Extension System for Livestock Development in Developing Countries: Knowledge Management Application

Budi Guntoro[1]

[1]Faculty of Animal Science, Universitas Gadjah Mada, Yogyakarta, Indonesia
e-mail: bguntoro@gmail.com

Livestock Development in Developing Countries

Smallholder livestock farmers represent almost 20 per cent of the world population and steward most of the agricultural land in the tropics (McDermott *et al*., 2010). Two-thirds of the world's domestic animals are kept in developing countries, where over 90 percent are owned by rural small holders. They dominate crop–livestock systems, with livestock playing an essential role in highly diversified livelihood strategies that typically combine crops and livestock with off-farm activities (Ellis and Freeman, 2004; Deshingkar *et al*., 2008). In Asia and large areas of Latin America and Africa, a major role of animal such as cattle and buffaloes are to provide draught power. The major constraints for improving livestock productivity, where production efficiency is only one-quarter of that in developed regions, include a devastating animal disease burden, a near-ubiquitous shortage of good-quality livestock feeds, rapidly diminishing forage and natural biodiversity, poor access to markets, and unresponsive policy environments.

In agriculturally-based economies, poor rural and urban people with low and slowly increasing incomes will provide much of the increasing demand for livestock products, largely from local informal and domestic markets, because livestock products are not widely traded over long distances (generally less than 10 per cent of livestock products are traded across borders (Staal, 2001)). Smallholder livestock farmers, however, need to be supported in order to be competitive as market forces cause these systems to become more intensive in response to market demands. In many situations, smallholders can be competitive primary producers compared to larger local producers or foreign importers. The competitiveness of smallholders versus the potential for economies-of-scale, tends to differ by commodity and stage of production. It will be argued that livestock production in developing countries must be a looked upon in much broader perspective which places equal, if not more, emphasis on sociological, ecological and political issues instead of being confined to parameters relating only to biological and economic efficiency.

Herrero *et al*. (2010) developed a typology of livestock systems that provides a measure of intensification potential. This typology integrates a system's natural resource potential, population density, and market access. The major livestock systems resulting from this classification are: Agro-pastoral and pastoral systems, Extensive mixed crop–livestock systems, Intensive mixed crop–livestock systems , and Industrial systems

Contribution of Livestock to Rural and Sustainable Development

Although largely underestimated, livestock make a major contribution to rural development in developing countries. In traditional livestock systems,livestock contributes to the sustainable livelihoods and security of poor smallholders, giving rise to a variety of outputs in the form of Natural Capital; Financial Capital and Social Capital. They produce food, enhance crop production and provide additional economic goods and services as well as cash income. The inclusion of livestock diversifies and increases total farm production and income, provides year-round employment and disperses risks. Sales of livestock products provide funds for purchasing crop inputs and for financing farm investments. Livestock often form the major capital reserve of farming households

and, in general, enhance the economic viability and sustainability of a farming system (Steinfeld & Mack, 1995). The manure from animals, particularly from large ruminants, serves as fuel which can be either used in the home or sold or bartered, and can also be used as fertilizer. In addition, animals provides a source of capital to be drawn on as required, especially following crop failure. Livestock, therefore, meet the multiple objectives that the poor thrive to meet.

In many development projects for the rural community, livestock is used as a mean for improving standard of living in rural areas. The importance of farm animals in household asset portfolios and the rapidly growing demand for livestock products in developing countries provide unique opportunities for using livestock as instruments for sustainable intensification and pathways out of poverty. It is, therefore, not a coincidence that the Integrated Sustainable Rural Development Strategy (ISRDS, 2004) identifies livestock farming as the agricultural enterprise with the most likely chance of improving household food security, alleviating poverty, and improving livelihoods in communal farming.The collective concept of livestock has special characteristics that enhance its potential to reduce poverty (World Bank, 2007).

The Role of Extension in Livestock Development

Today, most livestock extension services in Asia and the Pacific more over in developing countries are under the wings of the ministries or department of agriculture insofat as government services are concerned. The privatization of livestock extension service, however, has been in existence ever since in an informal way which means that distributors of vetenary products, feeds or day-old chicks have actually been performing extension work in the promotion of their products and/or services.

