

4-1-2016

Factors Influencing Self-Efficacy and Adoption of ICT Dissemination Tools by New Extension Officers

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Recommended Citation

Ganpat, W. G., Ramjattan, J., & Strong, R. (2016). Factors Influencing Self-Efficacy and Adoption of ICT Dissemination Tools by New Extension Officers. *Journal of International Agricultural and Extension Education*, 23(1), 72-85. DOI: <https://doi.org/10.5191/jiaee.2016.23106>

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Abstract

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doi:10.5191/jiaee.2016.23106

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Abstract

Information Communication Technologies (ICTs) offer Extension systems opportunities to expand participation and provide information faster to stakeholders. The study included fifty-seven new extension officers drawn from the public, private and state assisted extension organizations in Trinidad. Participants were surveyed to assess their level of confidence in the use of ICTs and the factors that impacted their use of these dissemination tools. The survey, which was conducted during March to May 2015 on the mandatory office days of the agents, consisted of five sections which captured socio demographic variables, performance expectancy, effort expectancy, social influence and self-efficacy in the use of ICTs. Percentages and means were used to describe the data set and multiple regression analysis was used to explore relationships with ICT use. Results showed that: use of ICTs was moderate; the professional level of officers, their education level, perceptions of ICTs as useful and easy to use and social influence significantly impacted their use of ICTs in their job functions. There are implications for the provision of quality and timely delivery of information to clients. It is recommended that the entry level requirements for new officers should be raised by employers, in-service training in ICTs and other modern communication methods and tools be provided to those already in the system, and the curricula at the main tertiary training institution be reviewed to include ICTs for extension work.

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Introduction

Information Communication Technologies (ICTs) include hardware and software associated with desktop, laptop, and tablet computers, cellular and land-line telephones, radio towers, televisions, DVD players and more (McCole, Culbertson, Suvedi, & McNamara, 2014). ICTs enable Extension officers to respond to audiences faster, disseminate information to larger audiences, and save travel time and expenditures (Ganpat, Webster, & Narine, 2014). Strong, Ganpat, Harder, Irby, and Lindner (2014) suggested that future research should examine new Extension officers' capacity for using ICTs. Developing a better comprehension of barriers prohibiting the use of ICTs by Extension officers who are new to the job would inform Extension professional development specialists of strategies to adequately prepare officers to use such dissemination tools routinely in their job.

Meeting the needs of farmers is the primary driving force contributing to the development and dissemination of ICTs to farmers (Andreopoulou, 2012). Aker (2011) suggested the expansion of mobile technology provides opportunities to develop agricultural ICTs that will meet the needs of more farmers. Farmers are open to acquiring agricultural information from ICTs because it saves them time by providing solutions quicker versus waiting on an extension officer to arrive at their farm (Dhaka & Chayal, 2010). ICTs offer opportunities to serve more female farmers for women who do not participate in traditional face-to-face trainings offered by male extension officers (Obayelu & Ogunlade, 2006).

The lack of training and preparing extension officers to use ICTs is one of the main challenges for extension organizations seeking to disseminate information through ICTs (Hassan, Hassan, Shaffril, & D' Silva,

2009). Only prepared and competent extension officers will be able to develop and disseminate information effectively using ICTs that meet the needs of farmers (Ballantyne, Maru, & Porcari, 2009).

Trinidad has a population of 1.3 million and although it generates most of its income from oil and gas, ICTs are being promoted as an important development tool for the 22,000 farmers and the estimated 100,000 persons who depend on farming for their source of employment or household income. Agricultural Extension in Trinidad is thus searching for ways to effectively use ICTs to improve the delivery of services to the farming community. The state, which is the main provider of extension services, has not kept up with advances with the use of modern technologies while the main state-assisted extension service provider, the National Agricultural Marketing and Development Corporation (NAMDEVCO) is the most effective user and promoter of ICTs, not only for Trinidad but the entire Caribbean region (Joseph, 2010).

Theoretical Framework

The Unified Theory on the Acceptance and Use of Technology (UTAUT) was developed by Venkatesh, Morris, Davis, and Davis (2003) as a method of assessing the likelihood of success for new technology introductions and enhances the understanding of what drives acceptance of technologies so that managers may proactively create interventions to encourage the adoption of the technology. Based on a thorough review of literature and models, the researchers found that seven constructs had significant direct effects on the intention or usage of a technology; four of these were determined to play a significant role in determining user acceptance and usage of behavior (Venkatesh et al., 2003). These four constructs are performance expectancy,

effort expectancy, social influence, and facilitating conditions (Venkatesh et al., 2003).

