Annex

I Phytosanitary Issues:

Summary of Report "Preparation of Sanitary and Phytosanitary Action Plan for Cambodia" by Ravi Khetarpal (SPS Subject Specialist – Phytosanitary Measures)

1. The Diagnostic Trade Integration Strategy (DTIS) of Cambodia prepared in 2007 identified 19 product sectors of export potential on which to focus further. Among these, nine were agrifood products (rubber, cashew nuts, cassava, corn, fishery, fruits and vegetables, livestock, rice and soyabeans). Among the strategies identified as necessary to stimulate export growth was better management of SPS issues. The selection of products (**rice, cashew nut, cassava, black pepper, mango, banana, corn, soybean and mungbean**) for study was done within the limits set by the 2007 DTIS, and in consultation with senior officials of the Ministry of Agriculture and Minstry of Commerce.

2. It has been estimated recently that more than one third of the volume of agri-food export is associated with a high SPS risk, mostly plant health-related given the predominance of plant products in Cambodia's export basket (64% of total exports in 2004 were phytosanitary risk sensitive).

3. A large number of weeds, insects and diseases are found to be the constraints in increasing agricultural productivity. Control of the pest and disease situation will improve agricultural productivity and may help resolve export problems which have arisen. Agri-food product export would also be boosted by the implementation of Good Agricultural Practices and Good Manufacturing Practices for post-harvest processing. For instance, excessive use or use of unapproved pesticides may limit Cambodia's access to developed country markets for products such as soybeans, rice, corn, fruits and vegetables.

4. The present study was made to obtain qualitative and quantitative information on constraints to market access for selected products where risks are associated with pest infestation or disease infection more specifically. The study also include identification of the various mitigation measures needed to meet market-specific entry conditions for selected markets both globally and regionally.

Potential SPS risks associated with the export of the selected products

Factors determining the SPS risk in Cambodia

Occurrence of diseases and pests in the field

5. Since rice is the main crop for Cambodian farmer, the main reports on pests are confined to rice crop. Golden apple snail is a rice pest which has been spreading throughout the country and making damage on the rice crop especially at young seedling stage. Brown plant hopper is other important pest of rice which is a common pest, often causing damage in a severe form. Armyworm, stem borer and rice sheet blast are also often recorded to attack on rice crop throughout the country. There is no data supporting amount of losses caused by these pests. In case of corn Downy mildew is the main disease that has contributed in reducing crop area in the last 4-5 years in Cambodia.

Of other crops selected for study not much documented information is available though in the field pests thought to be affecting agricultural productivity and production significantly.

Use of pesticides for seed treatment/ spraying in the field

6. The use of agrochemicals in Cambodian agricultural production is mainly in the form of fertilizers and pesticides (most popular are insecticides, herbicides and some fungicides)

   However, there is little or no data on the following:
   - volume of active ingredient of those agrochemicals used per year in the country,
   - agrochemicals used for specific crops
   - agrochemicals used in specific region of the country.

7. Pesticide residue in crop product in Cambodia may vary according to crop type. The vegetable crops having shorter period of cultivation and mostly consumed as fresh food have a higher risk of pesticide residue compared to rice, and cashew nut and others. Anecdotal evidence is that vegetable farmers may harvest their crops within few days of spraying (and certainly within recommended Pre Harvest Intervals). It was further found that despite suspected misuse of pesticides Cambodia has never received any notification of non-compliance related to pesticide residues from importers (which are mainly the other ASEAN countries).

Post harvest processing and storage

8. The processing of the end product (threshing, drying, treatments, etc) and the storage conditions such as temperature and humidity of store houses and duration of storage are also critical as unsuitable conditions can cause spoilage by rodents, storage pests, mold fungi etc and may also lead to production of mycotoxins in certain cases. Testing and certification especially for mycotoxins are crucial for trade. MAFF is empowered to control the food safety of agricultural product from farm until final phase of primary processing. MAFF has involved Agro-Industry department in the implementation of the provision stated by this Sub-Decree, but it is not clear whether there has been any activity to date.

Handling and packaging

9. The handling of the produce in transportation and nature of packaging is also crucial for trade. In case of packaging of material in containers of wood origin international standard developed by IPPC i.e. ISPM 15 has to be complied with for phytosanitary certification.

   The poor drying facility may be the one among many reasons acting as a constraint to paddy export to neighboring countries. The shortage/poor of drying facility have been reported from mostly all local millers.

Quarantine Inspection, testing and treatments

10. The quarantine processing of the material prior to export is very important because the exporter has to comply with the requirements of the importing country and has to issue an internationally approved Phytosanitary Certificate giving details of absence from pests and diseases, the disinfestations/disinfection treatments imparted to the material as curative or prophylactic measure and any special measure taken as stipulated by the importing country. This requires facilities and expertise for inspection, specialized protocols for detection and for disinfection/ disinfestations.

11. Plant quarantine inspection is still mainly base on visual check of consignment before export. The low knowledge and experience of PQ inspector, the lack of PQ inspection guidelines, inadequate pest diagnosis facility and staff (with no capacity to identify many species of arthropod pests, many species of fungus, all bacteria, nematode, and virus) are the set of reasons for non compliance in export of plant products.

12. There is no treatment facility in the NPPO for grains and dry plant products. Similarly, Vapour Heat Treatment or irradiation to treat fresh produce such as mango and banana are not available in Cambodia at present.

Export certification procedures

13. The export certification procedures involve the application of laid down guidelines, standards, Standard Operating Procedures for sampling detection of pests and for disinestation/ disinfection of the material.

    Food safety inspection

14. Since, food safety is a cross sectoral issues and there is no clear mandate among government agencies, this sector become a main constraint for Cambodian exports to the niche markets.

    At present the food safety law is not in place, all government agencies have used some general regulation/Law to discharge their duties for food safety.

