

Information management for agricultural technology innovation¹

Viviana Palmieri² and Lornel Rivas³

Summary

Technical information is a key element of any innovation or research process undertaken in the agricultural sector. Institutions that promote such processes are currently facing a number of challenges in relation to information management (IM). Processes must be carried out in a changing environment characterized by an exponential increase in the amount of potentially important information available, the continuing development of information and communication technologies (ICT), as well as other factors. The challenges include the need to incorporate information explicitly into the planning and execution of all institutional processes and to make maximum use of the tools offered by ICT, which will generate support for knowledge management processes. IM entails a set of actions that include: a) defining objectives and priorities related to the field of information; and b) planning, facilitating and coordinating the activities needed to attain the objectives set.

¹ The authors would like to thank Franz Martin, Information Management Officer at the FAO Regional Office for Latin America and the Caribbean (RLC) for his revision of, and contributions to, this document.

² Technology and Innovation Specialist, Directorate of Technical Leadership and Knowledge Management, IICA. viviana.palmieri@iica.int

³ Researcher in the Area of Management, Office for the Management of Research, NARI, Venezuela. lornelr@inia.gov.ve

Key words: *information management, information strategy, knowledge management, agricultural information, technical information, technological innovation.*

Introduction

▶ *Information management (IM) is the process of capturing, classifying, preserving, retrieving, sharing and disseminating the information that an organization generates, receives and/or acquires (Sánchez 2006).*

Information is one of the fields that has been most affected by major, rapid changes in recent years. This sphere of activity -which includes individuals, organizations, information and communication technologies (ICT), as well as information itself- is especially important for organizations involved in scientific and technological research and innovation processes in the agricultural sector. Information is the basic element of any technological innovation and a key component of all innovation and research processes. Any effort to improve its use will help achieve the objectives of such processes.

Information management (IM) is the process of capturing, classifying, preserving, retrieving, sharing and disseminating the information that an organization generates, receives and/or acquires (Sánchez 2006). The context is especially important for the concept of IM. O'Brien, for example, defines information as data that has been converted in a context that is significant and useful for specific end users (O'Brien 1999). **Information per se is passive; it becomes active as knowledge, when value is added through the generation of services and products** (Sánchez 2006).

In recent years, there has been an exponential increase in the amount of information available that is potentially important for agricultural production. Furthermore, changes in ICT have impacted the way in which organizations devoted to agricultural research and innovation work and have opened up a wide variety of new opportunities, while at the same time posing new and complex challenges. In exploring the potential value added of participatory research and development, Gonsalves et al. (2006) affirm that one of the key challenges is the development of the capacities of professionals and their organizations, through information services and the creation of networks.

To provide input on how to incorporate IM explicitly into the promotion of technological innovation, in this document we look briefly at the following points:

- a. First, information as the basic element of agricultural technology innovation;
- b. IM in the agricultural sector, including its characteristics and key activities; and, finally,
- c. The challenges facing IM.

Technical information as the basic element of agricultural technology innovation

All agricultural technology innovation processes involve the participation of a series of actors who design, adjust, test and/or implement the change of process or product resulting from the innovation. Each actor possesses knowledge, acquired through study and experience, that needs to be shared for the system to work properly. This process entails converting each actor's knowledge and know-how into explicit knowledge that can be communicated to others. The more effectively the knowledge is shared, the greater the likelihood of converting it into a practical innovation.

After studying cases in several countries, Farrington *et al.* (2002) underscored the importance of analyzing and supporting a larger group of actors in and around the agricultural sector that need information, inter-linkages and training.

These actors - be they researchers, producers, information intermediaries, trainers or a combination thereof - do not make up an isolated system (see Figure 1). They may receive information from different sources that will enrich the innovation process and even make it possible. Such external information may be scientific, on technologies applicable to similar situations, on the productive process and its actors, or on the socioeconomic, political, biological or agro-ecological environment in which the process takes place. The "external" information supplements the

internal information shared by the actors and makes it possible to enrich or adjust the design of the innovations.