According to Venkatesh et al. (2003), performance expectancy is the strongest predictor of intention and is defined as “the degree to which an individual believes that using the system will help him or her to attain gains in job performance” (p. 447). Effort expectancy is how easy it is to use the technology, and includes perceived ease of use, complexity, and ease of use (Venkatesh et al., 2003). Social influence encompasses pressure the individual perceives other important individuals exert on the use or disuse of the technology (Venkatesh et al., 2003). Lastly, facilitating conditions are defined by Venkatesh et al. (2003) as “the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system” (p. 453).

Strong, Irby, and Dooley (2013) used self-efficacy theory, self-directed learning theory, and the unified theory for acceptance and use of technology to frame an assessment of undergraduate students’ behavioral intention regarding the acceptance of mobile technology in agricultural education courses. Results of the study suggested that these three theories combined “accounted for variance in students’ behavioral intention towards mobile technology acceptance” (Strong et al., 2013, p. 156). Regarding the UTAUT, it was found that student’s level of self-efficacy and self-directedness influenced behavioral intention in accepting mobile technology (Strong et al., 2013). Strong et al. (2013) stated that according to Venkatesh et al. (2003), 70% of an individual’s acceptance of mobile technology could be explained by the UTAUT.

Self-efficacy is an individual’s belief in their personal capabilities and access to

sufficient resources to accomplish a given task (Bandura, 1991). Individuals with low self-efficacy tend to see difficult tasks as threats and thus avoid these tasks; individuals with high self-efficacy view difficult tasks as something to be mastered and gain a sense of accomplishment upon completion of the task (Bandura, 1991). The three principle functions that determine the self-regulation mechanism are “self-monitoring of one’s behavior, its determinants, and its effects; judgment of one’s behavior in relation to personal standards and environmental circumstances; and affective self-reaction” (p. 248).

Self-monitoring entails an honest, consistent, time-conscious analysis by an individual of their own performance, the conditions that occurred at the time of performance, and the effects produced by the performance (Bandura, 1991). The judgmental subfunction consists of observing patterns of behavior and judging them based on personal standards (Bandura, 1991). Self-motivation and self-diagnosis are aspects of this sub-function that influence self-reaction (Bandura, 1991). Bandura (1991) describes integral parts of this sub-function as including establishing personal standards, evaluating behaviors in relation to the attainments of others, placing values on activities, and perceived performance determinants. The last sub-function, self-reactive influences, hold that individuals are more likely to perform actions that produce positive self-reactions and avoid behaviors that result in self-deprecation (Bandura, 1991). According to Bandura (1991), self-motivating incentives “may be either tangible outcomes or self-evaluative reactions” (p. 256).

An individual’s beliefs regarding their control over their own functioning as well as other events in their lives is the most influential mechanism affecting self-regulatory systems (Bandura, 1991). Self-

efficacy beliefs play a role in determine how the sub-functions of a self-regulatory system operate, as well as affect the goal-setting sub-function of self-regulation (Bandura, 1991). Self-efficacy also influences how values is placed on activities; if an individual has high self-efficacy regarding an activity, they are more likely to continue that activity and vice versa (Bandura, 1991).

Purpose and Objectives

This study was a part of a larger study seeking to understand barriers that prohibit new extension officers from using ICTs in their job. More specifically, this study sought to:

1. Describe participants' performance expectancy, effort expectancy, social influence, and self-efficacy for using ICTs;
2. Examine the relationship between participants' performance expectancy, effort expectancy, social influence and self-efficacy; and
3. Examine the influence of participants' characteristics, performance expectancy, effort expectancy, and social influence on self-efficacy.

Methodology

The target population was new extension officers dispersed into eight geographic counties in the North and South Agricultural Regions of Trinidad, the centralized Extension Training and Information Services Division, the Tobago Division of Agriculture, state assisted organizations and private extension service providers across the country. The survey was conducted during March to May 2015, and self-reporting questionnaires were distributed to the entire population of 62 new extension officers. Participation was voluntary and respondents were informed of

the purpose of the study, by whom the data will be accessed and the confidentiality of responses was ensured by omitting names. The survey was conducted on a weekly basis on the mandatory office days of the officers. There was a 92 % response rate as some 57 officers agreed to participate in the survey and returned the instrument which took approximately 20 minutes to complete.

