Characteristics of successful extension education programs: Dairy examples from the University of Maryland Extension

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Abstract: *The purpose of agricultural extension education is to transfer knowledge, technologies, and methodologies to farmers so that they can make informed decisions. It also facilitates farmer to farmer interactions in pursuit of community goals for increasing farmer income and family living standards, protecting natural resources, and improving national food security. Educators and researchers work with farmers to improve efficiencies in the food sector resulting in increased food production per unit of input and/or reduced food cost to the citizenry which justify expenditures on agricultural extension education. To achieve these purposes, basic principles common to successful extension programs need to be in place.*

Successful extension programs are demand driven with systematic development that leads to desired outcomes and impacts. They are geographically decentralized among various research and education institutions to extend knowledge to the farmers and to adapt to local agricultural enterprise, soil types, topography, and climate. Successful extension programs are conducted by well-qualified and trained educators and researchers who are organized into multidisciplinary teams led by effective leaders. These teams utilize research across disciplines along with sound pedagogical methods to facilitate learning and application to meet community needs and maximize the contributions of participant expertise to the learning process. Additionally, successful programs incorporate the expertise of private organizations without competing with them. The extent to which each of these characteristics is realized has a significant impact on whether the extension education programs can fulfil the purposes for which they are created.

Keywords: *successful extension education program characteristics*

Introduction

The purpose of agricultural extension education programs is to transfer technology and knowledge to farmers, advise farmers in their decision-making, educate farmers so that they can make their own decisions, and facilitate farmer to farmer interactions as they work together in pursuit of community goals. This in turn, will increase farmer income and family living standards, protect natural resources, and improve national food security (Feder et al., 1999; Swanson, 2008).There are operational characteristics that are common to most successful extension programs. This paper shares characteristics of successful extension education programs as illustrated through examples drawn from University of Maryland dairy extension programs.

The Maryland Dairy Situation

The state of Maryland is characterized by urban development driven by the Baltimore and Washington D.C. metropolitan area. Agriculture is still an important economic driver and dairy production is one of the primary agricultural enterprises. Development pressures on land values and environmental constraints are making it increasingly difficult to produce milk economically. Expanding the farm or replacing depreciated facilities is not an option for most small dairy farms. Unless economical alternative methods of production are implemented, many dairy farms will cease operation. University of Maryland dairy extension programs over the last two decades have helped to mitigate the decline in the number of Maryland dairy farms.

Theoretical Background

In response to criticisms regarding low efficiency and lack of equity in extension agencies, Alex et al. (2002) reviewed past investments, current trends, and future issues of World Bank financing of agricultural extension in rural development. In addition to identifying eight generic problems inherent to extension systems, they also identified fourteen guiding principles of good practice in the development of national extension systems. They organized these principles under four headings.

First, they highlighted the importance of government support in extension, but indicated that this support should be made within a sound policy framework and it should be based on clear national strategies. In addition they discussed economic efficiency so that outcomes justify the investment. In terms of government support they also stressed that there must be equity in the availability of services for all demographic groups.

Second, they identified the need to strengthen demands for extension services. One way this can be done is by strengthening producer organizations in identifying needs and interests so that priorities can be demand driven. They also focused on the need to empower and draw on local people to mobilize their resources and solve problems. Additionally, they indicated that responsibilities should be placed at the level of government closest to the people that would benefit from it to improve organizational competency and efficient use of funds.

Third, they need for quality services was stressed. They indicated that this includes accountability for use of funds and for results. They also indicated that extension services needed to be relevant to different categories of clients. Involving a range of institutions to provide a range of service providers for improved operational efficiency and accountability was characterized by his principle of plurality. They also stressed the importance of a results-driving orientation with well-monitored and evaluated impacts.

Fourth, Sustainable systems were highlighted. These systems had to be based on the capacity of local clients and institutions of continuous learning and problem solving. Cost sharing by major stakeholders was critical for continuance when initial funds were not renewed. Finally the ability of stakeholders to develop political support to secure future financing was stressed.

While these principles were applicable at the national level in regard to financing, it was unclear whether or not these principles could also be applied to individual extension programs and to elements beyond financing that were relevant to the program.

Method

To examine this question, the authors identified a number of dairy extension programs carried out in Maryland that were deemed successful. In order to be included for consideration, a program had to have been in place for a minimum of two years and/or to have reached more than 100 individuals. Additionally programs needed to have evidence gathered from participants as to its effectiveness in meeting the program's stated goals.

