EC-FAO Food Security Programme, project GCP/RAS/247/EC

DATA MANAGEMENT AND MAPPING TOOLS AND SYSTEMS FOR FOOD SECURITY

REPORT

Paolo Romano
International Data Management and GIS Consultant

ROME - June 2010

TABLE OF CONTENTS

ACRONYMS

BNA	Boundary Line Datafile
CAMIS	Cambodia Agricultural Market Information System
CARD	Council for Agricultural and Rural Development (Cambodia)
CIT	Climate Impact Team
CNIP	Cambodia Nutrition Investment Plan
CSV	Comma Separated Value
CYF	Crop Yield Forecasting
DMH	Department of Meteorology and Hydrology (Lao)
DoS	Department of Statistics (Lao)
DPS	Department of Planning, Statistics of MAFF (Cambodia)
EC	European Commission
EMIS	Education Management Information System
FAM	FAO AgriMarket
FAO	Food and Agricultural Organisation
FIVIMS	Food Insecurity and Vulnerability Information Mapping System
FOSS	Free and Open-source Software
FSSM	Food Security Statistics Module
GIEWS	Global Information and Early Warning System
GIS	Geographical Information System
GLIPHA	Global Livestock Production and Health Atlas
GTZ	German Technical Cooperation
IFDM	Interactive FIVIMS Data Mapper
IM	Information Management
IPC	Integrated Food Security Phase Classification
IT	Information Technology
KIDS	Key Indicator Data System
MAF	Ministry of Agriculture and Forestry (Lao)
MAFF	Ministry of Agriculture, Forestry and Fisheries (Cambodia)
MDG	Millennium Development Goal
MIF/MID	Mapinfo Interchange Format
MOP	Ministry of Planning (Cambodia)
MOWRAM	Ministry of Water Resources & Meteorology (Cambodia)
NAFRI	National Agriculture and Forestry Research Institute (Lao)
NGO	Non-Governmental Organisation
NHS	National Household Survey
NIS	National Institute of Statistics (Cambodia)
NPC	National Project Coordinator
NRC	Climate, Energy and Tenure Division
NSC	National Statistics Centre (Lao)
NSO	National Statistical Organizations
OCHA	Office for the Coordination of the Humanitarian Affairs
OGC	Open Geospatial Consortium
OSGeo	Open-source Geospatial Foundation
PRSP	Poverty Reduction Strategy Papers
RAP	FAO Regional Office for Asia and Pacific
SDMX	Statistical Data and Metadata eXchange
SIFSIA	Sudan Integrated Food Security Information for Action
SOA	Service Oriented Architecture
SPSS	Statistical Package for Social Science
SWOT	Strength, Weakness, Opportunities and Threats
UNCT	United Nations Country Team
UNDAF	United Nations Development Assistance Framework
UNDOCO	United Nations Development Operations Coordination Office
UNDP	United Nations Development Programme
UNEP	United Nations Development Programme
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNFPA	United Nations Population Fund
UNICEF	United Nations Children Fund
WAICENT	FAO World Agriculture Information Centre
WFP	World Food Programme
WREA	Water Resources and Environment Administration (Lao)

EXECUTIVE SUMMARY

This report presents a review of data management and mapping tools used to improve informed decision-making in food security, and makes some recommendations for their implementation within the EC-FAO Project CGP/RAS/247/EC, which aims to link information and decision-making to improve food security in Cambodia, Lao PDR and Myanmar. The report makes recommendations and proposals for data management and mapping tools in line with the projects' objective of developing national and regional mechanisms to monitor, analyse, and report on (i) the prices of food staples; (ii) agriculture disaster risks caused by climate-related natural hazards, including the identification of priority climate change risk management options; and (iii) chronic food insecurity, livelihoods and vulnerability.

The report categorises the data management and mapping tools examined according to their main function. Their main advantages and weaknesses are summarised in Annex 1. This report covers the analysis of data management and mapping requirements and opportunities for the project only. A through technical evaluation of systems and tools, based on testing, is outside its scope and timeframe and is not discussed.

DATABASE AND MAPPING SYSTEMS

- The availability of statistical information is a key element for the development of any food security and early warning information system. The study recommended that the project explore with the national institutions responsible for statistical information in the project countries, which expressed interest, the possibility of requesting the implementation of **CountrySTAT.** CountrySTAT (section 2.1.) is a web-based information technology system for food and agriculture statistics at national and sub-national levels.
- **DevInfo** (section 2.2.), has been recommended as the main database tool. DevInfo is a sustainable and cost effective integrated database system. Although it has been developed for monitoring the achievement of MDG, it can be adapted to user requirements and it can integrate food security data. Information can be visualised in the form of tables, graphs and maps.
- The **GIEWS Workstation** (section 2.3.), is a web mapping application for assessing and analysing food security information. Among the systems analysed by the study, the Workstation is the most comprehensive as it integrates inter-sectorial data, helps avoiding duplications by using existing information and it has a good mapping interface. Due to its complexity, time and cost of implementation, the use of the GIEWS Workstation should be recommended only after a careful assessment of country requirements and technical capacity.

DATA ANALYSIS TOOLS

- The **Food Security Statistic Module (FSSM)** (section 3.1.), is used for the Estimation of food consumption and security statistics derived from food consumption data collected in National Household Surveys. The study has identified FSSM as a tool for strengthening national institutions capacity in statistical analysis for food security. Its implementation has been proposed within the EC-FAO Food Security Programme, under the SE Asia project (GCP/RAS/247/EC).
- The **National Basic Food Price - Data and Analysis Tool** and **FAO Agri-market** (section 3.2.) are tools developed by FAO to assist with monitoring and analysis of market data. Data inter-operability with data processing and mapping software has been recommended, in order to integrate such information in a comprehensive information system on food security.
- The **Crop Monitoring and Forecasting Tool** (section 3.3.) is an automated software suite that analyses weather data to assess their impact on crop production. The report recommends that the project explore the possibility of supporting local capacity building for provincial teams (in Cambodia and Lao PDR) on key parameter collection to improve the regular production of a crop yield forecasting and monitoring bulletin.
- The **Climate Change Impact Tool** (section 3.4.) is an integrated toolbox to assess climate change impacts on agriculture at national levels in a view of decision-making support, currently being developed by FAO. The report recommends that once the system is fully developed and tested, the possibility of using it for the countries concerned by the project should be explored.

DATA VISUALISATION AND DISSEMINATION TOOLS

- The **Key Indicator Data System (KIDS)** (section 4.1.) is a software framework that provides the ability to implement thematic information systems that collect, reference, visualize exchange and disseminate statistical, survey and indicator data. Already used in the region for FIVIMS data, it should be associated with a database system linked to a GIS application and used as the on-line and off-line output visualisation and dissemination tool.

- **Dynamic Atlas** (section 4.2.) is a web based information management and publishing suite. As opposite to KIDS, this package which functions are similar to KIDS, has not been already used in the region, therefore its use would not be of any comparative advantage.
- **Geo-Network Open-Source** (section 4.3.) is a standard based geographic data and information management system for the web. As it is usually utilised for sharing big size geographic files, weak IT infrastructures in the region may hamper its use.

METHODOLOGIES AND INITIATIVES FOR FOOD SUCURITY ANALYSIS

- The **IPC** (Integrated Food Security Phase Classification) (section 5.1.), is a food security indicators classification and mapping methodology, which helps in translating complex analyses into decision-making, thus helping to fill the gap between analysts and decision-makers. The project should support the implementation of IPC in Cambodia and Lao PDR, where data availability and quality seems to be more suitable for such methodology.
- The **FIVIMS** initiative (section 5.2.) promoted cross-sectoral analysis of the underlying causes of food insecurity, hunger and malnutrition for improved policy making, programming and action. It has been used in the region within the AsiaFIVIMS project that has been terminated in 2009. Data collected during AsiaFIVIMS should be linked to DevInfo, which is well consolidated in the region as a data management and mapping system.

The report recognises that, in order to recommend cost effective and sustainable solutions for the use of such tools in support to informed decision making for food security, a careful review of country requirements and technical capacity is necessary. Recommendations are made to assess such needs in the three project countries, in order to develop data management strategies, which take into account different country requirements, to ensure that data systems are carefully tailored to the country-specific context. Three scenarios (see Annex 2) with different levels of complexity and cost implications are considered and their feasibility will be evaluated against the results of requirement and technical capacity assessment. The three scenarios are based on hypothetical assumptions on (i) the need for training, (ii) data availability and (iii) the efficiency of the IT infrastructure and monitoring network. Based on the assessed technical capacity, requirements and sustainability in the project countries, one or more of the aforementioned scenarios will be adopted to develop the data management and mapping strategy to support informed decision-making in food security at national and regional level.

1.   INTRODUCTION

A four-week consultancy at FAO Headquarters has been conducted under Project GCP/RAS/247/EC, which aims to link information and decision-making to improve food security in Cambodia, Lao PDR and Myanmar. The consultancy's main objective was to develop recommendations and a proposal to support data management and analysis, including GIS/mapping, at project, national and regional level. The project is designed to strengthen national and regional capacities to provide timely information and analysis for impending food and agricultural crises, improve the understanding of potential impacts of climate change and variability on food security, and inform effective policies, strategies and/or interventions for hunger and vulnerability reduction. More information on the project can be found in the EC/FAO Food Security Programme GCP/RAS/247/EC Project Document[1].

Available data management and mapping tools and systems have been examined and analysed against the requirement of and opportunities for the project, the countries and the region. This report presents the result of such analysis. The document gives an introduction to the data management and mapping tools used to improve informed decision-making in food security, considered relevant for the project. One section is dedicated to AsiaFIVIMS and opportunities for its future management. Conclusions and recommendations include an evaluation of challenges and opportunities related to the adoption of alternative information systems.

Data management and mapping tools have been analysed with regard to their possible adoption (or continuation, if they proved useful in the past) to support the objective of developing national and regional mechanisms to monitor, analyse, and report on (i) the prices of food staples and relevant market intelligence on a regular basis, linking them directly to ongoing regional and international food market information efforts; (ii) agriculture disaster risks caused by climate-related natural hazards, especially flood, storm, and drought, whilst identifying priority climate change risk management options; and (iii) chronic food insecurity, livelihoods and vulnerability monitoring and analysis in support of information and analysis-based decision-making[2].

Requirements and technical capacity in the three countries covered by the project are different.   For this reason, and acknowledging the need for simplicity and sustainability, the report takes into consideration three scenarios with different levels of complexity and cost implications. The proposed options should be considered in light of the actual country requirements, which should be carefully assessed on the basis of (i) the technical capacity at national and local level, including the IT infrastructure, (ii) the level of engagement of the recipient country to allocate adequate resources during project implementation and after its completion, and (iii) the ability and willingness of governments and stakeholders to sustain implementation and technical support of the information systems provided, even beyond the project timeframe.

This report is organised in six sections: Section 1 is the introduction; Section 2 describes database and mapping systems; Section 3 is dedicated to tools for processing and analysing statistic and market price data, as well as monitoring and forecasting crop yield; Section 4 describes data visualisation and dissemination tools; Section 5 shows methodologies and initiatives for food security analysis; Section 6, conclusions and recommendations, is mainly based on a SWOT analysis table (Annex 1), also summarising the use of each tool, as well as a table (Annex 2) summarising the three aforementioned technical capacity scenarios.

Generating country specific recommendations was difficult to given the lack of specific country requirements. Moreover, the limited duration of the assignment did not permit testing of the various tools, nor a thorough consultation for the SWOT analysis. However, the project assignment coincided with an informal review of data management and mapping systems for food security to which this exercise was considered relevant. The feedback and cooperation received from all the collaborators are gratefully acknowledged.