The survey instrument comprised five sections which captured the following: Section 1 consisted of 17 demographic and job characteristics questions. Section 2 assessed performance expectancy and consisted of 14 Likert- type questions to measure the intensity of the respondents' agreement to the item statements with possible score for each item ranging from 1 to 4; *Strongly agree* (4), *Agree* (3), *Disagree* (2) and *Strongly disagree* (1).

Section 3 assessed effort expectancy and consisted of 14 questions to measure the intensity of the respondents' perceived level of usefulness of selected ICT tools and with possible score for each item ranging from 1 to 4; *Very useful* (4,) *Somewhat useful* (3), *Not very useful* (2) and *Totally useless* (1).

Section 4 assessed social influence and sought to measure the intensity of the respondents' likelihood to use ICTs as a result of interaction with other individuals such as peers, admired superiors and friends who use ICTs. Possible score for each of the 16 items ranged from 1 to 4; *Very likely to use* (4), *Somewhat likely to use* (3), *Likely to use* (2), and *Not at all likely to use* (1).

Section 5 consisted of 6 questions which assessed respondents' self-efficacy; these related to issues that create difficulties for extension agents as an educator using ICTs. Respondents were asked to indicate their level confidence in using ICTs by choosing the response best suited to them from the response set and coded; Score for each item was; *No* (1), *Very little* (3), *Some confidence* (5), *Quite a bit* (7), and *A great*

deal (10). This score range has been recommended by Bandura (2006) as being simpler than the previous 0-100 score range used by others.

A review of the questionnaire for content validity was done by a panel of six experts in the field of extension which comprised: two past Extension Directors, two University Lecturers in extension and two subject matter specialists with many years of experience in the Trinidad and Tobago Extension system. The instrument was reviewed and edited according to the recommendations and feedback given. A pre-test was conducted among 5 new extension officers to assess the questionnaire before conducting the survey. Some minor modifications were made to the statements and items being assessed.

Percentages were used to describe the socio-demographic characteristics of the sample and means and standard deviations were used to describe other study variables. A correlation matrix was developed to explore the bivariate relationships among key study variables (performance expectancy, effort expectancy, social influence and self-efficacy). Multiple linear regression (ordinary least squares-OLS) was used to assess the impact of independent n self-efficacy scores. Nominal and ordinal variables were entered as dummy variables into the regression model. These are

specified in the table with the regression results. Statistical significance was established at a p-value of <0.05. All data analysis was conducted using the Statistical Package for Social Sciences (SPSS) version 21 (IBM Corporation, New York, USA).

Results

The extension officers surveyed were employed by the Public extension service (95%) and were Agricultural Assistants I (82%: lowest professional level), and Agricultural Extension Aides (AEA: paraprofessional level) (14%) and 4% were Agricultural Officers 1 (AOI: highest professional level) respectively. There was almost even gender mix. With respect to education, 30% possessed associate degrees, 25% had an undergraduate degree, 22% completed postgraduate degrees and 14% had diplomas. Although these were new officers to the extension system, some 67% had 1-3 years of working experience while 33% had less than 1 year experience. The majority of the respondents were between the ages of 18-30 years (77%). Most officers had extension and communication specialization (51%) and crop production (37%) and a smaller amounts had expertise in livestock production (12%). The sample majority (88%) earned between 900-1200 USD monthly (see Table 1).

Table 1
Personal Characteristics of Participants

Variable	Level	%
Extension Service Provider Group	Public	95
	State assisted and Private	5
Professional Level	Ag. Officer 1	4
	Ag. Extension Aide	14
	Ag. Assistant1	82
Education	Associate degree	30
	Diploma	14
	Undergraduate degree	25
	Postgraduate degree	22
	Other	9
Work Experience	Under 1 year	33
	1-3 years	67
Age	18 to 30	77
	31 to 45	23
Gender	Male	49
	Female	51
Area of expertise	Mainly Crop	37
	Mainly Livestock	12
	Extension and Communications	51
Salary range (TT\$)	Less than 5,000	5
	5-7,000	95

