Sixth International Conference on Agricultural Statistics

Rio de Janeiro, Brazil, 23-25 October 2013.

Summary Notes of Selected Sessions

23 October 2013

Technical Session 1.1: APN 1 - Environmental Issues, , 23 October, 11.30-13.00

Organizer and Chair: Eszter Horvath, UNSD.

This session focused on statistical and institutional dimensions for integrated agri-environmental statistics. The presentations reflected on the various stages of statistical development in developed and developing countries.

The following presentations were made at this session:

Technical Efficiency of Kenya's Smallholder Food Crop Farmers: Do Environmental Factors Matter? Ogada Maurice Juma (Kenya). This paper argued that the country has room to improve agricultural productivity by addressing environmental and farm-level constraints. The government of Kenya achieved this result by investing in production and dissemination of productivity-enhancing technologies such as high-yielding varieties and inorganic fertilizers. The importance of using traditional organic fertilizers, rather than synthetic fertilizers was stressed. The need to move to irrigation technology, rather than relying on rain feed systems was also noted.

CAPRI: a spatial assessment tool for agri-environmental indicators in the EU, Adrian Leip, Wolfgang Britz, Claudia Bulgheroni et al. (Italy). This paper described how the agro-economic model CAPRI has been extended to provide a spatial assessment tool for agri-environmental indicators in the EU. For a recent assessment on the 'greening of the CAP' (European Commission 2011) additional indicators have been included, such as the risk of soil erosion, biodiversity friendly farming practices, farmland bird index, agricultural landscape structure, and an indicator related to environmental compensation zones. All indicators are provided at the regional scale (NUTS2) and at the high-resolution scale (HSMU).

Application of the System of Environmental Economic Accounting (SEEA) Central Framework and SEEA Experimental Ecosystems Accounting at FAO: Preliminary Findings and Ongoing Work, Robert Mayo (FAO), Carl Obst (FAO), Gary Jones (IMF), The on-going work by FAO to advance SEEA methodology for the compilation of internationally comparable environmental-economic accounts for the agriculture, forestry, and fisheries sectors was outlined in our presentation. Emphasis was placed on describing the on-going development of a data management and analysis application in FAOSTAT aligned with the SEEA-Central Framework as well as a set of SEEA-based indicators that can support monitoring the development outcomes articulated in FAO's five strategic objectives. There was good feedback from the audience, in particular there was interest having open access to the SEEA-AGRI tables from outside FAO. Additional questions were raised on how to deal with multi-cropping and the development of agri-environmental indicators. It was clear that there needs to be on-going communication with such audiences on the SEEA and SEEA-AGRI.

Technical Session 1.2: IDCB 1 - Indicators on Country Capacity to Produce Agriculture Statistics, 23 October, 11.30-13.00 –

Organizers: Mukesh Srivastava, FAO and Mark Miller, NASS, USDA

Chair: Oliver Chinganya, AfDB

The lead paper of the session presented the work of FAO and other partners on building a framework for Assessing Country Capacity to produce Agricultural and Rural Statistics. The other four papers presented the experience of carrying out country assessment in Asia, Africa, Latin America and Caribbean and the CIS regions. The presentations and discussion are reported below:

"A Framework for Assessing Country Capacity to Produce Agricultural and Rural Statistics" by Mukesh Srivastava and Michael Trant (FAO). The paper outlined the need for a standard framework for assessing country capacity to produce agricultural and rural statistics, particularly to meet the need for monitoring the progress made under the Action Plan of the Global Strategy to Improve Agriculture and Rural Statistics. Outlining the process followed since the constitution of a Task Force at ICAS-V to develop the standard framework for assessment of country capacity, the paper presented a review of similar work by other international organization. The paper, supported by a Poster presentation, presented the Capacity Framework with its 4 dimensions and 23 elements and the methodology for building indicators based upon a standard self-reporting questionnaire. The paper also highlighted the uses of the indicators for grouping and categorizing countries according to level of development of statistical system.

*"**Assessing the capacity and needs of countries to produce agricultural data – the African Experience"* **by** Oliver J.M. Chinganya (AfDB). The paper highlighted the limitation on availability of information on national capacities to produce agricultural statistics and the need for assessing the countries for capacity building and technical assistance at the time of preparation of Africa Action Plan (2011-15) for I*mproving Statistics for Food Security, Sustainable Agriculture, and Rural Development*. Such information is also needed for: (i) baseline for target-setting and performance measurement, (ii) country statistical capacity profiles, (iii) a designing technical assistance program for Africa as a whole, as well as for each country, and (iv) a monitoring and evaluation (M&E) system to track the progress of implementation. The paper highlighted the experience of African countries, which have also contributed to development of standard tool for capacity assessment, in collecting data on standard questionnaire for capacity assessment and building indicators. The training imparted for completing the questionnaire has helped in coordinating the data collection from diverse set of institutions. Establishing coordination among various agencies for data collection was an important aspect in building reliable capacity indicators.

"Assessing Country Capacity for the Production of Agricultural Statistics In Asia and the Pacific" by Jairo Castaño et al. (FAO, Bangkok). The Asia and the Pacific region pilot tested and initial version of the standard questionnaire (SQ) based on traditionally used questionnaires for reporting progress to the Asia and Pacific Commission on Agricultural Statistics (ACAS). While a number of lessons were learnt from this pilot exercise regarding coordination needed at country level for collecting complete information and difficulty level of the questions, the available data, though not complete, served as the basis for defining Country Capacity Indicators. The information available from indicators was also used preparation of Regional Action Plan to implement the Global Strategy. The implementation of the draft questionnaire in Asia concluded on difficulties in collection of information on

Human and Financial resources for agriculture statistics, primarily because often there is no clear budget allocation of statistics, and the available staff in engaged in multiple duties including agriculture statistics.

"Countries Capacity to Produce Agricultural and Rural Statistics in Latin America and the Caribbean" by Veronica Boero (FAO, Chile): presented by Susana Perez (Mexico). The presentation highlighted the contribution of the region to the process of development of Country Capacity Indicators. The questionnaire prepared on the basis of feedback from Asia and Africa was discussed in a workshop of pilot countries in the region. In June 2013, the Spanish/English version of Standard Questionnaire was sent to the 33 FAO member countries in the Latin America and Caribbean. An analysis of responses received from four countries (Colombia Ecuador Mexico and Peru) was presented to reflect the strength and weakness of their systems. Although these countries are not a representative sample of countries, the analysis of their responses provided an indication of the situation prevailing the region.