---

[1] Support to the EC Programme on Linking Information and Decision-Making to Improve Food Security for Selected Greater Mekong Sub-regional Countries (GCP/RAS/247/EC) – Project Document, 2009
[2] Support to the EC Programme on Linking Information and Decision-Making to Improve Food Security for Selected Greater Mekong Sub-regional Countries (GCP/RAS/247/EC) – Project Document, 2009

REVIEW OF FAO DATA MANAGEMENT AND MAPPING TOOLS FOR FOOD SECURITY

2. DATABASE AND MAPPING SYSTEMS

2.1 COUNTRY STAT

CountrySTAT is a web-based information technology system for food and agriculture statistics at national and sub-national levels. It provides decision-makers access to statistics across thematic areas such as production, prices, trade and consumption. This supports analysis, informed policy-making and monitoring with the goal of eradicating extreme poverty and hunger. Through national and regional CountrySTAT projects, FAO forms partnerships with statistics offices and the ministries of agriculture, fisheries and forestry among others to introduce the system and build national capacity to use it. In each country, the national government makes a substantial contribution to ensure its deployment and continued training and maintenance[3]. CountrySTAT provides a two-way data exchange facility between countries and FAO, by feeding FAOSTAT, the FAO global statistical system, which provides time-series and cross-sectoral data relating to food and agriculture for some 200 countries.

CountrySTAT is aimed at producing accessible, high-quality, nationally owned statistics on food and agriculture, supporting the worldwide drive to reduce extreme poverty and hunger, with the longer-term objective of achieving global coverage. CountrySTAT is currently implemented in 12 countries in Africa and Asia, as well as in one region. Statistical data and metadata on food and agriculture coming from different sources are organized, integrated and disseminated in order to build up an effective programme for handling interconnected statistical information and visual indicators on food and agriculture, for analysis and evidence-based policy-making.

CountrySTAT mainly aims at:

- Supporting country expertise by providing the methodology, classification and coding system that allows them to collect, standardize and harmonize data coming from various local sources, thus improving data quality and facilitating data reconciliation.
- Promoting partnerships between various statistical institutions within countries, including national statistical offices and other statistical authorities – establishing a one-stop centre for accessing existing food and agriculture statistics in the country.
- Assisting countries in integrating and organizing national data to make them comparable at the international level.
- Helping countries disseminate data through a communication and information tool at national and sub-national level.
- Facilitating the analysis of data for supply utilization accounts and food balance sheets, in order to obtain more derived indicators relevant to nutrition, food and agriculture.
- Implementing a programme that facilitates electronic data collection from countries, reducing the burden on these countries in completing numerous questionnaires.
- Developing a statistical information system containing data and metadata relevant to food and agricultural policy.

2.1.1 IMPLEMENTATION OF COUNTRY-STAT

CountrySTAT is implemented upon request of the recipient country. A formal request is conveyed to the FAO Representative in the country who transmits the request to the Director of the Statistic Division at FAO Headquarters. The system implementation is managed through CountrySTAT projects, which assist participating countries with set-up, training and ongoing support. Ongoing work is carried out under several FAO projects, funded by the European Union, private donor organizations and others, but it can be also financed through regional TCP funds. The cost for the CountrySTAT implementation in a low capacity country is about 585,000 USD for a three-year project, including set-up, PC-Axis Licence (around 650 USD for Cambodia and Lao), training and support[4]. If the implementation is carried out in two or three countries within the same region the cost per country becomes proportionally reduced. However, it is possible to implement the system using other viable options, such as the one used in Bhutan where the training has been provided by a statistician consultant from the Philippines at a cost that is estimated at about 100,000 USD.

---

[3] Source: FAO Country STAT (http://www.fao.org/economic/ess/countrystat/)
[4] The cost will be lower where IT trained personnel and equipment already exist

The country is the generator and the owner of the statistical information stored in the system. For this reason, CountrySTAT may differ from country to country. CountrySTAT is currently implemented in Africa (Angola, Burkina Faso, Cameroon, Côte d'Ivoire, Ghana, Kenya, Mali, Niger, Tanzania, Togo and in the Western Africa Region). In Asia CountrySTAT is implemented only in Bhutan and in the Philippines. The example of the Bhutan CountrySTAT database, which contains information on national food and agricultural statistical data along with metadata for analysis and policy making, is given below. Data are available at national, district and sub-district level for the following variables:

- Land Use
- Agricultural Productions
  - ➢ Agriculture
  - ➢ Forestry
  - ➢ Livestock
- Agricultural Inputs
- Exports and Imports
- Commodity Prices
- RNR (Renewable Natural Resources) Infrastructures
- General Statistics
- Farm Machinery and Prices

The availability of statistical information is a key element for the development of any food security and early warning information system. For this reason, **it is recommended that the project explore with the national institutions responsible for statistical information in Cambodia, which expressed interest, the possibility of requesting FAO to implement CountrySTAT. Given the high implementation cost of CountrySTAT, supporting the approval of a special project for implementing CountrySTAT in Cambodia might be an option.**

2.2. DEVINFO

DevInfo is a powerful database system used to compile and disseminate data on human development. The software package has evolved from a decade of innovations in database systems that support informed decision-making and promote the use of data to advocate for human development. The DevInfo project is an inter-agency initiative managed by UNICEF on behalf of the United Nations (UN) system. Developed to track progress toward the Millennium Development Goals (MDGs) in 2002, DevInfo was proposed as a standard software package for the whole UN system. Its specific purpose is to store existing data, identify gaps in the MDG indicators, provide a single entry point for data on the MDG indicators, and disseminate information in the form of tables, graphs and maps.

DevInfo is an integrated desktop and web-enabled tool that supports both standard and user-defined indicators. The standard set of MDG indicators[5] is at the core of the DevInfo package. In addition, at the regional and country levels, database administrators have the option to add local indicators to their databases. The software supports an unlimited number of levels of geographical coverage: from the global level to regional, sub-regional, national and sub-national levels down to sub-district and village levels (including schools, health centres, water points, etc.).

DevInfo has simple and user-friendly features that can be used to query the database and generate tables, graphs and maps. The system provides an ideal tool for evidence-based planning, results-focused monitoring, and advocacy. It allows for organizing, storing and displaying data in a uniform way to facilitate data sharing at the country level across government departments, UN agencies and development partners.

DevInfo is compliant with SDMX[6], which makes the exchange with other SDMX-compliant systems easy. It also offers a series of data exchange modules which allow users to import data from a range of systems and statistical packages, including SPSS, STATA, SAS, CSPro, REDATAM, MS MS-Excel and others[7]. In addition, data from DevInfo can be exported to XLS, HTML, PDF, CSV and XML files and imported from spreadsheets in a standardized format.

DevInfo, now available at version 6.0, is distributed royalty-free to all Member States and UN agencies for deployment on both desktops and the web. The user interface of the system and the contents of the databases it supports, include country-specific branding and packaging options which have been designed

---

[5] For a complete list and description of MDG indicators, see http://mdgs.un.org/unsd/mdg/Default.aspx
[6] SDMX is an initiative aiming at fostering standards for Statistical Data and Metadata eXchange (SDMX), sponsored by various international institution, among which are the International Monetary Fund, the European Central Bank, Eurostat and others (source: Wikipedia, http://en.wikipedia.org/wiki/SDMX).
[7] Source: UNDOCO, personal communication

to ensure broad ownership by national authorities. UNICEF has no restrictions on the database and its use. The most common DevInfo users include UN country teams, national statistical offices, planning ministries and district planners[8].

2.2.1 DEVINFO SUPPORT AND TRAINING

There is a global training calendar which can be accessed on the DevInfo website (www.devinfo.org/di_training_schedule.html). Most of the trainings are country/agency specific, but the ones supported by UNDOCO are open to nominations from all UNCTs. Also, the DevInfo Support Group can facilitate training on demand for a fee. Often UNICEF or other agency country offices are able to support activities. In addition, UNDOCO is able to support a few countries every year in the implementation of DevInfo. UNDOCO priorities are "Delivering as One" countries and countries using DevInfo for UNDAF or other inter-agency initiatives.

2.2.2. DEVINFO IN CAMBODIA (CamInfo)

DevInfo has been introduced in Cambodia from 2004 and adapted to the country's requirements with support from UNICEF and GTZ. The DevInfo customisation for Cambodia is known as "CamInfo". It has been developed by the National Institute of Statistics, Ministry of Planning, as part of its mandate to support the statistical data requirements of policy-makers and to facilitate the development of an effective and efficient National Statistical System in Cambodia. CamInfo is available in Khmer and English languages, and includes data from national surveys and censuses, the commune database, and other sectoral information systems such as the Education Management Information System (EMIS), Health Information System and the Food Insecurity and Vulnerability Information Mapping System (FIVIMS).

Institutional support has been provided with funding and implementation support by UNICEF and GTZ, including staff salary supplements, capacity development activities, user training, dissemination, equipment needs, and other administrative requirements. The system seems to be well established in the country. Nine full-time staff are engaged with CamInfo from the National Institute of Statistics: 5 Data entry officers; 3 Supervisors; 1 Manager. The hardware infrastructure is made of ten desktops and three laptops.

New versions of the database are released on an annual basis with data collected from ministries and surveys as they become available. The database is organized by sector, goals (national and international), themes, institutions and sources, as shown in the following table:

Sectors	Goals	Themes	Institutions
• Agriculture • Demography • Economy • Education • Governance • Health • HIV/AIDS • Housing • Mine Action • Nutrition • Protection • Tourism • Transport	• National Poverty Reduction Strategy (2003-2005 and 2006-2010) • Sector Support Programme (2004-2008) • Health Sector Strategic Plan (2003-2007) • Declaration of Commitment on HIV/AIDS • Education for All • World Fit for Children • Cambodia Nutrition Investment Plan (2003-2007)	• Child Survival • Food Security (FIVIMS) • Gender • HIV/AIDS • Poverty Reduction • Road Accidents • Trafficking and Sexual Exploitation of Children	• Ministry of Agriculture, Forestry and Fisheries • Ministry of Defence Ministry of Economy and Finance • Ministry of Education, Youth and Sport • Ministry of Environment • Ministry of Health Ministry of Interior Ministry of Justice Ministry of Land Management, Urban Planning and Construction • Ministry of Planning Ministry of Tourism Ministry of Water Resources and Meteorology • Ministry of Women and Veterans Affairs National AIDS Authority • National Bank of Cambodia
Source: DevInfo Wiki (http://www.devinfo.org/Di-wiki/index.php?title=Cambodia)			

CamInfo has been updated and released in a strategic manner, to coincide with the release of major surveys/data collection of national importance. CamInfo training in 2007 was provided at five regional centres (Phnom Penh, Battambang, Kratie, Siem Reap & Sihanoukville) covering all provinces. These trainings were combined with the Statistics literacy training which was supported by the World Bank, UNESCAP and UNDP. Challenges in the implementation of CamInfo are related to:

- Limited capacity of data users at national and provincial level (e.g. knowledge of spreadsheet and database software, basic data analysis concepts);
- Implementation and support in rural and remote areas is hampered by weak IT infrastructures, with few potential users, particularly in remote and rural areas, having access to a computer and even fewer have access to a reliable Internet connection;

---

[8] Source: http://www.devinfo.org/Di-wiki/

- CamInfo 3.0/3.1 (based on DevInfo v5.0 technology) requires high hardware configurations which are not available at sub-national levels[9].

The following figures show two graphic outputs from CamInfo, from 2005 data[10]

Prevalence of stunting among women aged 15-49, 2005

Cambodia Demographic and Health Survey, National Institute of Statistics, Ministry of Planning, 2005.

