The LIMS Community and its collaborative Livestock Information Management System for managing livestock statistics and sharing information in the SADC region (Southern African Development Community).

Pascal BONNET [1], Berhanu BEDANE [2], Krishan J. BHEENICK [2], Xavier JUANES [1], Benoit GIRARDOT [3], Caroline COSTE [3], Cyrille GOURMENT [3], Gift WANDA [2], Welbourne MADZIMA [2], Gerard OOSTERWIJK [2], Thierry ERWIN [3]

1. Affiliation of the corresponding author (Research unit or laboratory, Institution, Country, and Email address - Times Roman Point 12.)
2. Affiliation of other author(s), Times Roman Point 12.
1. Département ES, Unité UPR18, CIRAD, Montpellier, France, pascal.bonnet@cirad.fr, FANR, SADC, Botswana
2. FANR, SADC, Gaborone, Botswana
3. DSI, CIRAD, Montpellier, France

Abstract

The paper aims at presenting some selected components of the SADC collaborative LIMS (Livestock Information Management System), particularly a wiki, a web mapping and a forum used in combination with other tools. The system experiments new ways for collating fragmented livestock statistics and sharing information in a region. It was developed in the context of the sector-wide integration of a regional economic community achievable through an improved institutional collaboration which LIMS shall foster. The initial problem stated that stakeholders of the region and in the sector were not sharing enough data or information, because of accessibility and interoperability problems, fragmentation of dataset lying under the responsibility of too many stakeholders, lack of standardization of contents, lack of a sharable virtual web space or due to sociological and institutional barriers. To overcome problems an hybrid information system was designed based on collaborative principles and components. The system is ruled by a few international standards on contents and exchange protocols. It is firstly based on an institutional alliance, the LIMS community, forming professional and somehow social networks organized at regional and national levels. This community is made of key stakeholders from countries and livestock commodity chains of the region who endeavour to share and disseminate information and knowledge in a common system. They already use a collaborative database developed with a view of better collating quantitative data which contents were standardized. Finally the system was broaden up by adding a series of new collaborative software's which have been grouped under a portal to achieve specific communication and information management functions. The portal (url: http://www.printlims.org ; wiki.printlims.org) uses a content management system (CMS EZpublish) and other WEB2.0-derived tools like WIKI manuals and documents, technical and thematic forums (Dgroups from CTA and phpBB) and a new interactive mapping tool (Geoclip©) to complement an already existing web mapping service. The LIMS system can be compared to similar initiatives like DEVinfo developed by the United Nations and CountrySTAT by FAO

Introduction

The primary role of SADC is to define regional priorities, facilitate regional integration and development. The regional approach is designed to complement, support and enhance national activities rather than replace or compete with them. There are currently 15 SADC Member States (Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe). They have very contrasted situations regarding the characteristics of their livestock sectors and related commodity chains, be they about disease status, production systems (commercial versus subsistence), industrialisation level (agribusiness and market infrastructures), degree of organization (horizontal and vertical integration) to mention a few. In this context, the access to and integration of accurate livestock-related statistics at their appropriate temporal and spatial scales and the sharing of general information (news, events, documents) are essential in order to design regional policies and monitor their implementation. Nevertheless such a regional database and information system was not existing at the start of the SADC PRINT project (Promotion of Regional Integration in the SADC Livestock Sector), therefore the endeavour to collaboratively design and experiment a first regional LIMS.

Aim and Methodology

The essential functions which were identified for an information workflow to be established in a collaborative manner were: firstly to collect data and information from sources as diverse as technical governmental departments (ministry of agriculture or livestock) and the private and parastatal sectors (firms, associations); secondly to analyze data according to needs, thirdly to publish information and display interesting results (e.g. in governmental portals), fourthly to share documents in “warehouses” and edit them collectively and lastly to facilitate their dissemination to the relevant bodies through relevant channels and electronic means.

