A Model for Postharvest Extension in the Caribbean

Wayne G Ganpat

Abstract

Most farmers sell at farm gate, choosing not to engage in any significant way activities after harvesting. Since tropical crops are highly perishable, losses in the region have been consistently high. Farmers can significantly improve their incomes if they seek to reduce such losses. To achieve this, farmers as well as others involved in postharvest activities must be empowered with the latest technical knowledge and modern skills. The special characteristics of those involved in further activities along the value chain as well as the nature of postharvest technologies demand that an extension approach that is different from the traditional methods used to transfer production technologies. A model that seeks to promote extension for categories of clients based on the technical expertise available is proposed. When combined with the concept of clustering i.e. groups of farmers, processors, marketers, or exporters working with the same or similar commodities, this approach can be more effective. A system of mentoring and training to build extension staff capabilities is incorporated in the model for sustainability. Teaching activities based on the principles of experiential learning must have a stronger focus; discovery based activities in which learners are involved in action and reflection can bring about higher quality and more sustained learning. Such an approach, along with some of the traditional lecture/demonstrations is proposed. For this model of extension to be successful, it must be supported with increased training at all levels; tertiary level training for the development of postharvest Subject Matter Specialists and diploma level training to provide skilled technicians. Recommendations include curricula revision at all levels and both national and regional coordinated approaches for postharvest development in the Caribbean.

Keywords: Postharvest; Extension; farmers; processors; experiential learning

1. INTRODUCTION

According to Parfitt *et al*., (2010), food losses refer to the decrease in edible food mass within the fraction of the supply chain that specifically leads to edible food for human consumption. The “fraction” of the supply chain can be subdivided into the production, postharvest and processing stages. Postharvest operations include cooling, curing, handling,

storage, processing, packaging, transport and the market phase. Similarly, postharvest management is responsible for maintaining quality from production in the field to the vegetables being placed on a plate for final human consumption. Kantor et al., (1997) noted that losses occur in storage, as a result of insect infestations, mold, deterioration, improper transportation and handling, shrinkage (loss in weight or volume) due to poor packaging or simply with the passage of time. Additionally, produce quality can be negatively affected by extreme and uncontrolled temperatures which can result in deterioration, wilting and bacterial degradation. Adding to the array of conditions under which postharvest losses can occur, a typical food product is handled on average 33 times before it is ever touched by a consumer in the supermarket (USDA, 1996).

The losses associated with insufficient or improper postharvest practices application are difficult to quantify worldwide. This is more so true in developing countries where data acquisition is usually problematic. Even so, postharvest losses are not restricted to quantitative losses in value and output, but also in qualitative measures such as loss of caloric and nutritive value, loss of acceptability by consumers, and loss of edibility. While qualitative losses can be seen, it is complicated to approximate the loss in terms of monetary value (Kader, 2005). On the other hand, quantitative losses (output) can be estimated. Statistics USDA (1996), indicated that one-third of the food produced in the world goes to waste, representing 1.3 billion tons every year. In the USA, losses of fresh fruits and vegetables are estimated to range from 2% to 23%, with an overall average of about 12% losses between the production stage and final consumption (Ceponis and Cappellini, 1983).

In developing nations such as the Caribbean region there is wide variability on a number of factors which affect postharvest losses. Extremes in rainfall, wide variation in humidity, and fluctuations in labour availability at critical times, poor road infrastructure, and access to electricity and water for sanitation on farms are just some of the factors that are responsible for losses as products more from farmers' fields to consumer plates. Some of the other factors that are known to be responsible for losses in perishable crops in the region includes; seasonality, the crop type and variety, location of farm within a country and market facilities and the type and quantity of postharvest treatments done. Other variables such as temperature, moisture, atmosphere, light and gravity, disease and insects affects produce weight, internal quality (e.g. texture), and external appearance (e.g. wilting).

The consequence of such losses means that a significant portion of food produced is not available either for sale or consumption. Farmers have less produce to sell, market prices are higher and consumers have less to purchase. Because fresh fruits, vegetables and staples have been shown to be more nutritious, if Caribbean populations do not have sufficient access, in terms of availability and affordability, then the region's food and nutrition security is at risk.

While regional food and nutrition security are grave concerns of governments and efforts are being taken on several fronts to ensure some level of security, much more need to be done with the primary producers and primary produce handlers along the route from farm to plate.