Proportion of households using iodised salt, 2005
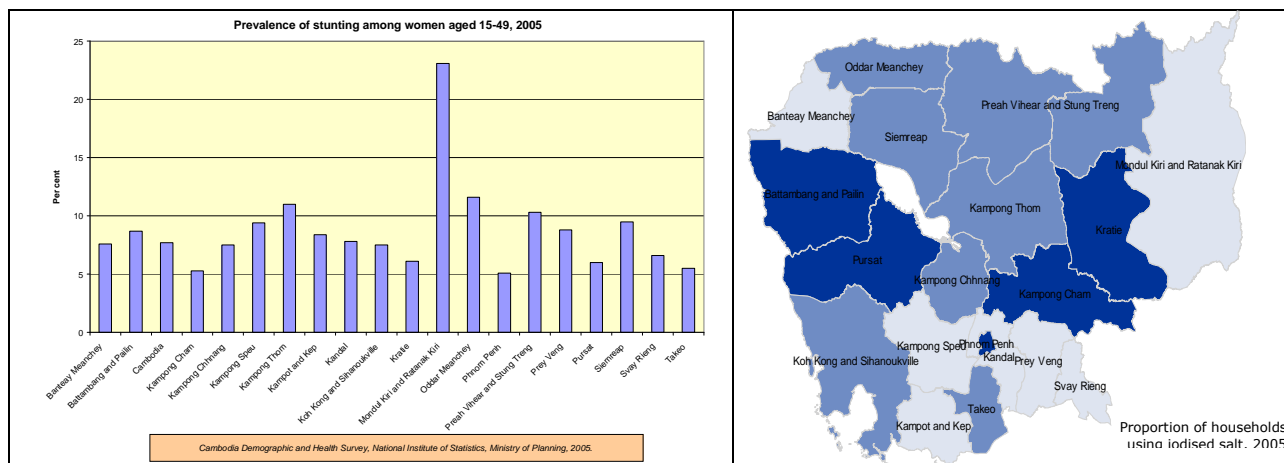
2.2.3. DEVINFO IN LAO PDR (LAOINFO)

In Lao PDR, DevInfo is part of the National Human Development Report project, implemented by the National Statistics Centre (NSC), started in 2004. LaoInfo version 4.1 has been adapted in 2005 from DevInfo technology to Lao specific requirements by the NSC, with the assistance of UNDP, UNICEF and UNFPA. In recognising DevInfo as the most appropriate tool for monitor MDG progress and other national activities, the Lao Department of Statistics (DoS)[11] proposed to the Government to include the implementation of LaoInfo database in the socio-economic development strategy for 2010 to 2020 of the country. However, the implementation of LaoInfo still needs participation from other national stakeholders. Responsible for administering the database at central level, is the DoS, under the Ministry of Planning and Investment.

The implementation of the system in Lao PDR is still in progress and is focusing on the following priorities:
- Monitoring the MDG progress (updated every year with data from the MDG report and other national data sources);
- Monitoring the implementation progress of the National Socio-Economic Development Plan, with information at district, provincial, and central level (implementation still in progress);
- Integrate the system with indicators from various census and surveys, such as Population and Housing Census, Lao Reproductive Health Survey and Maternal and Child Health Survey;
- Capacity building of national staff, especially at provincial level.

Version 4.1 provides data on national MDG indicators for Lao PDR as of September 2005. An upgrade to LaoInfo v.5.1 was expected to be released in 2006 in both, Lao and English language. A review of the available information from the LaoInfo web site (http://www.nsc.gov.la/Selected_Statistics.htm) show statistical information available up to 2007.

Challenges in the implementation of LaoInfo, now at version 5.0, are similar to the ones described for Cambodia and mainly relate to lack of technical capacity, equipment and connectivity.

Integrating the existing national DevInfo platforms with food security related information, will address the issue of a common standard platform for managing required data across time and space. However, even though DevInfo can import and export data to various systems as well as easily generate table, charts and maps, it is not an analysis tool. Therefore, the link with statistical packages such as FSSM (if the project proposed by FAO Statistic Division will be put into operation) or SPSS, STATA and with a GIS application is a key requirement to produce food security analysis. The use of DevInfo, mainly as the database component of the data management systems for food security in the region, is the recommended option.

---

[9] Source: http://www.devinfo.org/Di-wiki/index.php?title=Cambodia
[10] Source: http://www.caminfo.org/CNIP.htm
[11] The Department of Statistical (DoS) is an organ of the Committee for Planning and Cooperation. NSC (under the Ministry of Planning and Investment), is the Government core agency in the coordination and management of all national statistic activities in Lao PDR. The organizational status of the NSC equals to a department of a line ministry. (http://www.nsc.gov.la/Decree140_1.htm).

2.3. GIEWS WORKSTATION

The GIEWS Workstation is a web mapping application that gives access to food security related information and serves as an information management tool at global, regional and national levels. The aim of the Workstation is to harmonize food security and early warning data within and across countries and to strengthen analytical capacity of key national institutions to support food security policy formulation and emergency interventions.

The Workstation includes software tools to analyse food security implications of natural and man-made disasters. These tools allow users to process historical and recent data in order to detect anomalies of environmental and economic factors (e.g. drought, excessive increase of market prices) that may reduce local populations' capacity to access key food items. Text management tools facilitate the preparation and dissemination of early warning messages and the results of the analyses.

The application handles different types of information such as remote sensing data, GIS layers, databases and texts. The Workstation is structured as a network in which individual applications (e.g. Workstations installed in the countries) represent the nodes of this network. The network is the base for information sharing. A communication tool built on a peer-to-peer technology regulates the flow of the information among nodes of the Workstation network. The application is entirely based on an open-source technology and it is distributed free. Training, data collection and development of tools are integral parts of the Workstation "package". These activities are carried out with full involvement of national partners/stakeholders that play a major role to ensure data coherency and effectiveness/relevance of the software tools for country use[12].

The GIEWS Workstation is expected to help the analysis of food security situations from different angles by integrating existing multi-sectoral/multi-disciplinary data, thus increasing the ability to identify food security problems at national/local levels and assist community-oriented needs assessments. Since it looks at a broad spectrum of food security dynamics, the Workstation is designed to accept and store a large variety of data produced and managed by different sources. On the other side, data collection and quality control are very expensive and resource demanding tasks. For this reason, one of the primary needs of the application is to maximize the use of existing data and avoid duplication of efforts in data collection and compilation. Systems like CountrySTAT are excellent sources of data required to build a baseline layer of information as reference for analytical processing. In the Workstation, these data (normally managed by the National Statistics Offices) are analysed side by side with information collected by national institutions, NGOs, international sources, etc., that complement CountrySTAT data with more recent information or forecasts, such as crop yield forecasts generated by the CM Box[12].

The Workstation has started creating compatibility with CountrySTAT and Geo-Network[13] data/metadata. Initially conceived to be a food security analytical tool to be used at FAO Headquarters, the application has gone through a major re-development phase in the past years. The previous version of the application was based on KIDS technology but due to several technical constraints related to performance and lack of flexibility, it was recently decided to re-design the application, in order to increase the flexibility and performance of the system, organise it according to independent modules, which can be used alone or in combination, thus overcoming the limitations experienced with the KIDS architecture. This flexibility, along with its capability of integrating inter-sectoral data to perform analysis, makes the GIEWS Workstation one of the most advanced applications to produce a picture of the food security in a given country, which would be comprehensive enough to support informed decision-making. However, due to server maintenance, it was not possible to test the GIEWS Workstation at the time this report was prepared. For this reason, the considerations reported here are mainly originated from consultations held with staff who developed the application and with stakeholders who were involved in different roles in the implementation of the application.

The application is currently being implemented in five developing countries: Sudan, where it contributed to SIFSIA[14], Egypt (completed), Bangladesh (in progress) and Armenia (in progress); in Haiti, GIEWS has implemented a customised Food Security Emergency tool of the Workstation. The standard cost for implementing the application in a country that requested it is around 200,000 USD, including technical assistance, training, customised tools development and data management.

Most of the stakeholders requested to give their impressions on the capacity of the Workstation to meet countries expectations and requirements, expressed concern about its appropriateness against the technical capacity of most recipient countries, and sustainability. Some of the most relevant stakeholders' comments are summarised in the following:

---

[12] Source: Grita F., FAO-ESTG, verbal communication, May 2010
[13] Geo-Network: Open-source web-base application for sharing geographically referenced thematic information between different organizations (see section 2.8).
[14] SIFSIA: Sudan Integrated Food Security Information for Action

i. The workstation can generally meet the requirements for most countries, especially those in search of analysing complex food security issues. However, the baseline data available in the average developing countries is limited. Therefore, the potential of the GIEWS Workstation may be far in excess of what is needed for such countries. This seems to be the case for Cambodia and Lao PDR.

ii. Countries' expectations are often not explicit and differ from country to country. This implies that considerable ad hoc adaptation work must be done, thus increasing cost, training need and implementation time. However, this applies equally to most of the tools considered in this report.

iii. Many stakeholders pointed out that the original Workstation interface was difficult to use for non experts and required extensive training. The external interface approach used for Haiti tries to address users concerns and seems to be much more user friendly. However, many stakeholders express concern about the continuous development process the application went through until its last release, which does not allow working and evaluating the final product.

iv. Irrespective of the characteristics of the Workstation, the issue of genuine government commitment also poses a sustainability issue. For example, when the workstation was presented in Bangladesh, about three agencies have asked to be part of it, but the main agency has not yet hired the national staff that can manage the system.

v. Concern was expressed also with regard to the follow-up in a country when the set-up projects finishes. Who maintains the workstation, with what resources? Since the application set-up in countries is a relatively new initiative, there is not enough experience yet with operational country workstations to be able to measure its sustainability.

vi. Development and adaptation of the workstation to country-specific requirements relies on inputs from staff in FAO Headquarters, who serve a number of different countries. This leads to delays in implementation (in Bangladesh the process begun a year ago and a truly functioning workstation is not yet in place) and has high cost implications, posing medium/long-term sustainability issues.

vii. On the other hand, there is no corporate medium or long term strategy for the Workstation and therefore FAO cannot guarantee to countries which invest in the application that the agency will continue to support its development and maintenance in the coming years.

It can be concluded that the GIEWS Workstation can be one of the best systems for food security information processing and analysis. However, due to its complexity, its relatively recent completion, as well as sustainability issues, especially in countries with limited technical capacity, it is recommended that the possibility to use it in the countries concerned by the project, is evaluated in future, possibly when case studies about its set-up in other countries are available. It should also be noted that many of the issues addressed in relation to the workstation tool also apply to other systems.

3. DATA ANALYSIS TOOLS

3.1. FOOD SECURITY STATISTICS MODULE (FSSM)

The FAO Statistics Division has developed the Food Security Statistics Module (FSSM) software to help National Statistical Organizations (NSO) to estimate food consumption and security statistics derived from food consumption data collected in National Household Surveys (NHS). One of the main uses of these statistics is the assessment and monitoring of the national and sub-national food security situation in the context of the World Food Summit and Millennium Development Goals[15] targets on hunger reduction. The outputs of the FSSM are based on inputs for national decision-making processes in the economic and social policy analysis and programme implementation. The FSSM software aims at improving the quality, consistency and availability of food security statistics useful for assessing and monitoring food deprivation and other relevant statistics at the national and sub national levels. It also provides a suite of harmonized food indicators for the global community to measure the progress towards one MDG indicator (prevalence of under-nourishment) and inputs for country Poverty Reduction Strategy Papers (PRSP). The following table shows the list of food indicators that are processed and analysed by using FSSM[16].