Situation analysis of livestock information, statistical systems and portals in SADC member states

Before embarking into the design of the first architecture for a regional LIMS, the appraisal and analysis of the national structure, conduct and performance of information systems provided a rough understanding of hierarchical and functional cooperation existing within and between the various organizations involved. Therefore the form and intensity of institutional arrangements were deepened for understanding the circulation of information and data, and their processing along the information chain. We assessed the characteristics of data collected relating to themes like animal production, livestock infrastructures, animal health, trade and marketing and the standards adopted as potential inputs to the LIMS system. We also assessed the characteristics of information exchange and the frequency and spatial range adopted in the reporting routines established within the hierarchical & organizational charts of the various institutions visited (be they from private and public sector). We also reviewed applications and networking platforms used and we derived specifications in terms of hardware and software’s required for a regional system. This included an assessment of the web connectivity level within the countries, and interoperability between sub systems identified. Moreover we assessed to which extent and how information portals and communications tools like forum were used by stakeholders and for which purpose. Finally the results were used for the selection of the major components that would be required for establishing the LIMS prototype. Besides, a similar assessment was also carried out within the SADC secretariat as a need emerged for an integration of LIMS with other sub-sector information systems in agriculture, the LIMS being the sub system for the livestock sector.

Dichotomy between the various dimensions of an information system

The architecture of the system was designed in view of strengthening the considered four pillars of the collaborative information system: humanware, contentware, software, hardware. These four ingredients of a collaborative system are debated in the next sections. Collaboration can be described as a “recursive

process where two or more people or organizations work together in an intersection of common goals by sharing knowledge, learning and building consensus" (Wikipedia, 2009).
Although theoretical models of information systems are well described in many forums, though rather dealing with their development for firms, specifically building and implementing a prototype for such a sector-wide system at the scale of a region with 15 countries and numerous institutions was considered a new challenge. This was achieved gradually with a double objective.
The first objective was to provide a simple backbone for information share and to gradually assemble a set of simple additional tools which together or individually would facilitate the management of a regional database by professional networks and would therefore consolidate the existing interaction between actors. This was covered by a collaborative database developed to collate data from various sources and for 9 different technical themes covering the sector. This aspect is developed in a previous paper (Bonnet, 2009).
The second objective was to introduce a portal with some innovative WEB20-related tools and monitor their use. The paper focuses on this second part which deals among others with four components assembled under a portal: a CMS, a web mapping tool, a wiki, a forum. To serve within the information system all tools were selected given their capacity to foster some particular collaborative functions and limit barriers to enter (a pushing pulling strategy). Both approaches have imposed several trainings as lack of capacity would have directly affected the sustainable use of system components.

The Humanware dimension of collaboration on information systems

Stakeholders are naturally grouped in networks according to their themes of interest or following the existing shape of institutions like ministries or commodity associations. The formation of such bodies replies to natural needs or is ruled by laws which from an information perspective tends to differentiate the reasons why and several modus operandi at managing data and information.
The humanware dimension relates to the current or expected level of human and institutional interaction and to the level of collaboration needed towards a common goal. This means the capacity and willingness for collaboration, the degree of synergies & effectiveness expected, the auspices under which the collaboration is convened (here the SADC integration & policy agenda), and the role of interaction in driving changes over the professional and social environment. This generally opposes the individual or organizations' self-interests and the collective interests. In the case of the SADC region, the first aim for collaboration dated from 20 years ago and was caused by the need to tackle transboundary diseases therefore driving the collaboration and integrated management. Since then there was an embryo of a collective intelligence, with fair rules of cooperation having traits like openness, transparency, peering, and behavior of sharing and acting globally. The addition of communication technologies into LIMS was expected to firstly promote such an existing networking capacity and go a step further by bringing new stakeholders in the community in order to extend the collaboration to other fields and topics of interests than health. The model of a commodity chain strictly applies to such a vision (Fig. 1).