Huge losses negatively impact farmers' incomes and often their motivation to produce. Such huge losses encourage middlemen to add significant mark up on products destined for fresh markets e.g. municipal markets and road side stalls. Consumers pay high prices for lower

quality products in the market place; product which are low in nutrition and taste, have poor appearance and usually have pesticide residues on them.

While researchers seek new methods and techniques to address this situation, if food producers' education and training in postharvest practices do not match these efforts then the desired outcomes of reduced postharvest losses are not likely to be achieved.

Given the magnitude of the problem and its importance to food and nutrition security, efforts are required on all fronts. This paper focuses on the education and training of all involved in postharvest activities; the need to critically examine our present extension approach and formulate a new extension strategy that is based on successful experiences worldwide.

1.1 Present Situation

Extension for postharvest activates is done generally as an after-thought to production practices. It is generally done by public sector extension service providers who have little or no specialized training in the area. Few formal training courses are offered either by the government training centers or by tertiary level education centers.

A specialized extension service for postharvest is non-existent. In such a situation, farmers have no choice but to apply their best experience and try to solve problems on their own or they may consult with other farmers. Whatever the actions taken over the years by the farmers, it is clear that the desired results are not being achieved. The situation demands an alternative extension and education approach. Such a system must be adaptable to fit the different circumstances across the region, yet robust to with stand changing country and international realities.

The present reality is that in most countries extension is public sector driven; staffed by extension officers who are trained as “generalists” i.e. to treat with a host of problems that a farmer may have for the multitude of crops and livestock types that may be on-farm. Moreover, their focus is on increasing production on the farm. Such officers have little or no technical backstopping when they encounter postharvest problems as specialized officers for postharvest are almost non-existent in the region and the few at tertiary level organization simply cannot respond adequately to all the problems regionally. In addition, the methods of training food producers are limited and consist mainly of farm visits and group- based training activities using the instructional type techniques to information dissemination with no real major attempts to reexamine and modify them in light of modern extension learning techniques for postharvest extension and education.

Before an alternative model can be suggested a review of systems and approaches available worldwide must be done. Only then can an approach be suggested that is contextually appropriate for Trinidad specifically and generally appropriate for other countries in the region.

1.2 Worldwide efforts to reorganize

Changing realities in the marketplace have forced extension systems to adapt. The shift away from consumption in primary form to an increased demand for value added products that are ready to eat has meant that greater attention has to be placed on postharvest activities. Kader (2005) highlighted several strategies undertaken by developing countries to reduce postharvest losses. These include: the application of current knowledge to improve the handling systems

(especially packaging and cold chain maintenance) of horticultural perishables and assure their quality and safety; overcoming the socioeconomic constraints, such as inadequacies of infrastructure, poor marketing systems, and weak Research and Development (R&D) capacity; and encouraging consolidation and vertical integration among producers and marketers of horticultural crops.

In the Caribbean region, the shift away from production of primary products for exports, for example, banana and sugarcane, to production for local consumption to an increasingly more sophisticated and discriminating consumer and for export to niche markets overseas demand an additional focus on post production education and extension. An unresponsive extension system must be jump-started into action.

2. REVIEW OF EXTENSION SYSTEMS WORLDWIDE

Information dissemination through agricultural extension has played a vital role in the spread and utilization of improved agricultural technology and management practices (Swanson, 2008). Existing extension approaches and systems relevant to this discussion include:

1. Traditional Models: these are supply-driven, top-down in nature, include the training and visit (T&V) approaches, and are generally financed by Governments and donors.
2. Private extension services: Provided by private extension agents and financed by the farmers, cooperatives, or NGOs.
3. Cost recovery or cost sharing approaches: the provision of extension that is co-financed by the users, government, donors and other funders.

4. Pluralism: the situation in which there are multiple providers of extension services. This service no longer being the sole domain of government or state.

No one model is the “magic bullet” and each model is evolving in response to new realities and emerging opportunities (Nkonya, 2009).

2.1 Traditional models

Approaches that are Top Down in nature are characterized by technology transfer from sources of knowledge to users of such knowledge. The Training and Visit (T&V) system is a classic example of this approach. In Top Down approaches, the recipients of knowledge become dependent on the provider and are not empowered to seek solutions elsewhere, even from their own rich experiences through reflection and action. Moreover, they have come to expect such service for free and are generally opposed to any thought of paying for such a service. Top Down approaches in a sense tend to create a dependency on government extension.