Assessment of the production data

(see appendix for details)

Assessment of pests scenario

15. Data was collected from the National Phytosanitary Database for assessing the pest scenario of selected products. The major information on pest scenario is in case of rice which is the main crop of Cambodia. There are a large number of insect pests recorded indicating the skills that exist to some extent in diagnostics of insect pests whereas for all other pests the diagnostic skill is very limited or nil. On cashew, corn, soybean and mungbean there is no endemic list of pest documented in in the National Phytosanitary Database (NPD) of NPPO.

16. The pest list of NPPO was mainly drawn during recently completed FAO/TCP project by collecting and collating information from various sources such as books, bulletins, monographs, annual reports, reports of donor agencies etc and hence are mainly from the secondary and tertiary data sources. The importers are likely to be more vigilant in imports and may even like to go for pre-export certification at source.

Assessment of capacity

Crop	Detection of pests (Diagnostics)	PRA skills	Pest surveillance programmes	Identification of Pest free areas	MRLs Mycotoxins and Heavy Metals
Rice	Yes, mainly for certain insect pests	Very low	Yes, but not regular	Nil	Nil
Cassava	Pests yet not recorded	Very low	Nil	Nil	Nil
Cashew	Yes, mainly for insect pests	Very low	Nil	Nil	Nil
Mango	Yes, mainly for insect pests	Very low	Yes, but not regular	Nil	Nil
Banana	Yes, mainly for insect pests	Very low	Nil	Nil	Nil
Pepper	Yes, mainly for insect pests	Very low	Nil	Nil	Nil
Soybean	Nil	Very low	Nil	Nil	Nil
Mungbean	Nil	Very low	Nil	Nil	Nil

Market access conditions for the selected products in principal markets

17. Cambodia currently faces significant challenges to export some of the agricultural products (especially fresh fruit) to lucrative markets of EU, USA, Australia and Japan because of phytosanitary concerns (e.g. fruit flies).

    There are increasing concerns on the use of agricultural chemicals and residues on material for consumption (human and animal) with stringent standards being imposed on maximum residue levels under the CODEX Commission. As a regulatory agency, the sanitary and phytosanitary services would need to monitor the residue levels.

Phytosanitary requirements

18. A pest risk assessment was conducted keeping in view the pest scenario in Cambodia and in the potential export market countries. It became clear that exporting rice, banana, cassava, corn and soybean to the lucrative markets of USA, EU, Australia and Japan will not be an easy task as it would require ensuring freedom from a large number of pests in the products as a large number of pests known to occur in Cambodia do not occur in those countries. It may be comparatively easier to export to India, China and in all ASEAN countries.

    Production of corn and even soybean which is gaining momentum in Cambodia would likely to be restricted even to neighbouring ASEAN countries, if these countries were to start following strict import norms.

Export of mango could be enhanced – the few significant quarantine pests i.e. fruit flies occurring in Cambodia on mango – could be tackled on an area wide basis.

Export of cashew and black pepper to the niche markets seems a promising option owing to its relative freedom from pests in Cambodia, and so also in the potential export markets worldwide.

19. It appears that among ASEAN countries, the pest scenario in general is not much different, trade flows with little restriction and very few cases are reported of exports rejected on phytosanitary grounds; testing is not often considered mandatory and there is confidence level among the countries on the phytosanitary certificate issued by the exporters is sufficient.

Sanitary (food safety) requirements

20. While assessing the sanitary requirements it was found that in all the developed countries and more specifically in EU, USA, Australia and Japan there are very stringent norms for accepting a consignment after checking conformity. The details of the food safety requirements with respect to acceptable Maximum Residue limits for pesticides, heavy metals and mycotoxins are clearly specified and are accessible to all in respective national websites (note: details available in the companion laboratory consultant report). This would be a serious constraint for exporting to niche markets and needs very urgent attention by the donor agencies and the government. Among ASEAN countries there are harmonized norms for MRLs but often trade is not affected as testing is generally not mandatory.

Measures to be taken to address any of the potential phytosanitary risks and the outline requirements for a system to counter the risks

Regulatory Reform

21. The on-going project on Sanitary and Phytosanitary Standards Management Systems (SPSMSP), which has been recently initiated by UniQuest Pty Limited, Australia, is going to support regulatory improvement within Ministries dealing with SPS matters including the Phytosanitay law and is expected to push the regulatory reforms further.

Infrastructure Development

22. Equipment remains yet to be installed or is in minimal use due to lack of skill and motivation of the staff . Besides, there is no clear cut provision of the contingency funds to procure recurring items such as chemicals, antisera, enzymes etc.

Human Resource Development

23. The further improvement of skills and expertise is necessary for technical staff of the PPSPS Department in a number of areas including pest reporting, updating of National phytosanitary Database, pest diagnosis; pest surveillance (field and laboratory); pest inspection methodologies; pest risk analysis including risk profiling of commodities as per requirements of importing countries to develop appropriate

phytosanitary measures; critical assessment of pest risk analysis undertaken by trading partners; documented systems for all key phytosanitary activities and quality assurance (including audit) systems.

Information Management Systems

24. The development of transparent systems for consultation, decision making and information exchange on phytosanitary measures as part of the good governance initiatives promulgated by the Government.

Inter ministerial and departmental co-ordination

25. There is a need for strengthening pest surveillance and pest risk analysis between the various technical agencies. This can be achieved by forming by forming inter-agency national management committees and technical working groups for management and planning of such activities as plant pest surveillance and pest management, including emergency response systems for new pest introductions.

Developing internationally acceptable standards

26. In order to access international markets there is a need to develop internationally acceptable standards for organic or low-chemical products. The current international benchmark standards suggest integrated crop management systems, which combine the principles of Integrated Pest Management (IPM) – already well-known for rice in Cambodia – could be applied to an entire crops approach.