The first objective was to describe participants' performance expectancy, effort expectancy, social influence, and self-efficacy for using ICTs. Participants' performance expectancy for using ICT's is provided (see Table 2). Individual item means showed that these new extension officers had fairly good perception of the benefits of new ICS and methods in their job functions. Results indicated that officers believed that the most important benefits of using new extension methods were; i) new methods strengthen extension support; (ii)

the use of new methods in extension work generates fundamental improvements in program achievement and; (iii) Farmers can contribute ideas towards their own development. Lowest responses were in the areas of; (i) New extension methods ensure farmers' needs are met; (ii) Extension officers are able to make input in program planning and; (iii) National goals of food security and sustainability can be achieved if I use new methods in the delivery of extension service.

Table 2

Participants' Performance Expectancy with ICT's

Beliefs/perceptions	<i>M</i>	<i>SD</i>
New methods strengthen extension support.	3.35	0.62
The use of new methods in extension work generates fundamental improvements in program achievements.	3.32	0.47
Farmers can contribute ideas towards their own development.	3.32	0.56
New methods facilitate networking and create alliances.	3.30	0.53
New methods are tools of empowerment for extension agents in performing their duties.	3.30	0.49
New methods improve access to information.	3.25	0.48
Empowerment of farmers and rural communities are key benefits of new extension methods.	3.21	0.50
These new methods improve communication.	3.21	0.46
Using new methods help farmers to build capacity.	3.21	0.47
Farmers' lives can be improved using new methods.	3.18	0.45
More accurate responses are provided to clients when new methods are utilized.	3.16	0.61
National goals of food security and sustainability can be achieved if I use new methods in the delivery of extension service.	3.16	0.53
Extension officers are able to make input in programs planning.	2.98	0.47
New extension methods ensure farmers' needs are met.	2.89	0.54

Note. Overall. M = 3.20, SD = .32, Scale: 4 = Strongly Agree; 3 = Agree; 2 = Disagree; 1 = Strongly Disagree

The second aspect of the first objective was to describe participants' effort expectancy for using ICTs (see Table 3). Items were ranked by their level of usefulness (4 = *very useful* to 1 = *totally useless*). Individual item means showed that these new extension officers perceived that these new methods and ICTs as quite useful to them and easy to use in carrying out their job functions. All respondents indicated that

the most useful tools were; (i) Using emails to improve communication between researchers and extension; (ii) Mobile applications to access information to assist farmers; and (iii) Cellphone calls to connect to clientele. On average, respondents perceived all methods and tools assessed as being either *very useful* and easy to use or *somewhat useful* and somewhat easy to use ($f = 96\%$).

Table 3

Participants' Effort Expectancy with ICTs

I.C.Ts, Computers and methods	<i>M</i>	<i>SD</i>
Using e-mail to improve communication between researchers and extension.	3.67	0.55
Mobile apps to access information to assist farmers.	3.67	0.88
Cellphone calls to connect to clientele.	3.65	0.69
Using websites to access information to assist farmers.	3.63	0.65
Using social media to communicate extension information.	3.63	0.67
Using computer software to prepare and present slide presentations for extension programs.	3.60	0.63
Using computer software to organize and illustrate reports of extension programs.	3.60	0.70
Cellphone texts to communicate with all stakeholders.	3.54	0.76
Global Positioning System (GPS).	3.53	0.61
Web based apps to access information to assist farmers.	3.37	0.79
Farmer Field Schools.	3.19	1.03
Joint programs with multiple stake holders	3.18	0.98
Using computer programs to record and analyze data, prepare charts and graphs.	3.16	1.00
Participatory methods.	2.98	1.03

Note. M = 3.35, SD = 0.54. Scale: 4 = Very Useful; 3 = Somewhat Useful; 2 = Not very useful; 1 = Totally Useless

The third element of the first objective was to describe participants' social influence on ICT usage (see Table 4). Most respondents indicated that social influence had a significant impact on their use of cell phone calls to connect to clientele, use of computers, using websites to access information to assist farmers, using computer software to prepare and present slide presentations for extension programs

and the internet. However, social influence played a little role in their use of Global Positioning System, to conduct Farmer Field Schools and to have Joint programs with multiple stakeholders such as Plant Clinics and invasive species management. Overall, social influence had a fairly strong impact on respondents' decisions to use ICTs and new extension methods (75%).

