

doi: 10.5191/jiaee.2016.23305

**Agricultural Extension Officers' Knowledge and Perceptions of Food Security Issues in Trinidad and Tobago**

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***Abstract***

*Food security is a complex global problem that will require the interaction of a wide variety of people to solve. Although food insecurity has been reduced in Latin American and the Caribbean in the last decade, national governments in the region are still enacting policies to help further address the situation. In 2012, the government of Trinidad and Tobago enacted the National Food Production Action Plan and government extension agents are central to the field-level implementation of many aspects of the plan. This study explored agricultural extension officers' knowledge and perceptions of food security issues in Trinidad and Tobago. Results revealed extension officers need additional professional development training to have the requisite knowledge to help implement the plan with the most pressing topics being data storage and retrieval; research and development; and understanding legislation and policies. Additionally, results revealed training needs varied for officers based on: (a) plans to stay in extension; (b) education level; (c) attention paid to global issues; and (d) training received on food security.*

**Key Words:** food security; extension; Caribbean; Trinidad and Tobago; agriculture

### Introduction

Despite global efforts to eradicate hunger and malnutrition, food insecurity continues to be a serious issue affecting at least 805 million people in the world in 2014 (FAO, 2014). While the amount of chronically undernourished individuals in 2014 has decreased more than 100 million over the past decade, and 209 million since 1990, there still remains a significant portion of the global population suffering from food insecurity (FAO, 2014). The seriousness of this issue has caused governments, nongovernmental organizations (NGOs), and various other organizations from around the world to seek solutions to this problem. However, with a world population expected to increase from 7.2 billion to 9.1 billion in 2050, food insecurity will continue to be a prominent challenge requiring continued attention (FAO, 2009).

According to the FAO, Latin America and the Caribbean is the region that

has shown the highest reduction in hunger and increase in food security. Since the early 1990s, the prevalence of hunger has been reduced by nearly two-thirds (FAO, 2014). Initiatives like the Hunger-Free Latin America and the Caribbean Initiative 2025 (FAO, 2014), have contributed to the unmatched strides of Latin America and the Caribbean. National governments throughout the Caribbean have also responded with a variety of policies aimed at increasing food security in their respective countries. In 2012, the Ministry of Food Production, Land, and Marine Affairs (MFPLMA) in Trinidad and Tobago created the *National Food Production Action Plan* to address the food availability and stability dimensions of food security. This plan emphasized increasing local production of safe, nutritious, and affordable foods in sufficient quantities to ensure food security through a framework of 26 strategies (see Table 1) (MFPLMA, 2012).

Table 1

*Strategies for Obtaining Food Security from the National Food Production Action Plan*

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1. Policy
  2. Legislative
  3. Post-harvest Technologies
  4. Infrastructure Development: Agricultural Access Roads
  5. Infrastructure Development: Water Management and Flood Control
  6. Infrastructure Development: Fisheries Infrastructure
  7. Land Distribution Program
  8. Agricultural Labor Program
  9. Young Professionals in Agriculture Development and Mentoring Program
  10. Marketing Program: Promotion of Local Commodities
  11. Marketing Program: Marketing-promotional Campaign
  12. Marketing Program: Marketing Infrastructure
  13. Home Gardening Initiative
  14. Technology: Research and Development
  15. Technology: Information and Communication Technologies
  16. Technology: Development of Tech Packages
  17. Innovation
  18. Standardization of Production Practices
  19. Extension Services
  20. Improved Data and Statistics Collection
  21. Access to Credit
  22. Praedial Larceny Program
  23. Creation of Domestic Market Access/Investment Opportunities
  24. Agricultural Incentive Program
  25. Human Resource Capability
  26. Strengthening Linkages
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However, as is often the case with national-level policies, the task of implementation does not fall on the politicians who created the plan, it falls on front level field staff, agricultural extension officers in this case.

Extension officers are in direct contact with farmers working in all farming communities in Trinidad. They are tasked with both education and non-education responsibilities. The non-education activities would include attending to access roads, praedial larceny, labor for farms, marketing, and the incentive program of the government. The extent of these roles vary among communities but they are all geared to increasing national food security.