GROUP	INDICATOR
Food deprivation	Prevalence of undernourishment in total population
	Number of undernourished persons
	Intensity of food deprivation
Food needs	Minimum dietary energy requirement
	Rates of change
Food consumption - Nutrients	Dietary Energy, Protein and Fat

[15] For a complete list and description of MDG indicators, see http://mdgs.un.org/unsd/mdg/Default.aspx
[16] For metadata details on each food indicator see http://www.fao.org/economic/ess/food-security-statistics/en/

	Food consumption and population growth
Food consumption - Quantities	food groups
	food items
Food consumption - Role of Trade	Net-Trade & Imports
Food Production	Index
	Group quantity
	Item quantity
Food Trade	Index
	Group quantity
	Item quantity
Diet composition - Nutrients	Nutrients
Diet composition - Food consumption pattern of main food groups	Dietary Energy
	Dietary Protein
	Dietary Fat
Diet composition - Food consumption pattern of main food items	Dietary Energy
	Dietary Protein
	Dietary Fat
Diet composition - Diet diversification index	Dietary energy
	Dietary protein
	Dietary fat
Diet composition - Food from animal origin	Dietary energy
	Dietary protein
	Dietary fat
Diet composition - Micronutrients	Iron
	Vitamin A
Access to food	Inequality of dietary energy consumption distribution
	Share of food consumption expenditure to total household consumption
Food aid	Cereals
	Share of food aid in total consumption
Nutritional status	Children
	Adults
Health	Life expectancy at birth
	Child mortality
	Infant mortality
Poverty	Urban, Rural, Total
Population	Total, Age groups
	Agricultural Population Density

The FSSM software consists of a set of programs developed to process food consumption, income and other relevant data, implement statistical procedures for estimating food security statistics, integrate results in standard tables and prepare charts and graphs ready for publication.

The SPSS[17] software implements all statistical procedures and algorithms. MS-Excel produces final tables for country reports on food insecurity. NHS data files contain all information collected from each household during the household reference period, sampled over the NHS reference period. They usually contain a large number of records, given the number of sampled households and the number of variables related to each household, its members and the numbers of items in household consumption (including food) and expenditure. The NHS data file usually varies across different countries due to the wide-spread use of electronic computers and availability of several program platforms for data entry and editing on the markets. The NHS data file structure is not a simple flat data file with records (rows) and variables (columns), but a complex one with information on three hierarchies of statistical units: households, household's members and expenditure items. The FSSM uses the NHS detailed data on food consumption and income together with other variables related to household and member characteristics, particularly household's head, for cross sectional analysis with demographic and socio-economic factors. FSSM has recently been upgraded to include additional functionalities for estimating the minimum dietary energy requirements and micro-nutrient analysis (see table above)[18].

Within the EC-FAO Food Security Programme, under the SE Asia project (GCP/RAS/247/EC), a two-month activity on "Strengthening Capacity of National Statistics Systems in Trend Analysis of Food Security Statistics of Food Consumption Data from National Household Surveys"[19] is proposed for implementation during 2010 in Cambodia and Lao PDR. Among other activities aimed at strengthening national statistical systems capacity to produce timely and quality food and agriculture statistics, the proposed activity is

---

[17] SPSS (Statistical Package for the Social Sciences) is a computer program used worldwide for statistical analysis
[18] For more details on the functionality of the different modules of FSSM, see: http://www.fao.org/ fileadmin/templates/ess/documents /food_security_statistics/household_survey_programme/FSSModule2.pdf
[19] FAO Statistic Division - "Strengthening Capacity of National Statistics Systems in Trend Analysis of Food Security Statistics of Food Consumption Data from National Household Surveys", Project Document, 2010

aimed at performing a trend analysis of food insecurity and monitoring the progress of the MDG hunger and other food security indicators in the two countries, using FSSM.

If this activity is approved, its implementation will significantly strengthen national institutions capacity in statistical analysis for food security. The availability of commercial statistical packages such as SPSS or STATA[20] with statistical offices in Cambodia and Lao PDR should be assessed, although these software packages are standard applications for statistical data processing and analysis almost everywhere in the world at national Statistics institutions level. If necessary, recommendations on the adoption of such systems for statistical analysis should be done during the project implementation.

3.2   MARKETS, PRICE VOLATILITY AND FOOD SECURITY

One of the programmatic themes for the EC/FAO Food Security Programme is about markets and food prices.   The recent impacts of soaring food prices helped identify the need for efficient market information and analysis. Two FAO systems for price monitoring are briefly described below.

3.2.1   NATIONAL BASIC FOOD PRICE - DATA AND ANALYSIS TOOL

The FAO/GIEWS has developed a "National Basic Food Price - Data and Analysis Tool" as part of the FAO Initiative on Soaring Food Prices (ISFP) to assist with monitoring and analysis of domestic food price trends in developing countries. The database covers about 800 monthly domestic retail and/or wholesale price series of major foods consumed in 58 developing countries, and international cereal export prices. It allows the analysis of different data series both in nominal and real terms, and for the conversion of quotations from national currencies to US dollars and/or to a common unit of measure (kg or tonnes), as well as comparisons of domestic and international price trends. The system can be accessed on-line at http://www.fao.org/giews/pricetool/#. Data Tables can be downloaded and imported into CSV[21], a text format which can be easily opened in MS-Excel.

The price-tool web site has been examined to assess data availability for the project countries. The following table show National Basic Food Price tool data availability for Cambodia. In order to assess further availability of market price information, the data source used by the price-tool, the Cambodia Agricultural Market Information System (CAMIS), which is the website of the Agricultural Marketing Office (AMO) has been examined[22].   AMO, which is one of the ten offices and units of the Department of Planning and Statistics (DPS) within the Ministry of Agriculture, Forestry & Fisheries (MAFF), collects market wholesale price information three times weekly. CAMIS provides a wide range of information on market prices (in Riel/kg), as shown in the following table (right side). Data from CAMIS can be exported into MS-Excel.

FAO National Basic Food Price Data availability for Cambodia (as of May 2010)						CAMIS Data availability	
Commodity	**Market type**	**Location**	**Start date**	**End date**		**Category**	**Commodity**
Prawn	Wholesale	Kampot	1/2006	2/2010		Cereals	Paddy, Rice, Black pepper, Nuts, Bean, Sesame, Soy bean, Maize
Rice (Mix)	Wholesale	Banteay Meanchey	1/2006	2/2010		Vegetables	Beet, Bitter ground, Cabbage, Chinese kale, Cucumber, Dried chilli, Gourd, Lettuce, Sweet potatoes, Tomatoes, Long Bean, Water Convolvulus, Masta Green, Petsai, Cauliflower, Cassava, Potato, carrot, Cassava, SoiySum, Pumpkin Egg plant Pakgoy, Masta flower, Onion leaf, green pepper
Rice (Mix)	Wholesale	Battambang	1/2007	2/2010		Fish	Bronze Featherback, Butetr catfish, Eel, Featherback, Frozen fish, Great white shealfish, kamong fidh, Live fish, Micronema, Snake fish, Tire treak eel, Dried fish, Samll scale croker, Smoked fish, Crab, Prawn
Rice (Mix)	Wholesale	Kampong Chhnang	1/2006	2/2010		Meat	Carcass, Live chicken, Live duck, Live pig
Rice (Mix)	Wholesale	Phnom Penh	1/2006	2/2010		Fruit	Banana, Durian, Orange, Pineapple, Watermelon, Melon
Soya beans	Wholesale	Banteay	1/2007	2/2010		Other Crops	Sugar Cane

---

[20] STATA is a general-purpose statistical software package created in 1985 by StataCorp. It is used by many businesses and academic institutions around the world. Most of its users work in research, especially in the fields of economics, sociology, political science, and epidemiology.
[21] CSV: Comma Separated Value text format
[22] Cambodia Agricultural Market Information System (http://www.camis-kh.org/)

		Meanchey		
Soya beans	Wholesale	Kampong Cham	1/2006	2/2010
Soya beans	Wholesale	Phnom Penh	1/2007	2/2010

The table on the right shows National Basic Food Price tool data availability for Myanmar[23]. Due to lack of connectivity, it was not possible to connect to the Myanmar Central Statistical Organization, which is the data source for market prices,

MYANMAR				
Commodity	**Market type**	**Location**	**Start date**	**End date**
Gram (split)	Retail	National Average	9/2006	2/2010
Prawn (dried)	Retail	National Average	9/2006	2/2010
Rice	Retail	National Average	9/2006	2/2010

to assess data availability. No data are available for Lao PDR through the FAO National Basic Food Price - Data and Analysis Tool.

In order to integrate these data with a more comprehensive information system, it is recommended to export them to MS-Excel and then into the FAO AgriMarket (FAM) MS-Access database (see section 2.8.2.), where they can be managed for processing, reporting and disseminating. Data can also be mapped by exporting them from MS-Excel into a mapping application, which can be the DevInfo mapping visualisation tool or a GIS application (MapInfo or ArcView), if a more complex GIS product (i.e. a map resulting from the combination of two or more different variables) is required.

3.2.2. FAO AGRIMARKET (FAM)

FAO-AgriMarket (version 3) is an MS-Access database, developed by the Agriculture Dept., Agricultural Support Systems Division, for the management of market data. The programme automates the entry, processing, transmission, reporting and electronic diffusion of market data (prices and quantities of agricultural products and inputs). It thus reduces the time and effort required to manage large volumes of data, and increases the accuracy and speed with which various operations are performed. FAM is meant to be used by marketing agencies, statistical offices, ministerial departments, chambers of commerce and agriculture, traders, producer and consumer associations, import and export companies, research institutions and NGOs interested in maintaining a database and analysing market data of agricultural products and inputs[24]. The FAO-AgriMarket package is available only in English and is supplied on a CD Rom, free of charge to public institutions and organizations in developing countries or countries in transition.

As AgriMarket is an MS-Access database, interoperability with MS-Excel and from MS-Excel to a mapping application should be relatively straight forward. Therefore, data from the National Basic Food Price tool and from AgriMarket can be integrated with the FS data management and mapping system, which will be adopted. Since this system is free and, being based on MS-Access, its use is relatively easy, it is recommended its adoption for all the three technical capacity scenarios identified in Section 4 of this report.

3.3. CROP MONITORING AND FORECASTING TOOL

The turn-key Crop Monitoring Forecasting Tool (CM Box), developed by NRC under the previous phase of the EC-FAO Food Security Programme, Information for Action, is an automated software suite that analyses weather data to assess their impact on crop production. The Crop Monitoring "CM Box" offers software, training, and data (on request) for setting up an operational national crop monitoring and forecasting system. Countries asking for CM Box implementation receive a combination of training, hardware and software (AgrometShell, New_LocClim and Windisp) customized for local use, as well as the real-time data required to operate the system in-country. The package can be tailored to suit countries' specific requirements, based on national preferences as well as available expertise and data.

The CM Box is meant to offer solutions for setting up an operational crop monitoring and forecasting system. In the initial phase, reference data as well as real-time satellite and weather data based on international sources can be provided by FAO headquarters. However, over the duration of the project, more and more national data will be used, as local know-how increases while the institutional set-up of the national food security system is improved[25].

---

[23] Myanmar data source: Central Statistical Organization (http://www.csostat.gov.mm/)
[24] Source: http://www.fao.org/ag/ags/AGSM/FAM20/index_E.HTM
[25] Source: EC-FAO Food Security Programme, Information for Action (http://www.foodsec.org/tools_cw_01.htm)

The CM Box is fed in real time with weather, satellite and crop information. It generates a set of indicators[26] that are relevant for food security. The indicators can be presented as text, maps and tables by provinces or districts.

3.3.1. THE USE OF THE CM BOX IN CAMBODIA

Up to 2007, crop yield forecasting in Cambodia was based on traditional and non-scientific method, i.e. using direct observation on crops health, various technical conditions of the current growing season, and by making comparison with the level of production in previous years. Based on these factors, crop forecasting was ad hoc, without using systematic modelling. Generally, the results were not accurate, inconsistent, and changed greatly from year to year[27].