Funding

27. The PPSPS Department is seriously constrained by not having sufficient funds in the operational budget lines to carry out routine activities such as pest surveillance, pest diagnosis and other core activities of an NPPO. Hence, most of the phytosanitary activities currently carried out by the PPSPS Department have been done with project funding. The dependence on externally-funded projects for routine mandated activities of the PPSPS Department is not sustainable and therefore there is an urgent need to review the budgeting process and explore means by which phytosanitary activities could be undertaken as part of the regular program of the PPSPS Department.

28. Further, the salary scale of the technical staff such as the phytosanitary inspectors is extremely low with most staff having to rely on supplementary incomes, either from projects or from secondary employment. With such low wages, it is unlikely that the phytosanitary service would be able to employ staff that are dedicated and motivated to improve the quality of the service to meet international standards.

Requirements for a system to demonstrate that risks had been countered (in terms of national surveillance and monitoring, inspection, testing and certification schemes)

Establishing a National Co-ordinated Surveillance and Monitoring Programme

29. Pest surveillance on most crops has essentially been an *ad hoc* activity with the provincial governments allocating most of their resources to monitoring insect pests on rice. There was an IPM Management Unit based at the Central Laboratory in Phnom Penh activities of which were sponsored by FAO. Surveys on other crops were not nationally coordinated and of limited in scope. Hence, the pest status information for Cambodia for most crops was not reliable and unlikely to be accepted by trading partners as national pest lists.

    The nature and scope of pest surveillance activities for all major crops (with export potential) grown in Cambodia and for all pest groups (e.g. insects, mites, fungi, bacteria, nematodes, virus etc) requires a nationally-coordinated program with substantial manpower inputs from the central and provincial departments of agriculture.

Strengthening inspection and testing

30. The high priority needs for strengthening inspection and certification systems included: enactment of the legislation (sub-decree or Prakas) to enable phytosanitary inspectors to return to the checkpoints, strengthening of the infrastructure (building, communication equipment etc), inspection equipment and other resources to conduct pest inspection activities to international standards – especially ISPM No. 23 and 31 and all personnel trained for conducting phytosanitary inspections – skills on detecting pests and/or pest symptoms, sampling methods etc.

Enhancing pest diagnostic capabilities

31. Due to the extensive capacity development needs required by the laboratory to develop the required level of competencies in pest diagnosis, it necessary to have pest diagnostic experts working in the laboratories with the local staff for a longer period to train a critical mass of local staff in pest diagnostic methodologies and establish documented laboratory procedures and systems.

Conducting a preliminary pest risk assessment for the potential importers of Cambodian products

32. Though PRA is generally conducted prior to import but in order to be proactive to undetake market access for boosting export countries undertake PRA keeping in view the pest profile of the countries where exports could be made possible.

    Since the PRA process is a critical component to proactively managing phytosanitary risk and has to be a national capacity, there is an urgent need to involve personnel with advanced qualifications in plant protection disciplines from other agencies (e.g. CARDI and RUA) to formally assist in undertaking PRAs.

Developing Inter-departmental Collaboration and Information Management Systems

33. This is very crucial keeping in view the limited manpower resources within the PPSPS Department to carry out all the technical functions of the NPPO. There are currently no formal systems for collaborative planning and implementation of plant protection or phytosanitary activities on a national scale and effective mechanisms for

rapid information collation and transfer. Hence, the opportunities for optimizing outputs from various activities such as Integrated Pest Management Programs (IPM) with other pest surveillance operations for compiling national pest status records were minimal.

Developing management skills

34. Although most of the senior managers have attended numerous technical meetings/workshops organized by FAO and other donors (AusAID, NZAID, JICA etc) and have a good knowledge of the technical aspects relating to management of an NPPO, they need regul;ar formal training specifically on management and leadership skills such as team building, change management, strategic planning, project management, conflict resolution, performance management and quality systems development (including auditing).

II Fisheries

Summary of Report "SPS Action Plan for Fisheries"
by Andreas Villadsen and Sem Viryak

Introduction

1. Fisheries is one of the sub-sectors identified as a priority sector for the development of Cambodia's exports of food and agricultural produce. A team of an international and a local consultant examined the Cambodian fisheries sector to determine progress towards compliance with SPS-related standards in export markets achieved in recent years (following the EU ban on Cambodian imports in 2005).

2. The terms of reference specifically covered contamination by drug residues, heavy metals, and microbial contamination. Despite relatively rapid growth of inland aquaculture in Cambodia, the species involved are largely produced for domestic consumption and export to Thailand and Vietnam. Therefore the team primarily reviewed the export sector based on marine/capture fisheries.

Fisheries in Cambodia

3. Fisheries provide livelihood for 6 million people in 2008 of a total population of 14 million people; the vast majority is also involved in post harvest activities. The fisheries sector produces nearly one third of total agriculture sector output. The fisheries contribution to national GDP has been estimated to 8 to 12% of total GDP in 2001-2009. An estimated 100,000 mt of fish or about 25% are exported annually. FiA estimated the value of exports to be as high as USD 100 million in 2009. The annual consumption rate per household varies between 132kg and 400kg, and FiA estimated the per capita intake of fish in 2007 to at least to 52.4 kg/year.

Fish Production and Resources

4. Estimated figures suggest that the Cambodian total inland fisheries production is 300,000-500,000mt/year. The inland fisheries in 2008 was estimated at 380,000mt excluding 38,000mt of inland aquaculture.

5. Marine landings are reported to 66,000 mt in 2008 per year but the figures are unreliable. Much of the catch caught in Cambodian waters does not enter the landing statistics, but are harvested by local or foreign vessels and shipped directly to Thailand and Vietnam. Further supply is 2,185mt of marine aquaculture.

6. The total production of wild harvested fish is estimated to 500,000mt in 2009, excluding aquaculture and rice field production.

Institutional set up

7. The Department of Post Harvest, Technology & Quality control was created in 2006 (as a division) and made the national Central Competent Authority, CCA with the responsibility for inspection, and authorising processing plants for export of fish products. The primary aim of the DFPTQ is to promote positive change in the

behaviour of the wider post harvest fisheries communities to reduce post-harvest loss through improving food quality, food hygiene and therefore food security and improved export potential.