"Experiences of Initial Country Assessment in the CIS (Commonwealth of Independent States)" by Irina Goryacheva, CISSTAT and Giorgi Kvinikadze, FAO. The Statistics office of Commonwealth of Independent States (CISSTAT) is the implementing partner of the Global Strategy in the region. In Summer 2012 CISSTAT conducted a round of assessment of capacity of CIS countries to produce agricultural and rural statistics based on the draft Standard Questionnaire for Country Assessment (SQ). The paper described the experience of this exercise. In particular, it showed how the questionnaire was adapted and how it was administered, as well as discussed the lessons learnt. In designing the Russian version of the questionnaire for the CIS states, the following approach was adopted: a) The structure of the questionnaire was changed to match the indicators for country capacity; b) Only the questions indispensable for compilation of the indicators were retained. This approached facilitated early compilation of indicators and analysis to get panoramic view of the situation in the statistical systems of the region. In view of fast changes taking place in the statistical systems of region, it is planned to administer the questionnaire on annual basis.

The questions and discussion on this related to following points: (1) Africa region is willing to share the IT instrument developed by it for collecting data; (2) Reporting bias in self reporting in normally expected but it can be reduced by using focus group discussion. (3) A mechanism to conduct country assessment in all regions at the same time need to be considered for monitoring progress. This will help in showing changes in the global picture.(4) Importance of expert missions in getting the validated information was highlighted; (5) link between the Corporate Baselines Survey of FAO and Country Capacity Indicators was discussed. A possibility for use of CCIs for monitoring an outcome of FAO corporate objectives was seen as possibility.

Technical Session 1.3: SPP 1 - Master Frames for Agricultural and Rural Statistics, 23 October, 11.30-13.00

Organizer and Chair: Elisabetta Carfagna, FAO

Various approaches to the problem of developing a sampling frame to be used for multipurpose agricultural surveys were presented, highlighting advantages, disadvantages and requirements. The following papers were presented:

"Indirect Sampling as a Strategy for Building and Updating the Master Sampling Frame for Integrated Agricultural Surveys: a General Approach for Designing Unbiased Sampling Strategies", Pietro Gennari, Piero Demetrio Falorsi (FAO). Pietro Gennari presented a paper that addresses the case in which the sampling frame of the desired target population is not available (or not updated), by assuming a known relationship of this population with another population for which the frame is available. The sampling frame indirectly related to the target population is then chosen and the initial sampling units are selected from the so-called indirect frame. The data collection is carried out using an indirect sampling approach and the estimates of the target population are obtained with the generalized weight sharing method. This sampling technique allows dealing with imperfect or outdated frames with a rigorous and generalized approach, addressing therefore the problems encountered in developing countries where frames are often not updated.

Questions concerned the efficiency of the proposed approach and the need to increase the sample size to keep under a certain threshold the sampling errors. When comparing the overall costs associated to the implementation of alternative sampling methodologies, however, we should also take into the cost involved in updating the frame, which is a requirement in case we do not use the indirect sampling approach.

"The use of a point sampling as a master frame for agricultural statistics", Javier Gallego (JRC). Javier Gallego described the LUCAS (Land Use and Cover Area-Frame Survey) survey conducted by Eurostat, mainly for environmental monitoring and analyzed the feasibility to use it as a master sampling frame for agricultural statistics. LUCAS was first run in 2001 and 2003 with a systematic non-stratified sample based on clusters of 10 points. The sample design changed in 2006, moving from a clustered (two-stage) non-stratified sampling method to a two-phase sampling of unclustered points. In order to use this sampling frame as a master sampling frame, the points are not used only for observing the physical characteristics of the point, but also for selecting farms.

The proposed sampling rule is as follows: points that fall on Utilized Agricultural Area (UAA) generate an element of the sample of farms. The definition of UAA may be flexible to some extent, but the concept of UAA used to decide if the point generates or not a sample unit should be the same considered by the farmer when they are asked about the total area of the farm and used for computation. Farm buildings and rough pastures may be included in the UAA if this is considered useful for the completeness of the frame.

If a point of the sample falls on UAA, the farmer managing that field is located and asked to provide global data for the farm, including total area and production of each crop or inputs such as fertilizers or pesticides. No question is asked about the production in each field. If several points fall on fields of the same farm, the farm will have in the computation a weight proportional to the number of points. The area of each crop can be estimated separately from the direct field observations and the farmers survey. This will provide a tool for cross-checking.

Locating the farmer may be a heavy task, depending on the livelihood structure. The task is heavier in regions in which people live in concentrated villages or towns rather than in scattered houses close to the fields. In some cases the owner or the manager of the farm may live in a city that is very far from the fields. However this is an investment to be made the first time the survey is run if the sample of points is kept constant: keeping a database with the link point-farm is much easier, although the amount of work depends on the communications structure or training level of the farmers, in particular whether or not the farmers have a telephone or access to internet.

Questions concerned the possibility to use this approach for estimating the number of farms. Javier Gallego also discussed about the level of bias in the estimates which can be generated in case a point sampling strategy is carried out only along the roads.

"Master sampling frames for agricultural and rural statistics in Ethiopia". Aberash Tariku Abaye (Ethiopia). The area frame developed by the Central Statistical Agency of Ethiopia (CSA) using segment as ultimate sampling units was presented. Enumeration areas have been used as Primary Sampling Units (PSU). The secondary sampling units are segments of size 40 hectare. The enumeration area and land cover maps were used to develop the area frame. The land cover classification, based on the LCCS legend, used spot-5 satellite imagery.

The primary sampling units (EAs) were selected by Probability Proportional to Size (PPS), where the size is the number of segments. The sampled EA were divided into segments of size 40 hectare and two segments were selected systematically from each EA for data collection.

The multiple frame approach is adopted combining the area frame with the list of commercial farms, which are treated separately and an independent survey is conducted for them.

Questions were posed about the results of the test conducted to compare the estimates from the area frame approach with the estimates of the list frame approach, which is still the official method adopted in the country. Another question concerned the time needed for identifying the farmers when using the area frame approach.

Technical Session 2.2: IDCB 4 – Administrative Data, 23 October, 14.30-16.00

Organizer and Chair: Jeffrey Smith, Statistics Canada.

A paper by Phiri Innocent Pangapanga and Shelton Kanyanda (Malawi) presented Malawi's experience of using administrative data. It was noted that National Statistics Service of Malawi is empowered by Law to go through different administrative data, and if they satisfy the respective criteria, they will be considered as official statistics and published accordingly.