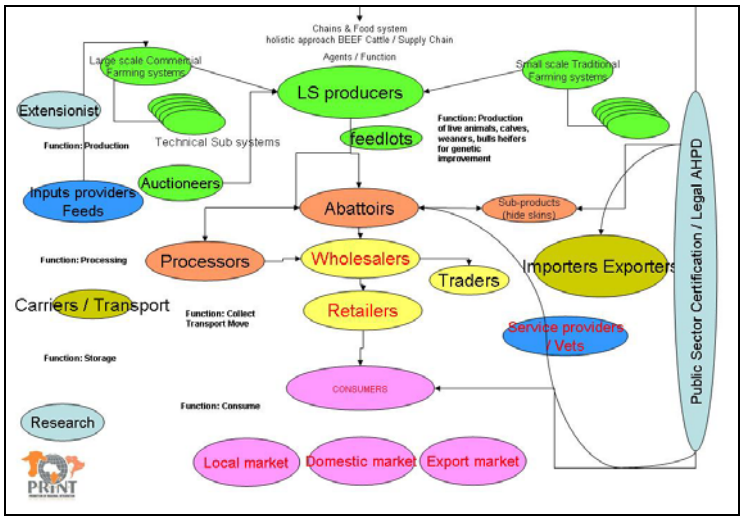

Fig. 1. Actors and Flows within the Commodity chains in the Livestock sector.

The Contentware dimension of collaboration on information systems

The contentware dimension of the information system relates to the type of data and information that is considered to be sharable within a community and to the technical means for sharing them. Not all information is to be shared as some will be perceived as business intelligence to be kept by firms. There is therefore a frontier between public and private information, which location may differ from one organization to another. The value added of regional information was perceived by stakeholders as the capacity of several single information to become more meaningful if shared and assembled regionally therefore emerging as a collective property. This was particularly agreed for data on marketing like prices and trade. The enhancement of an existing animal health database in the region was a key starting point for gradually extending the contents to more themes. Moreover there was a need to improve and easily share guidelines in order to better define terms before making collation of data in the region, therefore the publication of manuals in various formats was planned.

Finally professional networks had to be supported for the regular analyses of some data and the preparation of some maps, for results to be presented in some private public partnership and in official forum, as single presentation or as well published documents. There was also a need for the community to debate irregularly on topics like global warming and the adaptation of livestock to climate change which could be achieved by email discussions or improved through forum. All this was taken into consideration when listing the LIMS specifications.

The Software dimension

We privileged collaborative software's, which will support cooperative work with computer, like wiki, e-forums, web portals, social bookmarking, collaborative cartography & database etc.. All software responded to one or several demands as identified in the humanware or contentware dimensions of the system.

Some tools were already developed under an overarching portal initiative at SADC (Agricultural Information and Management System). Therefore we restricted our selection to some specific tools which would complement existing ones: i.e. a wiki, e-forums, a web portal managed under an open source CMS, and a light web mapping facility to complement the existing Web Mapping Service already developed with Mapserver.

At such level the criteria for selection were: simplicity, as many stakeholders did not properly manage some complex software's, capacity to mimic simple GIS-like software therefore to adapt to basic map fluency of most users when making web maps, and possibility to continue communicating by well known emails. Nevertheless most selected software's were totally unknown for the non technicians of the existing networks therefore bearing a risk of bringing technical barriers, although training was organized.

The Hardware dimension

The hardware dimension only related to the status of connectivity of the various computers and the use of Web by stakeholders. The status of connectivity was largely debated in the regional arena. In the context of SADC, though the web was widely used by administrations in their central offices this was not the case for district administrations or commodity associations evaluated at local level. Only emails were seemingly widely used but not necessarily from the institutions premises but rather from web café. This has gradually improved since the beginning of the initiative.

Results and Solutions experimented

Collaborative database & software with harmonized reporting templates and interoperability functions

The paper gives a focus on some features developed which seems to be gradually adopted. Meanwhile the other components are still under monitoring to capture uptake rate. The collaborative database developed was described in a preceding paper (Bonnet, 2009) and is already well adopted after 6 month existence. It forms the backbone of the system and it brings all networks together to make sure data are regularly collected and assembled.

