location

- Vegetables and edible mushrooms
  - Production base, wholesale market (Farmer's market as supplement) , supermarket
- Fruits
  - Wholesale market, farmer's market, supermarket
- Tea
  - Wholesale market, supermarket (including specialty store)
- Animal products
  - Wholesale market, farmer's market, slaughter house and supermarket
- Fishery products
  - Wholesale market (including transport cart and storage pond), farmer's market and supermarket.

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Vegetable production base

Wholesale market

Farmer's market

Supermarket

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

The general situation of routine monitoring in 2014- crop products

Vegetables and edible mushrooms: acceptability is 96.2%.

Samples including 87 varieties with total amount of 18434 are collected from 89 cities in 31 provinces.

For vegetables, 58 kinds of pesticides residues are detected. For edible mushrooms (fresh), 39 kinds of pesticides residues and fluorescent brightener are examined.

Fruits: acceptability is 98.9%

4049 fruits samples involving strawberry, banana, grape, peach, watermelon, apple, pear, orange and jujube are collected from 88 cities in 31 provinces. 58 kinds of pesticides residues are detected.

.

Tea: acceptability is 96.3%

711 tea samples including green tea and oolong tea are obtained form 56 cities in 24 provinces. 11 kinds of pesticides residues are determined.

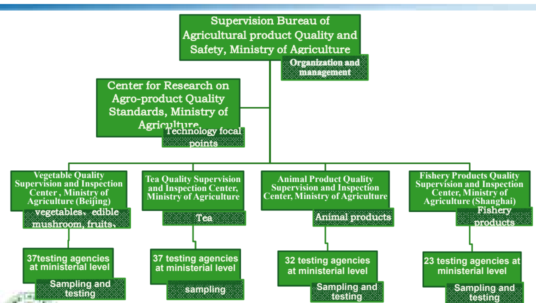
Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Outlines

- Origin of routine monitoring
- Main contents of monitoring
- Implementation and management plan

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Implementation and management of plan



Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Implementation and management of plan

- Technical leading department
  - The leading unit: Agricultural products quality standard research center of the ministry of agriculture
  - Crop products
    - Vegetables, edible mushrooms and fruits: Vegetable quality supervision and inspection center of the Ministry of Agriculture (Beijing)
    - Tea: tea quality supervision and inspection center of the Ministry of Agriculture
    - Animal products: animal product quality supervision and inspection center of the Ministry of Agriculture
  - Fishery products: fishery products quality supervision and inspection center of the Ministry of Agriculture (Shanghai)
- The selection of undertaking department
  - The undertaking departments are selected by proficiency testing and results of spot check the recheck among 277 national- and agricultural ministerial-level Quality and Inspection Centers

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

The implementation and management of plan

- Submitting the summarized results in time

  undertaking department → technical supporting department → leading department

- Establishing mechanism of results consultation

  In order to promote the data evaluation, analysis of situation and information communication of monitoring result, consultation system of routine monitoring has been established by the Ministry of Agriculture since 2009.

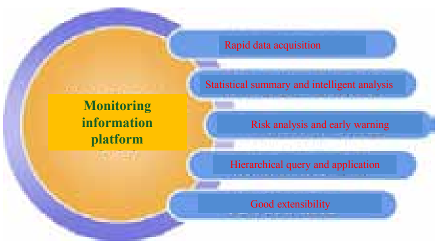
  The relevant divisions of the Ministry of Agriculture, the Bureau of Agriculture in Province

- Establishing monitoring information platform

  The national monitoring information platform of quality and safety of agricultural products

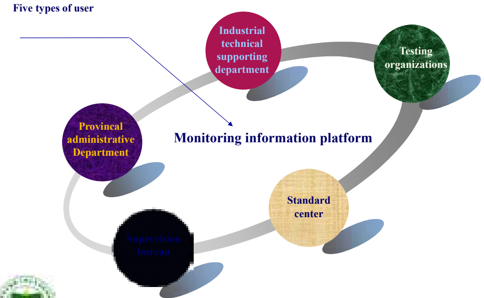
Institute of Quality Standard & Testing Technology for Agro-Products CAAS

The functional orientation of monitoring information platform



Institute of Quality Standard & Testing Technology for Agro-Products CAAS

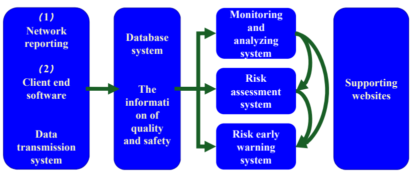
Functional orientation



Institute of Quality Standard & Testing Technology for Agro-Products CAAS

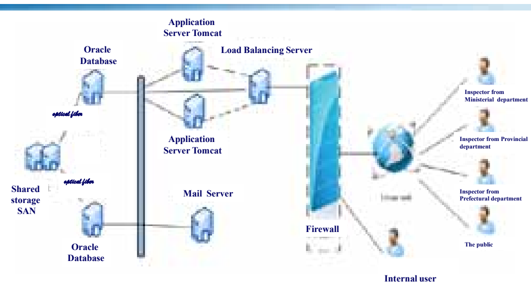
The basic framework of monitoring information platform

The monitoring information platform of quality and safety of agricultural products

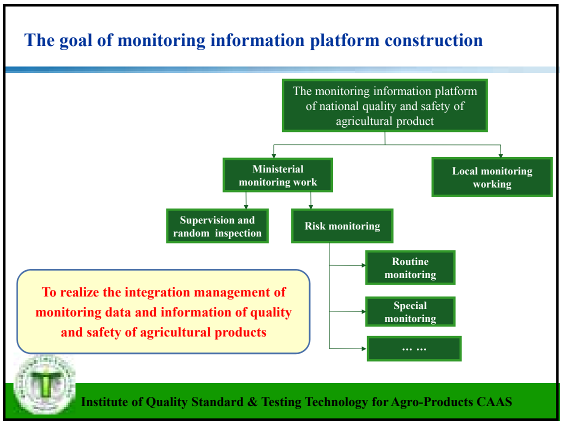


Institute of Quality Standard & Testing Technology for Agro-Products CAAS

The basic framework of monitoring information platform



Institute of Quality Standard & Testing Technology for Agro-Products CAAS


The goal of monitoring information platform construction
The monitoring information platform of national quality and safety of agricultural product
Ministerial monitoring work
Local monitoring working
Supervision and random inspection
Risk monitoring
Routine monitoring
Special monitoring
… …
To realize the integration management of monitoring data and information of quality and safety of agricultural products
Institute of Quality Standard & Testing Technology for Agro-Products CAAS


Thank You for
Your Attention!
Institute of Quality Standard & Testing Technology for Agro-Products
Chinese Academy of Agricultural Sciences

Prioritization in a PRM Programme

Yanyang XU
xyycaas@163.com

Institute of Quality Standard & Testing Technology for Agro-Products
Chinese Academy of Agricultural Sciences

Contents

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

1. Principles of risk ranking

Risk ={severity, probability}

Severity:

- **Toxicity of human health: Acute or chronic, reproduction, development, inheritance and cumulative toxicity, etc.**
- Effects on environment: Light degradation, biodegradation and bioaccumulation or bioaccumulation factors, etc.
- Aquatic toxicity: Acute and chronic toxicity for fish and aquatic invertebrates, and aquatic plants, etc.
- Physical and chemical properties of hazards: Active radicals, distribution coefficient of ester water, distribution coefficient of blood, melting point, boiling point and vapor pressure, etc

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Principles of risk ranking

Probability:

- The exposure types of population: Children, the elderly, the average person, sensitive population;
- Consumers coverage: For instance, the consumer group of rice coverage is more than that of honey;
- Detectable rate and content level over the years;
- Consumption habit: processing factors;
- Approaches and effects: Exposed frequency, continued exposure duration, etc.
- Food-borne pathogens: Transmission, pathopoiesis and lethal capacity (QALYs, DALYs, HALYs).

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Principles of risk ranking

Uncertain factors:

- Uncertainty of risk assessment: uncertainty of methods, uncertainty of modeling, uncertainty of data, etc.
- Uncertainty of risk management: management operability, management level and ability, etc.
- Uncertainty of risk communication: effectively communication about risks, etc.

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

2 .Categorization of risk ranking methods

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

3. Qualitative risk ranking

European Union
Based on decision tree

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

4. Semi-quantitative risk ranking

Pesticide residue monitoring and risk ranking of EU

- Background
  - EU Regulation (EC) No. 882/2004.
  - Two monitoring forms: coordinated by EU and member states
- Monitoring scope and parameters
  - Types of samples: 8-9 kinds per year, three year rotation(beans, carrots, cucumbers, oranges and citrus etc).
  - Number of samples: 12-93 samples of each food, a total of 11,610 samples per year.
  - Types of pesticides: 78 kinds. Based on previous monitoring results and RASFF notification options.

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Pesticide residue monitoring and risk ranking of EU

Calculation of the acute exposure amount of pesticide residue

- ✓ IESTI (International Estimated Short-Term Intake) is an international assessed value of short-term diet against agricultural products consumed within 24 hours.
- ✓ Data needed: daily food consumption (LP) of most people, single weight (U) of fruits, vegetables and other agricultural products, difference factor (V), etc.
- ✓ The calculation method of IESTI is proposed by JMPR, and calculation is under 3 situations.

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Pesticide residue monitoring and risk ranking of EU

- Situation 1
- ✓ Mixed sample residue data can reflect the residue level of the product consumed in a meal. Such as primary agricultural products (granule crops), single weigh of the agricultural products is less than 25g.

$$IESTI = \frac{LP \times HR}{BW}$$

- Situation 2
- ✓ Mixed sample residue data can not reflect the residue level of the product consumed in a meal. The eaten product may contain higher residue than the mixed samples and single weigh of food is higher than 25g. Such situation includes two conditions.
- ✓ Situation 2a The edible parts of a single unprocessed food weigh less than the maximum consumption of an individual meal. Such as: peach, plum and other fruits. $IESTI = \frac{U \times HR \times V + (LP - U) \times HR}{BW}$

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Pesticide residue monitoring and risk ranking of EU

- Situation 2b
- ✓ The edible parts of a single unprocessed food weigh more than the maximum consumption of the food in an individual meal. Such as: watermelon, celery cabbage, etc.

