

# **Knowledge Transfer for a Horticultural Revolution: The Lifelong Learning for Farmers Model**

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**Keywords: Lifelong Learning, Open and Distance Learning, Agricultural Extension, Innovation, Codified Learning, Tacit Learning, Transfer of Technology**

## **Abstract**

**This paper examines the relevance of the current theoretical perspectives in extension for promoting horticultural revolution in developing countries. At present agricultural education and extension occurs within a framework inspired by the green revolution. This paper analyses the inadequacy of this approach from two theoretical perspectives and proposes an alternative framework. It describes the relevance of the alternative framework of the Lifelong Learning for Farmers initiatives of the Commonwealth of Learning (COL) in developing countries. In particular it stresses the role of Open and Distance Learning (ODL) in enabling extension systems to address the dynamics of horticulture.**

## **INTRODUCTION**

The term extension was derived from the nineteenth century practice of some British universities reaching neighbourhood homes for adult education through out-of-college lectures. This practice was designated as University Extension and later adopted by the Land-Grant Colleges in USA to designate *the extramural work concerned with serving the needs of farm families* (FAO:1997). Thus extension essentially borrowed a didactic educational framework. In this process, following Paulo Freire's analogy, a farmer is viewed as an empty *account to be filled by the teacher* through a jug and mug approach. The supply-led green revolution adopted this model to strengthen its transfer-of-technology framework. Aid, subsidies, procurement, price-control, and state intervention were some of the tools that characterized the green revolution. Support for improvement in agricultural production technology was dominated by an "extension," or "technology transfer," orientation (Krueger et al, 1989:145). Cereal crops became the core of the green revolution. Without doubt, the green revolution resulted in impressive increases in production and productivity in many developing countries. The extension system received full support from various governments and international aid agencies to make the transfer of technology that spurred these increases. However, among the many criticisms of the green revolution and its extension model, their inadequacies in addressing poverty, gender issues and the environment have received particular attention. In the context of India Sulaiman and Holt (2002:29) argued that:

*“The basic issue underpinning many of these has been the lack of a clear articulation of what should be the role of extension in the Indian context. Public sector extension has to look beyond TOT (Transfer of Technology) roles. With the changing development agenda, extension in India will have to devise strategies for*

*facilitating poor to pursue broader livelihood options in on-farm and non-farm sectors so that their vulnerability could be reduced”.*

This argument is valid not only for India but for all developing nations. Allahyari (2009) also points that the “*conventional extension system cannot accomplish sustainability in agriculture; because today's agricultural extension must consider environmental implications, social issues, and overall economic growth within the agriculture sector.*”

Globalization has added a new dimension to the agricultural sector. By changing the conventional green revolution structures such as subsidies, procurement, price-control and state intervention , it has suddenly required millions of semi-literate and illiterate farmers in developing countries to face new challenges and opportunities. Singh and Sharma (2004) argue that agriculture has become more volatile, competitive, knowledge-led and market-oriented.

### **Horticulture and Extension**

While cereal crops enjoyed a substantial amount of protection in the days of the green revolution, horticulture in developing countries did not receive such support. Gopalan (1992) laments that the green revolution bypassed horticulture in many Asian countries. Therefore, horticulture was always competitive and volatile even in the pre-globalization period. There were no minimal price support, subsidy and procurement systems. In addition, operations in horticulture are generally more intensive than in agriculture. For instance, the wage costs of cultivating tomatoes in California are at least 4 to 7 times more per acre than for growing rice (Mann, 2002). This also implies a higher labour management cost. An interesting comparative study of the price spread for cereals and vegetables in West Bengal, India shows that the producer's share of the consumer price is much less for vegetables than for cereals and suggests that dis-economies of scale, lack of active markets, and other factors explain some of the inefficiencies in horticulture marketing (Table 1).

. Haji (2008) found a similar price-spread for vegetables in Ethiopia. Banana farmers in Kenya receive only 36% of price paid by the final consumer (Acharya and Alton 2008) Higher price spreads indicate higher transaction costs, weak infrastructure and asymmetrical information systems.