Each identified program was examined. The collective experience of those conducting the program, participants involved in the program, and any data or publication resulting from the program were considered in this analysis. The first author was directly involved with most of the included programs and was therefore able to provide details about programs not available in written documents. The goal was to determine the extent to which Alex's principles applied. In the process of this analysis, characteristics not applicable to these principles were also identified. These additional characteristics were compared to key elements to successful programs presented in two additional articles (Akridge, 1992; Place, 2001).

Results

This examination resulted in the identification of 10 Characteristics of Successful Extension Education Programs.

- Demand driven.
- Systematic development.
- Geographically decentralized.
- Qualified and well-trained extension educators and researchers.
- Effective leadership.
- Research based.
- Interdisciplinary.
- Sound Pedagogical Methods.
- Reciprocity
- Non-competitive and pluralistic.

Some of these characteristics confirmed program level relevance of Alex's (2002) national system level principles for individual programs. However, other principles presented by Alex (2002) needed to be modified to better reflect the smaller scale of extension projects. Finally, additional principles, common across all successful programs, but not encompassed by the national guiding principles, were identified. Language was then adopted to clearly articulate each characteristic.

The following sections present a discussion of each of the characteristics that were substantiated by this analysis. It also provides illustrations drawn from the programs examined.

Demand Driven

Educators and researchers communicate directly with farmers to learn what specific technologies, educational programs, and advisory services are needed. Extension must be driven by the demand of farmers for educational training workshops and improved technologies. This is the most important principle. If farmers do not perceive that extension is improving their businesses and their lives, then they will not use it or support it and it will fail. However, when farmers see that an agricultural extension program is meeting a real need and experience improved outcomes, they will become effective advocates for that program. Besides the private benefits to farmers, public benefits include increased tax revenue from agricultural production and reduced food prices to consumers. All benefits can also be used to help justify government expenditures on extension education.

Agricultural extension programs should make a dedicated effort to understand the needs of farmers by using a variety of techniques including formal or informal surveys with individual farmers, rural appraisals of communities, interactions with farm organizations and associations, and scientific analysis of technologies. These assessments are most effective when conducted by local agricultural educators in collaboration with the research institutes and universities.

In 2006 a needs assessment was conducted of the Maryland dairy industry (Wilson, et al. 2006). Dairy farmers in the state received a survey designed to determine strengths and weaknesses in housing & cow comfort, herd health, milking procedures, breeding, nutrition, feed storage, crop production, nutrient management, machinery management, labour management, business management, economic & financial management, access to services, and credit. This needs assessment resulted in many demand driven extension programs. Some of these programs are highlighted in the following sections.

Systematic Development

Once the demand for information or training has been determined, an extension education program to address that demand must be developed. To guide the development of and evaluate the success of extension programs, the Program Logic Model, which has been adopted by many extension services in the United States, provides a robust framework. (Taylor-Powell, E. & Henert, E., 2008) This model involves identification of inputs, outputs and outcomes-impacts.

However, as a precursor to using the actual Program Logic Model framework, the current situation must be described. This is important for two reasons. First, context matters. The

resources and limitations present will have a direct impact on what and how programs can be implemented and must be considered. Second, a description of the current situation forms the baseline against which any evaluation must measure its success.

With an understanding of the current situation, extension education program developers must then identify the desired outcomes or impacts of the program in the long, medium and short term. Long term outcomes should consider the desired goals of the program. These long term impacts come about as the result of specific behaviours, practices, decisions and/or policies that are desired in the medium term. Short term outcomes in regards to changed awareness, increased knowledge and/or skills is the stepping stone to those medium and long term outcomes. It is important for program developers to state all levels of desired outcomes/impacts in objective measureable terms.

Having defined short, medium and long term outcomes, program developers are then able to use backwards design in determining needed inputs in terms of time, money and other resources that will be invested in the education program and the outputs desired. In the Program Action Logic Model, outputs are divided into activities and participants. Activities are the actual tasks that will be undertaken by the developers. Participation involves the stakeholders or individuals to be served or engaged--how stake holders will become involved in the program.