Portal and WEB20 tools to serve the SADC social and professionals network given their roles and duties

Concerning the other communication and collaborative software's, we selected an open source CMS (EZ publish©) to manage the LIMS portal, the software Wikipedia© to establish wiki documents (starting with manuals and guidelines for running the collaborative statistical database), Dgroups from CTA to form thematic discussion groups and launch e discussions, one phpBB-based forum to debate technical issues regarding the software's and finally a non open source solution for the decentralized making of interactive web maps using the flash technology (Geoclip ©)

CMS

For the time being the CMS EZ publish is managed by a web master, but we finally expect members of the community (at least one member per country) to manage its contents. The portal (Fig. 2) is an institutional archive. Several features are also provided under the overarching portal AIMS not presented here.

Fig. 2. Home page of the LIMS portal http://www.printlims.org

WIKI

The wiki (Fig. 3) was put in place for several purposes. Firstly to make LIMS manuals available in an interactive way, therefore keeping the possibility for states to discuss and comment contents. Such discussion would gradually evolve towards the revision of the manuals and at regular intervals towards the publication of a new version established on line and converted into a .pdf document. If proved successful, one will ask contributors to use the tool for drafting reports like yearbooks and atlases established thanks to data from the collaborative database

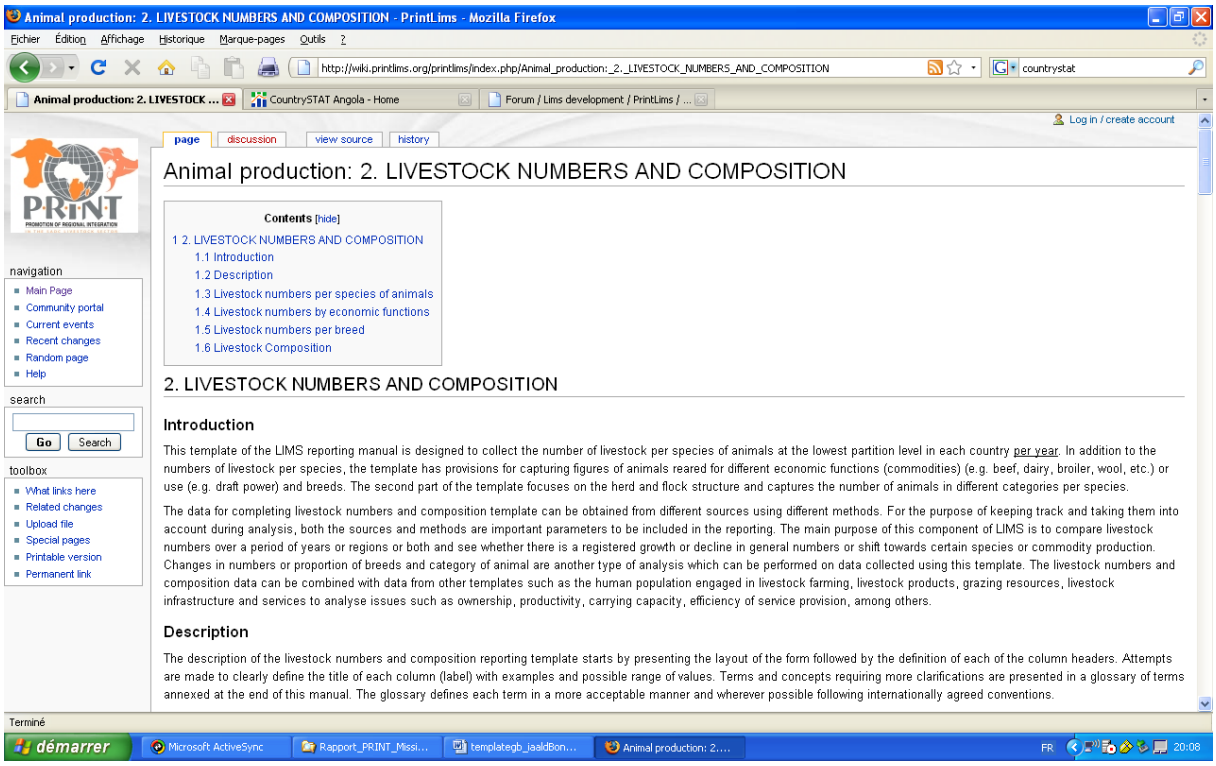

Fig. 3. Wiki manuals for the 9 quantitative modules of the collaborative database wiki.printlims.org

Web maps

The collaborative function of the web mapping was seen as the capacity to assemble layers and attributes to form a coherent set of maps to understand the regional situation. If the first web mapping facility was a classic one using Mapserver and WMS and OGC standards, it had some limitations as it only allowed for data updates (be they