Extension officers' function has traditionally been in the area of technology transfer for the production of vegetable to a large extent but also root and tree crops to some extent.

The link with research is weak. No formal arrangements are in place neither for them to relate farmers' concerns to researchers nor for them to access technologies. It happens though to some extent on the informal level when researchers and extensionists meet at meetings or in the fields.

If greater food security in Trinidad and Tobago is to be realized through successful implementation of the *National Food Production Action Plan*, implementers of the plan must have requisite expertise. It

is, however, unknown if extension officers in Trinidad and Tobago are ready for this task or if they are in need of additional training to accomplish their mandate.

The primary purpose of this study was to explore agricultural extension officers' knowledge and perceptions of food security issues in Trinidad and Tobago to be able to provide suggestions for professional development training. Further, opportunities for targeting training for different groups of extension officers were explored. Two research objectives guided this inquiry:

1. Identify the food security topics in which extension officers express the greatest need for additional information.
2. Determine if extension officer needs vary based on selected variables (education level, intended future in extension, pays attention to global issues, previous training, extension region, gender, operates a farm, grew up on a farm, length of service in extension).

### Literature Review

Although the term *food security* was formally established at the 1974 World Food Conference, this condition has been a topic of discussion throughout history. Today, organizations such as the FAO of the United Nations have taken lead roles in understanding the current state of food security around the world. In their 2014 publication, *The State of Food Insecurity in the World*, FAO stated that about 805 million people are currently undernourished. Although the Millennium Development Goal of reducing the proportion of undernourished people in the world in half by 2015 is within reach, some regions in the developing world are not on track to accomplish this goal. Specifically, Sub-Saharan Africa has the highest levels of undernourishment and the lowest levels of progress towards eradicating food insecurity (FAO, 2014). On the other hand, Latin America and the Caribbean have made the

greatest strides towards food security in the world.

The literature contains several innovative ideas aimed at reducing food insecurity. Ganpat, Badrie, Walter, Roberts, Nandlal, and Smith (2014) expressed the need for Trinidadian farmers to embrace Good Agricultural Practices (GAP) in order to ensure food security. They found that in order to ensure GAP, extension officers need to be better educated and government officials need to improve farmers' land tenancy arrangements, as farmers with clear land title tend to invest in longer term improvements in their farms thus leading to more sustainable food production. Grote (2014) took a socioeconomic and sociopolitical perspective when he analyzed the state of global food security. He argued that although it is a difficult challenge there are practical steps that can be taken to ensure food security, such as promoting productivity of farming and increasing the effectiveness of the food market system. He further proposed that policy reforms in agriculture are needed to improve global food security. Cistulli, Rodríguez-Pose, Escobar, Marta, and Schejtman (2014) suggested an effective way to combat food insecurity and malnutrition is by means of a territorial approach. They argued that although using a territorial approach is complex and difficult, by recognizing territories, this approach is able to address issues of food security and nutrition.

Literature focused on Trinidad and Tobago has focused on farmers and production. Ganpat and Bholasingh (1999) explored the attitudes of farmers towards farming in Trinidad and found farmers in Trinidad had positive attitudes towards farming, thus challenging the prevailing idea that farmers in Trinidad had negative views of their occupation. Løvendal, Jakobsen, and Jacque (2007) analyzed the impact of food prices on food security in Trinidad. They

concluded that although individuals in poverty will feel the impacts of the rise in food prices and food insecurity will continue to prevail, the rise in food prices would not affect the overall ability of Trinidad to reach the Millennium Development Goal hunger target.

