



# People's Knowledge for Addressing Societal Needs: Lessons Learnt while Engaging Farming Communities as a Part of Research System

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**Abstract** | Recognizing problems at community level is essential for developing appropriate tools of development. Rural societies understand, comprehend their difficulties and develop innovative solutions for sustenance. Societies try to find local means to experiment and overcome inadequacies. This has been happening since generations, but due to changing context, sharing of these creative or innovative measures has been limited. There are many studies regarding innovations developed at research stations that have been adopted by farming communities. However, experimental studies to show-case success of communities to innovate, accept and improvise their surroundings are inadequate. The review paper is based on lessons learnt while undertaking research with the help of farming communities. There are different forms of innovations maintained and shared by outstanding traditional knowledge holders with specific reference to livestock science. Sharing of such knowledge is vital for ability of future generations to sustain farm animal welfare. Novel medicinal practices (technologies) shared by knowledge holders are becoming part of innovation system(s). Communities acknowledge and make use of these simple, flexible innovations to overcome societal difficulties. This reinforces belief that innovations need not come from formal research and development systems. This review also illustrates necessity to reinforce open source and non-linear innovation system through continuous engagement with farming communities. This necessitates need for involvement of stakeholders, more particularly livestock farmers in program planning. A model for scaling up of livestock innovations involving farming community is proposed for effective implementation.

**Keywords** | Innovation model, Indigenous, Community, Research, Livestock

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## INTRODUCTION

Indigenous system derives its knowledge by engaging common property resources over generations. These resources are protected by intervention of public system, participation of society beyond self-interest and leveraging market potential (Raju et al., 2006). These can be sustained with association of entrepreneurship, innovation and sustainable development (Kardos, 2012). Availability of natural resources, reduced interaction between knowledge system and clientele as well as need for sustainable development necessitates acknowledgement of farmer's experience and knowledge (Koutsouris, 2012). This is more profound in livestock sector as farming communities face

constraints, which are magnified due to implications of etiological, factors elsewhere. Many factors are attributed for these changes, among them climatic factors are also realized. An example has been presence of ticks and outbreak of tick-borne diseases in not-so-common geographical areas. These changes also affect knowledge systems and deprive unearthing of unique practices (Shen et al., 2010). Hence, location-specific technological innovations are needed to minimize difficulties and improvise livestock production efficiency. Origin of these innovations need not necessarily be from formal system and role of farmers in this endeavour is stressed (Anandajayasekeram et al., 2009).

Knowledge system of farming communities along with their native skill in utilizing natural resources has to be leveraged for welfare of society. It is ideal to rethink ways to develop suitable technologies relevant to farmer's field through societal experience. The guiding principle for research in indigenous system is to recognize problem, identify required form of input and enable solutions at farmers end for sustainable development. It is known fact that traditional veterinary therapy can play pivotal role as it has survived over time (Mazars, 1994). These practices are widely used to treat livestock along with modern veterinary health care system (Gabalebatse et al., 2013, Gakuubi&Wanzala, 2012, Guarrera& Lucia, 2007). But gap between knowledge of farmers and effective implementation of intervention for economic benefit has been a challenge. Gupta (1984) indicated that felt-needs that were not well articulated, were not given importance by organizations.

The need for technology has been felt like never before as aspirations and challenges to farming communities are larger. In fact such innovation system based on traditional knowledge had maximized farmers return through less input-driven system (Bharwad et al., 2015). However, integration of this knowledge system through formal institutional program has not been done scientifically. The necessity is that these innovations have to be simple, flexible and less expensive than conventional methods already in practice. This review paper articulates lessons learnt from society during scientific validation of knowledge, extending technological options and sharing of developments with community. It is necessary to work closely with farming community so as to sustain their creative spirit and ability to solve animal health concerns through innovative approach. There exists a need to have enhanced dialogue between creative, socially conscious, learned, needy farmers with outstanding traditional knowledge holders and local institutions. This will reduce level of uncertainty in engaging innovation system through traditional knowledge by formal institutions.