A paper by Daniel G. Beckler (USDA) presented NASS practices in using Farm Service Agency (FSA) data in producing agricultural statistics. FSA is another agency, different from NASS, within USDA administering US Farm Programs authorized by the "Farm Bill". FSA data are incorporated into NASS process of producing agricultural statistics. They cover only crops. In particular, the data available are: a) crop acreage – used for setting minimums of crop area estimates; b) Names and addresses of the Program Participants – used for creating and updating sampling frames; c) Common Land units (GIS representations) – used as ground truth for remote sensing estimates. Different definition of the farm used by FSA and data quality put certain limitations on using the FSA data.

A paper by Jeffrey Smith, Martin Beaulieu, Erin Smith et al. (Canada) described Statistics Canada's intentions to use administrative data during the next agricultural census to reduce costs and respondent burden. It was noted that administrative data are not used instead of surveys so far, they are used just for comparison and validation of the survey data. However, the situation is going to change. A study revealed that financial data can be estimated quite closely from tax records. Therefore during the next agricultural census in 2016 the financial data will not be collected from the respondents but inserted directly from the tax records. Therefore a survey will be at least partly substituted by administrative data. Although financial data constitute just 7% of the questionnaire in terms of questions, the impact on reducing respondent burden is much higher.

A paper by Ann-Marie Carlsson and Anders Grönvall described a quality framework being developed in Sweden to use for deciding on replacing surveys with administrative data.

The general conclusion of the session was that administrative data may be very useful in reducing data production costs and respondent burden as well as in increasing the quality of official estimates. They can be used for validation of the survey results, creation and updating frames as well as for directly replacing data collection procedures. However, a careful scrutiny of compatibility of concepts and definitions as well as of the quality of administrative data is needed in order to ensure high quality of the released final estimates.

Technical Session 2.3: SPP 2 - Survey Design and Sampling Strategies for Agricultural Surveys, 23 October, 14.30-16.00 –

Organizers: Renee Picanso**,** USDA/NASS and Zelia Bianchini**,** IBGE. Chair**:** Zelia Bianchini, IBGE

"Brazilian Agricultural Survey System", IBGE. Description of the Brazilian approach of sampling techniques used in agriculture, mixing list and area frames. Establishment of list frame is based on a stratification of establishments above a threshold based on the production value and the economic activity. The area frame is made of PSUs which are not considered large enough to be part of the list frame. Use of area frame resulted into an inflated sample size which needs further investigation. Probably interesting for the research component of the GS.

"Redesign of the national Agricultural Survey in Argentina", INEC (Rossi). National Agricultural survey was designed on the basis of a list frame until 2007. A multiple frame approach combining area and list frames will be introduced soon. Satellite images will be used for the stratification of the territory and PSUs will be selected (with physical boundaries).

"Statistical methodologies for the development of Colombian Agricultural statistical system", DANE (Madrid). Rather a presentation of the agricultural statistical system than a paper on survey design and sampling strategies. Importance to develop a multiple frame is highlighted.

Plenary session 2: Rural Development in the 21st Century: Policy Options and Data Gaps, 23 October, 16.30-18.00 –

Chair : Gero Carletto (WB)

Panellists: Pietro Gennari (FAO), William Martin (WB), Maximo Torero (IFPRI), Mary Bohman (USDA-ERS).

The presentations from the panellists highlighted the key challenges and best practices in collecting rural data and in using them for policy analysis. Each panellist focused on his/her particular areas of interest/expertise to analyze what has worked and what has not.

After describing some recent not so successful efforts in producing international rural statistics, Pietro Gennari tried to identify the reasons why rural statistics, despite being so important, currently are not regularly produced even in developed statistical systems. In order to address this situation he outlined an international agenda to improve rural statistics and its links with the Global Strategy. He then concluded providing some technical proposals to increase the availability of rural data which will be studied by the GS research program (i.e.

including rural area as a planned domain in the sampling design in order to produce separate estimates; increasing the sample size of rural areas; producing direct estimates as averages of multiannual data; collecting integrated data through multipurpose surveys; applying small area estimation techniques using auxiliary variables from administrative sources; integrating ex-post different domain-specific surveys through imputation or a model-based approach).

Will Martin discussed the emerging policy issues and data needs on rural areas from an economist perspective (price data, statistics on sources of income, urbanization and the changing concept of rurality, etc.). He also suggested that the International Association of Agricultural Economists and the ISI Committee on Agricultural Statistics strengthen their collaboration and become partners in producing and analyzing policy-relevant data on agriculture and rural development.

Maximo Torero presented two IFPRI initiatives which link local market information and price data to the social and economic status of households.

Mary Bohman presented the US experience in using rural data and the lessons that can be relevant to countries at different levels of development. She also discussed what have been and continue being some of the key data challenges in countries like the US, and how can the diffusion of technology to survey operations can help with this problem.

The panellists agreed that one thing that can be done in the short-term to obtain additional information on the urban-rural divide, is to re-process available survey data and to use model-based approaches. Moreover, they concurred that some of the technical proposals to improve rural statistics in the longer term, especially improving the design of multipurpose integrated surveys, will need to be pursued in the context of the research programme of the GS. An important action, as a prerequisite for the availability of international comparable data, would be to reach a consensus within the context of the UN Statistical Commission on the international definition of rural areas.

Lastly, the International Association of Agricultural Economists and the ISI Committee on Agricultural Statistics will organize a joint conference in Milan in 2015 on the methodology for measuring the impact of statistics on policy/decision making.

24 October 2013

Technical Session 3.2: IDCB 3 - Carrying out in-depth assessment of agricultural statistics systems for building strategies for improvement, 24 October, 9.00-10.30 - Organizers: Mukesh Srivastava, FAO and Mark Miller, NASS,USDA

Chair: Michael Steiner, NASS, USDA

The session focused on gathering experience on carrying out an assessment of capacities statistical systems for meeting demand for agricultural and rural statistics. Following four papers were presented and discussed:

"Designing In-depth Assessment of Capcity to produce Agricultural and Rural Statistics" from M. K. Srivastava, FAO**.** The paper presented the objectives, methodology and process of proposed work of In-depth Assessment of Country Capcity planned in the selected countries under the Global Strategy to Improve Agricultural and Rural Statistics. It defined the scope of these assessments as a thorough diagnosis of system of statistics collection on crop, livestock, fishery and forestry sub-sectors. The framework for assessing the capacity to produce agricultural and rural statistics developed by FAO was presented, and the importance of participative process and national ownership was highlighted. The assessment report was

expected to be an authentic reference document for wider international community interested in the development of agricultural statistics, obviating the need of another assessment in the short term.