Literature on extension officers' perceptions of food security in Trinidad and Tobago is scarce. As mentioned before, most research has been focused on farmers' perceptions such as Wynn, Coppedge, and Strong (2013). Their research explored the perceptions of farmers towards technology adoption, especially Integrated Pest Management. By evaluating perceptions of 21 farmers they concluded farmers who were using the technology recognized its importance and had positive views of it and were receptive. In a study related to the current study, Roberts, Ganpat, Narine, Heinert, and Rodriguez (2015) examined the knowledge of farmers in Trinidad about food security issues. Overall, farmers expressed the greatest need for additional information related to: (a) the incentive program that is focused on outputs; (b) research and development for both livestock and crop farmers; (c) partnerships between public sector agencies, research institutions, and the private sector to provide suitable capacity to deliver all food production programs; (d) postharvest technologies that create employment opportunities, increase returns to farmers, improve food quality, and ensure food safety; and (e) and technology packages (of information) to help farmers improve yield, quality, and availability. However, needs of individual farmers were quite variable. Given the most pressing needs of farmers, Roberts et al. (2015) recommended extension officers should develop appropriate trainings and interventions. However, the capability of extension officers to perform these tasks is unknown.

### Methodology

The public extension system in Trinidad is administered through the MFPLA and charged with implementing government agricultural policies and meeting the education and training needs of farmers. The extension system is geographically positioned in eight (8) counties throughout Trinidad with approximately twelve (12) extension officers in each county, resulting in an estimated population of 96. The study attempted to survey the population rather than a sample. The survey was conducted in December of 2013 and extension officers were interviewed using a structured questionnaire administered by trained interviewers. During a four (4) week period, interviewers visited county offices and questioned all officers in attendance with their verbal consent. The survey was done on the obligatory "office day," i.e. Wednesday of every week. Ultimately, 63 extension officers agreed to participate in the study and became the accessible population.

The instrument consisted of two substantial sections; (a) socio demographic and work related questions and; (b) 27 current food security issues derived from the *National Food Production Action Plan* (MFPLMA, 2012), including the 26 strategies listed in Table 1 and adding climate change based on more recent efforts in Trinidad and Tobago. Personal demographic and work related questions included officers' age, gender, education, intention to continue working in extension, private farm operations (if any), level of training on food security, attentiveness to global agricultural issues, work experience in extension, and being raised on a farm. These demographics were included to match the previous study conducted by Roberts et al. (2015). With respect to food security issues, topics ranged from, but were not

limited to, governmental policies, post harvest technologies, agricultural infrastructure, land distribution programs, labor force concerns, career outlook, farm certification, GAP, home gardening initiatives, agricultural research initiatives, topics in ICTs, on-farm security and climatic change.

Following the process established by Borich (1980) extension officers were asked to indicate; (a) their current level of knowledge of the issue and; (b) the importance they attached to the issue for each of the 27 issues. The *knowledge* was assessed using the scale of: Extremely Knowledgeable = 5; Very knowledgeable = 4; Somewhat Knowledgeable = 3; Slightly knowledgeable = 2; and No Knowledge = 1. *Importance* used the scale of: Extremely important = 5; Very important = 4; Moderately important = 3; Slightly Important = 2; and Not important = 1.

Content validity of the instrument was established by using *The National Food Production Action* from the Trinidad MFPLMA (2012). Face validity was established by having an expert panel familiar with survey design review the instrument. Post hoc reliability was established using internal consistency. The knowledge scale had a Cronbach's alpha of .94. The importance scale had a Cronbach alpha of .93. The instrument was deemed a valid and reliable tool to collect the required data.

Data analysis also followed the procedures established by Borich (1980). To begin, mean weighted discrepancy scores (MWDS) were calculated as follows:

1. First, a *discrepancy score* was calculated for each item by subtracting the knowledge level from the importance level.
2. Next, a *weighted discrepancy score* was calculated by multiplying the discrepancy score by the mean importance rating for that item.
3. Finally, the MWDS were calculated by averaging the responses from all participants for the weighted discrepancy scores for each item.

For Research Question 1, each item was ranked according to the MWDS. For Research Question 2, analysis was conducted using a one-way, between subjects analysis of variance (ANOVA) to compare the MWDS of each item/issue by socio demographic and work related factors of extension officers who participated in the study.