## INNOVATION SYSTEMS THROUGH TRADITIONAL KNOWLEDGE

### REINFORCEMENT OF INNOVATIONS IN TRADITIONAL KNOWLEDGE

Livestock sector provides minimum risk to vulnerable communities and employs at least 1.3 billion people worldwide (Thornton, 2010). However, veterinary public health systems through hospitals and village level animal health care centres find increasingly difficult to address health care of livestock (Singh and Misri, 2006). This is due to large number of livestock, diversified species, institutional location, shortage of qualified veterinary resource personnel's and environmental risks (Mishra et al., 2010;

Satapathy, 2010; Rochfort et al., 2008). This sector requires development of new technologies/product and improvement in existing products to cater towards enhanced productivity. But, developing an animal health product takes time and involves cost (Kiss et al., 2012). The response of industry in addressing multitude of challenges faced by farming communities has been huge as well. Experimental studies had illustrated that reinforcement of local knowledge among farmers provides innovative, cost-effective solutions (Kadivendi et al., 2015). Technologies can be more successful and sustainable if such knowledge is considered (Poorna et al., 2014). In this context, role of traditional knowledge system in complementing veterinary health care acquires significance (Gaur et al., 2010). In India, indigenous knowledge has moved from simple folklore to more science based medicine (Gupta et al., 2013). As farmers found it difficult to adopt package of practices due to high input costs (Hassanali et al., 2008), indigenous system provided alternative options.

The transformation of farmers attitude, recognizing problem, identifying innovative practices and influencing their decision making capacity is vital for sustaining these technological innovations (Gaikwad et al., 2015). In case of smallholder livestock production system, women knowledge holders hold robust technological knowledge owing to their close association with husbandry practices. However, steadily increasing work load of women in livestock sector and exit of youth in farming sector (Jothilakshmi et al., 2013) is a cause of concern. This limits exchange of knowledge among farmers as they find animal husbandry activities physically demanding and time consuming. Studies need to be conducted to showcase traditional knowledge as open source innovation that can be adopted and practiced with help of animal husbandry institutions. Thus clarity in conceptual understanding to utilize innovations in health sector is needed. This will help policy makers, professionals to recognize and get desired benefit (Omachonu and Einspruch, 2010).

Gupta (2013) opined that ethical value by academic institutions towards local knowledge holders were not enforced adequately. Evidence was shared wherein engagement with civil society had brought out different challenges and indigenous healer had reported new role of medication which was earlier confirmed for scientific efficacy against mastitis, a common problem affecting welfare of livestock (Devgan-ia et al., 2015). Learning from such findings illustrates nature of available knowledge with civil society and generation of research questions to scientific community. Some of these innovative practices are available in farmers premises and efforts needs to be undertaken in sharing such findings with community (Bharwad et al., 2015). Thus social innovation can convert societal problems into opportunities through community actors (Lisetchi and Brancu, 2014). In

order to enhance utility of indigenous knowledge system, research communities have to share developments to identified knowledge holders or communities. These features comprehensively prove that in traditional knowledge system, experimental learning of individual healers has to be recognized.

### MODELS OF INNOVATION SYSTEMS FOR UTILIZATION OF TRADITIONAL KNOWLEDGE

Transformation of creative knowledge of individuals into practical or utility based knowledge requires trained manpower. This will be a challenge as studies or research findings need to illustrate development of new knowledge or product based on documented practices. These actions tend to be localized and in most cases effectiveness of these programs depends on the person who responds to given situation (FAO, 1985). It was shared that little knowledge has been gained regarding performance of agriculture knowledge and innovation system (EU SCAR 2012). Development of clean technologies which are environment friendly and available locally has to be research priority in exploiting indigenous knowledge systems. The nature of distribution of livestock assets in larger geographical region calls for different implementation programs.

Experiences while involving communities, individual knowledge holders possessing common or novel traditional knowledge practices and farmers illustrate two models to scale up or reinforce them. They involve *Open Source Innovation System* (OSIS) wherein common technological practices based on widely known traditional knowledge can be value-added locally for betterment of farm animal welfare and productivity. It has to be viewed that strengthening local knowledge can complement disease control strategies. These intervention strategies can be implemented based on situation and nature of disease control program (Christensen, 2001). The other model has been *Non-Linear Innovation System* (NLIS), wherein involvement of community was emphasized in developing and evaluating technologies. This research system had predominant role of indigenous knowledge holder(s) or community in support with farming community. The primary characteristics of non-linear mode of innovation process are to recognize 'knowledge' along with feedback mechanism (Mikhaylova, 2014). Studies have demonstrated health care role of indigenous veterinary medications outside system of origin referring non-linear innovation model (Ravikumar et al., 2015c).