An example of this program development process using the logic model is illustrated by a Maryland extension dairy program developed by the first author (Johnson, 1994-2006) to teach dairy farmers computerized financial record keeping (fig. I). This successful extension program was conducted over twelve years beginning in the 1994. A goal of the project, as seen in the outputs was to train 160 dairy farmers. That goal was met and the project was expanded to other types of farms. The first author eventually conducted 61 workshops to train 663 farmers. Through on-farm visits and telephone conversations, follow-up support was provided for 375 of those farmers.

Current situation: Dairy farmers generally do not keep good financial records. Their skills and training are not in this area and their interest is in production agriculture rather than office work. Record systems range from the most rudimentary "shoe boxes" of deposit slips and sales receipts to ledger books. The main goal of these systems is to complete required tax forms rather than use financial records to drive management decisions for the farm. The advent of inexpensive personal computers and simple-to-use computer financial record-keeping software provides an opportunity for farmers to keep better financial records that will allow for easier tax preparation and make more informed economic and financial decisions. Extension can provide the training farmers need to make this transition.

Inputs	Outputs		Outcomes-impacts		
	Activities	Participants	Short term	Medium term	Long term
What we invest: Existing financial fact sheets. Development of Quicken dairy record keeping training materials. Community college computer labs. Team teaching - farm management specialists and extension educators.	**What we do:** Two 3-day workshops in each of four dairy counties – Carrol, Frederick, Washington, Garrett. Follow up telephone consultations as requested. Follow up on-farm consultations as requested.	**Who we reach:** 20 farmers in each of the 8 workshops. Telephone conversations with 20% of the participants. On-farm consultations with 10% of the participants	Farmers successfully complete the dairy case study example on computers. Farmers learn the concepts of solvency, profitability, and liquidity. Farmers understand how to tie income and expense categories to tax statements.	Farmers purchase computers and Quicken program. Farmers transition from paper record keeping to computer record keeping. Farmers develop balance sheets, income statements, cash flow statements, and tax statements for their farms.	Farmers better understand the solvency, profitability, and liquidity of their farms. Tax preparation is expedited through computer record keeping. Farmers make informed economic and financial decisions that improve their farms.

Figure I. Logic model development of the Maryland dairy financial record keeping extension program

Geographically Decentralized

A basic principle of extension is that education and improved technologies are "extended" out to farms and businesses which also leads to the decentralization of research. When research takes place across various public and private institutions, technologies can be developed that

are specific to different geographical locations. In addition, spreading extension research among research institutes, experimental stations, universities, and colleges that are geographically dispersed among major agricultural areas gives them a presence in the farm communities that will benefit from that research. It also results in extension educators who live and work in rural areas where they are better able to understand farmers' needs and situations. It is important to successful extension education programs to have agriculture educators in all areas in which agriculture is important. In regions where agriculture is sparse, educators can cover larger areas. These educators are the liaisons between the institutions and the farmers. They can communicate the problems of the farmers to the institutions and facilitate the transfer of new technologies from the institutions to the farms.

The United States is the oldest example of this model with a Land Grant University Extension system in each of the 50 states and also additional territories.

Maryland provides a typical example of this Land Grant system that geographically decentralizes extension programs. Two Universities anchor the system, the University of Maryland at College Park (UMD) (https://extension.umd.edu/) and the University of Maryland Eastern Shore (UMES) (https://www.umes.edu/Extension/). The College of Agriculture and Natural Resources (AGNR) at UMD and the School of Agricultural and Natural Sciences at UMES administer the Extension programs. There are seven UMD Research and Education Centers (research farms) located throughout the state which allows for diverse research based on site specific characteristics including soil types, climate, topography, and typical agricultural enterprises. There is a UMD extension office in each of 23 counties and Baltimore City. Each of these extension offices house UMD faculty members with expertise in agriculture & natural resources, family & consumer sciences, and youth development. Extension specialists and researchers at UMD, UMES, and the research farms team with county-based faculty members to carry out the applied research and education programs tailored to diverse clientele across the state.