## Results

Respondents are described in Table 2. The average extension officer respondent was a 39 year old male who has worked in extension for just over 12 years. He has a tertiary level education (65.1%). He did not grow up on a farm (58.7%), nor does he currently operate a farm (63.5%). He often pays attention (44.4%) to global agricultural issues, but has not had training on food security (60.3%). Respondents were more evenly split on which extension region they worked (47.6% in the north and 52.4% in the south). They were also more evenly split on their intentions to stay working in extension (46.0% said 0 to 5 more years and 36.5% said more than 10 more years).

Table 2  
*Characteristics of Respondents*

		Frequency	Percent	Mean	SD
Age				39.58	12.36
Years Working in Extension				12.53	10.79
Gender					
	<i>Female</i>	16	25.4		
	<i>Male</i>	47	74.6		
Education Level					
	<i>Primary</i>	0	0		
	<i>Secondary</i>	5	7.9		
	<i>Tertiary</i>	41	65.1		
	<i>Undergraduate</i>	12	19.0		
	<i>Post-graduate</i>	5	7.9		
Grew Up on a Farm					
	<i>Yes</i>	26	41.3		
	<i>No</i>	37	58.7		
Currently Operates a Farm					
	<i>Yes</i>	23	36.5		
	<i>No</i>	40	63.5		
Extension Region					
	<i>North</i>	30	47.6		
	<i>South</i>	33	52.4		
Plans to Stay in Extension					
	<i>Leave at first opportunity</i>	3	4.8		
	<i>0 to 5 more years</i>	29	46.0		
	<i>6 to 10 more years</i>	8	12.7		
	<i>More than 10 more years</i>	23	36.5		
Received Training on Food Security					
	<i>Yes</i>	25	39.7		
	<i>No</i>	38	60.3		
Pays Attention to Global Ag Issues					
	<i>Never</i>	0	0		
	<i>Rarely</i>	0	0		
	<i>Sometimes</i>	27	42.9		
	<i>Often</i>	28	44.4		
	<i>Always</i>	8	12.7		

### Extension Officer Needs for Food Security Information

Overall extension officer needs for information on food security issues are presented in Table 3. Positive MWDS indicate importance of that issue was larger than knowledge level, thus indicating a

deficiency. As a group, extension officers indicated training needs in 26 of the 27 food security issues. Only *Home Gardening* had a negative MWDS (-.19). The most pressing issues included: *A place to store up-to-date and accurate data and statistics for the agricultural sector* (MWDS 4.62) and

*Research and development for both livestock and crop farmers (MWDS 4.14).*

Table 3

*Overall Mean Weighted Discrepancy Scores for Food Security Issues*

Food Security Issue	MWDS
1. A place to store up-to-date and accurate data and statistics for the agricultural sector.	4.62
2. Research and development for both livestock and crop farmers.	4.14
3. National-level legislation that addresses production, land use, health, safety, human resources, and trade.	3.84
4. National-level policies for production, land use, health, safety, human resources, and trade.	3.79
5. Water management and flood control systems such as on-farm ponds, irrigation systems, and rainwater harvesting systems.	3.21
6. Research and development in product development and value-added processing.	3.18
7. Postharvest technologies that create employment opportunities, increase returns to farmers, improve food quality, and ensure food safety.	2.83
8. Young people entering careers in the agricultural sector.	2.82
9. On-farm security to minimize the sale of stolen produce.	2.67
10. Land distribution program focused on small and large farms.	2.63
11. Well-maintained farm access roads.	2.61
12. Partnerships between public sector agencies, research institutions, and the private sector to provide suitable capacity to deliver all food production programs.	2.60
13. Incentives for people in the agricultural sector to develop new knowledge and innovations.	2.55
14. Local foods initiatives (programs that encourage consumers to buy foods grown locally).	2.50
15. Climate change and its impacts.	2.48
16. Farm certification system.	2.47
17. Private sector involvement along the value chain to increase market access.	2.42
18. Specialized loan products for agricultural producers.	2.41
19. Technology packages (of information) to help farmers improve yield, quality, and availability.	2.39
20. Extension services to build capacity and transfer technologies to farmers.	2.29
21. Using modern Information and Communication Technologies to improve communication, efficiency, and effectiveness.	2.21
22. Post-harvest storage facilities strategically located near farms.	2.11
23. Training farmers in Good Agricultural Practices (GAP).	2.05
24. An incentive program that is focused on outputs.	1.94
25. Promotional programs to encourage consumers to eat healthy local foods.	1.52
26. Semi-skilled labor force to meet the labor needs of the agricultural sector.	1.50
27. Home gardening, especially for vegetable production.	-.19