The end product of the process, which almost always will include the design and testing of alternatives, is information for innovation in the productive process. The knowledge generated has to be communicated to producers, information intermediaries (infomediaries), developers and researchers. This may seem obvious, but in many instances it is the step that is omitted in carrying out a successful process of innovation. Managing this dissemination of information, taking into account the different types of end users, is a process of the utmost importance if the effort is to be successful.

Particularly when the group of actors involved in the process make up an entity that specializes in promoting innovations (e.g., a research organization), the dissemination is not limited to making the knowledge generated available to the producers or intermediaries. Information about what is being done and accomplished also needs to be disseminated among the general public, policy-making entities, partners and the press. Such communication is essential to sensitize people to innovation activities and ensure that such activities are sustainable.

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Finally, there is another category of information that the process must produce - information for the purpose of accountability, normally intended for the entities that

financed the process and their partners. This category also includes information for the decision-makers in charge of managing the process.

Information in innovation processes

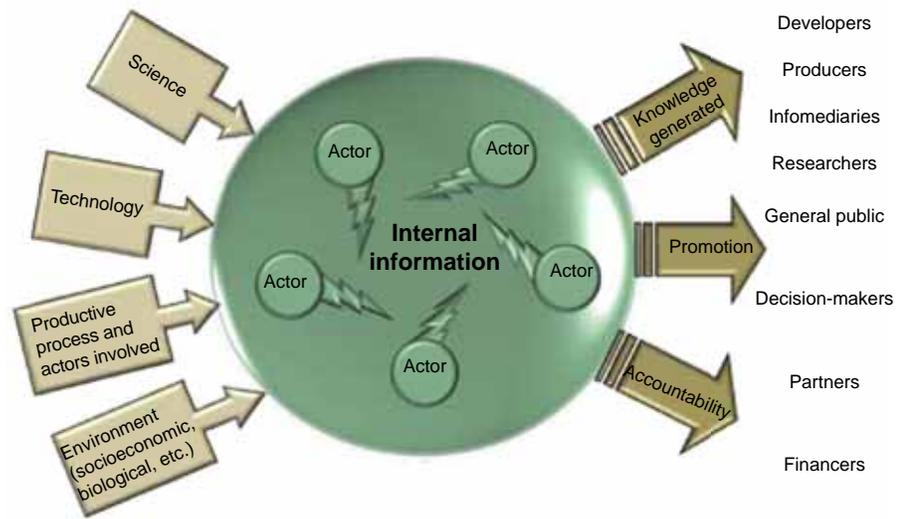


Fig. 1. Main information flows in an agricultural technology innovation process

Source: Elaborated by the authors.

Note: The term “actor” refers to all parties directly involved in the innovation process: researchers, producers, extension workers, suppliers and information intermediaries, and their organizations at the local level

In a recent study, the IICD (2006) suggested that increasing the efficiency and productivity of small-scale farms is one area where ICT can make a significant contribution to the attainment of the first Millennium Development Goal, i.e., the eradication of hunger and extreme poverty. The study states that farming is an uncertain business, with farmers facing threats from changing ecological and economic conditions. National

extension systems that used to provide information and advice to farmers have been drastically reduced (IICD 2006).

In this context, ICT can provide tools to facilitate the flow of information about production techniques to farmers and also open up new opportunities for farmers to document and share experiences with each other. Traditionally, the information flow has been



one-way. Thanks to ICT, systems and approaches have been put into place that allow input by local communities and dialogue between peers to be transmitted via two-way communication systems (IICD 2006).

Components and activities involved in managing technological information in the agricultural sector

La GI incluye varios grupos de actividades:

- a. **Design** of the information strategy
- b. **Capture** of content (from external and internal sources)
- c. **Production** of new content
- d. **Storage and retrieval** of content captured and/or produced
- e. **Dissemination** of appropriate content among users
- f. **Evaluation** of the process

To carry out these activities, organizations also require five key resources:

- Enabling **policies**
- **Organization** with efficient structures and procedures
- Constructive and supportive **partnerships**
- Motivated and skilled **people**
- Appropriate **technology**

The activities regarded as IM are very broad in nature and place particular emphasis on the development of capacities that allow institutions to create, prepare and implement top-quality information products and services that are highly creative and consistent with the dynamic of social change (Valdes 1999).