These technologies are location-specific and efforts to integrate such autonomous adaptation efforts with large scale initiatives are necessary (Wright et al., 2014). Thus technologies developed with help of resource-poor farmers need to be supported by formal system for dissemination to households (Conroy and Sutherland, 2004). In

small holder production systems farm inputs need to be devised towards economic utilization of natural resources. Thus indigenous knowledge system needs to be viewed as a complementing force in control of livestock ailments. Their application can help to minimize or overcome ailments affecting livestock with help of veterinary institutions.

### NEED FOR CONTINUOUS ENGAGEMENT WITH COMMUNITY

Community managed sustainable agriculture approaches tried to work out activities that are knowledge-intensive rather than input-intensive (Larson and Williams, 2012). Efforts in continuously engaging community only can lead people to understand different challenges in front of them. Chander et al. (2014) referred linear understanding and technology transfer from research to farmer had reduced credibility of extension services. The discussion activities are vital as tacit knowledge of individual or society was ignored while providing feedback to farmers. Prior (2013) referred that current agricultural innovation system needs to focus on smallholders through participatory methodologies. Indigenous knowledge system has been time tested and utilized by community over a period of time. Livestock farmers had good knowledge about traditional medications (Manivannan et al., 2014) and this unique advantage has to be exploited towards social, economic gain. Mort et al. (2005) referred that undermining value of local knowledge led to loss of trust. Concerted efforts have to be made to revive this knowledge system in the place of origin as well as at needy areas. Community based validation of indigenous veterinary system, fostering network and need for knowledge sharing are advocated (Shen et al., 2010).

The foremost activity being mobilizing community to understand the value in the manner they can feel and compare. In such a scenario, demonstration and engagement with various actors of community is pivotal. These programs should address felt-needs of farmers for sustained adoption of intervention package (Tamizhkumaran and Rao, 2012). Farmer's willingness to understand and being part of research were demonstrated in different regions (Rao et al., 2010; Patel et al., 2015). There are limited research studies shared in terms of community mobilization for reinforcing and strengthening knowledge systems (Devwania et al., 2015; Ravikumar et al., 2015b). In most of these circumstances, knowledge holders had more of social motive in addressing difficult situation. The members of society had reposed faith on indigenous system and harnessing such attributes requires understanding of local system. Ability to understand important needs from unimportant ones based on people's requirement will make effective program (GoI, 1961). These will pave way for control of resources through social entrepreneurship (Lisetchi and Brancu, 2014). Thus effective liaison between custodian of knowledge (which

may be individual or community) and livestock farmers will augment indigenous veterinary system.

### KNOWLEDGE HOLDER(S) AND COMMUNITY BEING PART OF RESEARCH SYSTEM

General developmental program over a period of time had created a situation, where innovations can only emerge from scientific stations. Though, technologies developed at scientific premises had demonstrated success, but not adequately at farmer's doorstep. This may be due to unpreparedness of farmers, who did not comprehend the intervention packages well as non-availability of technologies. This is more pertinent in rain-fed areas, wherein larger variations in agro-ecological and socio-economic conditions were noticed in short distances (Vandenban and Hawkins, 1998). The type of feeding system, preference to livestock species, method of cultivation and dependence on dairy societies by smallholders in these regions needs to be given adequate attention while promoting location-specific technologies (Ravikumar et al., 2015a). It is ideal to unearth the tacit knowledge of knowledge holders for innovation promotion activities of traditional knowledge system. This knowledge which may be novel, needs to be verified scientifically so as to gain from societal learning (Devwania et al., 2015). Successful instances of building upon tacit knowledge in transfer of technology were encashed in technology development (Freeman, 1995). Overall system approach is required for development and creation of innovations (Alexander and Yuriy, 2015).

Policies have to be encouraged to enhance gains derived through farmer skill along with others to meet global challenge to produce more food in future (Carberry et al., 2010). Government programs were evolved to train farmer volunteer to enhance quality of animal health service at village level (Calba et al., 2014). Efforts need to be undertaken to integrate traditional veterinary medicine with modern veterinary services (FAO, 1991). In modern economy it is learnt that innovation process can be complemented by recognizing 'knowledge' (Mikhaylova, 2014). Development of innovation is no longer domain of internal research program (De Jong et al., 2008) and it evolves through other outside forces. Scientific discipline needs to visualize and develop capabilities to enhance innovation or new knowledge system. Veterinary health service departments have advantage as it can recognize such expertise from farmer's field. However feedback findings from field and discussion activities are crucial and appropriate working arrangements need to be met (Ravikumar and Chander, 2011). Scientific intervention of indigenous medications had resulted in environmental friendly solution and applications in diversified species (Periyaveeturaman et al., 2015). Thus national and regional policies have to reflect upon development of network to enrich flow of indigenous knowledge into institutional research programs.