Extension methods, as they recognized today in the Asian context, come in three major apporaches: individual, group, and mass. The individual approach involves extensionist's visit to the individual farms usually by appointments or prearranged schedules. On the other hand, the group approach takes the other form of filed deminstrations, training courses, seminars, meetings, and group discussion. The mass aproach entails the production and dissemination of informational materials either through print, broadcast or computer media.

Four major paradigms of Agricultural Extension (Swanson, 2008): Technology Transfer, Advisory services, Non formal education, and Facilitation extension. These paradigms have an important role to play in helping achieve different livestock development objectives.

Technology Transfer – this extension model was prevalent during colonial times amd reemerged with intensity during 1970s and 1980s when the Training and Visit (T&V) system was established in many Asian and Sub-Saharan African countries. This "top-down" model primarily delivers specofoc recommeendations from research.

Advisory Services – both public extension worker and private-sector firms, in responding to specific farmer inquiries about particular production problems, still commonly use the term advisory system. In most cases, farmers are "advised" to use a specific practice or technology to solve an identified problem or production constraint.

Nonformal Education (NFE) – in earlier days of extension in Europe and North America, this paradigm dominated when universities gave training to rural people who could not affordor did not have access to formal training in different types of vocational and technical agriculture training. This approach continues to be used in most extension systems, but the focus is shifting more toward training farmers how to utilize specific management skills and/or technical knowledge to increase their production efficiency or to utilize specific management practices.

Facilitation Extension – this approach has evolved overtime from participatrory extension methods used 20-30 years ago and now focuses on getting farmers with common interests to work

in direction from the traditional linear model of linking research to extension to farmers,to an emerging new inovative extension model as illustrated in Fig 2.

Different Extension Models and Approaches

Over time, national governments and donors became increasingly concerned about the performance of national extension systems, and different models have been tried and tested. These approaches are: Technology transfer extension models (ex. Ministry-based agricultural extension or advisory services, Training and Visit extension), Participatory Extension approaches (Animation rural, integrated rural development, farmer-based extension organizations), Market-Oriented (commodity-based advisory systems, innovative, market-driven extension approaches), Non formal Education/Extension Approaches (Farmer field schools, University-based extension).

Table 1 Model/approaches of extension by various scholar

	Rivera (1988)	Axinn (1998)	Gemo *et al* (2005)
Top-down	Conventional	General agriculture	Public
	Training and Visit (T&V)	Commodity	Commodity
	University	T&V	T&V
	Technical innovation	Agricultural participatory approach	NGO
	Integrated agricultural development program	Project approach	Private sector
			Farmer field schools (FFS)
Participatory	Farmer information dissemination system	Farming systems research and extension (FSR/E)	
	Farming system research-extension	Cost -sharing	
		Educational institute approach	
Contrac farming	Commodity development		
	Commodity focused		
	Community development		
Rural development	Integrated rural programs		
	Animation rurale		

Alternative Perspectives on Knowledge

Knowledge is defined as a justified belief that increases an entity's capacity for effective action (Huber 1991; Nonaka 1994). Knowledge may be viewed from several perspectives (1) a state of mind, (2) an object, (3) a process, (4) a condition of having access to information, or (5) a capability. Knowledge has been described as "a state or fact of knowing" with knowing being a condition of "understanding gained through experience or study; the sum or range of what has been perceived, discovered, or learned" (Schubert *et al*. 1998). The perspective on knowledge as a state of mind focuses on enabling individuals to expand their personal knowledge and apply it to the organization's needs. A second view defines knowledge as an object (Carlsson *et al*. 1996; McQueen 1998; Zack 1998). This perspective posits that knowledge can be viewed as a thing to be stored and manipulated (i.e., an object) Alternatively, knowledge can be viewed as a process of simultaneously knowing and acting (Carlsson *et al*. 1996; McQueen 1998; Zack 1998).

Three major points emerge from the above discussion: (1) A great deal of emphasis is given

to understanding the difference among data, information, and knowledge and drawing implications from the difference. (2) Because knowledge is personalized, in order for an individual's or a group's knowledge to be useful for others, it must be expressed in such a manner as to be interpretable by the receivers. (3) Hoards of information are of little value; only that information which is actively processed in the mind of an individual through a process of reflection, enlightenment, or learning can be useful. (Alavi and Leidner, 2001).