"Landscape Analysis of the Agricultural Statistics' Sector in Malawi" by **Mariam ATJ Mapila, Klaus Droppelmann, Isaac Chirwa et al.** (IFPRI and Ministry of Agriculture, Malawi). The paper presented the results of a study on key challenges and capacity constraints that hinder provision of timely, reliable and accurate agricultural statistics at national level. The study explored the nature of partnerships and institutional linkages as well as interactions between players and stakeholders in agricultural statistics in Malawi, including those in public and private sectors, development community, academia as well as local and international research institutions.
The Study revealed that primary stakeholders have a high frequency of interaction but the strength and depth of interaction is weak leading to weak harmonization and contradicting statistics. Institutional rigidities, inadequate technical and financial capacity further constrain the provision of data for evidence based decision making. Stakeholder perceptions show that the sector is performing below capacity. Factors preventing the full utilization of potential capacity include inadequate human and financial resources; organizational slowness in adopting technological advancements; low demand for and utilization of agricultural statistics in decision making processes by policy makers; and inappropriate incentives for staff.

"Status of agricultural statistics in Sudan" by **Mwahib Elseid, Nuha Mahammed** (MOA and CBS, Sudan). Sudan earns 45% of its GDP from Agriculture. The evolution of statistical activities and building of related institution set-up since 1903 was presented. For collection of data the agriculture sector in the country is divided in "Irrigated" and "Rain-fed" sectors. Rain-fed sector is again split in "mechanized" and "traditional" sectors for the purposes of sampling designs. The detailed sampling design to estimate area, production and yield was presented. The country prepares a Cereal Balance Sheet and has a methodology for assessment of Food and Nutrition Security. The paper also outlined the existing Market Information System for Crop and Livestock.

"China's Capacity Assessment to Produce Agricultural Statistics" by **Zhiquan Xu, Wei Zhou** (China),. In China most of agricultural and rural statistics including the crops output, livestock output, agricultural producer prices are produced by the National Bureau of Statistics (NBS) of China. Complementary statistics on forestry, fishery and commodities market information are collected by the line ministry and departments such as Ministry of Agriculture, National Forestry Administration. The paper presented an assessment of Capcity of China's agricultural and rural statistics in four aspects: (1) Legal and institutional infrastructure, (2) Resource allocation, (3) Statistical methodology and practices, (4) Information dissemination and data accessibility. The strengths, weakness and constraints analysis of the current agricultural and rural statistical system in China were presented.

The questions and discussions of the session related mainly to the lead presentation from FAO. The participant from African Development Bank suggested the leader of in-depth country assessment should normally the same person who has been the national focal point for self-reporting type capacity assessment. It was also clarified that in-depth assessment is expected to take 3 to 6 months. The issue relating to linkage between report of the in-depth assessment and country proposal for technical assistance under the Global Strategy was

discussed. It was also recommended that the in-depth assessment should identify country priorities for investments in methodology, training and technical assistance.

Technical Session 3.3: SPP 4 - Crop and Yield Forecasting, 24 October, 9.00-10.30

Organizer and Chair: Naman Keita (FAO)

"Crop Yield Estimation with Farmers' Appraisal on Weather Condition". Jean Baptiste Habyarimana, Dr. Tugrul Temel, Enock Ching'anda et al. (Rwanda). Mr Habyarimana presented a Bayesian statistical model. In this context, four pieces of information were used "actual yield, yield targets, realized performance towards yields targets, and farmers' appraisal on weather condition". The author believes that the developed statistical model for crop yield estimation can contribute to reliable crop production estimation.

"On Precise Estimation of Crop Yield at Smaller Area Level by Integrating Agricultural Survey Data and Population Census Data Through Use Of Spatial Models". U C Sud and Hukum Chandra (India). Mr Sud spoke about an application of small area estimation technique to produce district level estimates of crop yield for three major crops of the State of Uttar Pradesh using the Improvement of Crop Statistics Scheme data and auxiliary data from various secondary sources. In particular, a spatial model was used for small area estimation to improve the district level crop yield estimates. The values of yield estimates generated by using direct survey estimator, EBLUP and SEBLUP estimators along with their percentage standard errors (%SE) were compared. These results reveal that the SEBLUP method provides better estimates than the usual EBLUP estimator and the direct survey estimator and showed the contribution of the spatial information.

"Reliability of rainfall for crop production. A case study in Uganda" Nansubuga Resty (Uganda). The paper, presented by Javier Gallego, describes the system used by JRC to provide the EU with yield forecasts on major annual crops for EU28 and neighbouring countries. The system is based on a meteorological infrastructure that uses daily data from approximately 4,000 meteorological synoptic observatories. These data are interpolated to a grid of cells of 25 x 25 KM. A soil map, with relatively coarse scale is also used. The polygons of the soil map intersected with the 25 km cells constitute the elementary monitoring units. The remote sensing infrastructure is based on time series of composite images of coarse resolution sensors, mainly Vegetation and MODIS. A crop model is adopted for each crop. The kernel of the model is based on WOFOST and needs to be fed with phenological data, partly obtained from local experts and partly with the help of meteorological and Remote sensing data. The statistical infrastructure is based on historical official statistics, used to calibrate the indicators computed by the models. The system provides yield forecasts and also maps of areas of concern, useful for decision makers. However the system is expensive and developing countries should assess the sustainability before deciding to implement this type of system.

Technical Session 4.1: APN 4 - The Challenges of Measuring Labour and Employment in Developing Economies, 24 October, 11.00-12.30

Organizer and chair: Kathleen Beegle (WB)

Defining and Measuring Non-standard and Informal Employment in Agricultural Sector, Blagica Novkovska (Republic of Macedonia). This paper focused on non-standard and informal employment in the agricultural sector in its diverse forms that contributes significantly to total employment of less developed countries. The presenter analysed the

definitions and measurement of employment in the agricultural sector through analysis of total employment, non-standard employment and informal employment in agriculture in the Republic of Macedonia. She concluded that improvement of the measurement of non-standard and informal employment in agriculture depends on: sources of data, the regulatory framework in each country and transparency of measurement results.