Table 4

Likelihood to Use New Methods Due to Social Influence

Items	<i>M</i>	<i>SD</i>
Cell phone calls to connect to clientele.	3.56	0.68
Computers	3.56	0.73
Using websites to access information to assist farmers.	3.49	0.71
Using computer software to prepare and present slide presentations for extension programs.	3.47	0.68
Internet	3.47	0.83
Using computer programs to record data, prepare charts, graphs and figures.	3.42	0.73
Using computer software to organize and illustrate reports of extension programs.	3.35	0.77
Using e-mail to improve communication between researchers and extension.	3.28	0.82
Multimedia software.	3.12	0.80
Mobile apps to access information to assist farmers.	3.07	1.69
Cell phone texts to communicate with all stakeholders.	3.02	0.86
Using social media to communicate extension information.	3.02	0.95
Web based apps to access information to assist farmers.	2.89	0.98
Joint programs with multiple stakeholders such as Plant Clinics and invasive species management.	2.88	0.93
Farmer Field Schools.	2.81	0.95
Global positioning system (GPS).	2.75	2.96

Note. Overall. $M = 3.52$, $SD = 0.68$. Scale: 4 = *Very likely to use*; 3 = *Somewhat likely to use*; 2 = *Likely to use*; 1 = *Not likely to use*

The fourth component of the first objective was to describe participants' self-efficacy to use ICTs (see Table 5). Item responses ranged from "*A great deal*" (10) to "*nothing*" (1). Respondents stated that their highest self-efficacy was ICTs that "allow them to respond to questions through ICTs" effectively and which allows them to implement alternative teaching styles using

ICTs to teach". The items that inspired the least amount of confidence for extension officers were; (i) "how comfortable they were using ICTs for evaluation strategies?" and "extent to which they could provide an alternative explanation, through ICTs, when clients are confused about what they are teaching?"

Table 5

Descriptive Statistics of Participants' Self Efficacy with ICTs

Items	<i>M</i>	<i>SD</i>
How well can you respond to clients' questions through ICTs?	6.32	2.11
How well can you implement alternative teaching styles using ICTs to teach?	6.23	1.79
How much can you gauge client comprehension of what you taught through ICTs?	6.04	1.80
To what extent can you craft good questions from your clients through ICTs?	5.74	2.03
To what extent can you provide an alternative explanation, through ICTs, when clients are confused about what you are teaching?	5.74	1.58
How comfortable are you using ICTs for evaluation?	5.70	1.89

Note. Overall. M = 5.96, SD = 1.44. Scale = 1-Nothing; 3-Very Little; 5-Some Influence; 7-Quite a Bit; 10-A Great Deal

The second objective was to examine the relationship between participants' performance expectancy, effort expectancy, social influence and self-efficacy. A correlation matrix based on Spearman's Rho was generated to examine the relationship of the inter-correlations of scores for

participant's performance expectancy, effort expectancy, social influence on self-efficacy (see Table 6). Positive statistically significant relationships ($p < 0.05$) were observed between effort expectancy and social influence and between effort expectancy and self-efficacy.

Table 6

The Relationship Between Performance Expectancy, Effort Expectancy, and Social Influence and Self-efficacy with Regard to ICT's

	Performance Expectancy	Effort Expectancy	Social Influence	Self-Efficacy
Performance Expectancy	1.00	0.07	0.09	-0.17
Effort Expectancy		1.00	0.34**	0.37**
Social Influence			1.00	0.10
Self-Efficacy				1.00

** $p < 0.01$

The third objective sought to examine the influence of participants' characteristics, performance expectancy, effort expectancy, and social influence on self-efficacy (see Table 7). Multiple linear regression of self-efficacy scores on independent predictors was the method employed to analyze the data. The researchers constructed the OLS Model:

Self-Efficacy = f (Social Influence, Effort Expectancy, Performance Expectancy, Professional level, Years of experience, Highest level of education, Expertise, Gender and Age). The multiple regression model fitted to analyze the factors predisposing extension officers' self-efficacy of using ICTs showed a good fit with an adj. R^2 of 0.62.