At a recent workshop (RAIN 2007) held by the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) to develop a postgraduate program in agricultural information and communication management, tasks were identified that the specialists of the future will be required to carry out, ranging

from managing indigenous knowledge to facilitating knowledge markets. All the tasks call for skills that will have to be developed (RAIN 2007).

The following are the major groups of activities that make up IM.⁴

determining the processes it will spearhead (Fig. 2). In formulating an information strategy, mechanisms need to be put in place to involve the stakeholders in the strategic thinking process and monitor the stages of analysis, identification of alternatives and selection of options.

1. An information strategy: a shared, guiding vision for management

2. Accessing or capturing information

All information strategies must be based on a set of objectives and a description of how those objectives are to be achieved. The strategy should also be aligned with the institution's strategy in a logical, coordinated way. The strategy is the road map of the information manager,

Traditionally, capturing information has been thought of as accessing bibliographic sources. However, there are other types of information that are very important for making decisions about aspects of agricultural technology whose management should not be overlooked, such as:

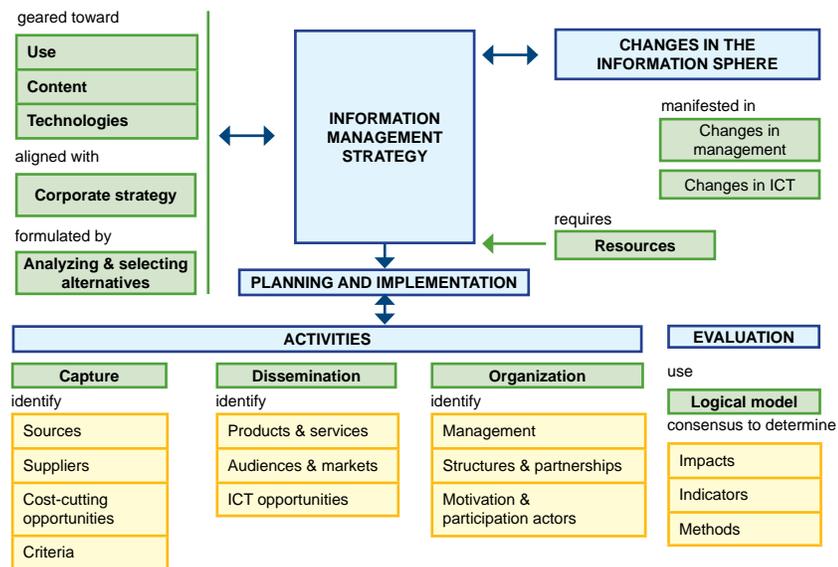


Fig. 2. Information strategy and management

Source: Adapted from IMARK 2006.

⁴ For further information about each type of activity, see the module “Investing in Agricultural Information” (IMARK 2006).

- The productive process and its actors
- The socioeconomic and agro-ecological environment
- Prices and markets
- The use of traditional knowledge
- The harnessing of internal information

In the case of bibliographic information, an increasing number of organizations are incorporating new ways of accessing information, with open source publications growing in importance. This type of resource can be used not only to capture external information, but also as an option for publishing one's own findings in scientific circles.

3. Organization

The activities include both those related to the organization and flow of information, and those that have to do with the management of the process and its actors. An example of the latter is the establishment of measures to motivate the different actors to take part in information projects.

4. Dissemination of information

Most agricultural organizations prepare and distribute information in different ways. An agricultural research institute may publish a document (containing information about

results), launch a new product (that applies those results) or offer a service (to promote a given technological innovation). In every case, information is the raw material. The delivery of pertinent information tailored to different target audiences is essential if organizations that promote agricultural technological innovation are to achieve their core objectives and ensure their own sustainability.