Between 2006 and 2007, in order to turn from traditional methodologies to a scientific approach, two staff from the Government of Cambodia, one from the Ministry of Agriculture, Forestry and Fisheries (MAFF) and one from the Ministry of Water Resources & Meteorology (MOWRAM) were trained (for 90 Days in FAO Headquarters in Rome) on the use of CM Box. Two staff from the Government of Lao PDR also participated to the training session led by FAO-SDRN. The first outcome of this training was a Crop Yield Forecasting Bulletin, published monthly from September 2007 to January 2008, which reported on weather, rainfall, and temperature and crop situation[28].

Although this exercise provided a good start to modernise the agro-met monitoring and analysis system in Cambodia, data collection and institutional capacity are still insufficient. Consultations with NRC staff and reports from the trained national staff from Cambodia, stressed that significant constraints still hinder the possibility of setting up an effective system, especially regarding the database on meteorology, which is generally inadequate due to the following:

- Lack of time series data and of some important parameters;
- Timely data submission from provinces;
- Equipment such as evaporations pan, sun radiation measuring devices, and wind observation in some synoptic stations is still lacking;
- In several regions of the country (Kg Chhnang, Kg Speu, Kandal, Takeo, Preah Vihear, Oddor Meanchey), lack of synoptic stations makes accuracy of information and modelling weak;
- Poor internet connection hampers communication among national institutions, and with FAO experts;
- Coordination between MOWRAM and MAFF needs to be improved with high responsibility.

Given the importance of crop forecasting to food security and that this issue is one the priority set by the Government of Cambodia, the project should explore the possibility of supporting local capacity building for provincial teams on key parameter collection to improve the regular production of a crop yield forecasting and monitoring bulletin. Quality and reliability of crop yield forecasting would also benefit from the installation of additional meteorological stations, either directly or by establishing some partnership with regional projects implemented in the Greater Mekong area. It is worth stressing that the whole region will benefit from a geographically distributed monitoring network and the resulting improved quantity and quality of data.

3.3.2. THE USE OF THE CM BOX IN LAO PDR

Following the training of two Lao government officials (one from MAF and one from DMH) described above for Cambodia, in April 2008, eleven technical staff from various divisions (meteorology, agricultural statistics, extension, research, information centre) of the Ministry of Agriculture and Forestry (MAF) and Water Resources and Environment Administration (WREA) were trained on the use of the CM Box's tools for producing crop yield forecasts. The training, held at the Centre for Statistics and Information of the Ministry of Agriculture and Forestry in Vientiane, built upon a six day training course which took place in Vientiane in March 2007 and the aforementioned three-month training course in Rome in 2006/07. The training, which focused on (i) developing the essential skills and know-how needed to produce accurate forecasts and (ii) helping ensure the sustainability of the activity upon conclusion of external support, was conducted by the two national experts from Cambodia, who were trained in Rome[29]. The two

---

[26] **Weather parameters**: Rainfall (daily, dekad); Temperature (Maximum, Minimum); Relative humidity (Maximum, Minimum); Sunshine hour; Wind speed average; Actual Evaporation; Potential Evapo-transpiration. **Crops parameters**: Planting dekad; Cycle length; WHC; Effective rainfall (%); Value of crop coefficient; Irrigation; Bund height (mm). Crop Yield Data
[27] SOTHY, SOKUNTH - Technical Report on Crop Monitoring and Forecasting for Cambodia, 2007
[28] Source: Cambodia Food Security and Nutrition website (http://www.foodsecurity.gov.kh/)
[29] Source: Food Security Information for Decision-making (http://www.foodsec.org/tr_cm_04.htm)

national experts from the Ministry of Agriculture and Forestry and the Department of Meteorology and Hydrology (now part of the Prime Minister's office) who attended the three-month crop yield forecasting course at FAO Headquarters (see section 2.4.1), customized a crop yield forecasting system for the Lao PDR and learned how to produce rice yield forecasts. The first forecasts were produced for the 2007 wet season in collaboration with the Asia FIVIMS regional project. The forecasts were disseminated in Lao language through the newsletter of the National Agriculture and Forestry Research Institute (NAFRI).

The same recommendation made for Cambodia should apply to Lao PDR. However, during consultations held with FAO NRC staff, it was stressed that the lack of a reliable meteorological network in Lao is even more severe than in Cambodia. Therefore it seems more realistic to recommend the improvement of the crop yield forecast analysis first in Cambodia, as a pilot, and subsequently in Lao PDR. As an alternative, the possibility of improving the meteorological network in both countries, through a regional project could be explored.

3.4. CLIMATE CHANGE IMPACT TOOL

Within project GCP/RAS/247/EC "Linking information and decision-making to improve food security", climate change and food security will be addressed according to the following main pillars:

- Training on climate-related agricultural disaster risk monitoring, assessment and management;
- Climate change analysis by evaluating historical and current climate variability and trends as well as selecting a model to generate a scenario of future climate;
- Analysis of potential impacts of a changed climate on agriculture, food security, and livelihoods;
- Identify actions to manage risks from a changing climate (i.e. adaptation strategies).

In 2007, the Climate Impact Team (CIT) of the FAO Climate, Energy and Tenure Division (NRC) collaborated in a comprehensive climate change impact assessment study in Morocco coordinated by the World Bank, in order to quantify the impact of climate change on Moroccan agriculture by the end of the 21st century. The objective of the study was to determine the economic and political options for adapting Moroccan agriculture vis-à-vis climate change so that Morocco is not caught unawares by crisis situations. Subsequent steps of the Morocco project will build on the climate change scenario data developed by the project[30].

In this framework, the NRC-CIT is developing an integrated toolbox to assess climate change impacts on agriculture at national levels in a view of decision-making support. The toolbox will comprise a set of components to carry out each step of the impact assessment from climate scenarios downscaling to economic impact analysis. The four main components of the methodology are:

1. A statistical downscaling method for processing GCM (Global Circulation Models) output data;
2. A hydrological model for estimating water resources for irrigation;
3. A crop growth model to simulate future crop yields, and
4. A CGE (Computable General Equilibrium) model to assess the effect of changing yields on national economies.

Climate change impact assessment includes simulation work and the determination of future risks, which implies that a number of repetitions of the simulations are conducted with different climate scenario outputs in order to determine risks and probabilities. NRC-CIT has developed the tools to carry out such a study at a high spatial resolution for about 50 crops, two scenarios and six agro-ecological zones. The toolbox will be accompanied with documentation on methods and tools, as well as user manuals and sample data, shaped for training purposes. The toolbox will be implemented in 2011 in two African countries[31].

Once the system is fully developed and tested, the possibility of using it for the countries concerned by the project should be explored. Although its sustainability might be hindered by lack of national capacity and meteorological monitoring network, the Climate Change Impact Integrated toolbox appears to be the only system able to estimate the impact of climate change on agriculture-based livelihood systems.

---

[30] See http://www.fao.org/nr/climpag/pub/FAO_WorldBank_Study_CC_Morocco_2008.pdf
[31] NRC-CIT, Summary Paper on Climate Impact Assessment

4.   DATA VISUALISATION AND DISSEMINATION TOOLS

4.1.   KEY INDICATOR DATA SYSTEM (KIDS)

The Key Indicator Data System (KIDS) was developed by the FAO World Agriculture Information Centre (WAICENT).   KIDS is a software framework that provides the ability to implement thematic information systems that collect, reference, visualize, exchange and disseminate statistical, survey and indicator data. Visualization is possible through tables, mapping, raster images and graphs. Basic GIS overlay and legend editing functions are available for non-GIS users.

Following a period of intense redevelopment, the first public KIDS-3g website was released in May 2009, for the Global Livestock Production and Health Atlas (GLIPHA)[32]. Work is currently underway to make KIDS-3g generally available. However, KIDS-2 will also continue to be supported.   Some of the new features of KIDS-3g include a more advanced GIS functionality that supports geo-features that change over time and multiple versions of geo-layers, as well as the possibility to support multiple sources of data[33].

KIDS was developed originally for the purpose of collecting, mapping and disseminating food insecurity and vulnerability indicators that are relevant to FIVIMS. FIVIMS has been implemented in Asia (Asia FIVIMS) to allow the analysis and visual display of data collected at different levels of aggregation, and to help the monitoring and surveillance of the food and nutrition situation over time. In addition, as a web-based tool it contributed to increased awareness of FIVIMS and improved food security information management and exchange at national, regional and international levels. For details on the current state of implementation of AsiaFIVIMS and data migration from the old KIDS-2 platform to the new KIDS-3g, the reader is referred to Section 5.2.

The new version of the KIDS data repository comprises a radical departure from previous versions in that it is based on a Service Oriented Architecture (SOA), which means that services are distributed to users/applications according to their needs while individual users are no longer required to download and install their own instances of the application.   The system is 100% Java based and portable across Windows, MacIntosh, Linux and other UNIX platforms.

Although KIDS has been tailored for FIVIMS requirements, it may be modified as those requirements change or expand. However, KIDS is not a Geographic Information System but it rather relies on GIS systems to provide its mapping layers and data providers for its data content. The software will allow the import and export of the major five GIS map formats (Atlas*GIS BNA, ESRI Arc/Info "un-generated", ESRI Shape-file, IDRISI VEC, MapInfo MIF/MID). KIDS-2 exports numerical data in CSV format and GIS data in the format that it was uploaded. The operation can be done locally and does not need any technical staff other than the Data Manager. KIDS-3g currently exports data in combined XML and CSV formats separated in multiple folders, while GIS data exchange can be done in the uploaded format and converted formats. At present, this action requires technical knowledge, but in the future release this will be directly available for Data Managers to manage.

KIDS was designed to combine GIS maps with related data sets and to allow the visualisation of information in stand-alone mode and over the Internet. Therefore, the system is a data and mapping visualisation tool, rather than an analytical tool. Some tests conducted on the GLIPHA Atlas[34] have shown this limitation, especially for overlapping different thematic layers and comparing two or more different variables, in order to analyse their interaction in a given area.

Amongst the advantages of using KIDS, it is available free of charge and is accessible to non-GIS users, and can be operated both on-line and off-line (which is useful in countries with poor internet connectivity). In addition, it can be adapted to changing user requirements. However, as for any other information system, its implementation requires a certain level of training, which might not be cost-effective for a system that is mainly used for data visualisation and dissemination.

If a database system linked to a GIS application, such as for example DevInfo and MapInfo or ArcGIS, is adopted by the project to support data analysis capacity, KIDS could be the on-line and off-line output visualisation and dissemination tool. In addition, a comparative advantage of KIDS, in terms of sustainability, against other visualisation tools, is that it has been already used in the region for FIVIMS data, so people may be already familiar with it. However, if this is not the case, DevInfo remains the recommended tool for web based data visualisation because its database functions are more powerful than the ones of KIDS and it offers both functions in one integrated system.

---

[32] http://kids.fao.org/glipha/index.html
[33] Source: FAO Key Indicator Data System (http://kids.fao.org/)
[34] http://kids.fao.org/glipha/index.html

4.2. DYNAMIC ATLAS

Dynamic Atlas is an information management and publishing suite of tools that enable the integration of spatial (map), tabular (spreadsheet), and unstructured (document) data and metadata. The software allows organizations to compile and publish their information in a way that makes it easy for anyone to access and use. Dynamic Atlas has been used in support of FAO's SDRN Technical Cooperation Projects in various countries in Africa and Asia as well as in the Africover project. Many TCP projects that have an IM component now promote the use of Dynamic Atlas. The system is available for free to FAO implemented project and Government staff.

The software package is composed of three main parts:

1. **Dynamic Maps** to create and publish thematic and indicator maps, view related documents, pictures, and URLs, and analyze tabular data for trends. Dynamic Maps also integrates with Microsoft's PowerPoint for easy publishing of the maps, and with MS-Excel for more advanced data analysis and the creation of charts and graphs. Dynamic Maps v3 is license free, thus it can be copied and distributed to partners and clients on CD or through a download, bundled with data.