According to Minot and Hill (2007) horticultural crops which are “*perishable crops imply additional risk because their prices are more volatile, so the sale prices are more uncertain. The crops may get spoiled before sale; and, in the absence of competition, farmers don't have the option of returning to the market for better prices another day, so they may be forced to accept very low prices. A study of seasonality in Mali found that the off-season price was only 7 percent higher than the harvest price for rice and 40 percent higher for maize, but it was 100 percent higher for fruits and vegetables. Similarly, coffee prices in Uganda were found to be two and a half times as volatile as prices for staple crops like bananas and potatoes, making engaging in markets risky.*

The extension system that emerged out of the cereal-based green revolution had limitations in addressing the more volatile context of horticulture. Jowkar (2005) pointed out that agricultural extension has been inadequate for solving horticulture issues in Iran. In many green revolution economies of the 1950s and 1960s, forward-backward linkages were under the control of governments, which provided seed, fertilizers, credit, irrigation and, through procurement, a market. The extension

system operated within this framework and could respond to the farmers. However, the forward-backward linkages of horticulture have always operated (more or less) under open market conditions and extension systems have intrinsic difficulties in addressing the issues that these create. Deshpande and Prachitha (2005) argued that there is no institutional structure to encourage and develop the process of integrating the chain from grower to final destination. A review of agricultural extension in Ghana (The Neuchâtel Initiative, 2006) pointed out that extension staff are trained in production technologies, but do not have knowledge about relevant marketing issues and linkages.

### **From Extension to Innovation**

It is evident that the dynamics of horticulture require an extension system that is different from a conventional green-revolution, cereal-crop-based extension system. However, over the last three decades, scientists and development professionals have started challenging the fundamental concepts of extension. These challenges expand the concept of extension beyond farm productivity issues and relate it more widely to the facilitation of livelihood options in the primary sector. Some of these critics now avoid the term 'extension' system and focus instead on the 'innovation' system. The farmer is seen not as a mere consumer of information, but as a partner in innovation. Thinking in terms on an innovation system avoids the beneficiary-benefactor dichotomy.

This paper will deal with two such new approaches.

1. The first approach is Roling's (1988) perspective on extension, which has three dimensions: structure, institutions and process. These form the basic framework for extension. The structure consists of two systems: an agricultural knowledge system and an agricultural information system. According to Roling (1988), an agricultural knowledge system is "*a system of beliefs, cognition, models, theories, concepts, and other products of the mind in which the (vicarious) experience of a person or group with respect to agricultural production is accumulated*" (1988). He defines an agricultural information system as "*a system in which agricultural information is generated, transformed, transferred, consolidated, received, and fed back in such a manner that these processes function synergistically to underpin knowledge utilization by agricultural producers*" (1988:33).

He defines the process in terms of five crucial elements; mobilization, organization, training, technical support and system management. He stresses the need for an institution in terms of an 'active utilizer constituency', which "makes demands upon the system and can exert a leverage" (1988:146). Such an active constituency can force knowledge and information systems to serve the needs of its members.

2. The other approach of major relevance to horticulture is the Innovation System. Proposed by Hambly Odame et al (2007) and further refined by Pant et al (2008), the innovation system "*departs from earlier notions of a research-driven process of technology transfer and views it instead as a social process where different sources of knowledge and ideas are put into use*". The concept has two dimensions: the interaction of various stakeholders and the institution where the process is located, shaped by and responding to the relevant contexts. The process of capacity building is perceived in terms of its

ability to influence behaviour of the system and not merely *in terms of quantum of research or the nature of technology-transfer elements* (Pant et al 2008:8). The intersection that emerges from blending the system of innovation and capacity building reflects the capacity to innovate. Such a capacity emerges from two critical points: *managing divides between key public and private stakeholder,s and enabling process of interactive learning and innovation* (Pant et al, 2008:8).