### PARTICIPATION OF LIVESTOCK FARMERS IN KNOWLEDGE SYSTEM THROUGH PROGRAM PLANNING

Enhancing farm income depends on complex interactions of farm productivity, environmental conservation and gender relations (Ellis, 1999). The rate at which new technologies are available determines rate of agricultural productivity (Piesse and Thirtle, 2010). This raises expectation on suitable implementation strategies that can sustain exchange of ideas, input process and impact of products. Farmers consider holistic animal health development and differ in priorities from veterinary authorities causing failure of disease control program (Chatikobo et al., 2013). Sandhu (1996) indicated that effective model for program planning needs to be envisaged. This would help in formulating activities so as to ensure relevant conditions and fulfil particular principle. In order to promote innovation system, sufficient information on technology and framework on interactive factors need to be assessed (Agwu et al., 2008). In utilizing indigenous system of medications, livestock owners are paramount as they are inherent part of sustaining this knowledge. Apart from it, careful choice at individual farm determines the standard of welfare and productivity in livestock production system (Stott et al., 2005). Sustainable intensification can be scaled up through desired understanding of practices and context where it has to be used (Lane and Oreszczy, 2013). Indigenous practices fit into criteria of technology suggested by Rogers (2003) as they cause instrumental action, reduce uncertainty in cause-effect relationship. These technologies have to be made available for livestock owners through suitable intervention.

One of the framework for replicating health care interventions is Replicating Effective Programs (REP) process. REP involves four phases, viz. preconditions, pre-implementation, implementation and maintenance, evolution. It suggests community working group should meet regularly in pre-implementation phase and undertake pilot testing for clarity as well as functionality of package at intervention site (Kilbourne et al., 2007). In general, action research involves cyclic activity of observation, reflection, planning and action with participation of affected people (AG, 2010). Most centres of agricultural research recognize on-farm research as it requires precise understanding of risk adjustments evolved at rural society (Gupta, 1995). The level of interaction based on these contexts with livestock owners will enhance scope to leverage technologies and be a part of innovation research system. Thus livestock owners play important role in generation and maintenance of technological innovations or practices. The key issue is how this valuable contribution can be linked with existing veterinary institutions at village or block level. This will determine the utility value of indigenous knowledge system in future.