2. **Dynamic Knowledgebase** enables all the information and data to be registered and organized in a structured format called a "warehouse". Once the data are registered in the warehouse, they are automatically available to users of Dynamic Maps on the desktop and to Internet clients. As a result, the complexity of dealing with spatial data and tabular databases is dealt with so that users don't need to know how.

3. **Dynamic Web Maps Server** brings the same maps, tabular data, and documents from the warehouse(s) onto the Internet. Users can click on a map feature and access related information about it – data from live databases, document(s), pictures, URLs, and more.

Such a system was tested by the Consultant in 2004, when it was first released. At that time it was not user-friendly and its mapping outputs were graphically poor. However, the system is now in version 3 and, although it could not be tested again due to lack of time, it is reasonable to assume that the graphic interface and ease of use has significantly improved. However, as other similar systems have been used in the past, especially KIDS for FIVIMS, it is recommended that these systems are kept operational instead of introducing a new one.

4.3. GEO-NETWORK OPEN-SOURCE

GeoNetwork open-source[35] is a standard based and decentralised spatial information management system, designed to enable access to geo-referenced databases and cartographic products from a variety of data providers, enhancing the spatial information exchange and sharing between organisations and their audience, using the capacities and the power of the Internet. In other words, GeoNetwork is a web platform for sharing geographical information (basically maps and GIS layers). The system provides a broad community of users and Spatial Data Managers that want to publish data and metadata, with easy and timely access to available spatial data and thematic maps from multidisciplinary sources, that may in the end support informed decision-making. The main goal of the software is to increase collaboration within and between organisations for reducing duplication and enhancing information consistency and quality and to improve the accessibility of a wide variety of geographic information along with the associated information, organised and documented in a standard and consistent way.

The GeoNetwork project started out as a Spatial Data Catalogue System for FAO, WFP and UNEP, and further developed with the contribution of OCHA and other contributors, in order to share and exchange spatial databases including GIS maps, satellite images and related statistics in digital format. The project, which is part of the Open-source Geospatial Foundation (OSGeo), is used as the basis of Spatial Data Infrastructures all around the world. Within the geographic information environment, the increased collaboration between data providers and their efforts to reduce duplication have stimulated the development of tools and systems to significantly improve the information sharing and guarantee an easier and quicker access of data from a variety of sources without undermining the ownership of the information. The harvesting functionality in GeoNetwork is a mechanism of data collection in perfect accordance with both rights to data access and data ownership protection. Through the harvesting functionality it is possible to collect public information from the different GeoNetwork nodes installed around the world and to copy and store periodically this information locally. In this way a user from a

---

[35] http://geonetworkopensource.org

single entry point can get information also from distributed catalogues. The logo posted on top each harvested record informs the user about the data source.

GeoNetwork has been developed following the principles of a Free and Open-source Software (FOSS) and based on International and Open Standards for services and protocols, like the ISO-TC211 and the Open Geospatial Consortium (OGC) specifications. It supports the most common standards to specifically describe geographic data (ISO19139 and FGDC) and the international standard for general documents (Dublin Core). It uses standards (OGS WMS) also for visualising maps through the Internet[36].

Although some mapping products are available for the region, such as for example a sub-national administrative units map of Cambodia, there is no evidence that Geo-Network has been previously used or supported by FAO information initiatives, specifically related to food security in the South-East Asia region. However, as it is a geographical information data sharing platform, it can be an opportunity for the project for accessing geographic baseline data for the region and, for sharing and disseminating spatial information at regional level, once sufficient data and metadata will have been produced. However, the use of geo-network is recommended when an advanced GIS and mapping system is established and at this stage it is not a priority the project should be focusing on.

5.   METHODOLOGIES AND INITIATIVES FOR FOOD SECURITY ANALYSIS

5.1.   INTEGRATED FOOD SECURITY PHASE CLASSIFICATION (IPC)

The IPC is an innovative tool to improve food security response strategies and decision-making by drawing together multiple indicators to provide a consistent and meaningful classification of food security situations. It classifies geographic areas and livelihood groups into one of five phases: Generally Food Secure, Moderately/Borderline Food Insecure, Acute Food and Livelihood Crisis, Humanitarian Emergency, and Famine/Humanitarian Catastrophe. The phases are general enough to accommodate a wide range of causes, livelihood systems, and political/ economic contexts, yet their distinction captures essential differences in implications for action.

Since its first development by the Food Security Analysis Unit in Somalia, the IPC is being further developed as an analytical tool in a global effort to improve food security analysis and assessment approaches. Central and eastern Africa have been targeted as key regions for the development of the IPC owing to a strong humanitarian imperative. In total, the IPC has been piloted or is being progressively adopted in 15 countries in the Great Horn of Africa, Western and Southern Africa and Southern Asia. An additional 13 national governments have been introduced to the IPC through training events and workshops. The IPC has been adopted, with operational maps being produced on a regular basis in Burundi, Cote d'Ivoire, Kenya, Somalia, and Nepal. Several countries have undergone IPC technical training and are moving towards producing operational maps, as in Democratic Republic of Congo, Uganda, and Tanzania. IPC awareness-raising events to provide technical training and initial support in adopting the IPC has begun in several countries in East and Central Africa, Southern and Western Africa and Central and South-East Asia (namely Indonesia, Cambodia, Sri Lanka and Tajikistan).

The IPC is being implemented at the regional level with multi-agency processes and established in coordination with food security inter-agency working groups or Regional Economic Communities to ensure regional ownership and mainstreaming into current approaches and processes[37]. Although the IPC was initially conceived to map acute food insecurity conditions triggered by shock, such as natural disasters, armed conflicts, political unrest, the possibility of expanding such methodology to map chronic food insecurity is currently being tested. By the end of the current year guidelines to adapt IPC to chronic food insecurity are expected.

The implementation of IPC in the region may provide a methodology for optimising the use of existing food security-related data and strengthen the analytical capacity of the actors involved in the food security information. Ultimately, this tool can be useful in addressing factors hindering informed decision-making processes in food security, by helping to translate complex analyses into decision-making, thus helping to fill the gap between analysts and decision-makers. For these reasons it is recommended that the project supports the implementation of IPC in Cambodia and Lao PDR[38], where data availability and quality seems to be more suitable for such methodology.

---

[36] Source: Geo-Network Opensource, The Complete Manual, By the Developers, Ver.2.4, 2007-2009
[37] Source: Integrated Food Security Phase Classification (IPC) - Review and Consultation Workshop Overview, June 2009, Johannesburg, Southern Africa
[38] Both Cambodia and Lao PDR have IPC implementation in their work-plan for 2010/2011

5.2. FOOD INSECURITY AND VULNERABILITY INFORMATION AND MAPPING SYSTEM (FIVIMS)

The FIVIMS initiative promoted cross-sectoral analysis of the underlying causes of food insecurity, hunger and malnutrition for improved policy making, programming and action. The initiative stems from the 1996 World Food Summit, when countries in the world committed themselves to strengthen information and analysis for improved targeting of hunger reduction policies and programmes by developing food insecurity and vulnerability information and mapping systems[39].

FIVIMS is an information system that assembles and disseminates information about individuals who are undernourished or at-risk of becoming so. The system is designed to inform on who they are, where they are located and why they are food insecure and nutritionally vulnerable.

At national, and regional levels, FIVIMS was aimed at helping countries carry out a more careful characterization of the food insecure and vulnerable population groups, improving understanding through cross-sectoral analysis of the underlying causes, and using evidence-based information and analysis to advocate for the formulation and implementation of policies and programmes enhancing food security and nutrition.

At global level, FIVIMS was aimed at promoting coordinated action among partner agencies in support of best practices in the development of national and regional food insecurity and vulnerability information and mapping systems to inform targeted actions in order to ensure eradication of extreme poverty and hunger.

In Asia the FIVIMS initiative was promoted through the establishment of Asia FIVIMS[40]. Currently it is possible to find information on the following for Cambodia and Lao (no Asia FIVIMS is available for Myanmar):

CAMBODIA		LAO	
Indicator	**Year**	**Indicator**	**Year**
Anaemia among women	2000 and 2005	Vulnerability to Food and Nutrition Insecurity	2005
Infant mortality rate	2000 and 2005		
Household Using Iodized Salt	2000 and 2005		
Low Birth Weight	2005		
Household with Access to Safe Drinking Water	1998 and 2004		
Household with Access to Sanitation	1998 and 2004		
Stunting (<5 yrs old)	2000 and 2005		
Underweight (<5 yrs old)	2000 and 2005		
Wasting (<5 yrs old),	2000 and 2005		

However, the Asia FIVIMS project was officially terminated in early 2009, while substantive field activities were over in the first quarter of 2008[41]. The data collected up to that time, are stored in the server at the Regional FAO Office in Bangkok, but a back-up copy is available with CIOK[42]. Consultations held with FAO CIOK at Headquarters, revealed that the old server currently storing the data will be turned off and migration from the KIDS-2 technology to KIDS-3G is on-going. The timeframe for turning off the old server and publishing the data migrated on the KIDS-3G, will be established by the project management.

5.2.1. FIVIMS in Cambodia

The FIVIMS initiative in Cambodia was launched in 2003 under the MAFF. A small group of experts consisting of officers from the MAFF and the MOP, called Core FIVIMS Analysts, was also established within the FIVIMS Secretariat, to work on data collection and processing, map development, vulnerability assessments, etc. A specific homepage for Cambodia was also established within the Cambodia food Security and Nutrition Website under the Council for Agricultural and Rural development (CARD) of the Council of Ministers. Relevant data and statistics on food security and nutrition in Cambodia are currently dependent on large national surveys conducted on a three to five-year basis. Regularly updated information is therefore not currently available, although a number of Line Ministries and stakeholders may collect data specific to their target areas. Examples include the monthly rice price data from selected provinces and the annual crop cutting survey, both conducted by the Ministry of Agriculture, Forestry and Fisheries (MAFF).

---

[39] Source: http://www.fivims.org/
[40] Link: http://www.asiafivims.net/
[41] Minamiguchi N. (FAORAP), verbal communication, May 2010
[42] Morteo C. (FAO CIOK), verbal communication, May 2010

The key sources for food security and nutrition-related data in Cambodia are the Cambodia Demographic and Health Survey (2000), the Cambodia National Micronutrient Survey (Helen Keller International, 2000), the Cambodia Socio-Economic Survey (1999), the Cambodia Socio-Economic Survey (2003-2004: available as of 2005, see table above) and Cambodian Anthropometric Survey (CAS, 2008). Most of these surveys can be obtained from the National Institute of Statistics (NIS)[43].

Data from these surveys can also be found in CamInfo, the national indicator database recently developed by the NIS, which incorporates indicators from global, regional and national MDG goals, as well as monitoring frameworks (See also section 2.2.2.). During 2003, key relevant indicators were identified and included (for nutrition) in the Cambodia Nutrition Investment Plan (CNIP) 2003-2007, and (for food insecurity and vulnerability) in the Food Insecurity and Vulnerability Information and Mapping System (FIVIMS). These, again, can also be found in CamInfo[44].

As FIVIMS was an initiative aimed at integrating inter-sectoral information related to food security, the national FIVIMS Secretariat collected information from various sources, and maintained it in a database managed by the Core Analyst Group. Timing of data collection depended on types, frequency and availability of data needed - e.g. yearly, seasonally, once every two years etc. The information gathered by the members of the Core Analyst Group and the national FIVIMS Secretariat from respective line ministries, private and international organizations and NGOs were collated and stored in a FIVIMS master database based on MS-Access at the FIVIMS Secretariat, located in the Department of Planning, Statistics and International Cooperation (DPSIC) of MAFF. The relational database is organized, for easy retrieval of data and information to be used for further statistical analysis. For this purpose, FIVIMS adopted administrative area codes developed by the MOP, which are commonly used by other governmental agencies, to store and maintain time series tabular data - e.g. provincial, district, commune and village level data.