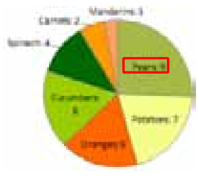
$$IESTI = \frac{LP \times HR \times V}{BW}$$

- Situation 3
- ✓ As for unpackaged foods or mixed processed foods, STMR-P represents the highest possible residue concentration. Such as fruit juice, milk etc.

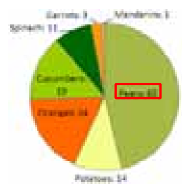
$$IESTI = \frac{LP \times STMR - P}{BW}$$

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Pesticide residue monitoring and risk ranking of EU

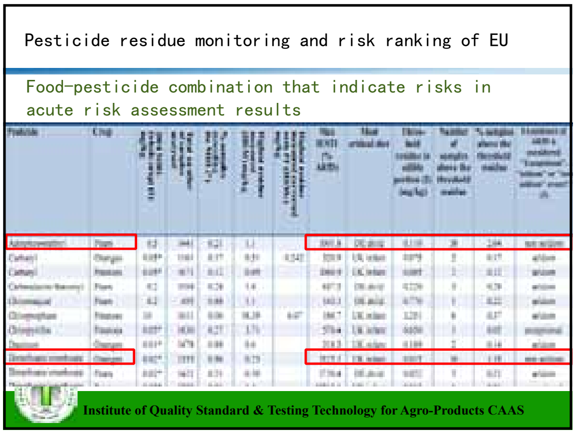


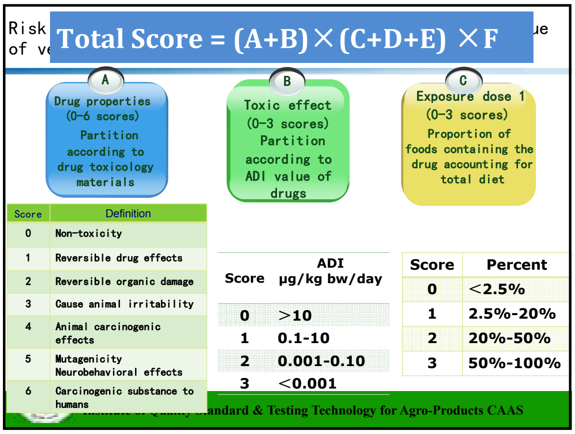
Types of pesticides in different agricultural products that may cause acute risks



Quantity of agricultural products that may cause acute risks

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

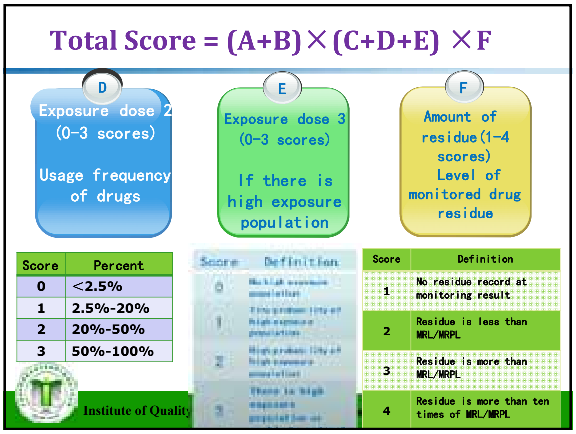




Score	Definition
0	Non-toxicity
1	Reversible drug effects
2	Reversible organic damage
3	Cause animal irritability
4	Animal carcinogenic effects
5	Mutagenicity Neurobehavioral effects
6	Carcinogenic substance to humans

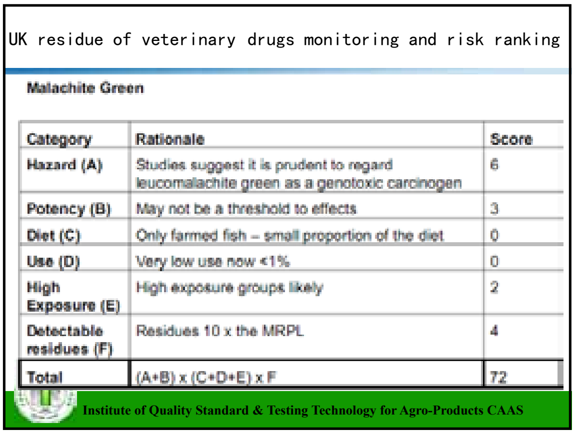
Score	ADI μg/kg bw/day
0	>10
1	0.1-10
2	0.001-0.10
3	<0.001

Score	Percent
0	<2.5%
1	2.5%-20%
2	20%-50%
3	50%-100%

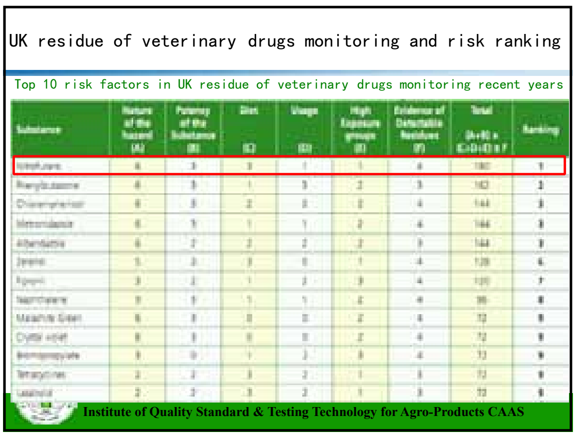


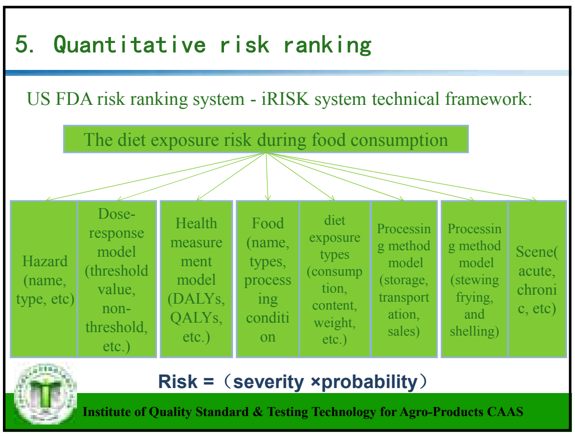
Score	Percent
0	<2.5%
1	2.5%-20%
2	20%-50%
3	50%-100%

Score	Definition
1	No residue record at monitoring result
2	Residue is less than MRL/MRPL
3	Residue is more than MRL/MRPL
4	Residue is more than ten times of MRL/MRPL



Category	Rationale	Score
Hazard (A)	Studies suggest it is prudent to regard leucomalachite green as a genotoxic carcinogen	6
Potency (B)	May not be a threshold to effects	3
Diet (C)	Only farmed fish – small proportion of the diet	0
Use (D)	Very low use now <1%	0
High Exposure (E)	High exposure groups likely	2
Detectable residues (F)	Residues 10 x the MRPL	4
Total	(A+B) x (C+D+E) x F	72

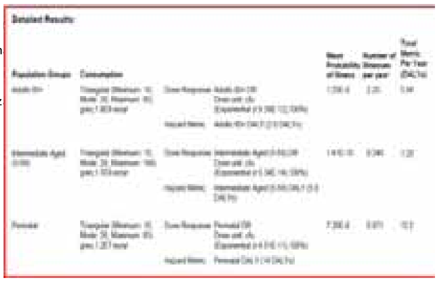




5. Quantitative risk ranking

iRISK ranking system based on MCA simulation technique

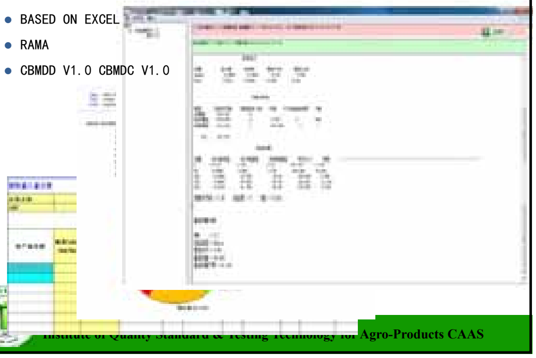
- A single ki
- Different h
pathogens and
- Various haz



Institute of Quality Standard & Testing Technology for Agro-Products CAAS

5. Quantitative risk ranking

- BASED ON EXCEL
- RAMA
- CBMDD V1.0 CBMDC V1.0



Agro-Products CAAS

6. Summary and discussion

- Risk ranking is the inevitable trend in line with international conventions
- It is the inevitable trend of cost beneficial optimization
- It is the inevitable trend of realizing the quality and safety of agricultural products

Institute of Quality Standard & Testing Technology for Agro-Products CAAS

Thank You!

Institute of Quality Standard & Testing Technology for Agro-Products
Chinese Academy of Agricultural Sciences

PRM Implementation: Sampling Techniques

Agro-Environmental Quality Supervision & Testing Center, MOA (Tianjin)

Zeying He
hezeying222308@163.com

Contents

- Principle of sampling
- Sampling design
- Conduct of sampling
- Sample preparation

2

1. Principle of Sampling

Concept of sampling

- Sampling: The procedure used to draw and constitute a sample.

The objective of these sampling procedures is to enable a representative sample to be obtained from a lot for analysis

Main factors affecting accuracy of results → ***Sampling*** *transport* *preparation* ***determination*** ***QC***

Sampling is an important step in PRM. Starting point and keystone for good results

3

1. Principle of Sampling

Purpose of sampling

- Compliance testing：

Surveillance of pesticide residue, whether comply with MRL.

Representativeness of sampling is critical

- Forensic testing：

Testing existence of specific property. Timeliness and specific sampling

4

1. Principle of Sampling

- **Randomness**

Non-selective sampling, sample is taken in the lot should preferably be chosen

- **Representativeness**

The primary samples must consist of sufficient material to provide the laboratory sample(s) required from the lot. The lot can not be represented by a single unit.
Avoid abnormal unit such as plant with pest and disease.

5

1. Principle of Sampling

- **Feasibility**

Sampling procedures, tools, sampling quantity should be practical.
Efficient, economic in the basis of ensuring randomness, representativeness.

- **Impartiality**

Sampling should be completed under the direction of organization in charge. Sampling officers should take sample in person.