layers or attributes) to be posted at regional level and through a central technical support. Moreover the WMS was relatively heavy to access from states and therefore was bearing the risk of being seen as a tool usable from SADC or central offices only (with good bandwidth). Its workflow also relied on availability of data to be consolidated for the entire region which required some times as it followed the agreed reporting schedules. Therefore in order to overcome delays in displaying some valuable information issued from the states (what ever the geographical scale), and to bring more ownership by stakeholders, there was a need for establishing a possibility for states to build their own maps in a decentralized way and post them on line. This was the reason for the selection of Geoclip© (Fig. 4), a flash mapping technology which was considered light, easy to decentralize and to run with limited training though requiring like all GIS-related tools some understanding of mapping.

Dgroups and pHpBB

The use of the Dgroups forum (from CTA, www.cta.int) is considered to be a frank success given the level of technology adoption we started from in many instances. The use of simple emails and of a unique address (LIMS@d2.dgroups.org) instead of the need to connect to the web to post a message is the guarantee that members of the community will interact using the tool more and more. There is still a niche for expanding the critical mass of users by actively inviting all stakeholders who have been involved in regional initiatives in one way or another to join the group. It was previously expected that current members be inviting their own networks which in fact did not occur.

On the other hand the other forum based on pHpBB (Fig. 6) was not a success due to possible duplication it represents and misunderstanding on its alternative use. It was reserved for technical discussions on the collaborative database, when the Dgroup (Fig. 5) was supposed to be only thematic. It will be soon turned into a FAQ platform by regrouping and collating all comments made through the Dgroup forum.