New Recommendations for Labour Statistics, Marcia Maria Melo Quintslr (Brazil). It was noted that measuring employment in developing countries faces a number of challenges. Statistics on employment are largely drawn from household surveys, but the quality and content of these surveys varies widely. Within country, definitions across surveys (designed for different objectives) may also vary. Moreover, international definitions (ILO and others) of labour force status, unemployment, and main job may not be applicable to countries characterized by low income, high seasonality, and informal work. Labour income in household surveys is often only partially measured, particularly in agriculture where unit value of labour is often not available for a lack of measures of the aggregate supply of household labour. Job creation measures from enterprise surveys often miss microenterprises, which can dominate in many of the poorest countries, thereby distorting the picture of where job creation lies. And, the lack of annual labour force data in many countries necessitates estimates derived from models/estimates. The presentation focused on the recommendation for changes to the current ILO employment statistics definitions and the implications of such changes.

The discussion following the presentation focused on the point that the change in the employment definitions proposed by ILO at the recent ICLS means that a new category of work is being created and that subsistence farmers and own producers (among others) would be moved from employment to that new group and would no longer be considered employed. A number of comments were made from the attendees on this issue that this was a "value judgement' and could not be supported.

Technical Session 4.3: SPP 5 - New Developments in Livestock and Fishery Statistics - 24 October, 11.00-12.30

Organizer: Alberto Zezza (The World Bank) and Flavio Bolliger (IBGE). Chair: David Babalola (Nigeria NBS)

"Fishery Statistical methodology: Onboard Fishing", IBGE (Moreira, Freitas, Dias, Green).
Description of the new methodology tested in the state of Espiritu Santo using a three phase sampling scheme: ports/landing locations grouped in strata according to the volume of fish landed, simple random of ports/landing locations taken within each stratum, systematic selection of all large vessels in the sample, systematic sampling according to order of arrival for small vessels. Methodology proved to allow calculation of estimates, sampling errors and coefficients of variation (VC less than 10% for almost all species). The methodology is to be expanded to all Brazilian costs in the future.

"How to integrate Agricultural Census with regular data collection of aquaculture and fishery statistics", FAO (Tsuji, Gee) presented by A. Zezza (WB). Short introduction of the paper prepared by FAO colleagues highlighting the on-going work in expanding SEEA for Fishery and aquaculture and the development of survey modules to be incorporated in the 2020 round of World Agricultural Censuses.

"Integrating data from different sources: improved spatially-disaggregated livestock measures for Uganda", IFPRI (Carlo Azzari), US Bureau labor statistics (Cross). Description of a project aiming at assessing the spatial density of livestock holdings in Uganda combining different data sources (Uganda national panel Survey 2009-2010; national livestock Census 2008) using SAE techniques. Results suggest that the integrated use of multiple data sources (household surveys, censuses) + satellite imagery + administrative data can provide reliable, coherent data for policy-making. SAE techniques have shown potentiality for informing livestock policy but require access to micro-data, more frequent livestock surveys (!) and integration with other environmental and satellite data. Not sure that requesting statisticians to organize censuses more frequently and with expanded questionnaires is a good idea.

"Questions that count: a livestock module for multi-topic household surveys", FAO (Pica-Camarra, Morgan), WB (Zezza), ILRI (Baker). Description of an approach aiming at improving the livestock module for multi-topic household surveys with lessons learned from implementation in three African countries. Major challenges remain with labour measurement and animal/health diseases. Many practical improvements are proposed for the questionnaires.

"Milking the data: measuring income from milk production in extensive livestock systems", WB (Zezza, Carletto), Università Tor Vergata (Federighi). Description of a validation exercise in Niger with tests of various methods of measurement of milking production through household surveys: from recall methods to 12-month system of physical monitoring and recording. Experience showed that traditional record methods were performing well (in particular questions related to averages) at a marginal cost. LSMS approach was not also considered as an optimum way for collecting this kind of data. Survey practices can be improved at marginal cost but seasonality needs more work.

Plenary session 3: APN - Environmental Issues, 24 October, 14.00-15.30

The Plenary Session provided an overview of:

- the latest developments in integrating environmental concerns in agricultural policies;
- the work so far on international statistical standards, recommendations and frameworks that help identify the necessary agricultural and environment statistics and link environmental conditions and health of ecosystems to economic and other human activity.

"Greening agriculture in the context of sustainable development and poverty eradication" Ademar Romeiro (Unicamp). This presentation argued that the focus of agro-environmental indicators is too often on 'Pressure indicators' such as nutrients surplus (N balance and risk of P pollution) related to mineral fertilizers consumption indicator; pesticide risk indicator related to consumption of pesticides indicator; soil erosion related to soil cover indicator; ammonia and other greenhouse gases emissions; water abstraction; and intensification/extension. He would like to see here more emphasis on 'State indicators' to cover all the degradation problems of the agro-ecosystem resulting from environmental pressures resulting from the predominant agricultural practices'. He concludes that this situation is due to the difficulty in producing 'State indicators'. He proposed that in Brazil it would be feasible to build a simpler State indicator to take into account a changing agricultural landscape scenario towards a more or less resilient agro-ecosystem.

"Frameworks for agro-environmental statistics in support of sustainable development", Dale Andrew (OECD), Robert Mayo (FAO), Johan Selenius (Eurostat). This joint

presentation focused on the following themes: farming and the environment; Agri-environmental indicators (AEI): trends and recent developments: Limitations of AEI and improvements to come. Food and agriculture sector is heavily dependent on natural resources (land, water, biodiversity and carbon and nitrogen cycles) in the production process and healthy ecosystems are a precondition for food security and livelihoods. The notion that agricultural activities can cause both environmental harm and provide environmental benefits was highlighted. Recent developments in understanding some of the interactions between agriculture and the environment, such as the calculation of GHG's from Agriculture, was presented. The need to make sure that agro-environmental indicators are relevant to the policy issues that need monitoring or analysis was also stressed. The current problems of agro-environmental indicators such as: data developed to answer one particular problem or question; it being difficult to figure out if all the information is included and it is not easy to see the whole picture was discussed. The current work on FDES and SEEA/SEEA-AGRI as tools to help over-come some of the problems faced by agro-environmental indicators was highlighted.

Technical Session 5.1: APN 6 - Agricultural Prices and Markets, 24 October, 16.30-18.00

Organizer and Chair: Jacques Delince (JRC)

Modeling Volatility of Price of Some Selected Agricultural Products in Ethiopia: ARIMA-GARCH Applications, Yegnanew Alem Shiferaw (Ethiopia). This paper addressed domestic market price volatility in selected agricultural commodities, and explored which of the selected commodities had the highest volatility. Different models that could fit domestic price volatility were examined and models with the best predicting power were highlighted. In the study, secondary data from the Central Authority of Statistics were used. The findings and conclusions of the study found that cereals, pulses, oil and crops experienced persistent domestic price volatility compared to other selected consumer commodities. The results of the study also revealed that although different models can be applied, GARCH(1,1), GARCH(1,2) and GARCH(2,1) proved to be the most appropriate models providing good forecasts.