6

2. Sampling Design

Background investigation:

- Review of residue data
- Regional intelligence on pesticide use
- Dietary importance of the food
- Information on the amount of imported food and domestic food
- Chemical characteristics and toxicity of the pesticide
- Production volume/pesticide usage patterns

7

2. Sampling Design

Sampling design Including:

(1) Purpose：incidence/level monitoring, focused sampling

(2) monitoring site:

- geographic area (latitude and longitude cross point)
- Planting region
- Countryside/city
- Population

(3) sampling site：production base, production enterprise, wholesale market, supermarket, farmers market

8

2. Sampling Design

(4) Sampling time:

production base: before harvest

production enterprise: production in storeroom

wholesale market: trading peak

(5) Sample quantity：

$$n_0 = \frac{(Z_{\alpha/2})^2\sigma^2}{L^2}$$

n_0:minimal quantity
α：type I error (two-sided test, 0.05)
$Z_{\alpha/2}$: critical value of normal distribution
σ ：degree of variation (residue level)
L: error (10~20%)

9

2. Sampling Design

(6)Sampling procedure setting:

training- preparation- sampling- record- sample preparation- package- storage- shipping

(7)Sampling officer: designated

10

2. Sampling Design

Example 1:

PRM–MOA, China

- Sampling time：4-a year
- Regional coverage：nationwide
- Variety：vegetable, fruit, tea, edible mushrooms
- Sampling quantity：vegetable 4000, fruit 540, tea 360, mushroom 610
- Pesticide coverage：80 commonly used pesticides

11

2. Sampling Design

Example 2:

Risk assessment–CFSA, China

- Sampling time：Fiscal year
- Regional coverage：nationwide
- Variety：vegetable, tea
- Sampling quantity：vegetable 9000, tea 1500
- Pesticide coverage：35 commonly used pesticides

12

2. Sampling Design

Example 3:

PRM – FDA, United States

- Sampling time：Fiscal Year
- Geographic Coverage: domestic (42 states)and imported (99 country)
- Variety：representative food, animal feed
- Sampling quantity： 1080 domestic samples, 4897 imported food
- Pesticide coverage: 203 detected /500 method detectable

13

2. Sampling Design

Example 4:

Supervision and spot-check– MOA, China

Example 5:

Focused sampling—FDA, United States

14

3. Conduct of Sampling

Precautions

- Contamination and deterioration of samples must be prevented
- Preparation of sampling tools, files, record form, etc.
- Technical training of sampling officer

15

3. Conduct of Sampling

Sampling officer：

- Authorized by corresponding authorities
- Responsible
- Familiar with sampling procedures
- Consistent adherence to the specified sampling procedures

16

3. Conduct of Sampling

Collection of primary samples

- Sampling from production base

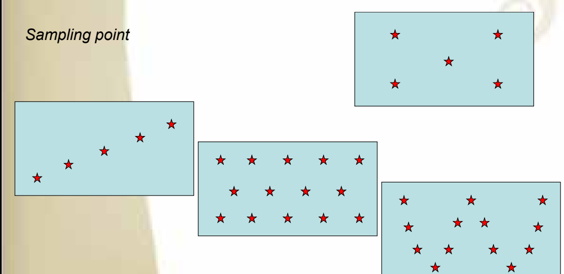
Sample quantity: according to planting area

Planting area	Batch area	
< 10 hm^2	1~3 hm^2	One batch
> 10 hm^2	3-5 hm^2	One batch

17

3. Conduct of Sampling

Sampling point



18

3. Conduct of Sampling

- FDA recommends

superimposing an imaginary grid on the field, dividing it into approximately 100 areas, randomly selecting 10 areas, and collecting 0.5 kg portions from each section. This yields 10 increments in the composite, which is typical for medium-sized crops.

19

3. Conduct of Sampling

Sampling from storeroom and market

(1) For packaged products:

Package number in a lot	number of primary samples to be taken from the lot
≤100	5
101~300	7
301~500	9
501~1000	10
≥ l000	15 (minimum)

20

3. Conduct of Sampling

Sampling from storeroom and market

(2) For bulk goods:

Weight (kg) or units in a lot	number or weight (kg) of primary samples to be taken from the lot
≤200	10
201~500	20
501~1000	30
1001~5000	60
≥ 5000	100 (minimum)

At least 5 units are sampled for large size fruit and vegetables (> 2kg for one unit)

21

3. Conduct of Sampling

Preparation of the laboratory sample

- Where the bulk sample is larger than is required for a laboratory sample, it should be divided to provide a representative portion.
- A sampling device, quartering, or other appropriate size reduction process may be used but units of fresh plant products or whole eggs should not be cut or broken.

22

3. Conduct of Sampling

Preparation of the laboratory sample

products	Units or weight of samples
Small fruits, walnut, hazel, chestnut, pea, green soy bean and others not included below	1kg
Cherry, morello, plum	2kg
Apricot, banana, pawpaw, citrus fruits, peach, apple, pear, grape, avocado, garlic, eggplant, beet, cucumber, cabbage, root vegetables, onion, pepper, radish, tomato	3kg
Pumpkin, watermelon, muskmelon, pineapple	5 units
Chinese cabbage, cauliflower, lettuce	10 units
sweet corn	10 units
Packaged vegetable	10 packages

23

3. Conduct of Sampling

Packaging of laboratory samples

- Pack separately, avoid cross contamination
- Clean, inert container which provides secure protection from contamination, damage and leakage
- The container should be sealed, securely labelled and the sampling record must be attached

24

3. Conduct of Sampling

Sampling Record

Sampling officers must record the complete information

- Sample name
- Sample number
- Sample status (brand name, grade, certificate, production date/batch lot, etc.)
- Sample size
- Sampling date
- location (GPS coordinate if needed)
- Information of producer (name, address, contacts, phone)
- Name of sampling officer

25

3. Conduct of Sampling

Transmission of the laboratory sample

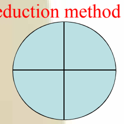
- Once packed, do not open the samples during the transmission
- Specialized staff in charge of transmission or mailing
- Fresh samples should be kept cool
- Frozen samples must remain frozen
- Receiving laboratories check the information and status of samples

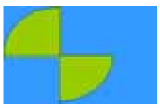
26

4. Preparation of analytical sample

- Pre-preparation

  Remove debris in the sample, deduct the sample to appropriate portion
- Reduction method





- Specified samples

  Consistent to the specific requirement of analytical method
- Prepared sampled stored in appropriate container and stored

27

REFERENCE

- **ISO 874:1980** Fresh fruits and vegetables – Sampling
- **COMMISSION DIRECTIVE 2002/63/EC** establishing community methods of sampling for the official control of pesticide residue in and on products of plant and animal origin
- U.S. Food and Drug Administration. **Investigation Operations Manual**, http://www.fda.gov/ICECI/Inspections/IOM/default.htm
- **Codex Alimentarius Commission. CAC/GL 33-1999**. Recommended Methods of Sampling for the Determination of Pesticide Residues for Compliance with MRLs, 1999; http://www.fao.org/home/en/ (accessed Jan 31, 2015).
- U.S. Department of Agriculture. Pesticide Data Program, Sampling SOPs and Commodity Specific Fact Sheets; http://www.ams.usda.gov/AMSv1.0/ (4th quarter 2014).

28

THANK YOU !

农药残留检测技术
Pesticide Residue Test Technology

农业部蔬菜品质监督检验测试中心（北京）
The Vegetable Quality Auditing and Inspecting Test Centre of the Agriculture Department (Beijing)

刘肃
Su Liu

农药残留限量标准
Pesticide Residue Limit Standards

- 中国食品中农药残留最大限量标准GB 2763-2014中，共涉及农药种类有387种，限量值有3650个。Under the Pesticide Residue Limit Standard GB2763-2014 for Chinese food, there are 387 pesticides and 3650 limit values thereof are included.
- 这个标准还在不断完善中，农药种类和限量值还在增加。This Standard is still under improvement with more pesticide categories and their limit values being added.

农药残留检测主要过程
Major Steps of Pesticide Residue Test

- 1、检测前工作准备；Preparation Prior to Test;
- 2、试样制备；Make Samples;
- 3、提取；Extract;
- 4、净化；Purify;
- 5、测定；Test;
- 6、检测过程的质量控制。Quality Control over Test Progress.

检测前工作准备
Preparation Prior to Test

- 环境的检查 Environment Check
  - 应对实验室、样品储藏室、前处理室和仪器室等环境进行控制，保证环境的温湿度符合检测的要求。Environment of the lab, the sample storage, the preliminary processing room and the instrument room should be controlled to guarantee the temperature and humidity of the environment satisfying test requirements.
  - 样品前处理室要进行控温，防止试剂的过度挥发，影响结果的准确性。湿度较大的地区，仪器室要除湿。Temperature of the preliminary processing room should be controlled to prevent reagents from over evaporation which may impact the result accuracy. Instruct rooms in heavy humidity regions should be dehumanized.

检测前工作准备
Preparation Prior to Test

- 试剂和药品的检查 Reagent and Chemical Check
  - 每进一批试剂和药品，在使用前按相应检验所要求的标准进行检测，对其进行杂质的检查，排除试剂对检测结果的干扰，如有必要应进行处理后再使用。Reagents and chemicals under each order should be checked of it’s impurities as per relevant requirements before they are applied, to avoid any potential interference to the test result from such reagents. Treat the reagents and chemicals before use when necessary.
  - 一般试剂浓缩50~100倍后测定，检查是否对被测组分有干扰。Under normal circumstances, reagents are concentrated 50 to 100 times before applied to test, to determine if interference to the objective element happens.

试样制备（样品取样部位）
Make Samples (Parts from Samples)

- 谷物 Grains
- 稻谷、小麦、大麦、玉米、高粱、薏仁、绿豆、豌豆等，取整粒。Rice, wheat, barley, maize, sorghum, coix seed, green been, pea etc, take the whole item.
- 油料 Oil
- 油菜籽、芝麻、棉籽、大豆、花生、葵花籽等，取整粒。 Rapeseed, sesame, cottonseed, soybean, peanut, sunflower seed etc, take the whole item.