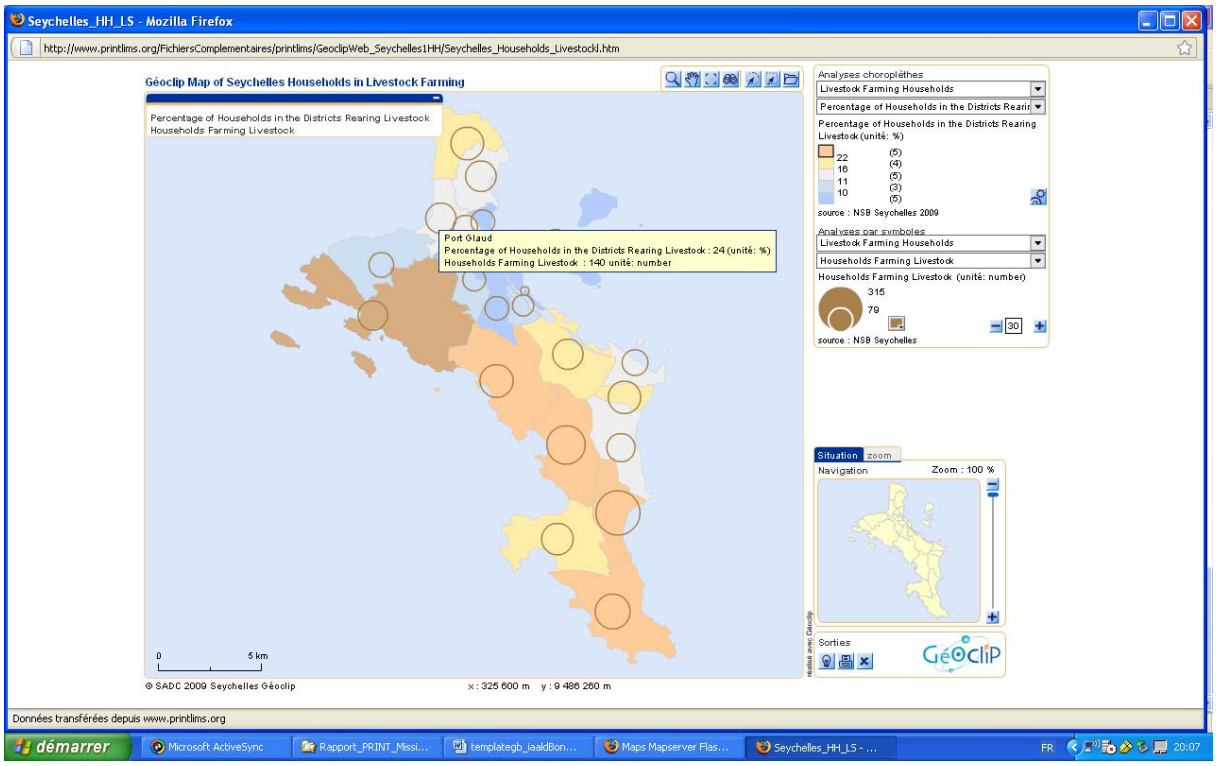

Fig. 4. Geoclips (flashmaps) can be processed by individuals and posted by the web master

Fig. 5. The major forum remains the Dgroup with a unique address for the community