Maize price differences and evidence of spatial integration in Malawi: The case of selected markets, Lovemore Nyongo (Malawi). This paper analyzed maize urban and rural market prices examining the effects of price information transmission and transaction costs. The main aim of the study was to test the hypothesis of efficacy of having a centralized maize market. Using short and long-run price information integration of the selected maize market samples, the study found that information transmission was very slow between markets especially when looking at short-run price information (price shocks) and that transaction costs seem to have a greater influence in price change in border markets. The author recommends that policy makers look at developing market and information sharing infrastructure to develop market linkages, as well as help traders with enhanced maize marketing strategies.

Predicting the future trajectory of domestic price response to world market shocks, Mahamadou Tankari, Anatole Goundan, Ousmane Badiane (IFPRI). This paper studied the price adjustments of non-traded food staples to changes in global food prices. As global markets shocks tended to have a much longer impact on local prices, the paper proved that the interconnectedness of the food consumer market lead to volatility transmission to non-traded staple foods. The study also found that prices hikes in non-traded staples tend to be stickier that traded ones, as the rate of increase decelerates slower. Rather than trying to provide an accurate price forecast, the model strives to provide a general indication about the evolution of prices.

Management of market risk for fruits: propositions, analyses and reflections on Juazeiro Market Producer, Bahia. Abdinardo Oliveira, Júlia Matos, Brenna Souza (Brazil). The paper studied the added value of "financializing" certain Brazilian fruits to minimize price risks for consumer and produces by providing market mechanisms for enhanced price stabilization. As fruits are not considered as tradable commodities, the authors found that by utilizing forecasting, risk measurement and hedging methods such as contracts and options, the price risk decrease was theoretically achievable with a hypothetical futures contract and an optimal hedge.

Conclusions. All four papers studied and focussed highlight the importance in studying market price volatilities vis-à-vis local markets, bringing in the need to cover information gaps and forecasting tools as possible remedies to global market and commodity price volatilities, sheltering or minimizing local shocks that can harm smallholder consumers and producers.

Technical Session 5.2: IDCB 5 – Agriculture Structure – Development of Harmonized Farm Typology for Policy Analysis, 24 October, 16.30-18.00

Chair: Mary Ahearn (USDA-ERS).

A paper by Mukesh K. Srivastava, Giorgi Kvinikadze and Adriana Neciu, presented the experience of ESS Agricultural Censuses and Surveys Team in working with WAW (World Agricultural Watch initiative) on farm typologies. The paper was prepared in collaboration with the WAW Consultancy Team. The objective of the WAW is to document agricultural structural transformations to inform policy dialogue at national and international levels. To this aim, internationally comparable farm typology is needed. An extensive literature review of typologies was carried out which identified 6 distinguishing criteria most frequently used in different world regions: Land & Business Size, Legal Status, Labor Usage Diversification, Specialization & Market Orientation Dimensions, Capital Asset Endowment, Gender. The following three dichotomous criteria were proposed preliminarily for building internationally comparable typologies: 1) Legal status/management (household vs. non-household); 2) Purpose of Production (self consumption vs. market oriented); 3) Labor usage (family vs. permanent hired). Combination of these three variables gives 8 potential international types, although some of them may not be relevant. This typology was tested on the data of the Nicaragua Agricultural Census 2011.

A paper by Eloi Ouedraogo (FAO) and Ankouvi Mawoudoudji (Côte d'Ivoire) described an experience of deriving farm typologies based on the data of the Mali Agricultural Census 2004-2005. This is an example of the use of a statistical method for building farm typologies: different typologies can be identified when homogenous groups with little intra-group and large inter-group variability are found. A multivariate analysis model was developed which enabled to create initial grouping of farms based an relatively large group of variables. The model also allowed to estimate probabilities for a farm to move from one group to another. Based on Markov analysis, "robust" variables were identified which allow to create farm typologies which are relatively stable in time. These variables are recommended to be included in the population census to ensure monitoring transformations.

A paper by Wagner Soares (Brazil) and Steven Helfand (USA) presented their attempt to create a farm typology suitable in the Brazilian context. The main reason for this exercise was the fact that traditional size classes and family/non-family classification were not sufficient and did not represent specificities of Brazil to ensure a proper tool for monitoring transformation in agriculture sector. The authors have reviewed several international examples

of farm classification including those of SNA (by institutional sectors), Brazilian Farm Family Law, USDA/ERS, Italy. For the Brazilian context the authors came up with a preliminary typology scheme based on characteristics such as farm management (family/nonfamily), income (ration of farm/off farm income), labour force utilization (family/hired) as well as some specific to Brazil characteristics such as status in Legal Entity Registry of Brazil and retirement status (the so called "rural retirement" which has some legal implications). The authors noted that the work is in progress on further refinement of the typology.

Katrin Nagelshmitz (Canada), Hugo Hernandez Ramos (Mexico), Mary Ahearn (USA) et al. presented North American experience in classifying farms based on land size and most sold commodity.

The general conclusion of the session was that there is a great variety of farm typologies based on various criteria and designed for different purposes. However there is no internationally agreed typology that would be internationally comparable and enable classify farms and monitor agricultural transformations at global and regional levels. The chair called for organization of further high-level discussions on international farm typology. Since agricultural census are important data sources for providing baseline information and frames for surveys for monitoring transformations, WCA 2020 Programme can play an important role in this respect.

Technical Session 5.3: SPP 3 - New Technologies for Data Collection for Agricultural Survey and Statistics, 24 October, 16.30-18.00

Organizer: Mark Harris, USDA-NASS. Chair: Andrea Lamas, USDA-NASS

This session analyzed the use of various kind of mobile computer devices (tablets, iPads etc.) for data collection. The advantages offered by the possibility to upload digitalized cartography, satellite images, electronic questionnaires were analyzed, like the possibility of eliminating the need for hard copies of aerial photo and paper questionnaires, displaying the area of interest, draw off polygons, collect attribute data in GIS layer. It was highlighted that the use of these devices allows checking the data during the interview, increasing the quality of the data and reducing the time needed for delivering the statistics. The issue of the cost was also addressed.