8. At present DFPTQ has no budget for testing, chemical and microbial analysis except for analysis financed directly under the projects nor funds to cover expenses for inspection.

Post-Harvest and Processing

9. The post harvest fisheries processing methods could be greatly improved to enhance food safety, increase yields by reducing wastage and by introducing process changes to increase the retail value of the products.

10. Similarly there is a huge potential for developing aquaculture for processing to the international export market, and at the same time create many jobs in the processing industry. Medium and large scale aquaculture, properly managed, can provide additional food security and especially provide raw materials for modern fish processing plants.

11. Cambodian fish and fish products can be exported to international markets however not until the country meets international standards and requirements. This can be achieved by implementing quality assurance system and SPS measures according to international standards, as well as the government investments in fisheries infrastructure, facilitating private investments, reducing import and export taxes and reduce or eliminate unofficial fees.

    The benefit of such development is high by contributing strongly to foreign currency earnings, enhances livelihoods and provides alternative mass employment.

12. Marine fish processing plants:

    Presently there are 3 large marine fish processing plants (FP) where at least two of the operate to a standard for international export. One is new, one of newer date, and one fairly run down. All situated in or near Sihanoukville, and export to international markets in USA, Korea, Hong Kong, Singapore and other ASEAN countries.

    Further there is an estimated 200-250 medium scale processor, of which about 20 produce marine fish products on a not very high standard. Most export to neighbouring Thailand and Vietnam move as border trade in numerous small quantities without official control, some illegally. Many have good possibilities of improved hygiene & GMP with training and small investments. Some have the potential to develop products according to international standard.

<u>Progress towards compliance with SPS-related standards</u>

13. Cambodia exported fishery products to EC until 1997. At that time no specific conditions for import of these products could be set up, so the export to EC stopped. The Cambodian authorities wanted to resume the export and a cooperation program

was established in 2004. A mission of three inspectors from the Food and Veterinary Office (FVO) visited Cambodia for inspection in September 2005.

The overall conclusion from the mission was that the provisions applied in Cambodia cannot be considered equivalent to those applicable in the EU. Therefore Cambodia was not in a position for exporting to the EU.

14. A diagnostic mission was requested to assess the progress since the FVO inspection in 2005. The critical constraints determined to be resolved by the CCA as a matter of urgency included: (1) approved food control legislation on fish and fishery products is not in place; (2) a lack of clarity on the CCA's authority to rule over the full production and marketing chain for fish and fishery products from farm (or boat) to table; (3) a systematic inspection / certification, sampling / testing, and, monitoring programme (4) analytical laboratories to perform many of the testing requirements with ISO 17025 accreditation.

Key findings SPS 2010

The team has the following key findings based on report reviews, visits to processing plants, and from interviews:

Legislation and standards

15. There is no legal basis for CCA to inspect based on food safety at present. DFPTQ have the mandate to do inspection; however in lack of a Food Law based on food safety, there is a need for a sub decree on "Fish and fish products based on food safety". The sub decree has been drafted but not forwarded and approved through the system.

16. The responsibilities between the ministries are still unclear and overlapping as they were in 2006.

17. The present first priority of the FiA is now ASEAN regulation which the MAFF have agreed upon as priority. EU accreditation and access to other international markets is the goal on the longer term.

Laboratory Access

18. There are no accredited local laboratories in place to carry out the required analysis, nor funding for testing. Presently the DFPTQ has an MOU with an accredited laboratory in Vietnam to carry out analysis, presently mainly histamine and heavy metals; however the funds come from donor funding and earmarked for the specific project, not for testing export products or inspection.

Capacity Building

19. The DFPTQ staffs have received a range of theoretical and some practical training on several projects in Cambodia and from outside since 2005, and at central level the staffs have achieved a good sense of fish processing and SPS knowledge.

    However there has been little follow up on implementation of the practical use of this. No inspections have been carried out, and there are no follow up on laboratory tests on fish and water quality which does not conform to international standards

    The capacity of staff at central level is sufficient to start training provincial staff in basic fish technology, how to improve hygiene, basic plant design needs, HACCP and critical points in some of the various processing steps.

Fish processing plants

20. Presently there are 3 large marine fish processing plants for international export where audits can be carried out. The two of the three would, with support and/or some modifications, pass an EU audit. Further there are about 20 medium scale processors producing marine fish products on a not very high standard for local consumption and for export to neighbouring countries. Training, introduction to GMP and small investments, could give these plants a much needed and efficient lift in hygiene and improved products.

Market access

21. Marine Cambodian fish can in principle be exported to all international markets as they have the same origin and conditions as Thai and Vietnamese fish, and both export to demanding international markets.

Recommendations

22. An efficient introduction of SPS needs to go hand in hand with strengthening of the processing sector, and implemented through long term donor support. Preferably a 10 year Fisheries Sector Program Support split in two 5 year periods, with efficient monitoring and support.

    The program support should concentrate on three major pillars:
    - Develop and implement high level well functioning SPS inspection and an efficient and competitive fish processing industry.
    - Develop a strong aquaculture sector to sustain raw material supply to the processing industry.
    - Increase income and reduce losses in freshwater fisheries, through introduction of simple robust modern fish technology.