Knowledge networking is vital in a self-sustaining innovation process and, as Pant et al (2008:10) argue, it *represents collective action of organizations and individuals in response to unpredictable economic, social, climate and environmental changes*. Horticulture has similar qualities and hence the archaic term extension should mean knowledge networking and not merely transfer of technology. Such knowledge networking can take place through the combination of four types of learning networks (Table 2).:

Based on this composite learning network Pant et al (2008:10) put forward the following interesting premise:

*“Within each type of learning network, knowledge conversion takes place from tacit-to-tacit, tacit-to-codified, codified-to-codified, codified-to-tacit (Nonaka, 1991; Nonaka and Takeuchi, 1995)). Tacit-to-tacit conversion takes place through socialisation; tacit-to-codified conversion takes place through codification or externalisation of tacit knowledge embedded with people’s habits and practices; codified-to-codified conversion takes place through systematisation or combination into a higher scale; and codified-to-tacit conversion takes place through decodification or internalisation to put codified knowledge into use. One or the other type of knowledge conversion takes place in a system, but an efficient system integrates all of these conversions to produce an upward spiral of learning networks. Here an upward spiral means that all four types of knowledge conversion begin at an individual, then at a group, organisational, network and system levels”.*

### **Commonwealth of Learning & Lifelong Learning for Farmers**

The Commonwealth of Learning (COL) is an inter-governmental organisation established by Commonwealth governments. Headquartered in Vancouver, Canada, its mandate is to create and widen access to opportunities for learning by promoting co-operation between Commonwealth educational institutions and developmental bodies with special emphasis on utilizing the potential of distance education/open learning and the application of information and communications technologies to education and learning. It has been focusing on Open and Distance Learning (ODL) as one of the strategies for adding value to the development process.

One of its initiatives, *Lifelong Learning for Farmers* (L3F), is an interesting application of Open and Distance Learning for Development (ODL4D) in Commonwealth countries such as Uganda, Kenya, Mauritius, Jamaica, Papua New Guinea, Indian and Sri Lanka. Banks, universities and marketing agencies are the partners in the L3F initiative. Using Open and Distance Learning (ODL) and Information and Communication Technologies (ICT), the initiative aims to strengthen the learning process among extension officers and farmers and create linkages between various stakeholders. The purpose is to improve the skill and knowledge of farmers and others in rural sector agro-enterprises in partnership with banks and financial institutions. L3F tries to add value to the development process.

L3F is based on the premises that:

1. Unexploitative, mutually reinforcing contractual relationships between rural producers and the formal public and private sector will promote rural entrepreneurship;

2. Learning and extension can be a self-sustaining process with secondary stakeholders supporting L3F within a win-win framework. For instance, by blending it with appropriate capacity building, rural credit would have a much better performance in terms of productivity, returns and non-performing assets (NPA) levels. These gains would lead the banking sector to support L3F.

3. Capacity building would also enlarge the market for bank credit among small and marginal farmers and among other marginalized section of the rural poor, particularly women

4. Modern information and communication technologies through structures such as rural internet kiosks, rural tele-centres, mobile phones and community radio,. can facilitate the capacity building process in a spatial-temporal context which is financially viable, economically feasible and socially acceptable.

The banks, microfinance institutions, ICT companies, as well as the rural poor, stand to gain if this hypothesis is proven and the banks, microfinance institutions and ICT companies can then deploy this strategy all over the country for enhancing their businesses. In addition to capacity building, banks and microfinance institutions could also use the ICT facilities to reduce transaction costs of lending. Integrating such strategies can help to build a framework for self-sustainability and self-replicability.

### **The Innovation System in the L3F Initiative**

Roling's Extension System has had considerable influence on the evolution of L3F. The concept of an active utilizer constituency helped COL to focus on social capital, particularly cognitive social capital, as an important pre-condition for success with L3F. His description of the process with the five elements of mobilization, organization, training (capacity building), technical support and system management became the framework for initiating ODL4D.

L3F does not merely provide learning materials to farmers. It aims at linking farmers with various stakeholders and focuses on enhancing their ability to negotiate with other stakeholders. This paper focuses on the understanding gained about knowledge networking in L3F initiatives in India. COL has been working with non-governmental organizations (NGOs), universities, colleges, farmers associations, banks and marketing agencies in Tamil Nadu, India. The focus on L3F in Tamil Nadu is on strengthening codified and tacit learning in an informal knowledge environment and linking it with formal knowledge environment to generate an upward spiral of learning networks. ODL is one of the important instruments through which the relationships and linkages are addressed.