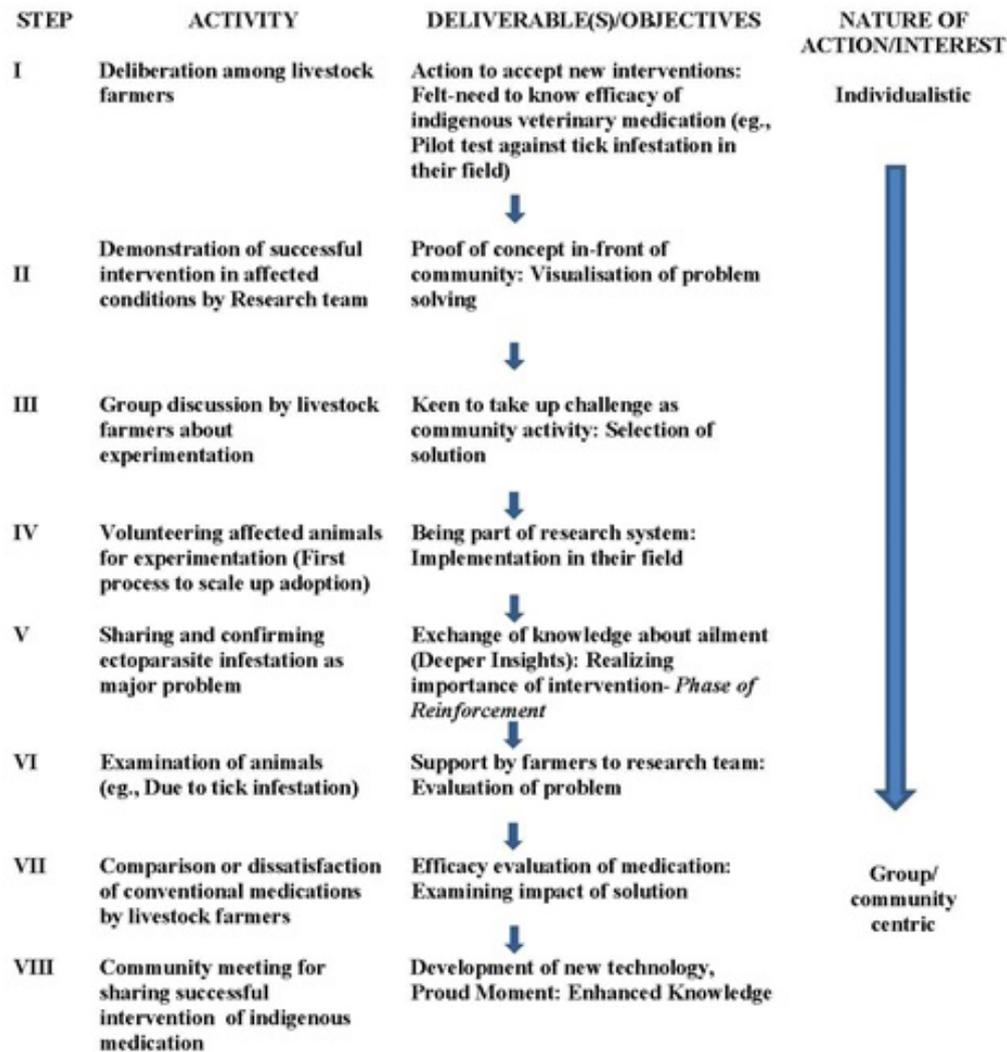


Figure 1: Eight step model for large scale on-farm experimentation in livestock

### SUGGESTED MODEL FOR SCALING UP LIVESTOCK INNOVATION(S) WITH HELP OF COMMUNITY

There is a need for adopting this environmental-friendly and low-cost indigenous knowledge practices in small holder production system. Deriving cost effective or low-cost solution based on readily available inputs from farmers field were illustrated (Ravikumar et al., 2015d). There were models proposed for incorporation of low-cost native technologies through decentralized approach (Bharwad et al., 2015; Gaikwad et al., 2015; Ravikumar et al., 2015b). Such activities try to maximize output in given situation and maintain ability of communities to meet their needs. Thus demonstrations need to be carried out in farmer’s field for scaling up of innovations. An eight step model for scaling up livestock innovations in farmer’s field is proposed (Figure 1).

The on-farm experimentation involving large number of ruminants had described importance of different stages of

trials. The perception of problem was through awareness of pragmatic possibilities of improvement. This is in concurrence with Albrecht et al. (1989). This had helped farmers in acquiring desired concepts to support their decision-making process. Experimental studies illustrated that livestock farmers who do not have dramatic problems in their animals had taken the cause for effective implementation. It was found that training may not be needed while facing an immediate problem that was acknowledged by farming community. Farmers can comprehend their situation better and organize themselves upon visualizing effect of diversified techniques.

During implementation phase, degree of individualistic approach by farmers had moved towards group/community centric activity. The framework of executing intervention activity exemplifies health intervention program against tick infestation. This eight step model can be dovetailed based on learning to achieve each of the objectives or deliverables. Each of these deliverables was based on reflection, planning, action, observation cycle. This can be adopted

for other indigenous knowledge practices as well. Animal health and welfare camps conducted by veterinary institutions may be focal point in pilot demonstration of such techniques. This will help farming community to adopt useful low or no cost technologies. This approach will be pertinent in situation where farmers were away from seeking regular veterinary service. University research centres have to join animal husbandry departments in reaching out to livestock farmers for effective demonstrations. This illustrated model may be road map for community participation in large-scale demonstration of innovative technologies.

## CONCLUSION

Traditional knowledge system can complement the efforts of animal husbandry department efforts in providing quality health care. Sustaining this knowledge system is critical for future generations as novel veterinary medications can be developed with help of experimental learnings derived from knowledge holders. Models for promoting indigenous knowledge in form of *Open Source Innovation System* (OSIS) for common technological knowledge and *Non-Linear Innovation System* (NLIS) for developing, answering research questions emerging from farming community were enlisted. The advantage of this system has been to blend with existing resources so as to demonstrate low or no cost technologies. The importance of engaging community encompassing knowledge holders and livestock farmers was emphasized. This will provide measures to involve civil society in utilization of techniques in their premises and be a part of research system. The eight step model framework may provide opportunities for stakeholders in large scale demonstration of indigenous veterinary technology in farmer's field.

## CONFLICT OF INTEREST

No conflict of interests are declared by authors for the contents in the manuscript.

## AUTHOR'S CONTRIBUTION

All authors contributed equally to the manuscript.

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Livestock farmers who had volunteered during experimentation.

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