Activities

23. *Legislation*

    - Drafting of legislation

- Delineation of responsibilities along the food chain between ministries
- Finalising Sub-decree for approval
- Finalise the incorporation of Codex Standards and Guidelines in the legislation

24. *Infrastructure/laboratory*

- Support in setting up laboratories (for food analysis) with view towards ISO 17025 accreditation
- Set up and have accredited (ISO 17025) a small laboratory for tests that are not sufficiently covered by other laboratories, such as screening for drugs and pesticides and analysis of histamines and TVN/TMA

25. *Capacity Building*

Training in:

- Theoretical & practical general fish technology, microbiology, hygiene, GMP, GHP, HACCP, Fish inspection etc.
- Thorough theoretical & practical HACCP, risk assessments, monitoring, inspection procedures & audits, starting with processing plants, but covering landing sites, fishing vessels, aquaculture farms, and ice plants.
- Traceability systems set up and recall procedures
- Sampling Techniques

The capacity building should be system-based hands-on so the training will be a continuous upgrading of inspectors as well as management from private plants.

26. *Cross-Cutting Issues*

- Make importance of fisheries more visible, raise the fishery profile, to top level decisions makers
- Make the various work plans for FiA and DFPTQ much more goal oriented with budget according to and linked to outputs
- Support cross cutting issues for the export industry, setting up national processors & exporters association to coordinate with CDC Cambodian Development Council (re tax, utilities-electricity & oil), capacity skilled labour, freight cost for reefer containers re feeder vessels (Sihanoukville versus other destinations like HCMC), unstable supply of raw material, foreign fleets & feed costs aquaculture, Coordinate and streamline pre-shipping inspection by Customs & CAMCONTROL.

III Laboratories

Summary of Report "Evaluation of Laboratory Capacities in Cambodia"
by Klaus Ziller

1. This study examines both technical capacity (equipment / facilities / services) and institutional capacity (trained individuals, sample collection and handling, laboratory procedures, etc) for laboratory testing. The study reviews institutional mandates, examines cases where critical volume of tests is not reached, and makes suggestions for options to improve arrangements for testing.

   Supported by a national consultant the study also looks at the costing of laboratory analyses within the frame of food control and import/export certification as well as present public funding and commercial activities.

2. Among the nine laboratories visited were the four focal governmental laboratories involved in food control and belonging to four different ministries or departments (considered in the study); apart from those, 4 other governmental laboratories (not directly considered by the study) and one non-governmental laboratory (partly considered in the study) were visited.

   Those laboratories are:
   - CamControl (Ministry of Commerce)
   - Industrial Laboratory Center of Cambodia (ILCC)
   - National Agriculture Laboratory (NAL)
   - National Health Products Quality Control Center
   - Feed quality Control Laboratory
   - National Veterinary Research Institute
   - Metrology Laboratory
   - Environmental Laboratory (Ministry of Environment)
   - Pasteur Institute (non governmental)

3. The visits to the above governmental and non-governmental laboratories in Cambodia revealed a great variability of facilities, staff, equipment, budgets and activities; therefore it was decided to additionally organize a questionnaire based survey amongst the laboratories dealing with SPS related issues and food safety.

   The questionnaire included key laboratory issues such as mandates and legislative backup, general laboratory facilities, qualification and experience of staff, availability and condition of equipment, sampling programmes and strategies, and sample capacities, budgets and ability to sustain laboratory operations.

   The questionnaire was distributed to the main governmental laboratories dealing with food safety, and to the Pasteur Institute. Feed back was received from CAMCONTROL, ILCC, MOH, NAL and the Pasteur Institute.

As part of a national consultancy, data and information on laboratory organization and management as well as particular operating cost and environment were collected and analyzed.

Key Findings

4. The key findings cover the national laboratory capacity to analyze contamination in food products intended for exports, including contamination by mycotoxins, pesticides and other residues, heavy metals, microbial contamination and others.

National Laboratory Capacity

Laboratory facilities

5. Each of the five public sector laboratories seen would have to make some improvements to layout or use of infrastructure/facilities in order to be upgraded. International accreditation according to ISO 17025 requires that laboratories ensure that their environmental conditions do not invalidate the results or adversely affect the required quality of any measurement.

6. Laboratory safety devices are lacking in many places and should therefore be uniformly introduced to, or increased in all laboratories. HVAC systems appear to be neglected; proper air exchange according to the type of laboratory is not guaranteed and not integrated into their design. Another week point is that not all laboratories have a waste management plan and related facilities; with upgrading the laboratories, this should be an integral part of each laboratory design and management procedure.

Equipment and supplies

7. Equipment – of varying levels of sophistication – has been provided by development partners over a number of years. Some is in use; some is no longer in use; some has not yet been used.

8. High tech equipment such as GC-MS or HPLC-MS or any MS/MS has not been found in any of the food laboratories; the EU and many other countries, however, assume the use of such specific equipment in their accredited laboratories to determine the very low levels of some contaminants such as pesticides or veterinary drugs, and for confirmation of positive results obtained in many cases through screening tests.

9. All laboratory managers interviewed commented on the difficulty of obtaining supplies (reagents, gases, glassware, etc) as one of the constraints they are currently facing.

Types of testing

10. Several of the laboratories are equipped in similar fashion to undertake a similar range of tests. This is being justified by the different mandates claimed by the different laboratories.

Volumes of activity

11. The visits and the evaluation of the questionnaire showed that the total number of samples analyzed over one year was below or even well below 2000 samples in all laboratories.

12. In visiting the laboratories, it is clear that much of the laboratory activity is driven on a project or issue basis. When a particular problem results in a sampling programme for a particular product being set up, samples are collected, supplies procured, and tests carried out. In the absence of such stimuli, activity levels are not high, depending on occasional private sector requests, requests for testing from NGOs, etc.

13. As a general rule, without specifying a benchmark level of activity (which varies depending on the nature of tests undertaken), if laboratories do not operate to a regular programme of work, the quality (accuracy) of testing results will suffer. It seems likely that most of the public sector laboratories visited would be prone to this.

14. No evidence was seen of sampling being designed on risk-based considerations.

Laboratory supplies, administrative "red tape" and budget issues

15. The process for purchasing and receiving laboratory supplies and consumables such as chemicals, reagents or media for chemical or microbiological testing is cumbersome. In addition, the budgets for purchasing laboratory items are usually quite limited and laboratories have no right to receive or keep that budget for directly purchasing the items needed.