"The applications of high-tech means in China agricultural surveys". Fenghua Wei (China). The presentation described some experiments made in China on the use of GIS, GPS, PDA, unmanned aerial vehicle (UAV), NDVI, the leaf area index, canopy nitrogen logger and soil moisture for producing agricultural statistics. A question was posed about the constrains imposed to the use of unmanned aerial vehicle in China.

"Field Data Collection for an Area Frame Survey using iPads, the USDA's June Area Survey". Jaki S. McCarthy (USA). Ms McCarthy spoke about a CAPI data collection cloud based web application that is being developed by NASS. The application allows collecting data in both on-line and off-line situations, in order to allow its use also when the internet connection is not available. Some issues concerning the data security were addressed, as well as the possibility to use the device for a standard e-learning training.

"Geospatial data collection in the US National Resources Inventory". Sarah Nusser (USA), Ms Nusser presented the geospatial data collection system currently adopted in the US National Resources Inventory. The National Resources Inventory (NRI) survey program monitors the conditions and trends in natural resources on the US non-federal land, particularly as it relates to agriculture. The survey is conducted annually on a stratified

random sample of 75,000 area segments whose size is 0.8 km x 0.8 km. At the second stage, three points are randomly selected within each segment. The primary purpose of the survey is to detect changes on the land.

"National Agricultural Survey". Susana Pérez Cadena (Mexico). Ms Cadena spoke about the use of a mobile computer device adopted for data collection in the Mexico National Agricultural Survey. Satellite images and questionnaire were loaded for improving the positioning and the data collection. A stratified sample design with sample size of 97,442 farms was adopted. Face to face interviews with farmers were facilitated by the use of the device and the field work for the entire country was carried out in a very short period (from October 22 to December 14, 2012).

25 October 2013

Plenary Session 4: The Role of Agricultural Censuses, 25 October, 9.00-10.30

Chair: Pietro Gennari, FAO

A paper by Naman Keita (FAO), prepared jointly with FAO Statistics Division Census Team, presented the vision for the coming WCA 2020 round. It was noted that the guidelines for the WCA 2020 round will have to take into account the new international development agenda (Post 2015 and Sustainable Development Goals, Green growth) and other emerging policy issues (Rural employment and gender, Food Security, increasing volatility of the agricultural industry). Measuring impact of development policies and programmes is also gaining growing importance. This leads to expanding data requirements. At the same time there are increasing resource constraints and need for more timely data. This implies that in the next round intensive use should be made of digital/mobile/geo information technology and data revolution (PDA, GPS, CAPI). The methodological features of the previous WCA 2010 round which worked well (modular approach, linkages with population census, collection of community level data) will be maintained. Lessons learnt from methodological and technological innovations in Population Censuses (growing use of administrative data, rolling census) could also be useful. New Global initiatives in the area of Statistics (Global Strategy, AMIS, Busan Action Plan for Statistics) create new opportunities. Many issues connected with data items to add/revise, classifications, processing, dissemination (including archiving and access/dissemination of micro–data) and analysis, which arose during the extensive consultation process with users and countries, will be considered during the elaboration of the WCA 2020 Programme and accommodated to the extent possible.

A paper by Fred Vogel (presented by Mark Harris, USDA-NASS) discussed an alternative approach for producing agricultural statistics at the lowest geographical level – a world without censuses. The underlying idea is using surveys based on area frames for obtaining agricultural statistics. In this paradigm the traditional role of census in creating a list frame of agricultural holdings is denied in favour of area frames which also provide a complete coverage of the country territory. The Area frame is more stable over time, but its creation may have high cost implications for developing countries (although with development of technologies this may cease to be an issues). Moreover, area frames may not be appropriate for the collection of certain types of data (e.g. social data).

A paper by Jean Michel Durr described the experience in conducting rolling population censuses in France. A rolling population census means splitting the population into a number of mutually exclusive representative samples and enumerate one sample per year, completing the whole enumeration within a number of years. In case of France the number of years required is 5. The rolling census approach has several advantages: a) the cost of the census is

spread over many years; b) high level professional staff is maintained continuously; c) non-sampling errors are reduced; d) is well compatible with the modular approach and integrated survey framework – each year different modules may be attached to the core module; e) each year updated information are produced as available for a large part of the population (traditional census data are 5 or 10 year old at the end of the cycle). The possible disadvantage is that data at lowest geographical levels might not be available. But this will be a problem during first transition years. As more information comes in, moving average method can be used to obtain estimates at detailed level. Transition to the rolling census is a change of paradigm: while traditional census is something like a photo, the rolling census follows changes.

The general conclusion of the session was that Agricultural Censuses must adapt to the new environment and emerging data needs and take advantage of the new technologies and methodologies. The next WCA 2020 Programme must strongly advocate the use of new technologies in both data collection, processing and dissemination. It should also provide countries with various methodological options (like use of administrative data, rolling census, area frames) in their endeavour to decrease costs and respondent burden and meet increasing data needs.

Technical Session 6.3: SPP 6 - Census and Dissemination, 25 October, 11.00-12.30 Organizer: Susana Pérez Cadena, INEGI. Chair: Arturo Blancas Espejo, INEGI

"Atlas of Polish Agriculture as example of statistics utilisation for decision making" Jerzy Banski (Poland). The Atlas presents the state of Polish agriculture on a spatial dimension, transforming a broad set of statistical data into maps. It also presents a dynamic analysis of selected issues. This allows to evaluate the most significant processes and phenomena that took place in the Polish agriculture following the accession to the EU and the ensuing structural transformations. This Atlas has become a basic source for studies and spatial planning on the agricultural sector, as well as on regional and, particularly, rural development.

"Efficiency and Effectiveness: The FAO Statistical Yearbook". Filippo Gheri, Michael Kao, Amy Heyman (FAO). The paper, presented by Pietro Gennari, describes the new architecture that the FAO Statistics Division has developed for producing its annual Statistical Yearbook in a sustainable and cost-effective way. The architecture, based on the R and LaTeX packages, provides a one-stop-shop for the production of template publications, enables version control of data and text, ensures easier process monitoring and backstopping through line managers. As a result, fewer staff are needed along the whole production process, therefore more time and resources can be dedicated to analysis, write-up and quality control. The architecture is fully documented and can be easily extendable to other publications or other clients, as it is currently happening both inside FAO and with external partners. In fact, the combined power of R and LaTeX makes this a new data publication in line with the open data philosophy. And the use of open source software and the availability of the package – therefore total transparency – makes the entire procedure – and the possibility of using the technology to produce other publications – available to anybody.