试样制备（样品取样部位）
Make Samples (Parts from Samples)

- 芸薹薯类蔬菜 Brassica Vegetables
- 结球芸薹属：结球甘蓝、球茎甘蓝、抱子甘蓝等，取整棵。Cabbage brassica: head cabbage, brassica oleracea, brussels sprout etc., take the whole item.
- 头状花序芸薹属：花椰菜、青花菜，去除叶，取整棵。Capitulum brassica: cauliflower, broccoli, remove the leaves then take the whole item.
- 茎类芸薹属：芥蓝、菜薹、茎芥菜等，去除根，取整棵。Root brassica: cabbage mustard, brassica campestris, stem mustard etc, remove the leaves then take the whole item.
- 瓜类 Melons
- 代表作物：黄瓜、西葫芦、冬瓜、苦瓜、南瓜、丝瓜等。Representatives: cucumber, summer squash, wax gourd, bitter gourd, pumpkin, sponge cucumber etc.
- 去掉柄后的全瓜。The whole item except pedicels.

试样制备（样品取样部位）
Make Samples (Parts from Samples)

- 豆菜类蔬菜 Bean Vegetables:
  - 荚可食类：豇豆、菜豆、豌豆、四棱豆、刀豆等，取全荚。Pod edible: cowpeas, beans, peas, asparagus peas, sword beans etc., take the whole item with pods.
  - 荚不可食类：菜用大豆、蚕豆、豌豆等，去荚后的全豆。Pod unedible: soybeans, horsebeans, peas etc., take the whole item without pods.

  茄果类 Solanaceous Fruits

  代表种类有：茄子、西红柿、茄子、黄秋葵等 Representatives: eggplant, tomato, eggplant, okra etc.
  - 除去果柄后的整个果实。The whole fruit without carpopodiums.

试样制备（样品取样部位）
Make Samples (Parts from Samples)

- 柑桔类水果 Citrus Fruits
  - 代表种类有：橙、柚、橘、柑、柠檬等。 Representatives: orange, grapefruit, tangerine, mandarin, lemon etc.
  - 取整个果实。Take the whole fruit.
- 核果类水果 Drupe Fruits
  - 桃、油桃、杏、枣、樱桃、李子。Peach, nectarine, apricot, jujube, cherry, plum.
  - 除去果柄及核的整个果实，但残留计算包括果核。The whole item without capopodiums and drupes, but the residual calculation will have the drupes included.

试样制备
Make Samples

- 将实验室样品混合后用四分法缩分，按以下方法预处理样品：Mix all lab samples and split in quarters, preliminarily treat samples as per below:
- ——对于个体小的物品（如苹果、坚果、虾等），去掉蒂、皮、核、头、尾、壳等，取出可食部分；As for small size items (such as apple, nuts, prawn etc), remove the pedicle, skin, drupe, head, tail, shell etc and take only the edible part.
- ——对于个体大的基本均匀物品（如西瓜、冬瓜等）可在对称轴或对称面上分割或切成小块；As for large size items with even shapes (such as water melon, wax gourd etc), they can be cut into halves or chopped into blocks along the symmetry axis or symmetry face.

试样制备
Make Samples

- ——对于不均匀的个体样（如鱼、菜等），可在不同部位切取小片或截成小段。As for samples with uneven shapes (such as fish, vegetables etc), small sections can be taken from different parts, or the whole sample can be chopped into sections.
- ——对于谷类和豆类等粒状、粉状或类似的样品，应使用圆锥四分法（堆成圆锥体—压成扁平形—划两条交叉直线分成四等分—取对角部分）进行缩分。As for grain and beans in granular, powder or similar shapes, samples can be split in Cone Quartering (dump samples into a cone-press and flat-quarter the dump by two crossing lines-take the diagonal parts).

农残检测方法
Pesticide Residue Test Method

目前蔬菜和水果农药残留检测方法用的最为广泛的是：The current most popular methods adopted in testing pesticide residue from vegetables and fruits are:

1、 NY/T 761-2008，使用气相色谱和液相色谱，一次能检测105种农药；NY/T 761-2008, using gas chromatography and liquid chromatography, which can have 105 pesticides inspected in one go;

2、GB/T 19648-2008，使用气相色谱串联质谱，一次能检测500种农药；GB/T 19648-2008, using gas chromatography tandem mass spectrometry, which can have 500 pesticides inspected in one go;

农残检测方法
Pesticide Residue Test Method

3、GB/T 20769-2006，使用液气相色谱三重四级串联质谱，一 次能检测450种农药；GB/T 20769-2006, using liquid-gas chromatography triple quadrupole tandem mass spectrometry, which can have 450 pesticides inspected in on go;

以上三种方法，在提取、浓缩步骤上基本一样，只是在净化步骤上有所不同，NY/T 761的方法测定有机磷时 All the three methods above share the same extraction and concentration steps, but have different filtration processes. When NY/T 761 is adopted in testing organic phosphorus,

4、目前国际上使用最多的QuEChERS 方法。The most worldwide popular method nowadays is QuEChERS.

称量
Weigh

- 称取25.0g试样于150mL烧杯中。Weigh to take 25.0g sample and place into a 150ml beaker.
- 样品称量时应充分搅匀，避免样品粘到容器壁上。When weigh, sample should be stirred evenly to prevent it from sticking onto the container wall.

提取
Extract

- 加入50mL乙腈，用高速组织匀浆机提取2min。Add 50ml acetonitrile, and extract with a high speed tissue homogenate machine for 2 min.

组织捣碎法：又称匀浆提取法，优点是简便、快速、效果好。一般操作是样本加提取剂后高速捣碎，使溶剂与微细试样反复紧密接触、萃取，从而提取出检测成分的方法。
Tissue Stirring also know as Homogenizing takes advantages of convenience, quick progressing and excellent efficiency. Normally it vigorously smashes the sample with extractant added, to let the solvent and fine samples frequently contacted and leached, then extract elements for test.

提取过程中注意事项
Notes When Extract

- 样本在提取过程中，应保证样品提取时间、提取过程与质控样品尽量相同，使质控更清楚的反应前处理操作的准确性。
- During the extraction process, the extract time, extract process and quality control of each sample should be maintained as similar as possible, to guarantee quality control clearly reflects the accuracy of the preliminary treatment operation.

过滤
Filter

- 将过滤纸连续两次对折，叠成90° 圆心角形状；把叠好的滤纸按一侧三层，另一侧一层打开，成漏斗状；把漏斗状滤纸装入漏斗内，滤纸边要低于漏斗边，加少许水润湿，沿玻璃棒向漏斗口内倒入均质好的试样。Fold the filter paper in half twice consecutively into 90° radius angle shape. Open the folded paper into a funnel with three layers at one side and one layer at the other. Place this filter paper into the funnel. Top of the paper should be lower then edge of the funnel. Moist the paper with a little water then dump the stirred samples into the funnel guided by a glass rod.
- 过滤到最后，用玻璃棒将滤纸四边挑起折叠，用塞子压一下，将滤液收集到装有5 克～7 克氯化钠的100 毫升具塞量筒中。To the end of the filtering, peel up all sides of the filter paper then fold them up, followed with pressing with a plug. Collect the filtered solution into a 100ml cylinder with stopper that contains 5ml to 7ml sodium chloride.

盐析
Salt Out

- 盐析过程中振荡频率和振幅应一致，保证样品的平行性。Shaking frequencies and swings during the salt out need to be in consistency to guarantee parallelism of the samples.
- 盐析过程中，要充分摇匀后再静置。如果摇匀过程中发生乳化现象，则长时间静置或者加少量试验用水，直到分层清晰。During the salt out, completely shake the sample until even before let it sit. Should emulsification happens when shaking, sample needs to sit longer or extra little water is added until clear layers appear.
- 静止时间应足够，一般不应小于0.5小时。在静止过程中，应不时轻摇容器，使器壁上的水珠下落。Sitting time should be sufficient, normally it' s longer than 0.5 hour. Shake the container from time to time during the sitting and let any water drops from the container wall fall.

浓缩
Concentrate

- 旋转蒸发器 Rotatory Evaporator
  - 其特点是可以边减压边旋转，故温度变化不大时，热量传递较快，使蒸馏能快而平稳地进行，而不发生暴沸；在使用中还可根据浓缩液体积，更换各种容量（10毫升～l升）的烧瓶。旋转蒸发器的特点是浓缩速度快，且回收率高。Its characteristics include hardly temperature change out of simultaneous decompression when rotating, quick heat transfer promoting fast and even distillation without boiling. Depending on volume of the concentration, flasks in different volumes (10ml-1ltr) are changeable during the process. Rotatory evaporators also have fast concentration progress nad high recovery rate facts.
- 气流吹蒸浓缩装置 Air Flow and Steam Concentration Device
  - 利用空气或氮气流吹带出溶剂的浓缩方法，适用于体积小、易挥发的提取液，但对于蒸汽压较高的农药就比较容易损失。This device is used for concentration by blowing the air or nitrogen out from the solution, suitable for extract solution in small volume but high evaporation. However, pesticides with high steam pressure are easily lost with it.

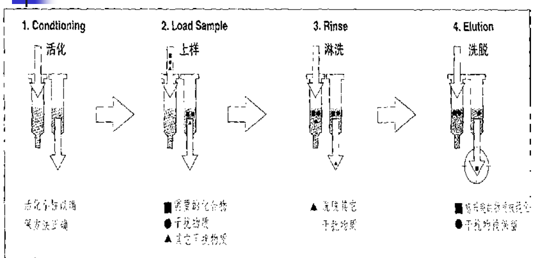
浓缩注意事项
Notes When Concentrate

- 使用氮吹浓缩时，加热温度不宜过高，一般控制在80 ℃以下。氮气流量不能过大，不能将样品吹干，在近干状态下取离水浴锅，自然晾干，若一定要干涸时，则操作必须细心，可以用橡皮球慢慢吹入干燥空气。Heating temperature should be moderate and normally lower than 80 ℃ when concentrate by nitrogen blowing. Overflow of nitrogen may dry the sample up, which is prohibited. Remove the nearly dry sample away from the water bath and dry it up naturally. When compulsory drying is required, blow dry air into the container with rubber balls carefully.
- 若易氧化的样品，还必须使用氮气，否则会导致某些农药回收率偏低。Easy oxidation samples need nitrogen applied to avoid low pesticide recovery.
- 氮吹时，氮吹管不能离液面太近，防止污染。To prevent pollution, don’t keep the nitrogen blowing tube too close to the liquid surface.