In situations where the government extension is unable to deliver the quality and quantity of information needed by food producers in a timely manner, this approach must be re-evaluated.

2.2 Privatization Models

Developed countries have privatized some if not all of their extension activities starting in the 1990s. In this model, farmers pay for most if not all of the cost for the provision of the service. The Netherlands, Germany, the United Kingdom and Denmark have all embraced this

approach. Some developing countries, for example, Chile, Ecuador, and South Africa which can be classified as mid- income countries have also embraced the model of privatized extension.

Based on the experiences in these countries, the International Monetary Fund (IMF) and the World Bank demanded at one time that countries seeking their assistance privatize their extension services. The jury is out however on whether wholesale privatization of extension services is the solution. While there have been successes, there have been great resistance and failure in many countries. Countries in the low- income range and with multitudes of small limited resource farmers who operate on diverse, complex and risk- prone environments have resisted wholesale privatization of these services which they consider essential to their economic survival. Most of the countries in the Caribbean would fall into this category. Several researchers are documenting the privatization of extension in Uganda but the financial sustainability of privatized extension has not been fully settled (Anderson, 2007).

Such fee-for-service extension models are usually associated with high value commodities in highly organized or mechanized systems of production. Usually in fee-for-service extension models, there is some level of state- granted subsidies for the service in the initial stages. Consultants who provide services are usually experts in the field and the quality of advice provided is usually high and encompass all aspects of production, including value added activities and marketing. While Consultants may be full-time private providers, in some countries, public officers with specialized knowledge are allowed to function as paid consultants on a part-time basis.

2.3 Cost Recovery Model

Some developing countries have embraced the system in which users pay part of the cost associated with provision of the extension service. In this system, the farmer is expected to pay some of the cost of extension with the aim of achieving cost recovery in the public extension system (Anderson and Crowder, 2000). Such fee for service extension is usually provided by qualified persons and paid for by the farmers. Single farmer or groups of farmers can contract the services of a provider of their choice. While this model has had success in developed countries, it may have difficulties in countries with struggling economies; farmers may be unable to pay. Notwithstanding, it may be appropriate for some categories of farmers in developing countries. Farmers who wish to sell at farm gate or those who sell out their produce while it is still in the field may not be included to pay for postharvest extension. However, middlemen, who are most often farmers themselves who purchase products directly from farmers for later resale, may be more inclined as the benefit for them in reduced postharvest losses will be greater.

Moreover, if postharvest extension and education is available at a cost and can be assured, it may encourage entrepreneurs to enter the food production chain at the postharvest stage. Enterprising business folk, young agriculture graduates can develop a plan for taking produce from primary producers to consumers with minimum loss of quality and quantity. The cost of the extension service should be factored into the entire business plan at preparation.

2.4 Financing Extension Service

Some developing countries for example Ghana and Tanzania have experimented with an approach which allows for the pooling of funds from which participating farmers can draw on to pay for extension services from providers of their choice.

This approach has potential in the region to work through the national farmers associations. In Trinidad, two such associations, the National Food Crop Farmers' Association (NFFA) and the Agricultural Society of Trinidad and Tobago (ASTT) may be positioned to be the location where funds can be pooled. This will require some definite structure and perhaps external intervention to set up a system for its administration.

In summary, the key features of a modern extension system are that: i) there are several extension service providers which include the state, farmers' associations, private companies, and individual consultants; ii) that they are highly organized with clearly defined structures and clear roles and responsibilities and; iii) that there is payment at some level for the provision of the extension service.

All innovative ideas and programmes are inherently risky, but must be seriously considered and tested if we are to build experience and move forward. The challenge is to find the appropriate ingredients from all the models worldwide and to reconstitute them into a model that contextually fits us best in the region given all our challenges as we try to reduce postharvest losses.

The table that follows shows the range of systems for paying for extension, ranging from full payment, through cost sharing and then free state-funded service as in the Caribbean region.