Qualified and Well-trained Advisors and Researchers

Extension educators and researchers need to exhibit the following qualifications to effectively plan and conduct farm education programs and projects. These qualifications should be used when hiring educators or considering researchers for extension work:

- Have a sincere desire to teach others and help solve problems facing farmers.
- Relate well to the agricultural community, working as partners with the community to increase agricultural profitability and productivity.
- Exhibit good teaching and presentation skills for farmer audiences.
- Use teaching methods that will motivate users to apply new learning. Lectures are often the least effective way to teach. Educators should use case studies, discussion groups, problem-solving examples, and hands-on projects to help participants develop the deep understanding needed to not only use, but to adapt new learning to their own farm situation.
- Possess strong general knowledge in many areas and have specific expertise in a few areas. They should be able to apply both general knowledge and expertise to real world problems and participate in multi-disciplinary projects.
- Educators should be interested in conducting applied research and demonstration projects and conveying the results of this research to farmers.
- Researchers should be skilled in applying their specialized knowledge in local situations. They should understand how their information, methods, and knowledge can be used in multi-disciplinary projects and systems approaches. Where possible, researchers need to be committed to making the connection between basic research and applied research.
- Both local educators and researchers should constantly seek to upgrade their technical expertise and skills.

For many years a standard educational requirement for a Maryland extension educator or a field specialist was a master's degree in addition to bachelor's degree. A high premium was placed on individuals with the skills listed above who would "stick around" and "be in it for the

long haul". A decade ago, the education qualification began trending toward a "Ph.D. or terminal degree required" on the assumption that additional education would make a better educator. This has recently been challenged.

The primary role of an agricultural educator or field specialist is to educate and transfer knowledge to farmers. While these extension workers often conduct applied research or demonstration projects, their main purpose is that of educator, not researcher. Requiring a terminal degree may eliminate candidates with the above qualifications who may be more qualified with respect to practical skills and applied knowledge than a candidate with a Ph.D. Experience in Maryland has shown that extension educators and field specialists with a Ph.D. are more likely to move on to research positions in academia or industry leaving vacant extension positions that need to be filled more frequently. This problem is compounded by learning curves for every new employee as they need months and sometimes years to grow into the position and become effective extension workers. During the writing of this paper, the job description for a vacant University of Maryland extension dairy field specialist was edited to eliminate the Ph.D. It is anticipated that many new extension positions at the University of Maryland will no longer require a Ph.D. The most important thing is to match the position qualifications and requirements to the extension job that needs to be done.

Effective Leadership

The development of each extension education program requires leadership. An effective leader coordinates and facilitates extension educators and researchers as they develop and deliver an extension program. However, this does not mean top down leadership from the formal institutional leadership structure. Effective program leadership often begins at the "grass roots" level with educators interacting in the local community to determine the needs of farmers and rural businesses and taking responsibility for developing an extension program to meet those needs. This will translate to collaboration involving extension educators and researchers in a team effort. It is the job of the team leader to make sure the team follows through from planning to completion of the extension program. The following are some of the responsibilities of the team leader.

Team Formation: Selecting or recruiting individuals with the necessary knowledge and skills who can effectively work together is a critical component of program leadership. While the majority of these individuals will be extension workers (educators and researchers) selected for their subject matter expertise and extension abilities, leaders should also consider farmers or agricultural industry representatives. Inclusion of local stakeholders can provide important insights and form the link that will help the program more effectively reach those it aims to serve.

Plan Development: It is easy for a strategic plan to become overly complex as numerous considerations are brought forward. Program leaders must provide guidance as the team considers all variables and decides which components will be most critical to the development of a successful and appropriately focused plan. The use of the Program Logic Model as described above can facilitate this process.

Obtaining Funding: For any program to be carried out, appropriate funds must be available. Program leaders need to be aware of and/or seek out funding sources. While other team members may be of particular help in this area, leaders make sure that whatever actions are needed to secure and oversee funds takes place.

Meeting Facilitation: Leaders identify topics for meeting agendas ensuring that key decisions are made as programs are developed and implemented.

Timetable Management: Follow through on all aspects of any project is needed for effective implementation of extension programs. Program plans should include a timetable for key tasks. Leaders must be aware of these deadlines and keep the team accountable for meeting deadlines necessary for the successful implementation of the plan.

Evaluation: Leaders should not wait for summary evaluation of the program outcomes/impacts. Ongoing monitoring of success of each program component allows the

leader to help the team identify emerging problems before they become critical. Leaders can then engage the team in important problem-solving to correct difficulties that could endanger the success of the overall program in a timely manner.

Coordination: Many extension programs are multi-faceted and complex requiring collaboration among several individuals over time. Even short-term projects generally require a great deal of coordination. Leaders recognize these complexities and work with individuals to ensure that efforts are neither duplicated nor forgotten.