### **Informal Knowledge Sources and L3F**

*Codified Learning in the Informal Knowledge Source.* COL emphasizes the importance of cognitive social capital in building the informal knowledge sources. In India its initiatives have helped to strengthen a micro-finance and self-help group association of 5000 women members and a farmers' organization with 600 members. Through specific mobilization activities, these organizations evolved into a codified

learning centre. COL has supported institutions such as VIDIYAL and the M.S. Swaminathan Research Foundation to help these organizations emerge as Village Knowledge Centres (VKCs), with local weather stations and legal conciliation centres. Data and information are collected on products, productivity, weather, market demand and supply and bank credit schemes on a regular basis. The farmers' association conducts seed germination studies and quality assessments of seeds. Through online information bulletins, street notice boards, newsletters and voice mail messages on mobile phones, information on such topics reaches thousands of women and farmers on a daily basis. The farmers' organization and the women's organization have been trained by COL in developing Open and Distance Learning materials. They have developed print-based and web-based learning materials on horticulture, animal husbandry and agriculture. More recently, audio learning materials for mobile phone based learning have been prepared in an ODL format and they are reaching nearly 2000 farmers and labourers every day. Formal meetings are organized to discuss various topical issues in agriculture, horticulture and animal husbandry. Both organizations have achieved a near self-sustainability with microfinance and marketing of horticulture seeds.

Through the process of building cognitive social capital, a codified learning network has been established. This process is strengthened by horizontal transfer of knowledge in a codified manner.

***Tacit Learning in the Informal Knowledge Source.*** Lifelong Learning (L3) is the informal and formal process of continuous learning. In particular it has the following characteristics (Baker, 2006): “*Non-formal learning is where learners choose what they want to learn, either inside or outside a formal organisational setting, may be one-off, voluntary and not credentialed; Informal learning enhances community capacity building through community ownership; learning for the love of learning, and happens through social and community organisations to meet the needs of individual learners with individual life circumstances*”.

Baker (2006) further points out that “*The concept of Social Learning Capital is created through interlinking social capital, informal lifelong learning and the idea of quality learning conversations. Social Learning Capital is the meshing of social capital and lifelong learning that reaches its potential through quality learning conversations*”

In L3F specific efforts have been made to strengthen the tacit learning network through *social learning capital*. For instance, farmers and women members have bought mobile phones through bank credit for learning through voicemail. They have been encouraged to share their learning with other members of the association using mobile phones. The mobile phone company has allowed free phone calls among group members. COL has helped the groups to develop a framework for quality learning conversations on the basis of which members share their learning experiences with others. These conversations are recorded and discussed in the codified learning network. In addition members regularly meet during community festivals. They also organize visits and picnics during which information and knowledge are shared. Community lunches and other social events are organized by the association. These activities provide a platform for informal exchange of information and knowledge.

***Linkages between Formal Knowledge and Informal Knowledge Sources.*** One of the important contributions of L3F is establishing linkages between formal and

informal learning networks. The participatory content and learning material preparation process fostered intensive interaction among actors from both networks. A consortium of agricultural and veterinary universities are involved in supporting the farmers' and women's association in developing business plans and purchasing materials such as seeds, animals and other inputs. The women's association assesses problems in a particular area, aggregates the queries and sends them through video emails to the universities. The designated professors in the university provide answers through video emails and these video emails are then stored in a digital library for the easy access of the farmers. Similarly, the FAQ system in the mobile phone based learning is also linked to the universities.

One of the colleges involved in L3F has mobilized a farmers association and has established a 'Light on the Wall' learning-cum-business centre where the association members and academics meet regularly to discuss issues. Libraries in the VKCs often subscribe to university journals and local newsletters use these materials in their publications. The basic premise of L3F is a win-win framework for all stakeholders and under this framework farmers' and women's association play an active role in the universities' field research. Similar linkages were created with financial and marketing institutions.

The reverse flow of contributing informal learning to the formal system also took place under the win-win principle. Data collected by farmers were used by universities for research activities, giving appropriate credit to the grassroots organizations. Under-graduate and graduate students of the universities undergo their field training under supervision of the farmers. Distance learning materials developed by the farmers association have been recognized by a university as textbook materials for diploma courses in agriculture and horticulture.