**Variability in Training Needs of Extension Officers**

Extension officers are busy people and a one-size-fits-all training approach may not provide the most efficient and effective approach to deliver professional development training. Observed differences are presented in Table 4. Fourteen of the 27

(51.8%) of the food security issues varied based on one of the descriptive variables included in the study. Training needs varied for four descriptive variables: *Plans to Stay in Extension* (5 food security issues), *Education Level* (4 food security issues), *Pays Attention to Global Issues* (3 food security issues), and *Received Training on Food Security* (2 food security issues).

Table 4  
*Differences in Training Needs for Extension Officers*

Variable Food Security Issue	MWDS			
	<i>Leave at First Opportunity</i>	<i>0 to 5 Years</i>	<i>6 to 10 Years</i>	<i>10+ Years</i>
<i>Plans to Stay in Extension</i>				
Postharvest technologies that create employment opportunities, increase returns to farmers, improve food quality, and ensure food safety ( $F = 4.38, p = .01$ )	4.16	1.15	5.20	3.98
Local foods initiatives (programs that encourage consumers to buy foods grown locally) ( $F = 3.03, p = .04$ )	6.91	1.57	3.11	2.88
Training farmers in Good Agricultural Practices (GAP) ( $F = 2.90, p = .04$ )	4.44	1.38	5.00	1.55
An incentive program that is focused on outputs ( $F = 6.20, p = .00$ )	10.54	1.09	2.47	1.72
Home gardening, especially for vegetable production ( $F = 3.63, p = .02$ )	-5.31	.14	1.99	-.69
<i>Education Level</i>	<i>Secondary</i>	<i>Tertiary</i>	<i>Undergraduate</i>	<i>Graduate</i>
Research and development in product development and value-added processing ( $F = 8.69, p = .00$ )	6.55	4.39	.68	-4.10
Partnerships between public sector agencies, research institutions, and the private sector to provide suitable capacity to deliver all food production programs ( $F = 4.03, p = .01$ )	8.39	2.42	.95	2.29

Climate change and its impacts ( $F = 3.69, p = .017$ )	1.18	1.28	-1.58	-1.72
Technology packages (of information) to help farmers improve yield, quality, and availability ( $F = 2.92, p = .04$ )	7.54	1.94	1.40	3.35
<i>Pays Attention to Global Issues</i>	<i>Sometime</i>	<i>Often</i>	<i>Always</i>	
	<i>s</i>			
Water management and flood control systems such as on-farm ponds, irrigation systems, and rainwater harvesting systems ( $F = 3.40, p = .04$ )	3.03	4.15	.54	
Postharvest technologies that create employment opportunities, increase returns to farmers, improve food quality, and ensure food safety ( $F = 4.29, p = .04$ )	2.93	3.71	-.52	
Using modern Information and Communication Technologies to improve communication, efficiency, and effectiveness ( $F = 4.57, p = .01$ )	2.36	2.99	-.99	
<i>Received Training on Food Security</i>	<i>Yes</i>	<i>No</i>		
Farm certification system ( $F = 4.60, p = .04$ )	.96	3.46		
Technology packages (of information) to help farmers improve yield, quality, and availability ( $F = 4.28, p = .04$ )	-1.13	2.10		

## Discussion, Conclusions, and Recommendations

### Discussion

Although many persons and agencies are tasked with food security objectives, extension officers have a significant role to play. They are the link between the government and producers and as such their knowledge of food security issues are important if they are to be effective agents of change. In many situations, extension officers are the bridge between agricultural policy makers and the stakeholders they serve. Failure to invest in this important human capital will most certainly negatively impact the implementation of any

agricultural policy. Extension officers can also be a valuable link between agricultural researchers and the farmers by bringing their urgent problems to the research stations. Developing extension officers' knowledge can be one strategy to enhance interaction between researchers and extension officers.