5. Evaluation

The evaluation of an information project provides its implementers with important feedback for making adjustments to improve the quality of the processes, products and services generated. The evaluation calls for good planning and management, and needs to be based on the logical model used for the design of the process in order to determine objectively what it is important to measure, and to encourage the active participation of all the stakeholders.

Conclusions: Challenges facing IM

In Latin America and the Caribbean, members of innovation systems have made progress in developing some of the activities involved in information management and the use of ICT tools. Most organizations, however, have not developed an explicit information strategy as part of a consistent investment policy. Instead, they carry out a series of independent initiatives as part of isolated, often unconnected, activities



that have not been integrated into the institutions' programming processes. In only a few cases have mechanisms been established that facilitate and promote effective communication and the participation all the actors in IM needed for each innovation effort.

Accordingly, the priority challenges are as follows:



Most organizations, however, have not developed an explicit information strategy as part of a consistent investment policy. Instead, they carry out a series of independent initiatives as part of isolated, often unconnected, activities that have not been integrated into the institutions' programming processes.

- To ensure that the information strategy is explicit, is developed in a participatory and inclusive way, and forms an integral part of the organizational strategy.
- To achieve integrating visions and forms of communication, to ensure the necessary support and position information clearly as a primary and strategic good.

- To undertake effective capacity development at all levels and design the incentives needed for effective participation in strategic planning and the execution of IM activities.
- To make informal types of information part of IM: the recording and systematizing of experiences, individual or collective knowledge that has not been recorded or written down anywhere and, in general, information produced in the course of the day-to-day work of an organization's own programs. Furthermore, to integrate information related to the knowledge of rural communities and their information and communication networks.

Finally, given the role of ICT in support of IM, many institutions are also faced with the challenge of updating their equipment, increasing the quality and amount of the access they have to information systems and databases, and improving their communication mechanisms in general.

Within the framework of its strategic priority of direct technical cooperation to promote the incorporation of technology and innovation for the modernization of agriculture and rural development, IICA has an Area of Concentration for the promotion of information management in support of technological innovation processes. In this area, it has collaborated

in capacity development; administers a system for sharing technological information on line (<http://infotec.ws>) under the aegis of the Forum for the Americas on Agricultural Research and Technology Development FORAGRO (www.iica.int/foragro); and is collaborating with the Global Forum for Agricultural Research GFAR (www.egfar.org) to develop a strategy for sensitizing people to the importance of investing in IM. With everyone's active participation in these efforts, it will be possible to meet the challenges posed.

References

Besemer, H.; Addison, C.; Ferguson, J. 2003. **Fertile Ground: Opportunities for greater coherence in agricultural information systems (on line)**. The Hague, IICD. 50 pp. Consulted on 3 March 2007.

Available at: <http://www.iicd.org/articles/IICDnews.import2292>.

Farrington, J.; Christoplos, I.; Kidd A. D.; Beckman, M. 2002. **Can extension contribute to rural poverty reduction? Synthesis of a six-country study**. ODI. AgRen Network Paper No. 123.

Gonsalves, J.; Becker, T.; Braun, A.; Campilan, D.; Chavez, H.; Fajber, E.; Kipiriri, M.; Rivaca-Caminade, J.; Vernoooy, R. 2006. **Investigación y desarrollo participativo para la agricultura y el manejo sostenible de recursos naturales (on line)**. Libro de consulta, Volumen 1: Comprendiendo investigación y desarrollo participativo. CIP-UPWARD/IDRC, 272 pp. Consulted on 5 March 2007.

Available at: <http://www.idrc.ca/openebooks/302-x/>.

IICD (International Institute for Communication and Development). 2006. **ICTs for agricultural livelihoods: Impact and lessons learned from IICD supported activities (on line)**. 76 pp. Consulted on 10 March 2007.

Available at: <http://www.iicd.org/articles/booklet-impact-agric>.

IMARK (Information Management Resource Kit). 2006. **Investing in agricultural information**. Training module. FAO.

O'Brien, J. 1999. **Managing Information Technology in the Internet Worked Enterprise**. 4th ed., USA, Irwin/McGraw Hill.