Table 1: Privatization and commercialization of extension services in selected countries

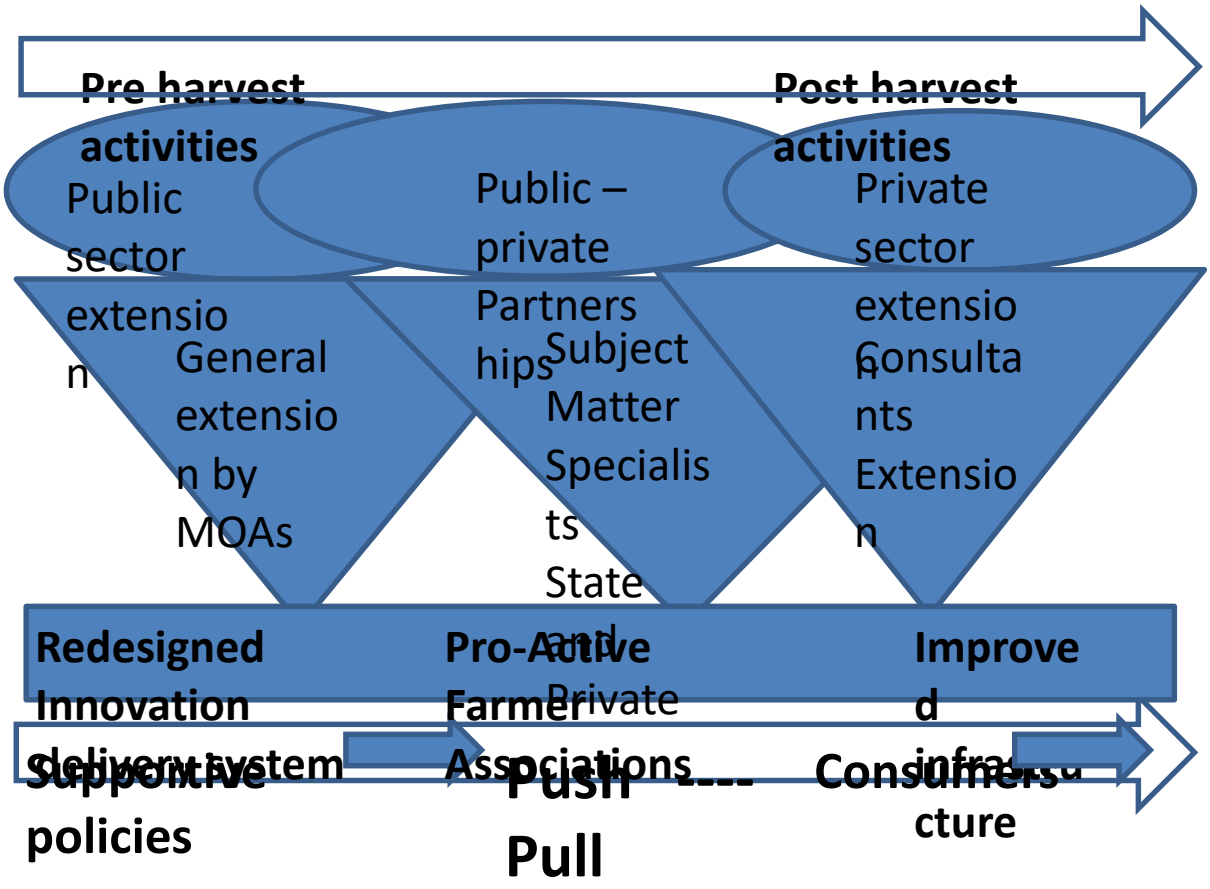
Countries	***Forms of Extension systems***
New Zealand	Complete commercialization/privatization of public extension
Germany	Many models in different states: Completely privatised, semi-privatised, subsidised farmers' associations; voucher system.
Netherlands	Increasing cost recovery from users.
Ireland	Increasing cost recovery from users.
USA	Subsidised extension through higher education institutions. Current privatization models vary from a complete withdrawal of state interventions to a commercialization and cost-recovery approach.
Turkey	Cost sharing of advisors.
Chile	Sub-contracting and voucher system.
Costa Rica	Voucher system targeted at small-farmers to contract private extension.
Denmark	Extension services rendered by farmers' organizations; 90% cost recovery.
Ecuador	Sharecropping between farmers and extension staff for a profit.
Ethiopia	Privatised service centres
Kenya	Extension associated with contract out-grower schemes.
China	Contracting of Subject Matter Specialists by farmers' groups.
Caribbean	Extension system publicly funded

For us in the region, some of the lessons we can learn from international experiences are that we should: lessen sole reliance on the public extension service; embrace other forms of extension service delivery systems; consider paying for some or all of the extension service; call on Farmers' Associations to play a greater role in the area; and seek to coordinate efforts nationally and regionally.