"Towards Bridging the Gap between Data Production and Data Utilization", Salih Hamza Abu-El-Yamen (Sudan). The objective of the paper is to provide a conceptual framework to measure the gap between data production and data utilization, introducing guidelines for researchers to address the problem with respect to scope, measurement, causes and solutions.

"Agricultural geo-statistical information query system" Mauricio Rebolledo Loaiza (Mexico). The paper described the database developed by INEGI to offer users spatial visualization of data from agricultural Census, in a GIS format (SCIGA).

Technical Session 7.2: IDCB 7 - Estimates, forecasts, expert opinions and assessment - their role in the official statistics, 25 October, 14.00-15.30

Organizer and chair: Flavio Bolliger, IBGE

"Integrating expert opinion in agricultural statistics". Miguel Galmés (Uruguay), The presentation addressed the issue of how to integrate expert opinions in the agricultural statistical system. The author believes that expert opinions, which are largely use to produce agricultural statistics in Latin America, have a role to play in a statistical system that integrates different methodologies of data capture (probabilistic methods, remote sensing, administrative records). In particular, Expert opinion is a procedure that, if adequately performed, can help in filling the gaps between consecutive sampling surveys and also provide approximate estimates for small administrative areas. Moreover, expert opinions integrated with other non-probabilistic methods (information coming from administrative registers and remote sensing), can also be a useful procedure to assess the magnitude of non-sampling errors in agricultural sampling surveys. Expert opinion, however, should never substitute probabilistic methods of estimation.

"Weekly Crop Progress and Condition at USDA-NASS". Hubert Hamer Jr. (USA). The presentation described the Crop Progress Report that is the most requested of all published reports on NASS' release calendar and is published each Monday during the U.S. primary crops growing season (from the beginning of April until the end of November). The report strives to answer the basic question of "How did the weather affect agriculture last week?" The report publishes the current estimate of the phenological stages of plant growth (planted, emerged, headed, mature, harvested, etc.) and growing condition of major crops and livestock for both national and state levels. This report is the only "expert opinion" survey NASS conducts. There are approximately 4,000 reporters across all states and counties in the United States. Each state maintains a group of trained reporters who are knowledgeable about agriculture production and come into contact with many farmers in their local county as part of their daily routine. Reporters are instructed on how to use the automated wed-based computer system NASS provides, taught standard terms and definitions, and asked to report each week. NASS provides written instruction at the beginning of the season and state offices touch base with reporters periodically throughout the season to answer questions and ensure all are reporting correctly. The weekly reports provide frequent updates on the current progress and condition for both crops and livestock.

"The place of 'Assessment' in current agricultural statistics for developing countries: Making best use of available information for timely crop production estimates in the absence of an system of agricultural sample surveys". Naman Keita, Nancy Chin (FAO), The presentation suggested that different sources of data and information should be considered to build cost effective and integrated agricultural statistics systems in developing countries, in order to address different data requirements and needs of users in a specific country context. The authors believe that an effective system of sample surveys and censuses should be the basis of any statistical system. In developing countries, however, in some cases provision must also be made for data which cannot be provided by probability surveys: namely, rapid assessment for emergencies, monitoring and evaluation, unforeseen economic events etc. In these cases, administrative and assessment information may be necessary. Nevertheless, issues for accuracy are inherent in the methods.

"Appropriate Survey Methods Different Country Profiles - Key Challenges, Gaps and Remaining Methodological Issues". Elisabetta Carfagna (FAO). The presentation analyzed the different approaches which can be followed for producing reliable agricultural statistics, identifying the most appropriate ones in relation to the kind of information available in the country and the characteristics of the agricultural sector. Sampling frames based on agricultural census, population census, administrative registers and area and multiple frames were taken into consideration, coming to the conclusion that the most appropriate approach depends on the specific characteristics of the country. Some aspects of the implementation of these approaches, however, need further research, like the over and under coverage of list frames created integrating various kinds of administrative data or when a module with a few questions concerning agricultural variables is included in the questionnaire of a population census. The key aspect to be further analyzed, in the contest of developing countries, is the time/cost for the identification of the farmers when they are selected through an area frame and they live far from the fields they operate. The focus of the analysis should be on the average time needed for identifying the farmers and the risk of missing data, in the different typologies of developing countries. Finally, the author highlighted the risk of collecting unreliable data through farmers interviews and proposed some preliminary ways for addressing this problem.

The general discussion of the session focused mainly on the role of administrative data for producing agricultural statistics and the need to analyze separately the different typologies of administrative data/routine data systems, based on informal opinions (extension workers) or expert opinions. It was highlighted that expert opinion surveys can be useful to collect only very specific type of information (e.g. early warning information) and should not replace sample surveys. In addition, expert opinion surveys should only collect qualitative, not quantitative data, and information on changes not on levels. Lastly, it was stressed that also expert opinion surveys are very costly, even if apparently they do not affect the budget of line ministries, since data collection is normally conducted using intensively extension workers.

Technical Session 7.3: SPP 7 - Remote Sensing Technology, 25 October, 14.00-15.30

Organizer: Jeff Bailey, USDA/NASS. Chair: Denise Abreu**,** USDA/NASS

"Alternatives to medium resolution images for crop area estimation: very high and coarse resolution images", JRC (Gallego). The presentation highlighted two facts: coarse resolution images can be used for improving crop area estimation …if size of fields are enough large. Very high resolution images are promising but are not cost-efficient with the current price policies. In brief: nothing new?

"Using remote sensing cropland classification data to update area sampling frame", NBS China (Yu). NBS China has used remote sensing for improving crop estimates since 2010. Medium resolution satellite imagery is used for area frame sampling and high spatial resolution images for classification. Methodologies are similar to the ones implemented by MARS project in Europe and by United States.

"Measurement of avoided deforestation in the pasture areas of Mato Gosso", IMEA Brazil. An interesting application of remote sensing measuring the positive impact of improved pasture and herd genetics on deforestation in the region of Mato Grosso (1 million km2). Increase herd and slaughter over the last 10 years resulted in a decrease of pasture areas. Results were also measured according to the different biomes showing a stronger impact in forests and savanna zones than in the Pantanal.

"Reported use of CropScape and the national cropland data layer program", *USDA* (Mueller, Harris). A highly-sophisticated system of cropland area monitoring programme developed by USDA focusing on remote sensing based land cover products delivered through a specific web portal. Data can be linked with many other layers and provide many kind of various information for researchers, policy makers