Digital administrative boundary maps maintained for FIVIMS also utilise the same codes to match both tabular and map together for further operations and analysis. Digital maps are maintained at MAFF's DPSIC, in Arc View Shape and/or MapInfo Tab formats being linked to Access based relational database. This facilitated easy data access and retrieval by system users, statistical analysis by using the ADDATI statistical analysis package, and uploading the data onto an online FIVIMS data dissemination system, based on the Key Indicator Data System (KIDS) architecture. The Cambodia KIDS permitted to update and maintain data and disseminate the information through the web or CD-ROMs. It could be also linked with Regional and Global KIDS for sharing FIVIMS information with a wider audience[45].

The Interactive FIVIMS Data Mapper (IFDM), which is the KIDS mapping interface used to map FIVIMS information, produced significant outcomes in Cambodia, in term of data availability and technical capacity at national level. Moreover, the limitations described in Section 4.1., dedicated to KIDS, with respect to poor mapping quality and analysis can be overcome by linking data to ArcView or MapInfo mapping applications. This solution is required to perform data analysis, such as for example to study the spatial relationship between two or more different variables to understand how their interaction affects food security. A web-based visualising tool, such as KIDS, allows the user to select only one variable and the system automatically produces a map. Therefore the capability of performing advanced analysis cannot be achieved using a visualisation tool such as KIDS, but requires a GIS application (ArcView or MapInfo).

- **Sustainability in continuing to use KIDS/IFDM may be hampered by lack of support by the AsiaFIVIMS project that has been terminated in 2009. For these reasons, it might be worthwhile for the project to assess national capacity, in order to evaluate if it is viable to continue building upon the existing experience that was consolidated in the country by using KIDS. However, for the sake of simplicity and sustainability it is recommended to link existing data to DevInfo (CamInfo), which is well consolidated in the region as a data management and mapping system for MDG indicators but, as stated in section 2.3., is compatible with any kind of data. DevInfo should therefore be used as the main database and web based data dissemination tool and linked to a GIS application for multivariable spatial analysis and quality map production.**
- **A careful assessment of the national GIS capacity should be carried out to identify gaps to be addressed, and assist in the selection of a suitable GIS application to put beside the database for spatial analysis.**

---

[43] Link: www.nis.gov.kh
[44] Source: Council for Agricultural and Rural Development (CARD), http://www.foodsecurity.gov.kh/
[45] Source: Council for Agricultural and Rural Development (CARD), http://www.foodsecurity.gov.kh/

6.   CONCLUSIONS AND RECOMMENDATIONS

With the objective of developing a strategy to support data management and analysis, including GIS / mapping for the EC-FAO Food Security Programme Project "Linking Information and Decision-Making to Improve Food Security in Cambodia, Lao PDR and Myanmar"[46], this report compiles information about data management and mapping systems available with UN Agencies, the open-source market and the private sector. The analysis has been conducted by looking at reference material, performing some test where possible, and by interviewing main stakeholders and systems developers. FAO staff responsible for technical backstopping of field projects, where some of these systems are being implemented, were also consulted, in order to ascertain their experience, lessons learned and best practices. This report can provide them with some background information on available systems, and on their applicability and sustainability, against requirements and technical capacity in their countries of concern.

Data management and mapping tools have been analysed with regard to their possible adoption (or continued use if they proved useful in the past) to support the objective of developing national and regional mechanisms to monitor, analyse, and report on (i) the prices of food staples and relevant market intelligence on a regular basis, linking them directly to ongoing regional and international food market information efforts; (ii) agriculture disaster risks caused by climate-related natural hazards, especially flood, storm, and drought, whilst identifying priority climate change risk management options; and (iii) chronic food insecurity and vulnerability information and analysis in support of evidence-based decision-making.

The report has been drafted paying particular attention to applicability and sustainability in the countries where the project is implemented. However, it should be stressed that, in developing a strategy for food security data management, the aforementioned variables should be measured against the requirements and technical capacity each country has. In this respect, **it is recommended that requirements and technical capacity are assessed in the three project countries, in order to develop data management strategies, which take into account variations between countries, to ensure that data systems are carefully tailored to the country-specific context.** From consultations with various stakeholders, including the project management, it was found that technical level and requirements are different between Cambodia, Lao PDR and Myanmar, with Cambodia being probably the most advanced, also in terms of already existing systems. For this reason, **it may be recommended to prioritise the assessment in Cambodia, develop and implement a data management strategy and, in a following phase, use this country as a pilot and export this experience to Lao PDR and Myanmar. In consultation with National Project Coordinators (NPC) from the three countries, the possibility of conducting the assessment in the three project countries at the same time has been mentioned as a time and cost effective solution. Cambodia would be implemented first; best practices and lessons learned would be applied to the subsequent implementation in Lao PDR and Myanmar.**

Many food security related data management and mapping systems have been developed in the last decade by FAO and its partners, ranging from simple data visualisation web based tools to more complex data management and analysis systems. Most of these are based on open-source technology and are seamlessly integrated with a range of closely related specialised systems, both commercial and open-source. The findings of the analysis of such systems are summarised in **Annex 1**, which show strengths, weaknesses, opportunities and threats of available data management and mapping systems. **It is recommended that, when possible open-source technology is adopted in the development of the data management strategy for the project countries. That is because (i) open-source is widely used by the UN systems and its partners, (ii) it is low cost and (iii) the development of open-source technology is dramatically expanding and it is a very promising alternative to expensive commercial packages, especially for developing countries.**

Given the different technical capacity and requirement context expected for the project countries, a flexible set of recommendations will be described in the following section, each depicting scenarios of increasing implementation complexity and cost, as well as identifying sustainability issues, which in general increase in proportion to the complexity of the data management systems implemented. Based on the result of recommended technical capacity, requirements and sustainability assessment that should be conducted in the project countries, one or more of the aforementioned scenarios will be adopted to develop the data management and mapping strategy to support informed decision-making in food security at national and regional level. **Annex 2** presents the three scenarios which are based on hypothetical assumptions on (i) the need for training, (ii) data availability and (iii) the efficiency of the IT infrastructure and monitoring network (particularly the meteorological monitoring network, which is essential for crop monitoring and climate change impact simulation). These assumptions should be assessed against the actual technical capacity and requirements in the project countries. Under the

---

assumption that the capacity of national statistic institutions is similar and of average level for the three project countries, the same recommendations have been set for statistical information in the three scenarios.

12ANNEX 1. - STRENGTH, WEAKNESS, OPPORTUNITY AND THREADS OF AVAILABLE DATA MANAGEMENT AND MAPPING SYSTEMS

TOOL	USE	STRENGTH	WEAKNESS	OPPORTUNITIES	THREATS
CountrySTAT	Web-based information technology system for food and agriculture statistics at national and sub-national levels	• Promotes partnership for data sharing and dissemination	• May be weak due to lack of data	• Feeds FAOSTAT allowing the development of a global statistical data repository	• High implementation cost
Food Security Statistic Module (FSSM)	Estimation of food consumption and security statistics derived from food consumption data collected in NHSs	• Strengthen capacity of national statistic systems in trend analysis of food security statistics	• May be weak due to lack of adequate Household surveys information	• Implementation in Cambodia and Lao PDR will support standardisation at regional level • Already implemented in Cambodia and Lao PDR	• Lack of Government commitment to ensure sustainability
DevInfo	Integrated Database system for monitoring achievement of MDG goals	• Sustainable and cost effective • Established and consolidated since long time; well known within and outside the UN system • Both desktop and web-enabled tool • it can be easily adapted to user requirements	• Poor mapping interface	• Free of charge • Already implemented in project countries • It integrates food security data	• Limited capacity of data users • As for all other tools, weak IT Infrastructures in rural / remote area, may hamper data availability and effectiveness of the system
KIDS	Collection, visualisation and dissemination of statistical, survey and indicator data	• Well known as it has been the engine for FIVIMS data dissemination	• It is only a visualisation / dissemination tool • Not suitable for data processing / analysis	• It is free of charge • Compatibility with GIS formats make it possible to export data for processing	• Sustainability
CM Toolbox	Automated software suite that analyses weather data to assess their impact on crop production	• Well established system	• Despite efforts made in Cambodia and Lao PDR, it has not actually proven to be workable	• National staff is already trained on the use of the system • It can be tailored to suit countries' specific requirements, based on national preferences as well as available expertise and data.	• Lack of adequate meteorological gauging network may hamper reliability of outputs • Complexity • High implementation cost • Sustainability
Climate Change Impact Integrated Toolbox	Simulate impact of climate change on agriculture	• Methodological approach	• Still under development	• Increased resilience to economic consequences of climate change.	• Complexity • Lack of quality and timely information
GIEWS Workstation	Web Mapping application for assessing and analysing food security information	• Comprehensive system as it integrates inter-sectoral data • Uses existing data, therefore helps in avoiding duplications	• It has been subject to major re-development and fine-tuning, therefore no case-studies are available to monitor its effectiveness in the field	• Based on open-source technology; it is free. • It has a good mapping interface and it is flexible enough to be adapted to country specific requirements • Will be compatible with CountrySTAT and Geo-Network	• High cost and long time for set-up • Likely lack of buy-in by Govts. covered by the project, once project completed • Lack of corporate long-term strategy may pose sustainability issues as countries investing in the WS cannot be guaranteed for continued supporting from FAO
AGRI-MARKET	Management of market data	• MS-ACCESS based application, inter-operable for data import/export	•	• It is free of charge	• Lack of data
Dynamic Atlas	Web based information management and publishing suite	• Used in various TCP projects with IM component • Can be used off-line and on-line	• It is only a visualisation / dissemination tool	• It is free of charge • Ms-Excel Integrated to export data for analysis, graphs and charts	• Ease of use and graphic quality of mapping outputs to be assessed
Geo-Network Open-source	Standard based geographic data and information management system for the web	• Information sharing • Metadata information and source reference allow for data reliability and usability	• Requires data management and mapping technical capacity, which may not be available at field level	• Avoid duplication of efforts • Makes available free of charge geographical information • Data standardisation	• Lack of data • Lack of interest of stakeholders in sharing information • Weak IT Infrastructures
IPC	Food Security indicators classification and mapping methodology	• Based on a set of well defined indicators • Based on consensus	• Not applicable if consensus and buy-in from national stake-holders is not reached	• Can bridge the gap between analysts and decision-makers	• Lack of data • Lack of consensus • Limited international capacity to backstop