    There is little flexibility left to respond to any modified or additional needs, unexpected events or emergencies.

Cost of analyses

16. As experienced in a number of other countries, there has been little awareness among the institutions, the ministry officials and political leaders regarding the real cost of undertaking analytical work in Cambodia. The use of models for business management and cost control in public institutions – leading to a need for laboratories to know the real cost of the different services they offer – has not been widely adopted yet in Cambodia.

17. Viewing the knowledge about the direct and indirect costs of laboratory operations as one of the basic prerequisites for investment and sustainability, the project chose some key examples to analyze the costs involved in chemical and microbiological analyses. For this reason, a catalogue of chemical and microbiological products was prepared by the national consultant referring to internationally-recognized analytical methods and using local prices for inputs and services required. *[see full report for details]*

18. At the same time, a second and different approach was chosen by the international consultant to develop a generic cost model considering as much as possible the basic costs for establishing and operating a modern food laboratory that would be able to

deal with a wider range of food safety parameters such as contamination with heavy metals, mycotoxins, pesticides or veterinary drugs, additives or other toxic products that may have been added or migrated into the food. *[see full report for details]*

19. Cambodian salaries for analytical chemists and other laboratory specialists are low but are hard to calculate. They need to be well calculated with direct and indirect costs, and incorporated into the overall estimation of the budgets required; particularly when highly sophisticated instrumentation is involved, the availability and sustainability of specially qualified staff to ensure optimum running of equipment can become a bottleneck and a high risk to the system.

Qualification, experience and skills of staff

20. Food safety monitoring, and the use of the required highly sophisticated analytical instrumentation for the laboratories, needs permanent, motivated, highly-qualified and specialized analytical chemists, food chemists and microbiologists. The education and training of such people is costly, and salaries would tend to reflect this. As the survey has shown, however, remuneration for staff employed in governmental laboratories is quite low and there are few incentives for performance.

Conclusions and Recommendations

21. The results of the visits, of the surveys and of the various discussions held show that Cambodia's food safety laboratory network is not performing well and cannot cope with the demands of modern food safety systems support and SPS requirements without major change. While several laboratories exist more or less in parallel, they partly duplicate work and compete with each other, but none of them is in a position to offer the range of required services at the expected level of quality and quantity, and none of them has actually reached international accreditation.

22. Mandates are not always clear and also seem to overlap, and above all, there appears to be little recognition of the difference between public and commercial interest. Any country, while concerned about their food exports being fit for human health (to ensure market access), should also extend a similar level of concern to the imported and domestically-produced food consumed locally.

23. Looking at regular budgets allocated to food laboratories in Cambodia, it becomes clear that these laboratories will have difficulties to fulfill their tasks within a food safety system. Consequently, consumer protection suffers.

24. The same, however, applies also to export control and certification: although some institutions may perform analyses against a fee, the volume of such samples is too low, and the laboratories are not usually able to retain these fees to organize and manage their operations. Without having a regular budget to maintain a minimum level of activities, it is virtually impossible to have a functioning and sustainable system of food control.

25. Such a minimum level of activities is not only described by the number of samples handled per year, but also determined through a number of other requirements and factors, such as for instance a certain redundancy in staff and equipment to ensure that

highly-sophisticated equipment runs optimally; laboratory accreditation demands for validation of analytical methods used, continuous training of staff according to their duties performed, participation in proficiency testing schemes, and many more. All in all, there is a great challenge also to each laboratory by the required documentation and quality management.

26. The development of the laboratory infrastructure and environment in Cambodia is still behind and not yet favorable to highly sophisticated analytical laboratory operation. The various technical cooperation efforts and donations of the past years have not fruited and not shown the desired results. And this will not change, if not both the Government of Cambodia and the donors will change their understanding, path and strategy.

27. The operational costs for a 'Government Laboratory' performing a minimum of food safety analyses are estimated as being of the order of 640.000 USD per year on top of capital investment of up to 2 million USD. Although different scenarios are explored, specialization – at least for all testing requiring costly equipment – would seem to be essential; however, there would still be a role for other laboratories, for sample preparation and management, and conducting less complex tests (to ISO 17025 standard).

    In principle, such operating costs could be recovered for instance through a levy of about 0,1% on agricultural exports; in this way, exports would at the same time support food safety for the local population.

Appendix: Details of production and pest status of various products in Cambodia

Rice

Rice production from 1999-2008

Year	Production Area (ha)	Yield (t/ha)	Total production (tons)	Exess paddy, T
1999	2,079,442	1.943	4,040,900	407,359
2000	1,903,159	2.115	4,026,092	142,477
2001	1,980,295	2.070	4,099,016	568,981
2002	1,994,645	1.916	3,822,509	243,759
2003	2,242,036	2.101	4,710,957	1,072,650
2004	2,109,050	1.977	4,170,284	650,184
2005	2,414,455	2.479	5,986,179	2,061,830
2006	2,516,415	2.489	6,264,123	2,240,438
2007	2,566,952	2.621	6,727,127	2,577,562
2008	2,613,363	2.746	7,175,473	3,164,114

(MAFF annual report 2008-2009)

Rice pests in Cambodia (as per NPD of NPPO)