The food security issues assessed in this study were derived from the *National Food Production Action Plan* of the Government of Trinidad and Tobago, which was developed after wide consultation among stakeholders in the food production sector. Extension officers highest knowledge needs had to do with the storage of up-to-date and accurate data and statistics. Data storage and retrieval has been shown to be a

key necessity to drive agricultural development (Hoeffler, 2006; Oluoch-Kosura, 2010). If extension officers are unable to capture, store and retrieve data on a regular basis then they will be unable to fully support food security goals at the field level and, more importantly, provide timely feedback to policy makers who are tasked to monitor outcomes. The other highest training need was in the area of research and development to support farmers. Research and development has also been shown to be a key component of food security action plans (von Braun, 2007) and as such, extension in Trinidad needs to be fully supported by adequate research and development. This finding is similar to the findings of Roberts et al. (2015) who found Trinidad farmers expressed research and development as their highest priority need in their quest for food security. Research and development for product development and food processing was a similar need.

Extension officers also indicated some activities at the national level were needed: national level legislation and national level policies that address food production, land use, health, safety, human resources, and trade as well as water management and flood control system, all of which can only be successful on a national scale. This is in keeping with the findings of Grote (2014) who proposed policy reforms are needed to improve global food security.

Extension officers had little need for training in the issue of incentives programs, eat healthy promotion programs and labor needs for the sector and no need for training in home gardening. These issues are not recent issues developed to support food security initiatives. They have been components of all national agricultural programs for several years and as such the finding is not unexpected, as both the public and extension are likely already knowledgeable of these issues.

Extension officers who indicated they intend to stay more than six years in the occupation had highest training needs. These needs must be fulfilled if food security goals are to be achieved since they are in direct contact with farmers, and will be for the foreseeable future. This represents approximately 50% of the extension officers, so the impact on food security could be significant if needs are not met.

The attained education level of extension officers jumps out as a potential area for intervention. The trend of the MWDS shows those with secondary level and diploma level training have greater needs for training in most of the issues assessed, compared to those with undergraduate and postgraduate degrees. It appears that at the secondary school level and diploma level institutions, less attention is paid to the issues of food security. A further examination is needed as well as restructuring of curriculum from production only issues to include the wider issues needed by extension officers for effective food security actions.

Extension officers who always keep abreast of global agricultural issues were more knowledgeable of food security issues than those who did not keep themselves regularly updated. They were particularly very knowledgeable on use of ICTs and modern post harvest technologies; two key areas for action to achieve food security. The area of water management needs special attention for knowledge increase. Water is a precious commodity in Trinidad and its wise use is important in the era of changing climate (FAO, 2008; Frederick, 1991) if food production and processing activities are to be increased to meet food security goals.

Training was also found to be an important factor. Food security has been on Trinidad and Tobago's national agenda for some time now and workers across agri-sectors, including extension, have some

access to training to build capacity. Staff of the extension service who did not participate in such training needed much more information than those who participated. Non-participants may be recent staff additions to the service or were absent for some other legitimate reason, as most training is often mandatory. A full complement of trained staff can hasten the achievement of food security.

### Conclusions and Recommendations

The results of this study show extension officers are not fully empowered with all the essential knowledge they require to support national food security objectives. Even though the issues investigated in this study were distilled from the government's *National Food Production Action Plan* and the respondents all belonged to the public (government) extension service, it is noteworthy that the higher ranked knowledge deficit area dealt with issues of policy and legislation and other actions which need governmental intervention.

The findings of extension officers training needs for food security bears several similarities to those of the food security training needs of farmers whom they service (Roberts et al., 2015). For Trinidad to make faster progress towards national food security, it is recommended that one strategy should be a meeting of government extension, its policy makers, and farmers to decide on definite steps which can be taken by the extension service to hasten the process. Policy and legislation were top ranked issues for intervention; however, these often take time. There were many other issues identified that could be classified as "low hanging fruit" which extension supervisors can immediately address to bring staff up to the knowledge levels required in these particular areas.

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