净化
Purify

- 使用有机溶剂提取样本中的农药时，样本中的油脂、蜡质、蛋白质、叶绿素及其他色素、胺类、酚类、有机酸类、糖类等会同农药一起被提取出来，会严重干扰残留量的测定。故必须将农药与上述杂质进行分离，然后才能对痕量农药进行分析测定。这一操作步骤就是所谓净化。
- When pesticides are extracted from organic solutions, the grease, wax, protein, chlorophyll and other pigments, amines, phenols, organic acids, sugars may also be extracted and its will significantly impact the residual test, therefore, before the pesticide is trace analysed any abovementioned impurities must be removed. This process is known as Purify.

固相萃取过程示意图
Solid Phase Leaching Flow Chart



Condition the column to guarantee the right method

■ Chemical Compound Required
● Interference Substances
▲ Other Interference Substances

▲ Elute other interference substance

■ Interested substances are purified
● Interference substances are kept

15g样品加15mL乙腈（含1%乙酸），6g无水硫酸镁和1.5g 醋酸钠后剧烈振摇1min。3450r/m离心1min，取1mL上层液加入50mg PSA ,50mg C_{18}和150mg无水硫酸镁混合20s，3450r/m离心1min。取上层液两份。一份稀释后进LC-MS/MS，另一份加保护剂后进GC/MS。
Add 15ml acetonitrile (contains 1% acetic acid), 6g magnesium sulphate and 1.5g natrium aceticum into 15g sample, shake vigorously for 1 min. Centrifugation at 3450r/m for 1 min, take 1ml liquid from the upper layer then add 50mg PSA, 50mg C_{18} and 150mg anhydrous magnesium sulphate to blend for 20s, Centrifugation at 3450r/m for 1 min. Take two sets of liquid from the tope layer, with one set diluted into LC-MS/MS, and the other charged into GC/MS with protection agent added.

在加入乙腈萃取溶剂后加入NaCl和MgSO4,此添加顺序防止过度放热，保证热不稳定农药的稳定性。During leaching, add NaCl and MgSO4 following adding acetonitrile. This adding sequence is to prevent over heat releasing, to guarantee stability of unstable pesticides.

提取步骤加入无水硫酸镁及氯化钠帮助农药向乙腈层分配，提高回收率！
During extract process, add of anhydrous magnesium sulphate and sodium chloride is to assist distributing the pesticides into the acetonitrile layer, to improve recovery rate!

多数蔬菜和水果: PSA+MgSO4，去除极性有机酸, 一些糖和脂肪类；Most vegetables and fruits: PSA+MgSO4, remove polarity organic acids, some sugars and fats;

蔬菜和水果>1% Fat, PSA+C_{18}+$MgSO_4$, 去除极性有机酸，糖类，脂肪和一些类固醇；Vegetable and fruits > 1% Fat, PSA+C_{18}+$MgSO_4$, remove polarity organic acids, sugars, fats and some steroids.

带色素的蔬菜和水果：PSA+GCB+$MgSO_4$, 去除极性有机酸，糖类，脂肪+类胡萝卜素和叶绿素，不能用于平面结构农药；Vegetables and fruits with pigments: PSA+GCB+$MgSO_4$, remove polarity organic acids, sugars, fats + carotenoid and chlorophyl, not suitable for parallel structured pesticides;

共面农药，可以在萃取溶剂中加入一定量甲苯。As for coplanarity pesticides, certain amount of methylbenzene can be added into the leaching solution.

标准溶液的配制
Formulate Standard Reagent

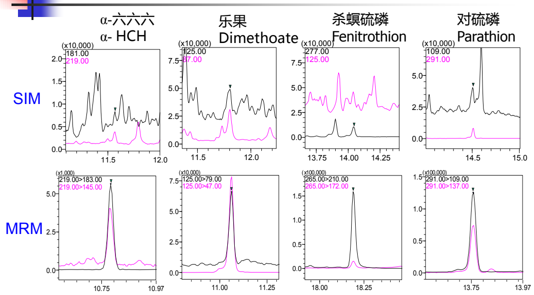
- 由于不同样品存在一定的基质效应，因此用试剂配制标准溶液测定样品往往会造成检测结果偏高或偏低的现象。Due to the fact that certain substrate effect happens to different samples, standard solution formulated from reagents may cause higher or lower test result when testing samples.
- 用气相色谱仪和气相色谱-串联质谱测定时，一般产生基质增强效益，用液相色谱-串联质谱测试时，一般产生基质抑制效应。Substrate enhancement effect occurs when test with gas chromatography and gas chromatography tandem mass spectrometry, while substrate restrain effect occurs when test with liquid chromatography tandem mass spectrometry.
- 采用样品空白提取液配制标准溶液，可以有效弥补基质效应带来的定量偏差。Standard solution from blank sample extraction liquid could effectively offset tolerance caused by substrate effect.

测定
Test

- 农药残留检测常用仪器：Common instrument used in pesticide residual test:
- 气相色谱仪、液相色谱仪、气相色谱-串联质谱仪和液相色谱-串联质谱仪。Gas chromatograph, liquid chromatograph, gas chromatography tandem mass spectrometry and liquid chromatography tandem mass spectrometry.
- 由于蔬菜基质比较复杂，干扰多，液相色谱仪的灵敏度较低，气相色谱仪和单级气相色谱-串联质谱仪抗干扰能力差，因此目前使用最多的是气相和液相色谱三重四级串联质谱仪。Due to complicated substrates from vegetables, abundant interference, low sensibility of liquid chromatograph, limited anti-interference function of gas chromatograph and single phase gas chromatography tandem mass spectrometry, the most instrument applied currently is gas and liquid chromatography triple quadrupole tandem mass spectrometry.

分析结果(1)：油麦菜样品加标(5 μg/kg)
Test Results (1) Target (5 μg/kg) added into lettuce samples

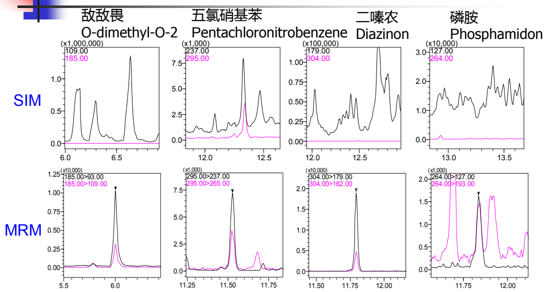
GC-MS(SIM)与GC-MS/MS(MRM)测定对比
Test and compare GC-MS(SIM) and GC-MS/MS (MRM)



30

分析结果(1)：生姜的样品加标(5 μg/kg)
Test Results (1) Target (5 μg/kg) added into ginger samples

GC-MS(SIM)与GC-MS/MS(MRM)测定对比
Test and compare GC-MS(SIM) and GC-MS/MS (MRM)



检测过程的质量控制
Quality Control over Test Progress

- **首先做试剂空白，空白值过高应检查试剂是否有问题或器皿被污染。Make reagent blanks at start. Check to see if the reagent is in question or the container is contaminated when the blank values are too high.**
- **每批次检测时应通过加标回收率或测定标准物质进行质量控制。农药残留检测每测定10个样品进一个标准溶液，每测定24个样品做一个添加回收率。Quality control during each batch of test is achieved through standard addition recovery rate or testing the standard substance. As for pesticide residual test, each standard solution should be added every 10 sample tests, and each standard addition recovery rate should be made every 24 sample tests.**
- **如发现回收率超过70 %~120 %的范围时，该批次样品要重做。Retest any batch of samples when the recovery rates is beyond range of 70 %~120 %.**

检测过程的质量控制
Quality Control over Test Progress

- **农药残留检测对超标或接近限量值的样品，应重新称样进行测定，并使用极性不同的柱子或不同检测器进行确认。经复测后仍超标的样品，用气质或液质联用仪进行定性检测。During the pesticide residual test, any sample of which the content exceeded the standard or the value is close to the limit, that sample needs to be reprepared, retested and confirmed by using another column with different pole or different instrument. Samples of which the content still exceed the standard after retest need to be confined by a gas or Liquid chromatography-mass spectrometry.**
- **标准溶液应现用现配，放置一段时间后浓度有所改变，每次再用时应与以前的图谱进行比较，检查峰面积是否有较大的变化。The standard solution should be freshly prepared for use. The concentration may change once being placed for a while, thus it' s required to compare the diagram with previous ones to determine if significant changes happened to the peak area.**

谢谢聆听！
Thanks for your time!

这些菜放心食用吧！
Enjoy these tested vegetables!

PRM Implementation: Quality Control

-----Quality Control in Laboratory Testing

Agro-Environmental Quality Supervision & Testing Center, MOA (Tianjin)

Zeying He
hezeying222308@163.com

Contents:

Overview

1. Concept of quality control (QC)

- QC procedures are specific tools that used to obtain reliable laboratory data based on modern scientific management and statistical methods.
- QC guarantees that the analytical errors are within allowed values and good accuracy and precision are obtained to ensure the intended use of the data.

2. Essence of QC

- Guarantee the traceability of testing results
- Achieving controllability of testing quality

QC in laboratory is the whole procedures that conducting "quality management system documentation", implementing "Quality Policy", fulfilling "Quality target", keep "quality management system " and constant improvement of these procedures.

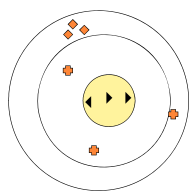
The aim of QC is reduce experimental error

3. Classification of Error

Error=observed value-true value
- Systematic Error
- Random Error

Systematic error affect accuracy, random error affect precision.

- Good precision do not ensure high accuracy;
- Bad precision, bad accuracy;
- Good precision result in good accuracy if there is no systematic error.



4. Relationship between measuring and error

- Accuracy is relative, absolute accuracy do not exist.
- Errors are controllable, and controllable errors are acceptable.
- Laboratory Technicians should be familiar with all the procedures involved in testing.
- Testing quality can be improved by effective quality management and control.