ANNEX 2. - TECHNICAL CAPACITY SCENARIOS AND PROPOSED SOLUTIONS FOR DATA MANAGEMENT AND MAPPING FOR FOOD SECURITY

Scenario	Technical capacity level	Need for training	Data Availability	IT Infrastructure / Monitoring Network	Implementation Cost	Recommended Tool	Remarks
1	Low	• Extensive in data collection, collation, processing and analysis. • GIS and mapping	• Scarce quality and timely statistical data[47]. Need to establish a data collection policy. • Poor metadata[48]	• Hardware/software infrastructure may be obsolete and in need to be upgraded. • Internet connectivity is available at national capital but at low bandwidth. Not available at provincial level. • Poor meteorological gauging network, necessary to analyse weather data to assess their impact on crop production and simulate climate change on agriculture.	• Medium for hardware/software upgrading • Medium for training • Low for data management and mapping tools, as many of them are open-source	• STATISTICAL INFORMATION - CountrySTAT and FSSM. Link statistical information to DevInfo and mapping application. Assess need for adopting commercial statistical packages (SPSS-STATA). • DATA STORAGE – DevInfo and/or MS-Access for ODBC[49] map linking • DATA PROCESSING - MS-Excel for data analysis, and development of charts and graphs. • MARKET DATA – Agri-market. • MAPPING – MapInfo or ESRI ArcView. • INFORMATION DISSEMINATION – Hard Copies, CDs, establishment of a dedicated web page on food security web site, if available.	• Although ESRI products are the standard for the UN system, MapInfo is recommended for countries with low technical capacity, due to its lower cost and ease of use. Data exchange from/to Excel and Access requires minimal training. Extensive training is required for mapping, regardless the system adopted.
2	Medium	• Data Analysis and mapping. • New IM tools introduced by the project. • Crop monitoring and climate change impact.	• Some baseline statistical data available. Need to improve data consolidation and standardisation. • Metadata available but it should be improved.	• Hardware/software infrastructure may be adequate, in need for minor upgrading. High performance computer needed for climate analysis. • Internet connectivity is available at national capital but at medium bandwidth. Available at provincial level at low bandwidth. • Meteorological gauging network operational but its low spatial resolution makes reliability of climate analysis doubtful.	• Low for hardware/software upgrading, except for high performance computer. • Medium for training • Low for data management and mapping tools	• STATISTICAL INFORMATION - CountrySTAT and FSSM. Link statistical information to DevInfo and mapping application. Assess need for adopting commercial statistical packages (SPSS-STATA). Assess potential for investing in the implementation of CountrySTAT. • DATA STORAGE – DevInfo and/or MS-Access for ODBC map linking • DATA PROCESSING - MS-Excel for data analysis, and development of charts and graphs. • MARKET DATA – Agri-market. • MAPPING / GIS Analysis – MapInfo or ESRI ArcView. • INFORMATION DISSEMINATION –Establishment of a dedicated web page on food security web site. Use DevInfo for web based data visualisation and dissemination. • Assess traditional crop monitoring techniques to evaluate the possibility of implementing CM Toolbox and Climate Change impact integrated toolbox	• Assess potential for integrating data management and mapping system into the GIEWS Workstation. To be done in a further phase of development of the food security data management and mapping systems, when technical capacity and country requirements are better defined, as well as when some case study on the implementation of the workstations in the field is available (see section 2.5.). • Training must be tailored according to current technical capacity
3	High	• New IM tools introduced by the project. • Crop monitoring and climate change impact.	• Quality and timely statistical data available. • Metadata available and adequate.	• Hardware/software infrastructure adequate. High performance computer needed for climate analysis • Internet connectivity is adequate for the establishment of a web based food security information system, both at national and local level. • Meteorological gauging network adequate for crop monitoring and climate change modelling.	• Low for hardware/software upgrading, except for high performance computer. • High for training • Medium for data management and mapping tools (in the case ESRI ArcGIS software must be purchased)	• STATISTICAL INFORMATION - CountrySTAT and FSSM. Link statistical information to DevInfo and mapping application. Assess need for adopting commercial statistical packages (SPSS-STATA). Assess potential for investing in the implementation of CountrySTAT. • DATA STORAGE – DevInfo and/or MS-Access for ODBC map linking • DATA PROCESSING - MS-Excel for data analysis, and development of charts and graphs. • MARKET DATA – Agri-market. • MAPPING / GIS Analysis – MapInfo or ESRI ArcView. • INFORMATION DISSEMINATION –Establishment of a dedicated web page on food security web site. Use DevInfo for web based data visualisation and dissemination. Assess potential for investing in the implementation of CountrySTAT. • Crop monitoring and Climate Change Impact - Implement CM Toolbox and Climate Change impact integrated toolbox	• Assess potential for integrating data management and mapping system into the GIEWS Workstation. To be done in a further phase of development of the food security data management and mapping systems, when technical capacity and country requirements are better defined, as well as when some case study on the implementation of the workstations in the field is available (see section 2.5.). • Training should build upon existing capacity ad focus on new tools.

---

[47] Including market price monitoring.

[48] Metadata is loosely defined as data about data. Metadata is a concept that applies mainly to electronically archived data and is used to describe the a) definition, b)structure and c) administration of data files with all contents in context to ease the use of the captured and archived data for further use (http://en.wikipedia.org/).

[49] Open Database Connectivity (ODBC) is Microsoft's strategic interface for accessing data in a heterogeneous environment of relational and non- relational database management systems (http://support.microsoft.com/)

ANNEX 3. - LIST OF USEFUL LINKS

WEB SITE	LINK
Agricultural Market Information Services FAO of UN	http://www.fao.org/ag/ags/subjects/en/agmarket/agmarketinfo.html
ASEAN	www.aseansec.org
AsiaFIVIMS	http://www.asiafivims.net/
Asian Disaster Preparedness Centre	http://www.adpc.net/
Cambodia Agricultural Market Information System	www.camis-kh.org/
Cambodia Food Security and Nutrition website	www.foodsecurity.gov.kh/)
Cambodia National Institute of Statistics	www.nis.gov.kh
CamInfo	http://www.caminfo.org/CNIP.htm
CM Box Climate Change simulation Pilot Project	www.fao.org/nr/climpag/pub/FAO_WorldBank_Study_CC_Morocco_2008.pdf
Council for Agricultural and Rural Development (CARD)	http://www.foodsecurity.gov.kh/
DEVInfo	www.devinfo.org
FAO Agri-Market	www.fao.org/ag/ags/AGSM/FAM20/index_E.HTM
FAO Country STAT	http://www.fao.org/economic/ess/countrystat/
FAO GIEWS National basic food prices - data and analysis tool	http://www.fao.org/giews/pricetool/#
FAO Key Indicator Data System	http://kids.fao.org
FAOSTAT	faostat.fao.org/
FIVIMS	http://www.fivims.org/
Food Security Information for Decision-making	www.foodsec.org/tools_cw_01.htm
GeoNetwork Open-source	http:// geonetwork.sourceforge.net
GLIPHA	http://kids.fao.org/glipha/index.html
IPC	www.ipcinfo.org
LaoInfo	http://www.nsc.gov.la/Selected_Statistics.htm
Myanmar Central Statistical Organization	www.csostat.gov.mm/
UNDOCO	www.undg.org
UNSTAT Millennium Indicators	mdgs.un.org/unsd/mdg/Default.aspx

ANNEX 4. - REFERENCES

Bunting G.	FIVIMS and Geo-Network User needs Assessment	2003
EC/FAO	Global Programme on Linking Information and Decision-making to Improve Food Security – Inception Report	2009
EC/FAO	Support to the EC Programme on Linking Information and Decision-Making to Improve Food Security for Selected Greater Mekong Sub-regional Countries (GCP/RAS/247/EC) – Project Document	2009
FAO NRC-CIT	Summary Paper on Climate Impact Assessment	
FAO NRC-CIT	Summary Paper on Climate Impact Assessment	
FAO Programme Committee	Summary Report of the Joint FAO and WFP Thematic Evaluation of Information Systems for Food Security – Management Response	2010
FAO Statistic Division	Strengthening Capacity of National Statistic Systems in Trend Analysis of food Security Statistics of Food Consumption Data From National Households Surveys	2010
FAO-SKE	Dynamic Maps v3.1 Manual of Features	2004
FIVIMS	Making FIVIMS work for you: Tools and Tips	2008
FIVIMS	Guidelines for National FIVIMS - Background and Principles	2000
FIVIMS Thailand	Manual of Operations – Version 1.0	2004
Geo-Network Open-source	The Complete Manual, By the Developers, Ver.2.4	2007-2009
Integrated Food Security Phase Classification (IPC)	Review and Consultation Workshop Overview, Johannesburg, Southern Africa	2009
Poulsen L., Stacy R., Bell L. Kumar Range S.	Joint Thematic Evaluation of FAO and WFP Support to Information Systems for Food Security, Final Draft Report	2009
SOTHY (Dept. Planning and Statistics, MAFF, CAMBODIA) & SOKUNTH (Dept. Meteorology, MOWRAM, CAMBODIA); FAO	Technical Report on Crop Monitoring and Forecasting for Cambodia	2007
The Integrated Food Security Phase Classification (IPC) Global Partners	Technical Manual Version 1.1	2008

ANNEX 5. - LIST OF PERSONS CONSULTED

	Mr. Kinlay Dorjee	ESA
	Mr. Marco Knowles	ESA
	Mr. Fabio Grita	GIEWS
	Mr. Karl Morteo	CIOK
	Mr. Seevalingum Ramasawmy,	ESS
	Ms. Francoise Trine	ESDG
	Mr. Michele Bernardi	SDRN
	Mr. René Gommes	SDRN
	Mr. Francois Delobel	NRC
Many thanks are to be conveyed to all stakeholders consulted for drafting this report. Special thanks to Mr. Kinlay Dorjee, Mr. Bruce Isaacson, Mr. Mark Smulders and Mr. Marco Knowles, for their kindness and their help.	Mr. Mark Smulders	ESA
	Mr. Michael Riggs	KECBD
	Mr. Luca Russo	ESAF
	Mr. Nick Haan	ESA
	Mr. James Edge	ESAG
	Ms. Astrid Marschatz	UNODOCO
	Mr. Kafkas CAPRAZLI	ESSS
	Mr. Kiran Viparthi	CIOK
	Mr. John Latham	NRL
	Mr. Naoki Minamiguchi	FAO REAP
	Mr. Antonio Martucci	NRL
	Mr. Renato Cumani	NRL

ANNEX 6. - TERMS OF REFERENCE

Terms of Reference

International Data Management and GIS Consultant

15 days wae, 26 April to 21 May 2010, Duty station: Rome

Under the EC-FAO Food Security Programme, project GCP/RAS/247/EC aims to link information and decision-making for improved food security in Cambodia, Lao PDR and Myanmar by working with national, regional and global partners and information systems. The project needs a strategy to support data management and analysis, including GIS mapping, at project, regional and national levels.

Under the overall supervision of the Coordinator, Regional Operations Branch (RAPR) of the FAO Regional Office for Asia and the Pacific (RAP), the direct technical supervision of the GCP/RAS/247/EC Chief Technical Adviser, the international *Data Management and GIS Consultant* will review existing data systems and requirements and develop a strategic proposal for GCP/RAS/247/EC support to data management and GIS mapping at both regional and national levels, as appropriate. The consultant will work towards achieving the following two outputs by undertaking the proposed specific tasks.

1. An analysis of (1) data management and mapping requirements and opportunities for the project, the region and the countries, and (2) available data management tools and systems, including both FAO tools and systems and others; and a proposal of appropriate data management and mapping systems that meet the requirements of the project, and a plan for their implementation.

   o Review FAO data management tools, including CountrySTAT, the GIEWS Work Station, and KIMS/KIDS and meet with relevant people at FAO Headquarters who are managing and supporting these data management systems.

   o Review past support of the EC-FAO Global Food Security Programme to data management and analysis tools and systems and identify lessons learned and best practices.

   o On the basis of the above, prepare a brief summary describing FAO data management and analysis tools and systems, including their strengths and weaknesses, and opportunities for the project.

   o Meet with the project Lead Technical Officer, the FAO FIVIMS Coordinator and the FAO Representative for Cambodia (in Rome) to assess potential requirements, options and opportunities for the project to support data management, analysis and mapping.

   o On the basis of the above, propose appropriate data management and mapping systems that meet the requirements of the project, the region and the countries (notably Cambodia), as appropriate.

2. Recommendations and a proposal for the future management of the web-based Asia FIVIMS database and mapping system.

   o Assess the current Asia FIVIMS database including the contents, platform, data management and mapping components, etc. Meet with Mr. Karl Morteo (CIOK) to discuss the planned migration to KIDS-3g.

   o Assess www.asiafivims.net to determine current functionality and if possible analyse the use and users of the website over the past two years or so.

   o Discuss with the FAO FIVIMS Coordinator and with the previous Asia FIVIMS CTA, ideas, plans and recommendations for the future of the Asia FIVIMS database and website.

   o Prepare a brief report summarising the above information with recommendations and a proposal for the future management of the Asia FIVIMS database and mapping system, considering all alternatives, with an emphasis on simplicity and sustainability.