***Oryza sativa* – Rice**				
Pest Category	Scientific Name	Common Name	Order	Family
Bacterium	*Acidovorax avenae subsp. avenae*	-	Burkholderiales	Comamonadaceae
Bacterium	*Pseudomonas syringae*	-	Pseudomonadales	Pseudomonadaceae
Fungus/oomycetes	*Mycosphaerella dearnessii*	Needle blight of pine	Mycosphaerellales	Mycosphaerellaceae
Fungus/oomycetes	*Tilletia barclayana*	Black smut of rice	Tilletiales	Tilletiaceae
Fungus/oomycetes	*Ustilaginoidea virens*	False smut of rice	Ustilaginales	Ustilaginaceae
Insect	*Cnaphalocrocis medinalis*	Rice leaf folder	Lepidoptera	Pyralidae
Insect	*Leptocorisa oratorius*	Slender rice bug or gundy bug	Hemiptera	Coreidae
Insect	*Leptoglossus gonagra*	Coreid bug	Hemiptera	Coreidae
Insect	*Melanitis leda ismene*	Rice butterfly	Lepidoptera	Nymphalidae
Insect	*Nephotettix*		Hemiptera	Cicadellidae
Insect	*Nephotettix nigropictus*	Rice green jassid	Hemiptera	Cicadellidae
Insect	*Nezara viridula*	Green shield bug	Hemiptera	Pentatomidae
Insect	*Nilaparvata lugens*	Brown planthopper	Hemiptera	Delphacidae
Insect	*Orseolia oryzae*	Rice gall midge	Diptera	Cecidomyiidae
Insect	*Oxya hyla intricata*		Orthoptera	Acrididae
Insect	*Pelopidas mathias*	Rice skipper	Lepidoptera	Hesperiidae
Insect	*Pyrilla perpusilla*	Sugarcane planthopper	Hemiptera	Lophopidae
Insect	*Recilia dorsalis*	Brown-banded rice leafhopper	Hemiptera	Cicadellidae
Insect	*Rhopalosiphum maidis*	Maize aphid	Hemiptera	Aphididae
Insect	*Scirpophaga incertulas*	Yellow stem borer	Lepidoptera	Pyralidae
Insect	*Scotinophara coarctata*	Black rice bug	Hemiptera	Pentatomidae
Insect	*Sitophilus oryzae*	Rice weevil	Coleoptera	Dryophthoridae
Insect	*Sitotroga cerealella*	Angumois grain moth	Lepidoptera	Gelechiidae
Insect	*Stenchaetothrips biformis*	Rice leaf thrips	Thysanoptera	Thripidae
Nematode	*Ditylenchus angustus*	Rice stem nematode	Tylenchida	Anguinidae

Nematode	*Meloidogyne graminicola*	Rice root knot nematode	Tylenchida	Meloidogynidae
Virus	*Rice grassy stunt virus*			Unassigned virus family
Virus	*Rice ragged stunt virus*			Reoviridae
Virus	*Rice tungro disease*	Rice tungro virus		
Weed	*Cyperus difformis*	Small-flowered nutsedge	Cyperales	Cyperaceae
Weed	*Cyperus iria*	Grasshopper's cyperus	Cyperales	Cyperaceae
Weed	*Cyperus rotundus*	Coco grass	Cyperales	Cyperaceae
Weed	*Echinochloa crus-galli*	Barngrass	Cyperales	Poaceae
Weed	*Eleusine indica*	Goose grass	Cyperales	Poaceae
Weed	*Ischaemum rugosum*	Wrinkled duck-beak	Cyperales	Poaceae
Weed	*Leptochloa chinensis*	Asian sprangletop	Cyperales	Poaceae
Weed	*Ludwigia adscendens*	Water primrose	Myrtales	Onagraceae
Weed	*Ludwigia octovalvis*	Primrose willow	Myrtales	Onagraceae
Weed	*Monochoria vaginalis*	Pickerel weed	Pontederiales	Pontederiaceae
Weed	*Paspalum distichum*	Couch paspalum	Cyperales	Poaceae
Weed	*Sphenoclea zeylanica*	Gooseweed	Campanulales	Sphenocleaceae

Cashew Nut

Cashew nut production

As per MAFF report 2006 cashew nut plantation has been expanding from year to year, especially in the time of land cost crisis in Cambodia. Amount the cashew nut plantation, there some part are not under properly mange/ take care by the owner, due to the main purpose is just to occupied land in some now developing area and waiting for good time to sell. However there are also some export statistic of this product (raw seed & processed) in some year back. There are not many studies on this crop in Cambodia, except some localized survey on insect pest by University student for completing their thesis. There are only yearly statistics, reported from PDA to MAFF on the cashew nut production area, which may not be the really true 100%.

The production of cashew nut crop are distribute in some provinces of Cambodia viz., Rattanac Kiry (21,562ha), Kampong Cham (17,765ha), Kampong Thom (7,515ha), Mundul Kiry (2,734ha), Seam Reap (2,646ha), Kratie (1,912ha), Koh Kong (1,835ha), when the total production are on 60,453 ha in 2006.

Pests of Cashew nut in Cambodia

***Anacardium occidentale* - Cashew nut**				
Pest Category	Scientific Name	Common Name	Order	Family
Insect	*Ferrisia virgata*		Hemiptera	Pseudococcidae

Cassava

Cassava production from 1999-2008

Years	Production	
	Ha	Tons
1999	14,039	22,512
2000	16,279	147,763
2001	14,239	142,262
2002	19,563	122,014
2003	25,740	330,649

Years	Production	
	Ha	Tons
2004	22,749	362,050
2005	30,032	535,623
2006	97,918	2,200,280
2007	108,122	2,215,427
2008	179,945	3,676,232

(MAFF annual report 2008-2009)

Pests of Cassava in Cambodia

There was no pest officially recorded on cassava as per National Phytosanitary Database of NPPO. It was interesting, however, to find the pests list of cassava in the Crop Protection Compendium (CPC) of CABI-UK. The pest list of CPC was used for comparing with the pests that are reported in various other countries.

Black Pepper

Black Pepper production : There is no data on production volume of black pepper.

a. Pests of Black pepper in Cambodia (as per NPPO list of Cambodia)

***Piper nigrum* - Black pepper**			
Scientific Name	Common Name	Order	Family
Ferrisia virgata	-	Hemiptera	Pseudococcidae

Mango

Mango production: There are only yearly statistics, reported from PDA to MAFF on the mango production area, which may not be completely reliable.