Knowledge Management in Organizations

The recent interest in organizational knowledge has prompted the issue of managing the knowledge to the organization's benefit. Knowledge management refers to identifying and leveraging the collective knowledge in an organization to help the organization compete (von Krogh 1998). Knowledge management is purported to increase innovativeness and responsiveness (Hackbarth 1998). In one survey, the majority of organizations believed that much of the knowledge they needed existed inside the organization, but that identifying that it existed, finding it, and leveraging it remained problematic (Cranfield University 1998). Such problems maintaining, locating, and applying knowledge have led to systematic attempts to manage knowledge. According to Davenport & Prusak (1998), most knowledge management projects have one of three aims: (1) to make knowledge visible and show the role of knowledge in an organization, mainly through maps, yellow pages, and hypertext tools; (2) to develop a knowledge-intensive culture by encouraging and aggregating behaviors such as knowledge sharing (as opposed to hoarding) and proactively seeking and offering knowledge; (3) to build a knowledge infrastructure-not only a technical system, but a web of connections among people given space, time, tools, and encouragement to interact and collaborate.

Knowledge management is the process of transforming information and intellectual assets into enduring value. It connects people with the knowledge that they need to take action, when they need it (Hawkins, 2000). Complementing what Bellinger (2004) stated, abesd on Fleming's as a basis for thought, with the phylosophy of extension, generates a more complex diagram (Fig. 3), to emphasize the position of knowledge management as the basis sub mix to extension and extension, revealing that extension is "maturation in knowledge management" in deed.

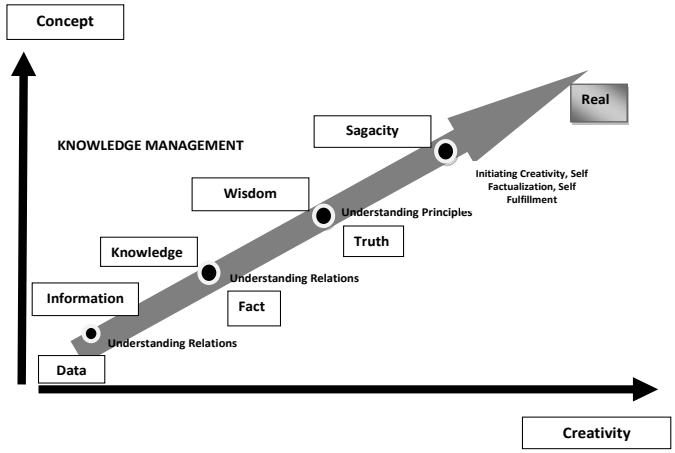

Fig.3. Position of extension comparing to knowledge management

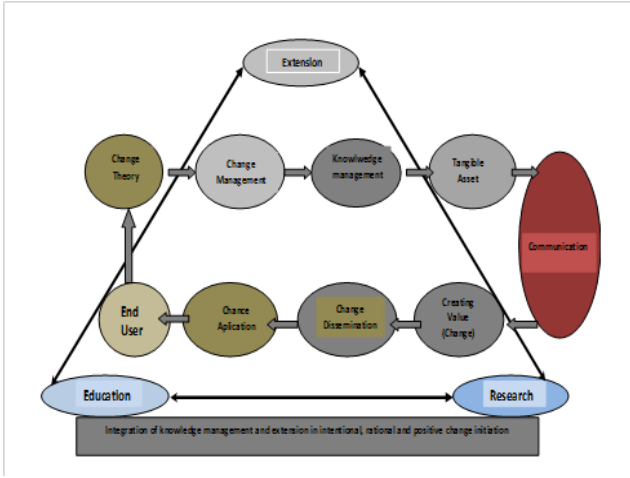

Fig.4. Agricultural extension and knowledge management mix (Mohammadi, 2008).

Fig 4 shows the road maps for voluntary change within the amalgamation of basic agricultural development mix and knowledge management mix

Technology-driven Development

Technology transfer is a two-way flow of technical information and materials among the farmers, researchers and those who disseminate technologies. This definition extends the meaning of extension beyond association with the traditional public sector to involve services provided by other institutions such as non-governmental organisations (NGOs), private firms, educational institutions and producers' associations. Our definition also implies that technologies are generated by all parties and diffused by all. There is a continuum with no hard boundaries.