Communication: Leaders are constantly involved in communicating with all those involved in a particular program so that all are informed of key information, expectations, and opportunities. Leaders also engage in communication between those involved in the project and those outside of the project who are interested in learning from it for the purpose of incorporating that input into their own extension programming.

Reporting: Leaders often assume the responsibility of reporting on the success of the project. Such reporting may involve developing an annual report on the activities and outcomes produced by the agricultural extension program, justifying the financial and other resources uses, and publishing.

The first author led the development of the "PRO-FARM Leadership and Management Training" for dairy farmers (Hanson, J.C., & Johnson, D.M., 1994, revised in 2009). The objective of this Extension program was to help farmers improve their management skills so that they will be able to develop and implement strategic and tactical plans to improve productivity, increase profitability, and fulfil long-term aspirations. This 12 hour workshop spread over two to four days taught dairy farmers to use many important tools that improve their management skills and increase the survivability of their farms. Dairy farmers were introduced to the concepts of leadership, management, proactivity, and paradigms. They learned how to use mission statements to set the direction for their farm business. They learned how to do an effective needs assessment and strategic planning. They learned the decision making process of problem identification and diagnosis, generating alternatives, analysing alternatives, planning and controlling. They also learned time management skills. Johnson served as the chair of the PRO-FARM Leadership and Management Focus Team which developed the program and materials. Johnson authored and edited most of the course materials. Train-the-trainer seminars were conducted for Extension faculty. Because of this in-service training, the Extension faculty played a major role in team teaching these workshops with Johnson as the primary educator. Fifty-three workshops and were conducted for 815 participants. A sample of 71 workshop participants were surveyed to determine the impact of the PRO-FARM program. As a result, 76% of participants indicated that they were able to differentiate between their leadership and management roles in their operations; 56% reported that they had changed paradigms related to their farm business after attending the workshop; 40% reported that they had developed mission statements for their businesses; 60% said that they had carried out strategic planning as outlined in the workshop; and, 92% indicated that they were using problem solving methods taught in the course.

Research Based

Extension education programs should rely on research that is based on sound science. University and institute researchers are the primary resource for this research, but other private and public entities may also conduct legitimate research that has value for farmers. As extension educators conduct on-farm research or demonstrations within their areas of expertise, they should seek assistance from Institute researchers and or universities for areas outside their own expertise.

Scientists and researchers are encouraged to use their skills in pursuing basic and applied research which may result in improved technologies and methodologies. These new technologies and methodologies may be unanticipated by farmers and agricultural educators. Thus, in these cases, this research may not be demand driven directly by farmers and educators.

The following lists some of the dairy research topics conducted and the University of Maryland that have resulted in extension programs for dairy farmers (Extension Programs, n.d.).

- Governmental dairy policies.
- Economics of dairy farm by size and type.
- Business management and planning.
- Labor management.
- Automatic milking systems.
- Optimal photo periods for dairy herds.
- Seed varieties for forages, concentrates, and pastures.
- Fly and other pest management.
- Disease management in dairy herds.
- Milking procedures.
- Manure management.
- Environmental mitigation on dairy farms.
- Splitting bunker silo ballast tires for Mosquito control.
- Optimal road bed construction for grazing operations.

Two of these applied research projects that have a particularly strong extension outreach include the following:

Maryland Dairy Farm Business Summary: Since 1994, income, expense, and profit data was collected from over 100 participating farmers. These data were then summarized to show averages of specific income and expense line items on a per hundred-weight, per cow, and total farm basis. The most profitable 20% and least profitable 20% of the farms were also averaged to help farmers understand successful and unsuccessful management practices. Different types of dairy farms are also analysed - conventional confinement, grazing, non-organic, and organic. Through this applied research and extension program, individual farmers compared their farms to industry averages to determine their competitiveness in the dairy industry. This helped farmers pinpoint their strengths and weaknesses. By comparing specific expense line items, farmers were able to determine areas of the business that were cost efficient and areas that were not. By using the Maryland Dairy Farm Business Summary to do this type of analysis, dairy farmers were able to make changes in their operation to improve management as presented in two journal articles (Hanson et al., 2013; Minegishei, K., & Johnson, D.M., 2017). The Dairy Farm Business Summary has also been used in various government and educational venues.