Table 7

Multiple Regression Analysis of Independent Variables on Self-efficacy with ICTs'

Explanatory variable	β	SE	t	p
(Constant)	5.46	13.76	.40	.69
Professional Level ^a	18.53***	2.71	6.85	.00***
Education	3.83***	.86	4.45	.00***
Experience ^b	3.09	2.36	1.31	.20
Age	-2.60	2.35	-1.10	.28
Gender ^c	-.04	1.93	-.02	.98
Crop expertise ^d	.54	2.34	.23	.82
Livestock expertise ^d	-2.72	2.94	-.93	.36
Social influence	.19*	.09	2.13	.04*
Effort expectancy	.26*	.12	2.16	.04*
Performance expectancy	-.42	.23	-1.88	.07

Note. $F(10, 46) = 10.18^{***}$; $Adj.R^2 = 0.62$; *** $p < 0.01$; * $p < 0.05$

a: Reference Category – Para professionals;

b: Reference Category – Less than 1 year;

c: Reference Category – Male; and

d: Reference Category – Extension/ Communication

Conclusions and Implications

While these new extension officers had fairly good perceptions of ICTs as appropriate tools that can aid them in doing their extension work, levels of self-efficacy is uncomfortably low and this has to be addressed. Results also suggested that persons at higher professional levels and who have more formal education are the ones that should be attracted to the Extension service as these officers are more likely to exploit the efficacy of ICT tools.

The data suggested that the level of usefulness that officers ascribe to ICTs is related to: the extent of interaction they have with their peers and colleagues who use ICTs (Venkatesh et al., 2003) and also directly related to the level of confidence they believe they have in their ability to use ICTs (Bandura, 1991).

These results have implications for the future professional development of the Extension services in Trinidad and Tobago. If extension officers are not comfortable and competent with the use of ICTs, then the service that they provide to clients will be

limited especially in this modern era when ICTs are being routinely used for agricultural development (Ballantyne, Maru, & Porcari, 2009).

Results showed that new extension officer's professional level, education, social influence and effort expectation were significant predictors of self-efficacy. These results implied that the self-efficacy of officers' increased as their professional status and educational qualification increased (Bandura, 1991). Extension officer's confidence and proficiency in using ICTs as tools for extension increased with their professionalism and education. Similarly, social influence, the influence of peers, admired superiors and friends who use ICTs, exerted a positive effect (Venkatesh et al., 2003) on their self-efficacy. Officers' perception of ICTs as useful and an easy to use tool for extension also significantly impacted their self-efficacy.

Recommendations

A stated requirement for the job of extension officer in these modern times should be fairly good ICT capabilities. Guidelines for recruitment should be modified to reflect this reality and the government, as the biggest employer (95%) of extension officers in Trinidad and Tobago, should review the entry level requirements for persons wishing to become extension officers.

Similarly, greater exposure of ICT tools to these new officers would impact positively on their ICT use. To better meet the needs of farmers in Trinidad and Tobago, extension officers need on-going professional development with ICTs to meet farmer's changing and diverse needs (Aker, 2011; Andreopoulou, 2012). As such, in-service training should be made available to those already in the system to raise their competency levels. These could be either short training courses or attachments to organizations that routinely use ICTs in their work. The NAMDEVCO has been identified as one such organisation.

Further, the curriculum at the main training institution for Extension officers should also be reviewed and ICT knowledge and skills development for extension work should be strengthened. Specialized training in ICTs to expose officers to new methods and tools will be required for new extension officers to become more comfortable using such tools in their work.

Farmers are willing to use ICTs because the tools save them time in getting information (Dhaka & Chayal, 2010). ICTs can help Extension systems broaden their reach and expand clientele and stakeholder support (Strong et al., 2014).

The use of ICTs should be studied to discern the effect of ICT use by Extension systems in mitigating food insecurity. The results would offer insight on potential ICT use strategies and barriers that exist which

could be addressed to help farmers acquire information faster in order to produce food. A list of best management ICT practices could be developed regardless of context and food commodity to help farmers proactively plan for production and marketing.

ICTs offer opportunities for farmers to communicate information to each other across broad distances that would save time and travel. Extension systems have the opportunity to be leaders in ICT diffusion and adoption. These opportunities could provide Extension systems, governmental or non-governmental, a rebirth in dissemination strategies to meet farmer's needs. "New" extension officers will eventually be the seasoned personnel and leaders that will make decisions and influence those new to the profession. Training individuals that are "new" now will only help Extension systems be more proficient with ICTs and thus, meet the needs of farmers and improve local food supplies.

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