### **TRENDS OF L3F**

Since L3F initiative is still in the take-off stage, it is too early to call it a success. That would require a self-sustaining and self-generative system with secondary stakeholders such as banks and markets directly supporting the system as a win-win strategy. However, positive trends are emerging. The Central Bank of Sri Lanka, using the L3F and ODL4d perspectives, has launched an ODL programme for banking staff in Sri Lanka in collaboration with Open University of Sri Lanka. In India, a total direct and indirect investment of CAD\$ 50,000 has helped to generate credit and assets worth CAD\$ 1.3 Million in 400 households during the last year. Through L3F, around 400 women have managed to develop enterprises on goat rearing, fodder cultivation, floriculture **and horticulture**. One of the studies conducted by COL compared health and fitness of goats managed by members of L3F and by non-L3F people in the same region. An intensive study of animals in 30 households showed that the quality of animals among the L3F members was significantly better than in non-L3F households (Table 3).

Differences identified are statistically significant (except the triplet %) at 1% and 5% level. The horizontal and vertical learning through ICT-based ODL, the participation of the farming community in innovation and the linkages with the secondary stakeholders have helped to achieve these outcomes.

### **Conclusions**

The Lifelong Learning for Farmers initiative represents a paradigm shift based on the following premises:

- (1) *Extension is a facilitation process through which a community is empowered to manage agricultural knowledge systems and agricultural information systems.*
- (2) *Extension takes place in the context of already established social capital such as cooperatives, Self-help Group and associations ., which form a strong active utilizer constituency. Cognitive social capital is a precondition for lifelong learning.*
- (3) *The community is not a mere consumer of information but partner in knowledge management.*
- (4) *Facilitating Self-Directed Learning among the active utilizer constituency is an important dimension of L3F.*
- (5) *L3F and Learning for Livelihoods are the processes of community understanding and internalizing Value Premise Analysis, Value Chain Analysis, Value System Analysis, and Value Coalition Process in the primary sector.*
- (6) *In L3F, an extension agent (or agency) is one who facilitates the community level knowledge management and transforms social capital into social learning capital.*

Such an approach has the potential to revolutionize the horticultural sector in developing countries.

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Table 1. Producers share of the price paid by the consumer for selected cereal and vegetable crops.

No	Crop	Share of the Producer in Consumer's Price (%)
1	Paddy	100
2	High Yielding Paddy	100
3	Wheat	80
4	Spinach	40-50
5	Egg Plant	40
6	Cucumber	50
7	Sweet Gourd	28-33

Source: [http://www.ncap.res.in/upload\\_files/workshop/ws1\\_chapter8.pdf](http://www.ncap.res.in/upload_files/workshop/ws1_chapter8.pdf)

Table 2. Types of learning networks for knowledge networking.

	Codified Learning	Tacit Learning
Formal Knowledge Source	Codified learning networks of the public, non-profit, private and for-profit private sectors; Example: policy briefs, manuals, journal papers	Tacit learning networks of the public, non-profit, private and for-profit private sectors; Example: Social events, Tea time chats
Informal Knowledge Source	Codified learning networks of rural communities : Example Rural bulletin board, newsletters,	Tacit learning networks of rural communities: social events, labour exchanges

Source: <http://www.merit.unu.edu/publications/wppdf/2008/wp2008-069.pdf>

Table 3. Comparison of productivity information on goats raised by farmers using the L3L and non- L3L systems in Sri Lanka.

	L3	Non-L3
Mean Weight of Male Goats in Kgs	31.20	25.80
Mean Weight of Female Goats in Kgs	25.60	22.00
Mean Height in adults in cm	70.13	63.60
Mean Length of adults in cm	63.73	55.27
Mean Chest Girth of adults in cm	69.87	67.53
Kidding intervals (in month) per household	6.93	8.27
Total no of kids born per household	32.13	28.47
Triplet Kidding %	17.22	7.50
Mortality of Kids	2.20	7.67
Total Income from selling of goats per household	Rs.44407	Rs.24133

**Source: Consultancy Report *Goat Health Impact Study:L3 Goat Farmers Project of VIDIYAL, Theni District, Tamil Nadu , India* submitted by Henry Francis, June 2010**

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