Maryland Pasture Seed Variety Trials: Studies conducted at the Western Maryland Research and Education Center determined the characteristics of various grass species for intensive grazing in Maryland (Fultz, S. n.d.) These studies included both plot work and grazing trials. Through plot work, thirty-eight perennial varieties and twenty annual varieties were harvested under a simulated-grazing cutting frequency. The results from the annual variety plots were released at the end of each season and a summary was released at the end of the three-year perennial trials. Trials using these perennial varieties were also replicated in paddocks grazed by pregnant Holstein heifers at the Central Maryland Research and Education Center. These trials focused on grazing suitability, stand persistence, and animal preference. This plot work and the grazing trials were used to assist producers in selecting improved grass varieties.

Interdisciplinary

Because farm businesses are complex, successful extension programs rarely stay within the bounds of a single discipline. Consequently, extension workers should develop interdisciplinary agricultural extension programs. Educators and researchers should consider a holistic approach in developing programs. This will involve including people from different agricultural disciplines. As farmers implement new technologies, there are often many consequences. As teams of extension educators and researchers from various disciplines work together on projects, it is easier to understand and analyse all the impacts of

the new technologies being delivered. The following are a few examples of interdisciplinary work in Maryland dairy extension education programs.

- Soil and plant scientists evaluating maize yield response to fertilizer and seeding rates for silage production included economic marginal analysis to develop optimal fertilizer and seeding recommendations for farmers.
- A forage specialist working with a livestock specialist determined crop rotations and plant species selection for optimal feed rations.
- Dairy scientists working with a farm management specialist analyzed the labor, management, and economic trade-offs of automatic milking systems.
- A dairy processing specialist working with marketing specialists assisted farmers in on- farm dairy processing and direct marketing to local customers.

Sound Pedagogical Methods

Researchers and advisors should use a variety of education activities and techniques in working with farmers. An important characteristic of these techniques is the active and on-going engagement of participants in actually seeing, experiencing, and exploring new methods from different perspectives. It is not enough to simply tell a farmer about some new research-based practice or to provide a single example of that practice. In order for research-based practices to be adopted, the farmer must participate in multiple experiences and see many examples over time in addition to having opportunities to clarify and build deep understanding through ongoing discussion. Educational activities must lead to understanding at a level that allows the farmer to recognize a practice's value to their own particular business. Additionally, farmers must be able to see how a particular practice conducted in one setting can be modified to fit to the specific variables they face.

The adage, "two minds are better than one", also applies. When farmers are able to come together to discuss a new method, each contributes a unique perspective to real-world application of what the specialists and researchers are teaching. As a result, extension activities that promote small group discussion are more likely to engage farmers in considering how to translate a new practice into something useable for their particular needs. Additionally, learning and discussing new practices with other individuals who have similar needs, can result in development of local groups of individuals who provide on-going support for attempted new practices that regional specialists cannot provide. The informal inquiry, "How's it going?" from a peer goes far in helping individuals set goals, monitor success, and persist in the face of the learning curve that comes with any new practice so that premature abandonment of such practices do not occur.

The following are some extension educational activities that have been conducted in the Maryland dairy extension programs that have these characteristics:

- Farmer field days at research institutes.
- Farm and twilight tours.
- On-farm research conducted by scientist or extension educators with farmers.
- One-on-one consultations between extension educators and farmers.
- Workshops, seminars, short courses offered in the local community.
- Extension-organized study tours for farmers.
- Annual conferences
- Agricultural expos and fairs

Reciprocity

Effective extension programs recognize that everyone has something to share. Farmers should be more than just passive recipients of information. Extension educators, researchers, and farmers must recognize and use the expertise that farmers contribute to furthering work in the many disciplines involved in farming. Extension administrators must ensure that farmers are active partners with extension workers in developing extension programs. One of the more, well-known types of participatory extension programs is Farmer Field Schools (Hughes and Venema, 2005). In Farmer Field Schools, extension workers act

as facilitators of farmer to farmer learning instead of the source of farmer learning. Farmers learn in the field and share what they learn with each other. The training follows the seasonal cycle, so farmers are aware of solutions for problems as they occur in practice over the course of a year and much of the educational material is generated by the farmers. There are regular group meetings with farmers taking the leadership in sharing information. Pasture walks conducted by the University of Maryland Extension are an example of a farmer field school.