Quality Control Measures in Laboratory

Within laboratory QC
- In-house QC
- Discover random errors and new systematic errors
- Evaluation of the stability of testing quality is the fundamental and necessity of laboratory testing.

Inter-laboratories QC
- External QC
- Discover systematic errors and the comparability between different labs
- Evaluate the testing system and analysis ability
- Compare with standard laboratory is an effective way of calibration

Within-laboratory QC

1. Validation of new analytical method

2. QC in the process of testing

1. Validation of new analytical method

- Laboratory should validate the performance of a new method.
- Validation parameters including :

Accuracy, precision, sensitivity, linear range, et. al

If there is missing of detailed procedures in the new method, which could affect the testing results, the detailed procedures should be written into Standard Operating Procedure (SOP) as supplement to standard method.

SOP
- Detailed description of key conditions and procedures
- Description of method deviation

A. Selection of matrix

- International organizations and domestic administrations have specified representative matrices for method validation.
- Appropriate matrices can be chosen from the table according to the matrix category.

Category	Matrix	Representative variety
meat	muscle tissue	pork, mutton, horsemeat, chicken, duck meat, turkey
	fishery products	haddock, salmon, trout, shrimp, crab, shellfish
	organ	liver, kidney
	fat	fat
high water content plant origin food	bulb vegetable	onion
	Fruited vegetable/melon	tomato, cucumber, green pepper
	Leafy vegetable	lettuce, spinach
	stem vegetable	leek, celery, asparagus
	Fresh legume vegetable	pea with pod, beggerweed, snow bean, broad bean, kidney bean
bakery product	cake	cake, moon cake
	bread	bread
	biscuit	biscuit
flavoring	soybean sauce	soybean sauce, oyster sauce, fish sauce

B. Selection of blank matrix

Ideal blank sample should be the same matrix category with the sample to be tested. There should be no target analytes in the blank sample and the constitutions should not interfere the testing.

- When the LOQ is lower than 1/3 limit value, the area (or height)of interfere peaks should lower than 1/10 of the area (or height) of LOQ
- When the LOQ is higher than 1/3 limit value, the area (or height)of interfere peaks should lower than 1/3 of the area (or height) of LOQ
- For illegal additive or banned pesticides and pharmaceuticals, the area (or height)of interfere peaks should lower than 1/3 of the area (or height) of MRPL(or LOQ by administration)
- When there is interferences in blank samples, the interference should be deducted

C. Accuracy

- **By Certified reference material (CRM)**
  - Accuracy was evaluated by the use of CRM subjected to the entire analytical process in replicates ($n \geq 6$).
  - The observed results should be within the allowable range of the CRM.

- **By matrix spike**
  - Accuracy is evaluated by calculating recoveries of the analytes spiked into blank samples.
  - Recoveries are determined by spiking experiment. Three spiking levels ($n \geq 6$ for each level) are needed.
  - The recoveries should meet requirement of accuracy.

Spiking level setting:

- For restricted and banned pesticides, the recommended spiking levels are: LOQ, 2*LOQ, 10*LOQ.
- For pesticides having MRL, the recommended spiking levels are: 1/2MRL, MRL, 2MRL.
- For multiresidue analysis, there are different MRLs, under this circumstances, the recommended spiking levels are: 1/2MRL (lowest MRL), MRL (lowest MRL), 2MRL (higest MRL).

Table 1 Recovery requirement of different spiking levels

Spiking levels mg/kg	Recovery Range %	RSD %
≤0.001	50~120	≤35
>0.001≤0.01	60~120	≤30
>0.01≤0.1	70~120	≤20
>0.1≤1	70~110	≤15
>1	70~110	≤10

D. Precision (repeatability/ reproducibility)

- Internal repeatability can be evaluated by duplicate analysis of parallel spiked samples.
- Reproducibility between different laboratories can be evaluated by inter-laboratory comparison (e.g.3-5 labs).

Table 2 Repeatability at different residue levels

Concentration mg/kg	RSD %
≤0.001	≤36
>0.001≤0.01	≤32
>0.01≤0.1	≤22
>0.1≤1	≤18
>1	≤14

Table 3 Reproducibility at different residue levels

Concentration mg/kg	RSD %
≤0.001	≤54
>0.001≤0.01	≤46
>0.01≤0.1	≤34
>0.1≤1	≤25
>1	≤19

E. Specificity

The ability of discriminate between the analyte and other compounds.

F. Sensitivity

LOQ: >10*S/N, matrix based standard, not solvent standard

LOQ< MRL(official limit)-3*SD

LOQ should be validated (accuracy, precision)

G. Linearity

Calibration curve, residues < ±20%

- Cover concentration range of target analyte, including 0.5*MRL, MRL, 2*MRL
- Recoveries should be considered at lowest and highest calibration level
- Calibration function (non weighed, 1/x)

H. Single-level calibration

- Accurate results can be obtained when the response of analyte is close to that of single level standard (within ± 30%).
- Satisfactory recovery (<100%) can be obtained at LCL

2. QC during the process of testing

A. Requirement of QC samples

- Known composition and content of analyte
- Can be used for repeatability
- Can be used to evaluate accuracy during testing

B. Control Samples in QC

Including but not limited to:

a. reagent blank

b. blank sample

c. CRM

d. incurred sample

e. spiked sample/fortified blank/blank spike

f. blind spike/blind sample (could be d or e)

C. Application of control samples

Control sample is analyzed in an identical manner as a sample and is used to document laboratory performance.

For each batch samples, control samples must be analyzed. a, b and at least one of the other four control samples must be used.

D. Application of spiked sample

For single analyte analysis:

- Pesticide: spiking level close to LOQ
- pesticide with MRL: LOQ, 50-100% MRL
- Incurred sample: spiking level close to target residue level

For multiresidue analysis:

- Spike all or part of analytes (representative analytes)
- Spike all the analytes over a half-a-year/1-year period

E. Injection order

Appropriate sequence arrangement---avoid cross-contamination

- Recommended injection order: reagent blank, blank sample, spiked sample (incurred sample), blank sample(reagent blank)again, real sample, spiked sample(incurred sample)
- In one batch, control samples are analyzed in intervals (e.g. 10 samples interval) when the batch is large.

Inter-laboratory QC

Proficiency Test

- **Twice a year**
- **Over 100 laboratories nationwide**
- **Two matrices**
- **10 out of 80+ PRM pesticides**

PRM Implementation:
Data Analysis and Report Formulation

Yun Li
Division of Risk Monitoring and Assessment
JUY 17th, 2015

Institute of Quality Standards & Testing Technology for Agro-products, CAAS

Outline

- Types and classification of data
- Target of data analysis
- Report formulation of the data results

Institute of Quality Standards & Testing Technology for Agro-products, CAAS
www.iqstap.com

Type and classification of data related to PRM

- Residue data: basic information about samples
  - ✓ Registration number of pesticide and its residues
  - ✓ The crops, commodities, and stored products
  - ✓ The total amount applied
  - ✓ The month, day, and year
  - ✓ The location of the application
  - ✓ The size of area treated
  - ✓ The name of the certified applicator
  - ✓ The behavior of new or previously untested pesticides
  - LOD,LOQ

Institute of Quality Standards & Testing Technology for Agro-products, CAAS
www.iqstap.com

Types and classification of data related to PRM

- Dietary data: basic information about consumption
  - ✓ Commodities (agro-products and its relevant processed foods)
  - ✓ Dietary patterns , frequency and consumptions of different population (general and sensitive)
  - ✓ processing factor
  - ✓ Body weight etc.,

Institute of Quality Standards & Testing Technology for Agro-products, CAAS
www.iqstap.com

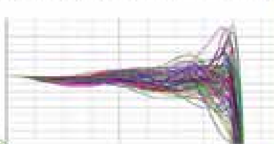
Type and classification of data related to PRM

- *in vivo* & *in vitro* toxicity data : basic information about hazard
  - ✓ Routine toxicological data, such as acute, sub-acute; liver toxicity, developmental toxicity; by animal or cell
  - ✓ NOAEL, LOAEL
  - ✓ ADI, TDI, PTWI etc.,

Institute of Quality Standards & Testing Technology for Agro-products, CAAS
www.iqstap.com

Type and classification of data related to PRM

- Simulated data: basic information about any related items which can not be acquired easily
  - ✓ Simulated by software with certain regulation, such as @risk, Crystal ball, SPSS, SAS etc.,



Institute of Quality Standards & Testing Technology for Agro-products, CAAS
www.iqstap.com

Outline

- Types and classification of data
- Target of data analysis
- Report formulation of the data results

Institute of Quality Standards & Testing Technology for Agro-products, CAAS   www.iqslap.com

Pesticide Residue Monitoring

how to apply to big data effectively for goals?

Institute of Quality Standards & Testing Technology for Agro-products, CAAS   www.iqslap.com

Target of data analysis

Pesticide Residue Program

- Residue data
  - **Goal 1**: Monitor pesticide residues in fresh products, water, soil etc., throughout the Agro-foods supply.
- Toxicity , dietary and simulated data
  - **Goal 2, 3, 4.. :**
    - Risk assess the dietary risk of certain pesticides (single and combined residues).
    - Formulate relevant standard (MRL)
    - Help keep produce with illegal residues out of the marketplace and protect trade

Institute of Quality Standards & Testing Technology for Agro-products, CAAS   www.iqslap.com

Outline

- Types and classification of data
- Target of data analysis
- Report formulation of the data results

Institute of Quality Standards & Testing Technology for Agro-products, CAAS   www.iqslap.com

Example for goal 1: Pesticide Data Program

Institute of Quality Standards & Testing Technology for Agro-products, CAAS   www.iqslap.com

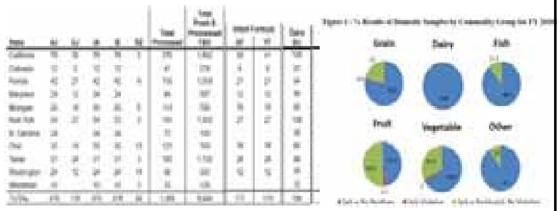
Example for goal 1: Pesticide Data Program

Example for goal 1: Pesticide Data Program

- **Report : the representative of the data.**

Institute of Quality Standards & Testing Technology for Agro-products, CAAS www.iqstap.com