Livestock development requires a mix of conditions. Although the precise nature of the mix depends on the context, it usually includes good infrastructure, access to credit, water, land, markets, input delivery, social organization, relevant technology and rewarding prices. As livestock develops, the need for this mix is increasingly met, giving farmers more control over their environment. The greater their control, the more important knowledge and technology become as the major determinants of development. In other words, technology development increasingly drives livestock development, as the other essential conditions are effectively provided for.

As technology-driven development occurs, many developing countries find it impossible to expand alternative employment fast enough to accommodate those leaving the land, moreover, their rapidly growing rural populations increase the pressure on land, reducing farm sizes, number of livestock raised, with each new generation.

Linking research and technology transfer

As the number of partners and stakeholders expands the effective linkage of livestock research and technology transfer is becoming more complicated. Greater coordination and synergy between research and technology development will also be required if technologies are to be transferred and impact achieved. The expanding global research system will need greater interaction with development agencies, including multilateral organizations such as FAO and UNDP, trilateral government agencies and NGOs. Developing country governments will also have an increasingly greater say in the research and development activities that take place within their borders. The framework for action must thus tackle the effective linkage of technology transfer with research. NGOs can also play an important role in transferring livestock technologies in developing countries.

They have close contact with producers and their potential to expand delivery of technical services to producers and to participate in field testing activities is high. Many donors are increasingly channeling development support through NGOs.

Links between Extension and On-farm research

In most developing countries, agricultural research and extension are separate pu lic institutions with different mandates and different ways of operting. Topdown systems of this kind have funtioned reasonably well to meet the demands of resource-rich farmers, as well as those of both large-and small-scale producers of high-value commodities. These farmers have been able to communicate their needs to researchers, either directly or through producers' organizations, and to assess and adapt the recommendations which come to them through the extension system.

Howwever, the lack of effective links between research and extension institutions has impeded the development and transfer of technology appropriate for small scale, resource-poor farmers, particularly those in low-potential, heterogenous agro-ecological areas. These farmers have no effective organizations through which to make their needs known. Farming System Research (FSR), and especially on-farm research, has been promoted as a way of developing appropraite technology and adapting to the specific agro-ecological and socio-economic conditions of small-scale farmers. Many national agricultural research systems have developed interdisciplinary programs of this kind, with two major objectives: to diagnose needs and cosntraints at the farm level, and to adapt technologies to the agro-climatic and socio-economic conditions of target producers.

Asssessing the effectiveness of linkage mechanisms: The effectiveness of mechanisms linking on-farm research with extension will be assessed in terrms of these questions (Ewel, 1990):

1. how well dose the mechanisn, or group of mechanism, facilitate the flow of informations on farmers' conditions and needs to researchers – does it improve the system's responsiveness to teh needs of its targeted clients?
2. How well does the mechanism facilitate the flow of information and techniques from the research system to resource-poor farmers – does it improve the system's capacity to transfer relevant technology?
3. How sustainable is the mechanism, given the variuous institutions involved?

CONCLUSIONS AND RECOMMENDATIONS

Knowledge management involves distinct but interdependent processes of knowledge creation, knowledge storage and retrieval, knowledge transfer, and knowledge application. At any point in time, an organization and its members can be involved in multiple knowledge management process chains. As such, knowledge management is not a monolithic but a dynamic and continuous organizational phenomenon. Furthermore, the complexity, resource requirements, and underlying tools and approaches of knowledge management processes vary based on the type, scope, and characteristics of knowledge management processes. Agricultural Knowledge Management System and Research Extension Linkage along with on the ground experiences identified few basic benchmarks along with some common useful global principles applicable across nations as possible general framework for agricultural development. In order to be effective, extension organizations need revtalization, intrapreneurship development and being prepared for the foreseeing new changes to come. At the same time, extension agents need knowledge, expertise, and competency to crete the right environment for desired changes to occur.

In doing so extension needs to change its mind map sp far, from; materialistic to realistic, participatory to partnership, authoritative to democratic, trickle-down to bottom-up, clientele to

partner, public to strategic, bureaucratic to dynamic, and passive to active. Major improvements in livestock productivity are possible and needed to assist economic growth in developing countries. Research can provide technologies to help achieve productivity increases but transfer of technology is needed to achieve impact. The global research and development community is expanding and new functional modes are required to ensure coordination of the use of resources. We should considers issues related to the role of research in the strategies making up an action framework to promote livestock development and especially effective linkage of research with technology transfer.

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