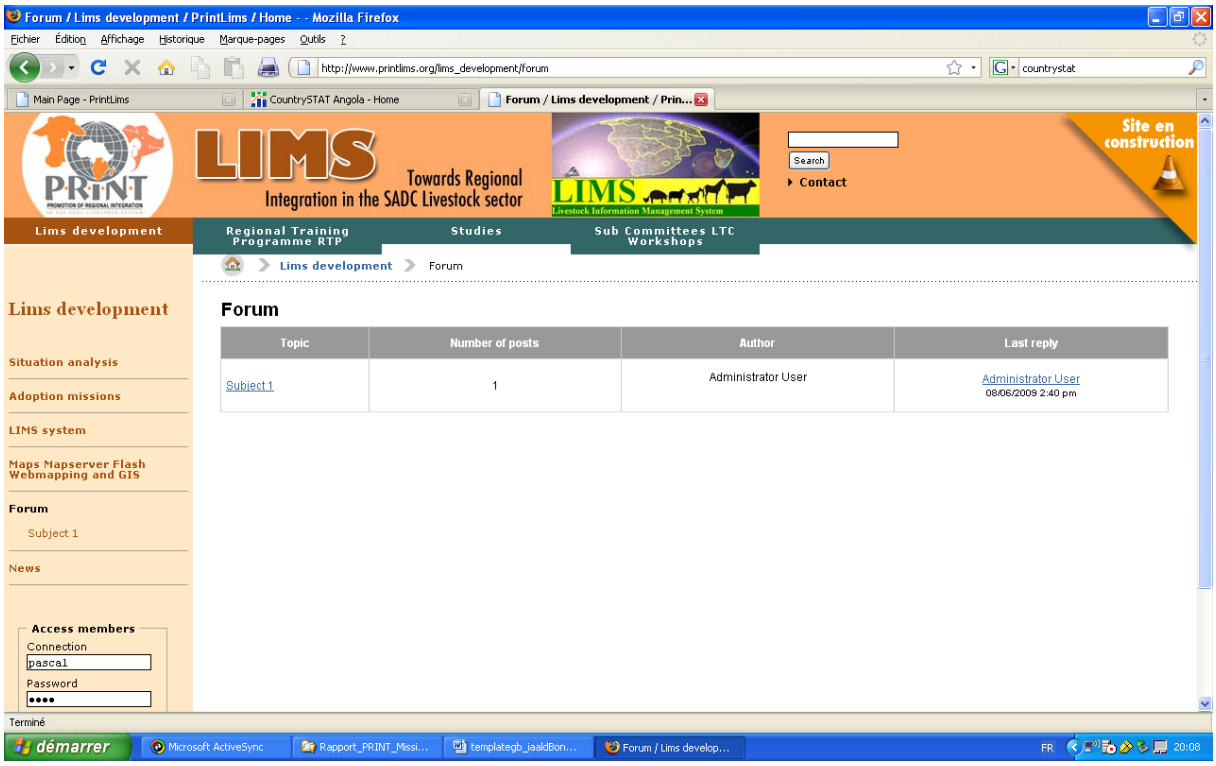

Fig. 6. The second forum with pHpBB was not a success so far

Discussion

Opportunities and Challenges

The LIMS experiment is considered to be a success after 6 month of full existence. Due to Metcalfe's law, one needs a critical mass to get some sustainable activity. Nevertheless it is still being lead by a too small group of active members and relies on a few strong leaders. We expect the adoption of tools to be a long standing adventure and be driven firstly at national level and in some thematic groups. As the tools remain the same for all users, the cross fertilization may gain in some instances. A major limitation is the lack of IT technical staff recruited to support thematic groups in states and at SADC. The virtual integration of LIMS portal within the AIMS portal of SADC may offer an example of smooth hosting under a unique architecture (http://aims.sadc.int/livestock/print-lims/). Finally the use of such tools is highly dependant on training and surprisingly relies rather on hierarchical constraints than on individual willingness. Championing is a key factor for ensuring success, but the incentive shall be created by the institution.

Conclusion

There are some major barriers that shall be considered when attempting such collaborative systems. It is easy to standardize contents for there are many available and well designed standards one could adopt to describe economic facts, though sources and methods to collect data may differ and issue different datasets. Moreover although contents might be harmonized, data & information may have different statuses that are not allowing direct sharing. They might be regarded as “public goods” like information about animal health, market and transport infrastructures, legislation, or as “private goods” alike market data (prices & volume of transaction), production & trade figures in some instances. It is therefore one of the first reasons claimed by stakeholders for establishing or strengthening barriers instead of engaging in data sharing. This is generally sorted out by a policy of “paying for data” reinforcing then its private value. Only the building of strong coordination mechanisms and adapted institutions may help to overcome such an asymmetry of information and the resistance to share public or private data and

information[1]. Incentives shall be given to support these collaboration mechanisms rather than paying for information. In fact one should firstly establish where the borders lay between data, information and business intelligence. In such a context, the use of the web environment can support a strong networking mechanism as it goes beyond the scopes of traditional institutions (be they hierarchical state firms or market) and will allow individuals to interact with members of a network with less risk. This is one of the key reasons of the success of collaborative journalism. Once this aspect overcome, the provision of an information system is also subject to technical evolution and revolutions of both hardware and software's solutions. Though important one shall not focus on such technical barriers though this aspect may cause technical or cultural and generation dissociations' and may require a program for continuous education delivered to all users and contributors of a system.

References

Article

BONNET P., et al, 2009, Collaborative Statistics For Livestock Development, Animal Production And Health, An example In The SADC Region With The LIMS Livestock Information And Management System, A Regional System Based On WEB 2.0 Principles, *Proceedings of the 12th ISVEE conference, International Society for Veterinary Epidemiology and Economics ISVEE*, August 2009, Durban, South Africa.

[1] referring to New Institutional Economics paradigms