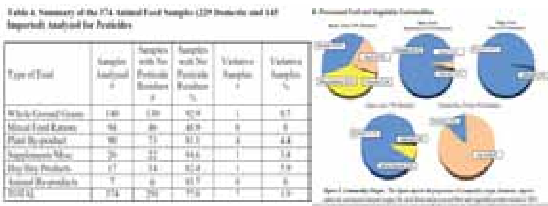
Example for goal 1: Pesticide Data Program



- **Report: the basic information about sampling, such as origin of samples, number, and commodities etc.**

Institute of Quality Standards & Testing Technology for Agro-products, CAAS www.iqstap.com

Example for goal 1: Pesticide Data Program



- **Report: the violation of the samples come from different places, and different commodities.**

Institute of Quality Standards & Testing Technology for Agro-products, CAAS www.iqstap.com

Example for goal 2,3,4: Food Quality Protection Act

- **FOOD QUALITY PROTECTION ACT – FQPA**
- **For reassessing and revising MRL: Health-based, single standard: "reasonable certainty of no harm" from pesticides in food, reassess 9,721 tolerances in 10 years**
- **For determing safety factor: Apply "10x child safety factor" where necessary**
- **For determing risks of combined pesticides in foods: Assess aggregate exposure and examine cumulative effects**

Institute of Quality Standards & Testing Technology for Agro-products, CAAS www.iqstap.com

Example for goal 2,3,4: Food Quality Protection Act

- **How to determine the MRL of pesticide**

Field trial → MRL1: the permissible content of pesticide in certain agro-products, diseases and insect pests prevention, High high quality agricultural Products etc.,

Risk assessment → MRL2: the permissible content of pesticide in certain agro-products, health of human being

Risk management → MRL3: the permissible content of pesticide in certain agro-products, CAC or Main trade countries

Report: the final MRL

Institute of Quality Standards & Testing Technology for Agro-products, CAAS www.iqstap.com

Example for goal 2,3,4: Food Quality Protection Act

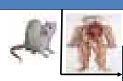
- **How to Risk assessment for determing safety factor**

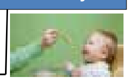
Hazard Identification: toxicity data

Dose-Response Assessment: toxicity data

Exposure Assessment : dietary data

Report : Safety factor





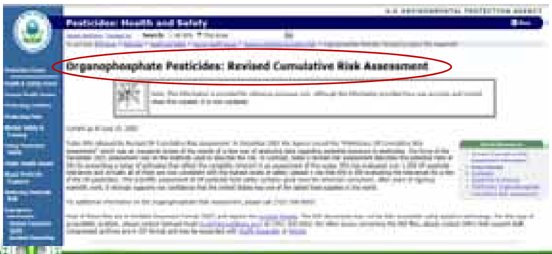
Risk Characterization : simulated data

Institute of Quality Standards & Testing Technology for Agro-products, CAAS www.iqstap.com

Example for goal 2,3,4: Food Quality Protection Act

●developed by EPA's Office of Pesticides Programs (OPP) :

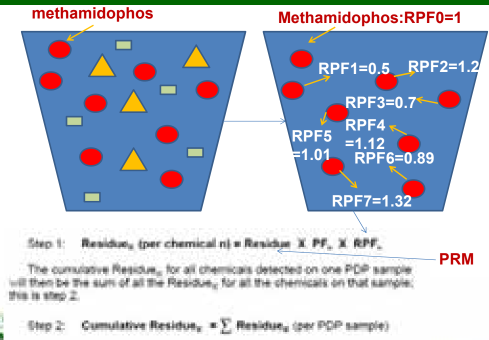
chemicals by a common mechanism of toxicity , organophosphorus pesticide



Institute of Quality Standards & Testing Technology for Agro-products, CAAS

www.iqslap.com

Example for goal 2,3,4: Food Quality Protection Act



Institute of Quality Standards & Testing Technology for Agro-products, CAAS

www.iqslap.com

3. 1 发表论文

Step 3:

Cumulative Risk=

Exposure(dietary) Data/Cumulative Residue$_{IE}$

Cumulative Risk ≥1 ， Report: Have dietary risk

Cumulative Risk ＜1， Report: Have no dietary risk

Institute of Quality Standards & Testing Technology for Agro-products, CAAS

www.iqslap.com

Thanks for your attention !

E-mail: GZ-liyun@126.com

中国农业科学院农业质量标准与检测技术研究所

www.iqslap.com

The Monitoring Data Application of Pesticide Residue in Edible Agricultural Products

Qiu Jian
ICAMA Residue Review Division

The researcher of the secretariat of Food Safety National Standard Pesticide Residue Committee

Tel: 010-5919 4033
Email: jianqiu@agri.gov.cn
July 22, 2015

Outline

- The purpose of monitoring
- The control range
  - Edible agricultural products varieties
  - Pesticide varieties
- The monitoring data applications
  - The source monitoring
  - Rotational pesticide application
  - GAP reevaluation
  - The amendment of MRLs

The purpose of monitoring

- **Discover the potential risk, and improve the targeted risk management and source control.**

Provide information for determination of regulation scope, emphasis and mode, as well as for establishment of risk management policy.

The scope of monitoring

- **Pesticide varieties**

- The government forbids to use 33 varieties or restricts to use 17 varieties of pesticide.
- The pesticide varieties with acute toxicity;
- The pesticide varieties widely needed for sterilization and pesticide.

The scope of monitoring

- **Edible agricultural products**

1. Fresh-eating agricultural products:
- Vegetables, fruits, tea, edible mushrooms, etc.

2. The varieties with a large dietary amount
- Rice, wheat, corn, oil crops, etc.;

- **The scope of monitoring**

The main producing areas and planting steps of edible agricultural products.

↑

It makes sure the monitoring so as to trace the sources.

The monitoring data application

- **Provide information for the source monitoring**

The 49 clause of *Food Safety Law* has stipulated as follows:

- Strictly implement the stipulations on application safety interval or withdrawal period of the agricultural inputs, and forbid to use the agricultural inputs which are officially prohibited by country.
- Forbid to apply the toxic and high-toxic pesticides to the vegetables, melons and fruits, tea, Chinese herbs, etc.

The application of monitoring data

- Provide information for source monitoring

The prohibitive and restrictive high-toxic pesticide should be sold in designated area

If any illegal use of high-toxic pesticide occurs → The local supervision department → shall punish the seller and the users after confirmation.

The application of monitoring data

- Instruction on rotating to use the pesticide

High-frequency detection of pesticide varieties → Issue the rotational application information on using pesticide. It is recommended to use the pesticides with different functional mechanism, and rotate to apply them.

The logo on the product tag shows the functional mechanism of pesticide. We should be noted that avoid using the pesticides with the same logo so as to prevent from resistance occurring which may result in exceeding the standard.

The application of monitoring data

- Control measures on adjustment of pesticide residue

High-frequency pesticide varieties exceeding the standard → Revaluation → Controllable risk. → Optimize the formulation or adjust the GAP: the additive dose, times and the safety interval

Revaluation → Uncontrollable risk → To be included into the elimination plan, and recommended to use alternative pesticide varieties.

The application of monitoring data

- Revaluation of MRL

It requires of revaluation of MRL if there are the conditions as follows:

1. The approved Good Agriculture Practices (GAP) has a great change;
2. Any new potential risks are proved in the toxicological study;
3. Any intake risks are shown in the monitoring data;

Reevaluate the dietary risk and revise the current MRL.

The application of monitoring data

- Overview of MRL

The GB 2763 is the only mandatory standard concernin with pesticide residue in the food by China.

- There are 3650 limited amount indexes for MRL:
- 387 kinds of pesticide occurring in 284 varieties (kind of food.
- 162 detection method standards;
- 317 varieties of foodstuff classes (Appendix A)

The Notice of National Health and Family Planning Committee and The Ministry of Agriculture of the People' s Republic of China

The No.4 of 2014

It is reviewed and approved by National Food Safety Standard Evaluation Committee according to the stipulations of Food Safety Law. It is hereby to issue "Maximum Pesticide Residue Limit in the Foodstuff of National Food Safety Standard" （Gb2763-2014）, to come into effect on Aug 1, 2014, while the "Maximum Pesticide Residue Limit in the Foodstuff of National Food Safety Standard" （Gb2763-2014）shall be abrogated as of the same date.

The notice is hereby given.

Sealed by: the National Health and Family Planning Committee

Sealed by: the Ministry of Agriculture of the People' s Republic of China

Date: Mar 20, 2014

The application of monitoring data

- The preparation of MRL in Spice/seasonings

For that has no standard residual test data, it should provide the detailed planting, production status, as well as enough monitoring data so as to establish MRL.


Conclusion
Thanks!
Please make comments!

NICAS

Data Collection at the National Level

——Monitoring Model Based

Zhijun Chen

NICAS

Content

1. Monitoring Elements
2. Monitoring Model
3. Practice in China
4. Conclusions

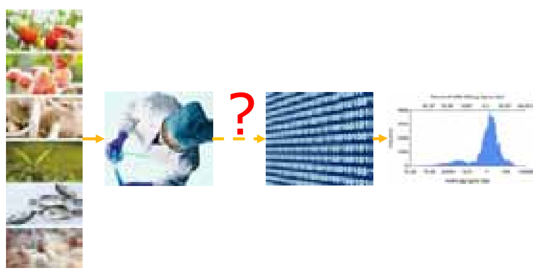
Global Pesticide Residue Monitoring Programs(1)

- FAO/WHO
  - Global Environment Monitoring System(GEMS/Food)
  - http://www.who.int/nutrition/landscape_analysis/nlis_gem_food/en/
- EU
  - Multi-annual Control Programme
  - http://ec.europa.eu/food/plant/pesticides/max_residue_levels/eu_multi-annual_control_programme_en.htm
- USDA
  - Pesticide Data Program (PDP)
  - http://www.ams.usda.gov/AMSv1.0/ams.fetchTemplateData.do?template=TemplateC&navID=PDPOviewBox2Link1&rightNav1=PDPOviewBox2Link1&topNav=&leftNav=ScienceandLaboratories&page=PesticideDataProgram&resultType=&acct=pestcddataprg

Global Pesticide Residue Monitoring Programs(2)

- China
  - National Food Safety Risk Monitoring Plans
  - http://www.nhfpc.gov.cn/sps/s5851/list.shtml
  - Risk Monitoring Program for Quality&Safety of Agricultural products
  - http://www.jgj.moa.gov.cn/

A Big Problem——How to collect data ?