The production of mango crop is increasing from 14,078ha in 2006 to 24,026ha in 2009 and distributed in almost all provinces of Cambodia.

Province /Town	Cultivated area, ha	
	2006	2009
Takeo	795	3,926
Kg. Cham	825	3,864
Kampot	3,044	3,044
Siem Reap	838	3,025
Kg. Speu	2,460	2,460
Kandal	1,205	1,205
Koh Kong	792	1,027
Pusat	817	817
Battambang	670	670
Kg. Chhnang	290	584

Province /Town	Cultivated area, ha	
	2006	2009
Keb	25	407
Kratie	502	502
Steung Treng	192	377
B.Meanchey	296	259
Kg. Thom	233	233
Svay Rieng	217	217
Pailin	155	155
Phnom Penh	78	78
Preah Vihar	76	76
Rattanakiri	0	40

Mundul kiri	91	569
Prey Veng	393	465

Udor Meanchhey	79	21
Preah Sihanouk	5	5
Total:	14,078	**24,026**

Pests of Mango in Cambodia (As per NPD of NPPO)

***Mangifera indica* – Mango**				
Pest Category	Scientific Name	Common Name	Order	Family
Insect	*Aleurocanthus woglumi*	Citrus blackfly	Hemiptera	Aleyrodidae
Insect	*Aonidiella aurantii*	California red scale	Hemiptera	Diaspididae
Insect	*Aspidiotus destructor*	Coconut scale	Hemiptera	Diaspididae
Insect	*Bactrocera dorsalis*	Oriental fruit fly	Diptera	Tephritidae
Insect	*Ferrisia virgata*		Hemiptera	Pseudococcidae
Insect	*Idioscopus clypealis*	Mango leafhopper	Hemiptera	Cicadellidae
Insect	*Lepidosaphes beckii*	Citrus mussel scale	Hemiptera	Diaspididae
Insect	*Planococcus lilacinus*	Cacao mealybug	Hemiptera	Pseudococcidae
Insect	*Pseudaulacaspis cockerelli*	Magnolia white scale (USA)	Hemiptera	Diaspididae
Insect	*Pseudococcus citri*	Citrus Mealybug	Homoptera	Pseudococcidae
Insect	*Pulvinaria psidii*	Green shield scale	Hemiptera	Coccidae
Insect	*Saissetia coffeae*	Helmet scale	Hemiptera	Coccidae

Banana

Banana production: The only data available was a total cultivation in 30,631 ha in 2006.

Pests of Banana in Cambodia (As per NPD of NPPO)

***Musa maculata* – Banana**				
Pest Category	Scientific Name	Common Name	Order	Family
Insect	*Aonidiella aurantii*	California red scale	Hemiptera	Diaspididae
Insect	*Ferrisia virgata*		Hemiptera	Pseudococcidae
Insect	*Pseudococcus citri*	Citrus Mealybug	Homoptera	Pseudococcidae
***Musa paradisiaca* – Plantain**				
Pest Category	Scientific Name	Common Name	Order	Family
Insect	*Maconellicoccus hirsutus*	Pink hibiscus mealybug	Hemiptera	Pseudococcidae
***Musa spp.* – Banana**				
Pest Category	Scientific Name	Common Name	Order	Family
Insect	*Aspidiotus destructor*	Coconut scale	Hemiptera	Diaspididae
Insect	*Lepidosaphes beckii*	Citrus mussel scale	Hemiptera	Diaspididae
Insect	*Saissetia coffeae*	Helmet scale	Hemiptera	Coccidae
***Musa textilis* - Manila hemp**				
Pest Category	Scientific Name	Common Name	Order	Family
Insect	*Rhopalosiphum maidis*	Maize aphid	Hemiptera	Aphididae

Corn

Total Corn (yellow & white) production

Years	Total and Yellow Corn Production			
	Ha		Tons	
1999	59,835	32,185	95,974	54,680

2000	71,462	44,347	156,972	121,741
2001	80,215	55,147	185,589	157,652
2002	80,470	54,657	148,897	117,344
2003	93,362	73,039	314,601	287,484
2004	91,203	69,689	256,665	223,656
2005	90,732	67,046	247,760	191,561
2006	108,836	68,759	365,836	269,572
2007	142,391	117,621	522,703	467,593
2008	163,106	141,264	611,865	561,584

(MAFF annual conference report 2008-2009)

Pests of Corn in Cambodia : There was no pest officially recorded on corn as per National Phytosanitary Database of NPPO. It was interesting, however, to find the pests list of corn of Cambodia in the Crop Protection Compendium (CPC) of CABI-UK.

Soybean

Soybean production from 1999-2008

Years	Production	
	Ha	Tones
1999	35,085	35,063
2000	33,256	28,111
2001	31,997	24,658
2002	33,438	38,661
2003	53,063	63,188

Years	Production	
	Ha	Tones
2004	84,886	110,305
2005	118,760	179,096
2006	75,053	100,100
2007	76,981	117,877
2008	74,413	108,449

(MAFF annual conference report 2008-2009)

Pests of Soybean in Cambodia

There was no pest officially recorded on soybean as per National Phytosanitary Database of NPPO. It was interesting, however, to find the pests list of soybean of Cambodia in the Crop Protection Compendium (CPC) of CABI-UK.

Mungbean

Mungbean production

Years	Production	
	Ha	Tones
1999	26,812	15,913
2000	24,991	15,100
2001	29,431	17,153
2002	39,802	23,925
2003	44,940	31,815

Years	Production	
	Ha	Tones
2004	39,089	45,253
2005	60,570	45,041
2006	85,140	60,954
2007	65,261	54,490
2008	45,605	38,600

(MAFF annual report 2008-2009)

Pests of Mungbean in Cambodia

There was no pest officially recorded on mungbean as per National Phytosanitary Database of NPPO. It was interesting, however, to find the pests list of mungbean in the Crop Protection Compendium (CPC) of CABI-UK.