RAIN (Regional Agricultural Information Network). 2007. **Stakeholder Workshop on Development of Postgraduate Programme for Enhancement of Skills in Agricultural Information and Communication Management in ASARECA (Association for Strengthening Agricultural Research in Eastern and Central Africa) Region (2006, Entebbe, Uganda) (on line)**. Consulted on 30 March 2007. Available at: www.asareca.org/rain/index.php?option=publications&Itemid=8&lang=eng&task=full&catid=16

Sánchez, S. 2006. **De la gestión de la información a la gestión del conocimiento: premisas y herramientas**. Paper presented at the first workshop on: The observatory as a tool for managing information and knowledge (on line). Caracas, Col., IICA - SELA - INIA - AN. Consulted on 25 Feb. 2007.

Available at: <http://www.sela.org/sela/ItallerSELA-IICA.asp#Programa>

Valdés Abreu, M. 1999. **Consideraciones generales en torno al valor añadido de la información**. ACIMED 7(1). Consulted on 23 Feb. 2007.

Available at: <http://eprints.rclis.org/archive/00002462/01/B8-03.pdf>

Résumé / Resumo / Resumen

► La gestion de l'information pour l'innovation technologique agricole

L'information technique est un élément fondamental de tout processus d'innovation ou de recherche dans le secteur agricole. Dans les institutions qui encouragent ces processus, les défis actuels en matière de gestion de l'information (GI) sont divers. Ils s'inscrivent dans un environnement en pleine évolution, caractérisé, entre autres facteurs, par l'accroissement exponentiel de la quantité d'information potentiellement importante et par les progrès de plus en plus rapides des technologies de l'information et de la communication (TIC). Ces défis sont, notamment, la nécessité d'incorporer explicitement l'information dans la planification et l'exécution de tout processus institutionnel et de tirer profit au maximum des possibilités qu'offrent les TIC disponibles, ce qui se traduira par un soutien aux processus de gestion des connaissances. La GI comporte une série d'actions qui comprennent : a) la définition des objectifs et des priorités en matière d'information ; et b) la planification, la facilitation et la coordination des activités nécessaires à la réalisation de ces objectifs.

► Gestão da informação para a inovação tecnológica agropecuária

A informação técnica é um elemento chave em todo processo de inovação ou pesquisa do setor agropecuário. Nas instituições que promovem esses processos, são vários os desafios atuais para a gestão da informação (GI). Eles ocorrem numa conjuntura de mudanças marcada por um aumento exponencial na quantidade de informação potencialmente importante e pelos constantes avanços nas tecnologias da informação e comunicação (TIC), entre outros fatores. Um desses desafios é a necessidade de incorporar a informação explicitamente no planejamento e execução de qualquer processo institucional e aproveitar ao máximo as possibilidades que proporcionam as TIC disponíveis, o que redundará em apoio aos processos de gestão do conhecimento. A GI demanda um conjunto de ações que envolvem o seguinte: (a) a definição dos objetivos e prioridades relacionados com o âmbito da informação; e (b) o planejamento, viabilização e coordenação das atividades necessárias para alcançar os objetivos.

► Gestión de información para la innovación tecnológica agropecuaria

La información técnica es un elemento clave en todo proceso de innovación o de investigación que tenga lugar en el sector agropecuario. En las instituciones que promueven estos procesos, son diversos los retos actuales para la gestión de información (GI). Estos se plantean en un entorno de cambios, marcado por un aumento exponencial en la cantidad de información potencialmente importante, y por crecientes avances en las tecnologías de información y comunicación (TIC), entre otros factores. Los desafíos incluyen la necesidad de incorporar la información de forma explícita dentro de la planificación y ejecución de cualquier proceso institucional y aprovechar al máximo las posibilidades que ofrecen las TIC disponibles, lo que generará un apoyo a los procesos de gestión de conocimiento. La GI tiene lugar mediante un conjunto de acciones que involucran: a) definir objetivos y prioridades relacionadas con el ámbito de la información; y b) planificar, facilitar y coordinar las actividades necesarias para alcanzar los objetivos.