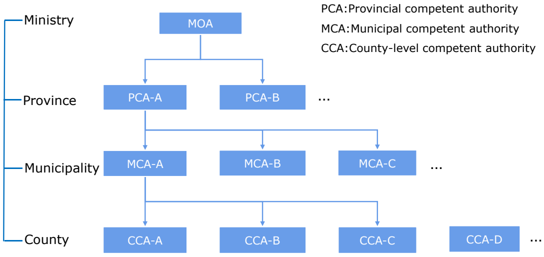


NICAS

Content

1. **Monitoring Elements**
2. Monitoring Model
3. Practice in China
4. Conclusions

Management Layers



MOA:The ministry of agriculture
PCA:Provincial competent authority
MCA:Municipal competent authority
CCA:County-level competent authority

Food Category and Encoding

Pesticides Index

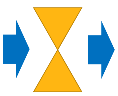
Maximum Residue Limits

Extended Standard

MRL（mg/kg）

Food	Dichlorvos
Vegetables	
Leafy vegetables	0.2

GB 2763-2014



Food Category

MRL（mg/kg）

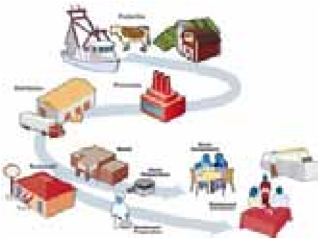
Food	Dichlorvos
Vegetables	
Leafy vegetables	
Spinach	0.2
Lettuce	0.2
Celery	0.2
…	

ES 2763-2014

Monitoring System——National Level

- Testing Center (TC)
  - More than 270 TCs
  - Categories involved include vegetables, fruits, tea, livestock, aquatic products, etc.
- Risk Assessment Laboratory (RAL)
  - 98 RALs of two types: specialized and regional ones
  - 13 categories involved, including vegetables, fruits, tea, livestock, dairy products, aquatic products, packing materials, etc.
  - Supervising their respective risk monitoring stations
- Risk Monitoring Station (RMS)
  - 145 RMSs
  - Responsible for sampling and reporting of risk-related information under the supervision of RAL

Monitoring links



From Farm To Table

NICAS

Many others

- Time and season
- Sampling and testing personnel
- Test method
- Test instrument
- …

NICAS

Knowledge of monitoring elements

- Effective monitoring will only be successful if various monitoring elements can be accomplished. Thus, sufficient illustration on these monitoring elements will be very helpful to better understand the informatization essence of monitoring;
- New monitoring tasks can be customized through reconfiguration of monitoring elements;
- Encoding lays the foundation for management of monitoring elements by converting these elements into standardized, formatted code data that can be processed by computer;
- Encoding makes data consolidation possible as information from various monitoring levels, sectors and types will have the same data format.

NICAS

NICAS

Content

1. Monitoring Elements
2. **Monitoring Model**
3. Practice in China
4. Conclusions

Purposes:

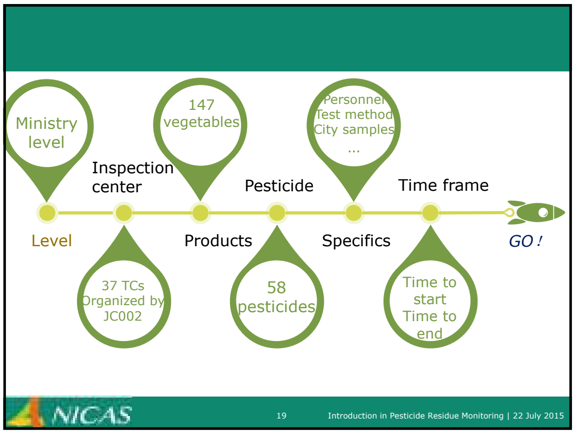
- Manage monitoring elements
- Standardize monitoring procedures
- Customize specific monitoring tasks by configuration of monitoring elements

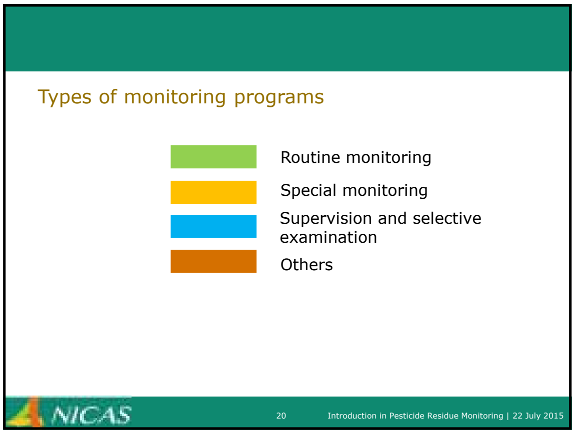
NICAS

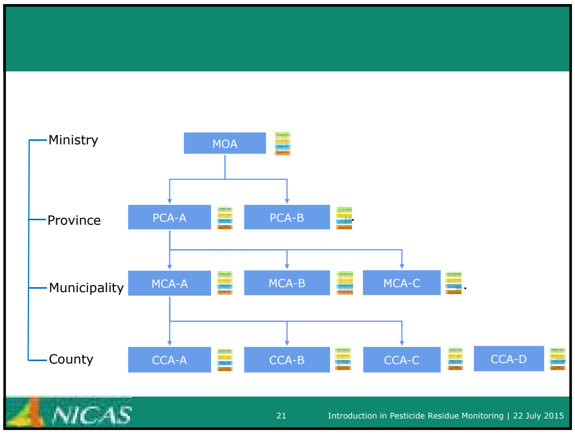
Example: MOA Routine monitoring of pesticide residue in vegetables

- Engaging 37 Quality Inspection Centers under MOA
- Organized by MOA Vegetable Quality Monitoring, Inspection and Testing Center (Beijing)
- Carried out quarterly, i.e. four times per year
- More than 100 cities randomly selected nationwide
- Involving 147 vegetables and 58 pesticides

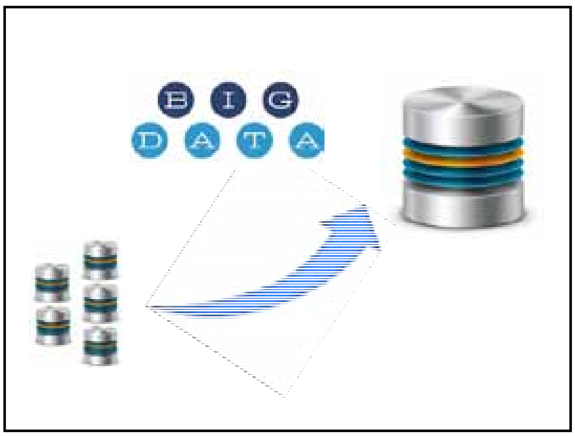
NICAS


Ministry level
147 vegetables
Personnel
Test method
City samples
…
Inspection center
Pesticide
Time frame
Level
Products
Specifics
GO !
37 TCs
Organized by
JC002
58 pesticides
Time to start
Time to end
NICAS
19
Introduction in Pesticide Residue Monitoring | 22 July 2015


Types of monitoring programs
Routine monitoring
Special monitoring
Supervision and selective examination
Others
NICAS
20
Introduction in Pesticide Residue Monitoring | 22 July 2015

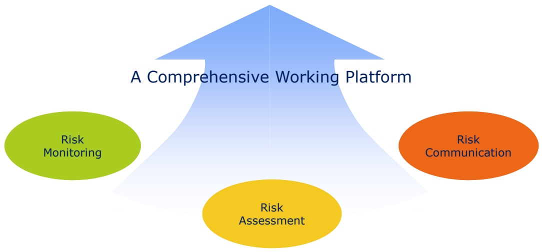

Ministry
MOA
Province
PCA-A
PCA-B
Municipality
MCA-A
MCA-B
MCA-C
County
CCA-A
CCA-B
CCA-C
CCA-D
NICAS
21
Introduction in Pesticide Residue Monitoring | 22 July 2015


监 测
NICAS
22
Introduction in Pesticide Residue Monitoring | 22 July 2015


BIG
DATA


NICAS
Content
1. Monitoring Elements
2. Monitoring Model
3. Practice in China
4. Conclusions
24
Introduction in Pesticide Residue Monitoring | 22 July 2015

National Information Center of Agro-products Safety



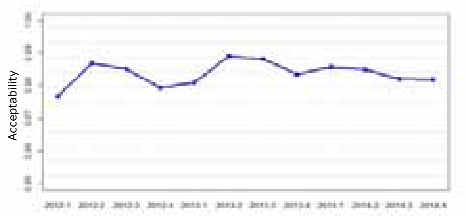
Monitoring Element Management

Data reporting

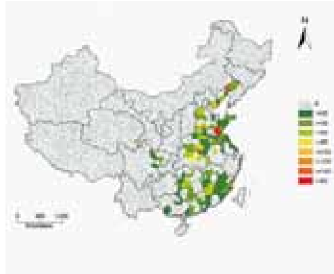
APP for Sampling

——Recording sample information and geographic coordinates

Preliminary Data Analysis



Application of geographic information system



RAMA
—— A Web—based Dietary Exposure Assessment Model

Application of Monitoring model in Jiangsu Province

NICAS

Content

1. Monitor Elements
2. Monitor Model
3. Practice in China
4. **Conclusions**

Basic Experiences (1)

- Informatization can significantly improve monitoring efficiency and provide information for decision making in risk management;
- Pesticide residue monitoring data can be consolidated across the nation by configuring monitoring elements via monitoring model;
- Attention should be given to how to properly handle the problem of sharing information with local government for the purpose of national-level consolidation of monitoring data.

Basic Experiences (2)

- Informatization process needs a well-designed top-level design, integrated planning and multi-step implementation;
- The information system needs to be operated and maintained by specialized agencies and professional technical teams;
- Stable funding support is required.

Challenges

Information Security & Big Data Analytics

NICAS

Zhijun Chen

Center of Standards Research for Agro-Products Quality, MOA
National Information Center for Agro-products Safety
E-mail: zhijunchen@vip.126.com