3. THE PROPOSED MODEL FOR POSTHARVEST EXTENSION

Any model that is proposed must be based on some key considerations mainly focusing on the quality and quantity of providers and the value attached to the service by the intended beneficiaries.

Given the peculiar circumstances of extension services in the region, their objectives, strengths and limitations, a mixed system approach is proposed to provide postharvest extension along the entire span of the production and post production chain. The front line extension staff in the region are generally well trained in production technologies but limited in post production training and expertise. These are some postharvest Subject Matter Specialists scattered across the region and a few experts in the region, usually associated with the institutions of higher learning. Information and communication infrastructure is generally good in most countries and in the Caribbean.



In the production phase:

- Most general extension staff are very good at transferring production technologies. They must however be supported by Subject Matter Specialists (SMS) to provide any specialized technical information needed by farmers.
- Some production practices have a direct impact on post production activities and actions taken in the production phase may limit the set of actions that may be applied postharvest. SMS will be instrumental to guide general extension in these technical areas.
- General extension is well suited for this phase since it involves all farmers whether they sell at farm gate or are involved to any extent in post production activities.

In the post production phase:

While general extension may be involved, this phase should really be the domain of specially trained postharvest extension staff. They may come from public or private in which case they are paid for their services.

- Specialists may be well suited for this phase since they have to deal with a lesser number of farmers and can work through groups organized by the national farmers' associations.
- These SMS can adequately provide the information required for the better treatment of produce from the farm gate to the point of sale.
- The role of general extension in this phase is really on- the- job training to build their technical capabilities in postharvest extension. They can be mentored by Subject Matter Specialists. When they take action however, they should be technically back stopped by experts in the field. Such expertise is usually available at the tertiary level institution, for example, the UWI and the UTT.
- General extension staff through training and experience should have a career path that leads them to become junior SMS. By even further training and experience they can aspire to become SMS in their own right. This is important for sustainability in the system.

For export:

In this area, very specialized information is required and the experts should be the ones to provide this service. It should be a formal fee-for-service arrangement, since export marketing is a business venture, and information has a cost. The experts at the UWI, national universities and regional organizations should take the lead tin this area. Notwithstanding, they can also train and mentor SMS who after a period should be able to assist in this specialized area of postharvest activities.

Methods of training

A new approach must be matched with modern methods of teaching and learning. In this regard, all service providers must embrace and use experiential learning principles and practices to present postharvest technologies for adoption. Reflection and action techniques and on farm demonstrations must be more pronounced in their toolkit of training activities.

The use of modern Information and Communication Technologies (ICTs) must also be enhanced. In the Caribbean there is good ICT penetration and increasing capacity, and this must be used by service providers to get information out to clients on a daily, if not more regular basis. Time is critical in postharvest work and the use of ICTs can geartly assit in promoting these technologies.

4. CONCLUSION

Postharvest extension must be given higher priority nationally and regionally to meet growing demands for nutritious food, year-round at affordable prices. Reducing postharvest losses through extension and education can help in this regard. The public sector is limited by the set

of actions that can be taken to meet this goal therefore public-private arrangements should be examined and where appropriate implemented so that all food producers can have the type and quality of advice that they need to reduce postharvest losses. Some type of stratification of food producers based on their level of commercialization will be necessary in order to efficiently assign scarce extension and education resources. Support systems must also be put in place to guide research and development and to coordinate interventions both at the nation level and the regional level.

5. RECOMMENDATIONS

- Ministries of Agriculture must formally include postharvest in the scope of work for extension and annual programmes of work should reflect this.
- A set of formal in-service training programmes at the national and regional level should be developed and executed to upgrade the technical capacities of extension staff in the area of postharvest activities. This could also promote the development of a cadre of consultants who are well trained and able to operate either individually or as small groups of consultants for hire.
- Some specialized courses should also be developed to keep SMS up to date with latest technologies in the areas. The Universities, both regional and national should take the lead in this training intervention.
- In the short term, an inclusive advisory board should be established comprising of food producers, middlemen, government officials, representatives of farmers' associations and experts which can get extension and education for postharvest going. A coordinated

effort would ensure quality of service and avoid duplication of efforts in a pluralistic extension provision system.. The board cam also lobby planners for the inclusion of postharvest education material to be included in the curricula of both the primary and secondary level schools as a component comparable to the that of the production aspects. It should also lobby for a much increased presence in the curricula of the tertiary level institutions.

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