Pasture Walks: Since 1996, University of Maryland Extension has conducted monthly pasture walks on dairy farms throughout the growing season. In a typical pasture walk, the participating farmers gather at the farm homestead where the host farmer describes the farm operation in detail. They tour the livestock housing facilities, milking parlor, feed storage, manure handing facilities and other ancillary structures. They observe the farm machinery and equipment. They visit the milking herd, dry cows, heifers, and calves. The group walks the fields and pastures. Throughout this process participants are able to ask the farmer clarifying questions as they seek parallels to their own farms and consider how such practices might translate to their own operations. In addition, at many pasture walks an economic analysis of the farm is also presented. At pasture walks, specialists in animal science, agronomy, pest management, economics, and other disciplines are often invited to give special presentations in situ. University of Maryland Extension pasture walks provide an extension-facilitated farmer-to-farmer discussion of the strengths and weaknesses of the participating farms as well as practical alternative methods of production that could be used to increase productivity and profitability.

Non-competitive and Pluralistic

Private capital is sometime insufficient for research and education. Consequently, public funding of research and education is justified. But as the agricultural economy develops, some research and educational activities can and should be passed on to the private sector. Extension should not compete with nor discourage private enterprise. Public monies should not be expended in areas where private enterprise would be more efficient. Public and private collaborations are useful in the transition of services from the public to private sector. For decades in the United States, university research and extension provided services for dairy farmers including the following:

- Plant breeding, seed development and variety trials.
- Soil testing and fertilizer recommendations.
- Nutrient management planning.
- Pesticide development.
- Financial record keeping.
- Machinery & equipment development
- Ration balancing.
- Farmstead and structure planning.
- Veterinary services.

While universities still provide basic research to support these services, many of these services are transitioning to the private sector. In areas where farms are not of significant numbers or size to support private sector companies, universities and extension still provide support. Extension can also provide unbiased information as these services are transitioned to private enterprise to help farmers avoid the effects of conflict of interest. For example, if a feed company provides ration balancing for a farmer, an extension educator can provide an outside opinion on the recommended ration without creating a conflict of interest as extension does not sell the feeds that will be used for the ration.

A pluralistic extension program partners with other public and private organizations to achieve its educational goals. There should be encouragement of all types of collaboration between institutions, educators, researchers, farmers, privatized extension efforts, government agencies and private companies. Collaborations should be well-defined and focused on impacts and outcomes.

A recent University of Maryland Extension program on Succession and Estate Planning for farmers (Farm Transition and Estate Planning Program, n.d.) was a collaborative effort of the following government and private organizations.

- Maryland Department of Agriculture
- United States Department of Agriculture Farm Service Agency & Natural Resource Conservation Service.
- Nationwide Insurance Company
- Mid-Atlantic Farm Credit
- Maryland Farm Bureau
- Southern Maryland Agricultural Development Commission

In this program, farmers attended day-long workshops in which specialists provided information necessary for estate planning. Some of these organizations provided presenters to work with extension educators in delivering instruction while other organizations provided funding and educational materials. Follow-up with individual participants is leading to improved succession plans for the intergenerational transfer of farm assets and management.

Conclusion

Reality can be messy and developing successful programs is never an easy process. While the results of this examination of extension programs should not be viewed as a definitive study, it does provide a framework for consideration and dialog between extension workers and between extension workers and potential funding agencies when new programs are proposed. Such a dialog can result in anticipation and prevention of potential problems. The framework can also provide guidance when problems do occur in an unfolding new program. Ultimately it provides guidance that can help establish practices that will make new programs more likely to be successful.

It is recognized that more formal research will be needed to establish the validity of these principles beyond the state of Maryland and for extension programs in other agricultural sectors. However the 'success' framework presented here can provide the foundation upon which formal future studies can build.

Extension programs have the capacity to make significant contributions to advising and educating farmers and for successfully transferring technology and research into practice. Identifying those characteristics needed for success prior to development can better ensure the effectiveness of proposed programs. The characteristics identified outlined here as illustrated through the examples shared from the University of Maryland Extension dairy programs, present a starting point for this purpose. When extension programs have these elements, advisors, researchers and farmers in Maryland have been able to successfully pursue community goals so as to increase farmer income and family living standards, protect natural resources, and improve national food security.

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